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CONTENTS

Meet the ITA ................................................................. 6
Thank You to Our Photo Contributors .................................. 8
Approaching 2016, Business Forecasts Point Upward
  for Global Aerospace Market .................................................. 9
Berkshire Hathaway/Precision Cast Deal Tracks Continued
  Strong Demand in Aerospace Market ....................................... 14
Desalination and Solar Energy – A New Age ......................... 18
Effort by ITA’s Industrial Sub Group Looks to Remove Restrictions
  on Grade 12 Titanium to Expand Applications ....................... 22
International Tele-Mentor Program (ITP) is Ready to Accept Your
  Mentoring Application Today .................................................. 24
Executive Profile; Women in Titanium – Heather Wollerman ........... 24
ITA’s Grant Committee Extends Congratulations to
  This Year’s Academic Scholarship Winners ............................. 28
Reinforcing ‘Staples’ for Concrete Bridge Secures
  2015 Titanium Applications Development Award ..................... 31
ITA Lauds Career of Walter Herman With Lifetime Achievement Award ... 35
ITA Safety Committee Makes Major Additions to ITA Website .......... 36
Life Cycle Costing Session Demonstrating True Long-Term Value of Titanium 38
New ITA Members ............................................................. 41

From the Wire
  In Acquiring Aerometals & Alloys, ACNIS International is
    Reinforcing its Position in the Aeronautics Industry .................. 46
  Westmoreland Mechanical Testing & Research Signs Long-Term
    Contract with Böhler Schmiedetechnik .................................. 48
  Rolled Alloys Receives Silver Boeing Performance Excellence Award .... 48
  ISGEC & Titan Create Joint Venture Manufacturing Operation ........ 51
  Norsk Titanium Appoints Christopher E. Kubasik Chairman of the Board ... 51
  Retech Systems LLC Announces Acquisition of Equipment & Process
    Patents From Ajax Tocco Magnethermic Corporation .................... 52
  Solar Atmospheres of California Adds Additional Large Furnace Capacity ... 52
  Tricor Metals Hires Jacob Whitesides, Project Manager .................. 54
  Perryman Company Enhances Revert Capabilities With Acquisition
    of Spectralloy, LLC .......................................................... 54
  Praxair to Market Fine Titanium Powders for the
    Additive Manufacturing Industry ........................................ 57
  In Memoriam ........................................................................ 58
  Titanium Career Announcements .......................................... 58
  Titanium Buyers Guide: Producers, Distributors, Fabricators, OEM’s,
    & Vendors to the Industry .................................................. 62
  Advertiser Index ............................................................... 98
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# Meet the ITA

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<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Responsibilities</th>
</tr>
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<tbody>
<tr>
<td>Dawne S. Hickton</td>
<td>ITA President, Women in Titanium Chair, Former CEO RTI International Metals, Inc.</td>
</tr>
<tr>
<td>Hunter R. Dalton</td>
<td>Executive Vice President, Strategic Growth Initiatives, ITA Vice President</td>
</tr>
<tr>
<td>Henry Seiner</td>
<td>Vice President - Business Strategy, TIMET, Titanium Metals Corporation, ITA Treasurer/Secretary</td>
</tr>
<tr>
<td>Brett S. Paddock</td>
<td>T.I. (Titanium Industries, Incorporated) President &amp; CEO, ITA Past President, Grant &amp; Membership Committee Chair</td>
</tr>
<tr>
<td>Lawrence D. Buhl III</td>
<td>Chief Executive Officer, Lawrence Holdings, Inc., ITA Director</td>
</tr>
<tr>
<td>Dr. Markus Holz</td>
<td>President, AMG’s Engineering Systems Division CEO, ALD Vacuum Technologies GmbH, ITA Director, Education Committee Co-Chair</td>
</tr>
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## Staff

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<thead>
<tr>
<th>Name</th>
<th>Title and Responsibilities</th>
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<tr>
<td>Jennifer Simpson</td>
<td>Executive Director</td>
</tr>
<tr>
<td>Ashleigh Hayden</td>
<td>Senior Sales Associate</td>
</tr>
<tr>
<td>Jennifer King</td>
<td>Operations Manager</td>
</tr>
<tr>
<td>Marisa Henriksen</td>
<td>Conference Registration &amp; Housing</td>
</tr>
<tr>
<td>Rebecca Verhaeghe</td>
<td>Membership Services Associate</td>
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</tbody>
</table>

## Contributor

### Michael Gabriele

A former managing editor with American Metal Market, Michael C. Gabriele has been a journalist for over 35 years and has done extensive freelance work for the International Titanium Association since 2005. He is based in Clifton, NJ.

## Educational Instructors

- Dietmar Fischer
- James Robison
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Cover Photograph provided by Frauke Hogue, Hogue Metallography http://hoguemet.com/ who has generously donated this image for ITA’s use in creating a variety of promotional items with all proceeds being donated to support the Women in Titanium committee. Frauke explains the image is Ti-6Al-4V, heated above the beta transus and air cooled. Then it has been etched with ASTM #186 and photographed in polarized light with sensitive tint plate to produce the colors. Ti-6Al-4V consists of 90% titanium, 6% aluminum and 4% vanadium. The use of Ti-6Al-4V for turbine blades in critical areas increases the efficiency and life of low-pressure steam turbines while decreasing downtime and maintenance. Ti-6Al-4V is the most widely used titanium alloy and accounts for nearly 45% of total titanium production.
Approaching 2016, Business Forecasts Point Upward for Global Aerospace Market

On the eve of the International Titanium Association’s annual TITANIUM conference and exhibition, (Oct. 4-7 at Rosen Shingle Creek Golf Resort, Orlando FL) and heading into 2016, all signs point to sustained growth in the global commercial aerospace industry—the titanium industry’s largest business sector.

Recent business forecasts and quarterly reports from major aerospace original equipment manufacturers suggests “upward and onward” growth during the next 10 years and beyond, which, by extension, translates into strong business opportunities for the titanium industry.

Some industry executives, observing the growth trends, have expressed concerns regarding the strength of links in titanium’s global aerospace supply chain. Olivier Cauquil, the senior vice president, material and parts procurement, and the chairman of the Airbus Group Material Board, quoted earlier this year, discussed the need to “de-risk” the supply chain. Cauquil said Airbus will look to do this through “horizontal collaboration” within the supply chain to simplify the flow of materials and parts. He said Airbus’ procurement of materials and parts “is articulated around five strategic objectives: commercial savings; double sourcing when relevant, de-risking the supply chain in the perspective of significant productions rates; optimization of material use (the fly-to-buy ratio) with additive manufacturing, friction-stir welding and recycling; and an emphasis of vertical integration in the supply chain.

Similarly, John P. Byrne, Boeing’s vice president, aircraft materials and structures, said Boeing is touting its “partnering for success” program for its supply chain partners. Byrne said Boeing is seeking “sustainable progress” and has a target of over $1 billion in savings in 2015. Last year Boeing implemented over 500 supplier ideas, which in turn yielded $1 billion in cost savings, he said. As for titanium, Byrne said specific supply chain standards going forward will include an emphasis on the use of more near-net forgings and extrusions; the exploration of new production technologies such as additive manufacturing and high-speed machining; and continued progress on increasing scrap/revert collection.

Global Market Forecast

An online 2015 aerospace industry market forecast, posted by Deloitte Touche Tohmatsu Ltd. (https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Manufacturing/gx-mnfg-2015-global-a-and-d-outlook.pdf), stated that, compared with 2015 levels, commercial aircraft production is anticipated to “increase significantly” during the next 10 years. The Deloitte Touche Tohmatsu aircraft delivery forecast was illustrated in a bar chart that projected annual aircraft deliveries in 2025 would reach 1,686 units, compared with 1,403 units this year—an increase of 20 percent.

The forecast indicated that this projected growth could spur the entrance of new global competitors to the existing duopoly (Airbus and Boeing). The report didn’t identify potential competitors, but one candidate known within the titanium industry is Commercial Aircraft Corporation of China (COMAC), which was founded in May 2008 in Shanghai, with the mission of becoming a major air transport manufacturer. Titanium industry sources also indicate that India is looking to become a player in the commercial aerospace market.

“IT is likely that new aircraft production programs may emerge from non-U.S. and European countries, and that they will face challenges introducing new products due to a lack of a track record,” the forecast stated. “This may result in expected new sales order challenges, possible delays in product development, and difficulty in establishing a track record of reliable, safe, and trouble-free operating history, which takes time. Given the (projected) demand for new aircraft over the next 20 years, new entrants are likely to eventually experience some level of sales and production success.”

Echoing the concerns mentioned above by the Airbus and Boeing executives, the Deloitte Touche Tohmatsu report stated that the rapid growth is expected to present challenges to the global aerospace supply chain to keep pace with demands from OEMs. The accelerating pace of business to build commercial jets, to keep pace with growing demand, especially in the Asian markets, will mean that suppliers will need to “dramatically increase the rate of production of components, systems, and services,” according to the report.

“Over the past decade, many aerospace suppliers have successfully met customers’ challenges by changing their business model,” the forecast pointed out. “Examples include investing in non-recurring research and development costs in new aircraft production programs, hiring design engineering staff to produce detailed designs for parts, investing in tooling for manufacturing, and managing a cadre of lower tier suppliers themselves. However, many aerospace suppliers have struggled to meet the new expectations and investment requirements.”

Long-Term Outlooks

Aerospace giants Boeing and Airbus issued statements during the recent Paris Air Show on their respective long-term business forecast—numbers that mirrored their projections are recent TITANIUM forums. Boeing forecasts long-term demand for 36,770 new airplanes, valued at $5.2 trillion through the year 2033. Single-aisle airplanes will continue to command the largest share of the market. Approximately 25,680 new single-aisle airplanes will be needed over the next 20 years. Airbus,
with an outlook that runs through the year 2032, projects that the growth in global air traffic will require over 29,000 new passenger aircraft and freighters deliveries at a value of nearly $4.4 trillion. Much like Boeing, Airbus indicated single-aisle aircraft will make up the majority of the overall total.

Embraer S.A., São José dos Campos, São Paulo, Brazil, in its recent financial report, said its firm order backlog reached nearly $23 billion, the highest level in the company’s history. Embraer said that, during the second quarter it delivered 60 aircraft: 27 jets to the commercial aviation market and 33 jets to the business aviation market. During the comparable period in 2014 it delivered 58 aircraft. Embraer, in a statement carried by PR Newswire on June 15, released its 2015-2034 market outlook, which forecasted deliveries of new aircraft over the next twenty years. The report focused on the 70 to 130-seat capacity category which is valued at $300 billion during that period. Embraer projects deliveries of 6,350 jets: 2,250 units in the 70 to 90-seat segment; and 4,100 units in the 90 to 130-seat segment, for an overall value of $300 billion. Montreal-based Bombardier Commercial Aircraft, on June 14, released its annual market forecast, projecting 12,700 aircraft deliveries from 2015-2034 in the 60- to 150-seat segment, valued at $650 billion.

Titanium Heavyweights

As for examples of jet platforms that reflect major levels of titanium (estimates that include fasteners), the list of “titanium heavyweights” includes 180,000 pounds for the A380 and 145,000 pounds for the A350, both from Airbus; 170,000 pounds for the Boeing 787 and 120,000 pounds for Boeing’s 777X, and 32,000 pounds for the regional C919 built by Comac. These estimates were presented at recent International Titanium Association conferences.

Bill Bihlman, the president of Aerolytics LLC, South Bend, IN, a speaker at the SpeedNews conference, held March 2 in Beverly Hills, CA, defined annual aerospace raw material (mill products) demand at 1.4 billion pounds, valued at $11 billion. Bihlman also gave a presentation at TITANIUM 2014 in Chicago, estimating that the titanium supply chain or “value chain” for the global aerospace industry represents an annual output volume of 130 million pounds of titanium. He said aerospace titanium accounts for 40 percent of the total titanium market and represents 12 percent of all aeromaterial demand.

More Passengers, More Planes, More Fuel

The strong growth in the number of global airline passengers, especially customers in the emerging middle-class economies of India, China and Indonesia, continues to expand the commercial aircraft market. A recent Associated Press report, citing information from the International Air Transport Association, Montreal, said the number of passengers expected to more than double to 7.3 billion a year by 2025.

Henry Seiner, vice president of business strategy for Timet, and the chair of the ITA’s aerospace committee, addressing the 2014 TITANIUM conference, quoted information from a study compiled by Airline Monitor, Ponte Vedra Beach, FL, report, which predicted the Asia/Pacific region will continue to grow in terms of its share of world commercial airline traffic. Airline Monitor indicated that the Asia/Pacific region, by the year 2035, will have an estimated 43 percent of world traffic, compared with 30 percent in 2013. By contrast, the United States will hold 13 percent in 2035, compared with 27 percent in 2013, while Europe will have 19 percent in 2035, down from 27 percent in 2013.

Transporting this vast number of passengers will require airlines to significantly increase their purchase of jet fuels, considered one of the largest and most volatile costs associated with the commercial aviation business. A recent Associated Press report said that U.S. airlines currently “burn through 45 million gallons every day.” As a result, major aerospace engine manufacturers—Rolls Royce, General Electric and Pratt & Whitney—are being compelled to develop higher performance, next-generation engines. Wade Leach, vice president of sales, marketing and product management, ATI Specialty Materials, Monroe, NC, in a presentation at TITANIUM 2014, observed the trend of “evolutionary change” for jet engine design.

Leach said industry demands are calling on manufacturers to create “greener” jet engines—with reduced noise and emissions, improved fuel efficiency, and lower operating costs for airlines. To boost fuel efficiency and reduce emissions, new designs and materials will be needed to survive higher engine operating temperatures. For new designs in engine components, Leach anticipated the use of composites, more nickel-based superalloys specified for the engine compressor section, a new wave of titanium-based materials such as gamma titanium/铝合金 alloys, and the implementation of advanced production techniques such as additive manufacturing.

A potential option to reduce fuel costs might come through the use of advanced biofuels made from agricultural waste, municipal trash, or specialty crops. Fulcrum BioEnergy Inc., Pleasanton, CA, in a June 30 press release posted on PR Newswire, stated that Chicago-based United Airlines has invested in a $30-million stake in Fulcrum, giving United the “option to directly participate in waste-to-jet fuel plants across North America.

According to an online report by Air Transport World, United signed a long-term supply agreement with Fulcrum “giving it the opportunity to purchase at least 90 million gallons of sustainable jet fuel a year for a minimum of 10 years, beginning in 2018, at a cost competitive with conventional jet fuel.” The United agreement covers the joint development of up to five refineries located near the airline’s U.S. hubs, with the combined capacity to produce up to 180 million
TITANIUM (all materials) is projected to reach global market for aerospace fasteners. GlobalFastenerNews stated that the Fastener Industry News, Portland, OR. GlobalFastenerNews.com, a unit of ID=39&ArticleID=11237)

Main.asp?SectionID=26&SubSectionId=39&ArticleID=11237 posted by GlobalFastenerNews, a unit of Fastener Industry News, Portland, OR. GlobalFastenerNews stated that the global market for aerospace fasteners (all materials) is projected to reach $6.8 billion by the year 2018, boosted by increased shipments of aerospace equipment and the growing trend towards large-sized aircrafts.

The online article drew on information from research report by Global Industry Analysts Inc., San Jose, CA, titled: “Aerospace Fasteners: A Global Strategic Business Report.” The report indicated that while titanium fasteners, introduced in the 1960s for use in military aircraft, has made significant moves into commercial aircraft. Fastener technology has been in the spotlight during the development of the high-profile, composite-intensive commercial aircraft such as the Boeing 787 Dreamliner.

“The current global demand for titanium fasteners is expected to double over the near-term, mainly due to the advantage of a favorable strength to weight ratio when compared to other ferrous, aluminum and nickel alloys, making it an ideal fastener material for both commercial and military airframe applications,” the GlobalFastenerNews story stated. “Use of titanium fasteners over the years has extended to jet and other engine support structures as well as aircraft landing gears.”

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While United’s interest in biofuel doesn’t directly affect the titanium industry, fuel is a major cost category for the airline industry and provides a key financial indicator that helps determine the near-term health, profitability and performance of the global commercial aerospace sector. The cost of fuel, by extension, is also an underlying factor that impacts engine design. As such, jet fuel costs, and potentially viable alternative sources, represents an “indirect” but important area of interest for the titanium industry—a development worth bookmarking and watching.

Securing a Fastener Forecast

Another perspective on commercial aerospace business forecasts that has a direct impact on the titanium industry comes from a recent online report (http://globalfastenernews.com/main.asp?SectionID=26&SubSectionID=39&ArticleID=11237) posted by GlobalFastenerNews.com, a unit of Fastener Industry News, Portland, OR. GlobalFastenerNews reported that the global market for aerospace fasteners (all materials) is projected to reach
The following chart provides a quick overview of the features and advantages of TFC’s coating processes:

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<thead>
<tr>
<th>substrates</th>
<th>advantages</th>
<th>benefits</th>
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<tbody>
<tr>
<td>Titanium</td>
<td>Stable base for other coatings &amp; adhesive bonding; appearance; color coding</td>
<td>Prevents fretting &amp; galling</td>
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<tr>
<td>Titanium Alloys</td>
<td></td>
<td>Natural, reproducible colors</td>
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<tr>
<td>Aluminum</td>
<td>Non-toxic;</td>
<td>Corrosion-resistance</td>
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<tr>
<td>Steel</td>
<td>Non-hazardous;</td>
<td>No hydrogen embrittlement</td>
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<tr>
<td>Alloys</td>
<td>Nonpolluting</td>
<td>High operating temperature (1100°F)</td>
</tr>
<tr>
<td>Titanium</td>
<td></td>
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</tr>
<tr>
<td>Aluminum</td>
<td>Hardness; eliminates burning &amp; dissolution of parts</td>
<td>Allows aluminum application where wear, corrosion or other factors would otherwise exclude its use</td>
</tr>
<tr>
<td>Aluminum Alloys</td>
<td></td>
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<tr>
<td>Virtually all</td>
<td>Automatic &amp; manual application; TFC processes comply with a variety of mil specs; combines with other coatings</td>
<td>Provides excellent lubricity</td>
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<tr>
<td>metals</td>
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<td>Improves corrosion resistance</td>
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Berkshire Hathaway/Precision Cast Deal Tracks Continued Strong Demand in Aerospace Market

Seismic shifts in the global titanium industry have unfolded in 2015, with an eye on capturing business in the lucrative aerospace sector. Two powerhouse transactions on this front include the recently announced agreement by Berkshire Hathaway Inc., Omaha, NB, to acquire Precision Castparts Corp., Portland, OR, and aluminum giant Alcoa finalizing its purchase of RTI International Metals Inc., both of which are based in Pittsburgh.

While these are separate, unrelated deals, it’s clear both transactions will have an impact on the titanium industry’s global supply chain regarding applications in aerospace manufacturing. The promise is that such deals will help to strengthen the supply chain. The deals also may provide resources needed to invest in and further develop leading-edge production technologies, such as 3D/Additive Manufacturing. Heavyweight aerospace original equipment manufacturers Boeing and Airbus, in recent forecast statements through the year 2033, anticipate demand for 26,000 to 37,000 commercial jets— with an estimated market value of $4 trillion to $5 trillion.

Veteran market analyst Chris Olin, the founder of Cleveland-based Olin Research Group LLC, observes that, for the most part, the titanium industry so far sees the Berkshire Hathaway move to acquire Precision Castparts as mainly a financial transaction. “But what it does do is put confidence in the titanium market,” Olin said. He noted that, in recent months, some Wall Street analysts have questioned whether the ambitious commercial jet build-rate projections touted by aerospace companies are actually sustainable.

“Berkshire sees long-term opportunities in its investments and was willing to pay a premium price for Precision Castparts. Berkshire looks at the long-term business cycle and sees aerospace manufacturing as a market with great promise.”

Olin also noted that, during the last three business quarters, Precision Castparts has fallen short of earnings expectations from Wall Street investors, mostly due to the slump in the oil and gas sector, which occupies about 15 percent of the company’s overall business portfolio. As a result, he said Precision Castparts’ stock price has dipped to $190 per share compared with $270 per share earlier this year. As a result, the offer from Berkshire “was too good to refuse,” he observed.

Regarding its management strategy for acquisitions, Olin said Berkshire Hathaway “tends to have a hands-off approach.”

As far as Alcoa completing its purchase of RTI, Olin sees this as an especially interesting situation. “Here you have a very strong player (Alcoa) moving into a specialty metal marketplace (titanium). This creates the possibilities of Alcoa moving further into jet engines and doing business with Airbus,” through its forging and aluminum segments. He said the move signals that Alcoa is poised to put more emphasis on the aerospace industry. “Buying a large titanium company like RTI could mean Alcoa is ready to invest a significant amount of money to expand its (new) titanium business to go after aerospace contracts.”

What’s the big-picture outlook for the titanium industry in the wake of these mega deals? Olin said he wouldn’t be surprised to see further merger and acquisition activity during the next six to nine months. “Big companies are looking to find ways to own the supply chain. This could mean additional deals. For example, now that it owns the RTI assets, does Alcoa need to be a player in nickel-based alloys?”

Precision Castparts (PCC), in a press release posted on its website (www.precast.com), dated Aug. 10, 2015, announced that its board of directors, along with executives from Berkshire Hathaway, “has unanimously approved a definitive agreement for Berkshire Hathaway to acquire, for $235 per share in cash, all outstanding PCC shares. The transaction is valued at approximately $37.2 billion, including outstanding PCC net debt.” The deal is slated to be finalized by the first quarter of 2016. The release quoted the well-known “Oracle of Omaha” Warren E. Buffett’s management and investment philosophy and how we manage PCC for the long-term. We believe that, as part of Berkshire Hathaway, PCC will be exceptionally well-positioned to support our customers’ needs into the future. This transaction offers compelling and immediate value for our shareholders, and allows PCC’s employees to continue to operate in the same manner that has generated many years of exceptional service and performance to our customers.”

Berkshire Hathaway and its subsidiaries engage in diverse business activities including insurance and reinsurance, utilities and energy, freight rail transportation, finance, manufacturing, retailing and services, as indicated in the press statement. PCC is a worldwide, diversified manufacturer of complex metal components and products. It serves the aerospace, power, and general industrial markets. PCC is a leading producer of titanium and nickel superalloy melted and mill products for
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FROM MELT TO FINISHED PRODUCT

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Titanium Production
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- Precision Centerless Ground Bar
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- Premium Fine Wire
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the aerospace, chemical processing, oil and gas, and pollution control industries, and manufactures extruded seamless pipe, fittings, and forgings for power generation and oil and gas applications. PCC produces complex structural investment castings and forged components for aerospace markets, machine airframe components, and highly engineered, critical fasteners for aerospace applications, and in manufacturing airfoil castings for the aerospace and industrial gas turbine markets.

The transaction garnered extensive coverage from The New York Times and The Wall Street Journal. The Times, in its Aug. 11 edition, said the deal would propel Berkshire Hathaway “further into the industrial sector. Not only is the acquisition Mr. Buffett’s most ambitious, but it is also a standout in what has been a banner year for mergers, with more than $2.7 trillion in deals already announced.” The article stated that PCC would fit well with Berkshire Hathaway’s other industrial acquisitions in the last decade, such as chemical producer Lubrizol and industrial manufacturer Marmon.

The Journal, in its Aug. 11 edition, described the managerial dynamics of the “match made in Omaha,” which indicated Buffett “hadn’t even heard of PCC” when of Todd Combs, one of Berkshire Hathaway’s two investment managers, began buying shares in 2012. The lead paragraph of the article stated that Warren Buffett needed only a half hour with PCC’s Mark Donegan to decide that his aerospace company was worthy of Berkshire’s largest acquisition ever. The article also indicated that Donegan, who joined PCC in 1985 and has led the manufacturer since 2002, would remain with the venture once the deal is finalized.

As mentioned, Alcoa, in July, completed its deal with RTI, which was announced online on Business Wire. “With RTI, Alcoa expands its reach into titanium—the world’s fastest-growing aerospace metal—and adds advanced technologies and materials capabilities for greater innovation power in aerospace and beyond,” the Alcoa release said, noting that the RTI transaction “positions Alcoa to capitalize on strong growth in the commercial aerospace sector.” Alcoa also stated it expects global aerospace sales growth of 8 to 9 percent in 2015. “Projections for 2016 and 2017 sales growth have nearly doubled to 8 and 13 percent, from 4 to 5 percent and 6 percent, respectively, showing the ongoing strength of the sector. Eighty percent of RTI’s revenues in 2014 were from the aerospace and defense industries. With RTI, Alcoa’s 2014 pro forma aerospace revenue increases by 13 percent to $5.6 billion.”

The press statement explained that RTI is being integrated as a stand-alone business unit into Alcoa’s downstream Engineered Products and Solutions (EPS) segment. “The new business unit, called Alcoa Titanium & Engineered Products (ATEP), will be led by Eric Roegner who has been named President of ATEP, effectively immediately. RTI’s titanium operations span midstream processes such as melting, ingot casting, bloom, billet, plate and sheet production; and downstream extrusions for aerospace, oil and gas applications, high-speed machining, and production of integrated subassemblies primarily for aerospace. These capabilities complement Alcoa’s titanium investment casting and forging capabilities, and enable a value-creating closed titanium scrap loop.”

RTI’s advanced manufacturing and materials technologies, such as high-velocity machining, forming, extruding and parts assembly operations, would enable Alcoa to produce some of the largest, most complex and finished aerospace components, according to the press release. “RTI expands Alcoa’s additive manufacturing capabilities to produce 3D-printed titanium, specialty metals and plastic parts for aerospace, medical and energy applications. RTI also grows Alcoa’s portfolio of cutting-edge materials, including titanium aluminides, increasingly used to manufacture lightweight, aerodynamic jet engine parts for next-generation jet engines.”
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Desalination and Solar Energy - A New Age
Contributor: Dennis J. Schumerth, ASME Fellow & Principal – DBA Titanium Tubular Consultants

The American author and humorist Mark Twain once remarked: “Whiskey is for drinkin’, water is for fightin’ over.” While considered a borderline grammatical violation of the pluperfect tense, the euphemistic accuracy of Mr. Twain’s statement has never been more apparent and relevant today where not only sustaining but growing expanded access to this precious life resource for seven-plus billion souls has emerged as a pillar of future species viability.

Notwithstanding historical millennia vs. current-day pro and con climate change alarmist arguments, localized parts of the world are being deluged with massive amounts of storm water. Indeed rising sea levels, severe flooding and horrific weather has been championed as the hallmark of impending climate change Armageddon. In stark contrast, severe localized shortages of this precious liquid continue to permeate our planet. These drought-stricken areas are diversely global existing in Europe, the western and central United States, Canada, Eastern Asia, North Korea, equatorial Africa, Australia and South America.

In areas of the Western world, only now are the cloaked-in-historical-denial political pundits imposing too-little, too-late, “knee-jerk” punitive rhetoric in favor of drastic measures to curtail, much less expand the use and availability of this precious commodity. Other less fortunate global inhabitants or developing nations totally lack or have limited resources to manage their own destiny let alone adopt conservation measures or expand necessary infrastructure.

As a blatant example of Italian economist Pareto’s 80/20 principle politicized, conservation measures imposed by local, miss-directed bureaucrats in the Western United States are currently and unfairly penalizing the populace that consumes the least of the resource. Rather than expand infrastructure, contentious water-rights finger-pointing, principally between municipalities and agriculture has replaced sound management decisions. The world continues to be frustrated by the words echoed from the poem by Samuel Taylor Cooleridge in his famous Rime of the Ancyent Marinere: “water, water everywhere, nor any drop to drink.”

Taking a page from recent history books where potable water production, particularly in the Middle East, has succeeded by necessity, this author proposes the expanded use of sea and brackish water desalination as a solution to alleviate the increasing shortage of fresh water that exists in many parts of the world today. Such a proposed solution faces a host of colossal challenges. At the forefront, palpable economics always lead the way with detractors pointing to a suspect ROI; Pollyannaisms and other special interest groups will identify ecological impracticality, while still others will impede progress by whatever benign means available just to present opposition.

This proposed paradigm shift in the production of potable water sourced from desalination will confront the titanium industry head-on with a host of unique and associated challenges. Following decades of successful installations that have validated the sustainability and longevity of desal water extraction processes and demonstrated the superior corrosion resistance of Grade 2 titanium vs. other materials in highly aggressive concentrated saline brine environments, the “mature,” large scale, Middle East, oil-fired, boiler-produced motive steam thermal process appears to have lost some of its luster.

Titanium faces a second challenge, wherein the “new kid on the block” called RO (reverse osmosis) has emerged scaled up to attract larger capacity users. The use of titanium materials is virtually non-existent in this process and poses a challenge to the titanium industry should RO continue its increased market penetration. Other technologies including photovoltaics, molten salt brine and other medium will challenge the titanium industry to aggressively promote and demonstrate the benefits of providing a high level of corrosion resistance and competitive cost structure in these emerging process mediums.

Two primary technology categories for desalination systems currently exist: membrane processes (RO process) and thermal distillation (evaporation). Thermal distillation is further broken out into several sub categories: multistage flash evaporation (MSF), multiple-effect evaporation (MED), and mechanical vapor compression (MVC) which is commonly used in conjunction with the MED process.

Titanium finds most of its applications in the thermal distillation category used for tubing, valves and PFHE (plate and frame heat exchangers). By contrast, titanium has only limited use in RO systems, relegated primarily to pump casings. It’s estimated that 60 percent of the desalination plants in the world use the reverse osmosis technology. However, thermal distillation is the technology used for the mega-desalination systems in the Middle East: the Ras Abou in

(Continued on page 21)
Quatar and Ras Al-Khair facility and the Yanbu 3 plant—both located in Saudi Arabia are primary examples of large capacity units. Each installation utilizes an estimated 6,000 metric tons of titanium. Recently, 2,800 km of Grade 2 titanium was supplied for an expansion of the Shoaiba Phase 2 MED desalination plant in Saudi Arabia adding a daily capacity of 91,200 m3 of water to Jeddah, Makkah and Taif implementing a strategic goal to develop additional potable water resources. Indeed, MED and MSF desalination technology has demonstrated its commercial viability and represents an industrial application that makes use of thousands of kilometers of Grade 2 titanium providing a corrosion-free support platform that has endured the test of exposure to the harsh process brines.

Fully aware that the MSF and MED thermal desalination process requires substantial quantities of energy, their wholesale implementation can be jeopardized by significant environmental impact should fossil fuels be utilized for the conversion process. Even the now-dominant, RO process technology requires like robust energy levels needed to anchor the plant parasitic pumping and filtering operations. Less energy intensive competing technologies to MSF, MED, RO and photovoltaics include movable parabolic collector plates, specialized trough design and innovative tower concepts to process updated heat-transfer fluids (Therminol®), mineral oil, molten salt brine and other medium requiring the use of both titanium and/or specialized stainless steel material choices.

As a brief interlude some years ago, one of the world’s largest engineering company proposed a series of nuclear power stations be built on the West Coast of the United States. These central station units would not produce electric power but instead be purposed as “super-size” flash evaporators generating potable water from sea water; indeed, a prospect well ahead of its time.

Facing not only the continually rising energy costs but the eventual exhaustion of the resource itself, the development of desalination technologies associated with the use of renewable energies can emerge as highly attractive, cost effective and environmentally sound. This is particularly true in the case of solar energy as geographical regions with the highest water shortages ironically tend to be those with the highest solar radiation availability.

A recent symposium dedicated solely to the application of solar energy for desalination was sponsored by the European Desalination Society and held in Almeria, Spain. This ground-breaking conference was conceived to develop the basic principles of desalination using solar energy and update attendees as to this promising and relevant technology including advanced photovoltaics, collector plates, trough design, and tower concepts culminating in a day-long tour of the local Plataforma Solar de Almeria desalination plant. It is indeed ironic that Almeria, Spain, has been touted as having the most hours of sunshine and the lowest rainfall in Europe. Much of the climate is semi-arid desert with associated sparsely populated wilderness. An annual 3,000 hours of sunshine and a natural protective barrier afforded by the sea provides for an agricultural bonanza. If the above paragraph is read too quickly, it would appear that the description would exactly fit the Golden State of California.

Desalination is not "future-gen" or hyperbole. The technology is available today and with the recent commercial operation of currently, the world’s largest, 550 MWe Desert Sunlight Solar Farm and the 377 MWe Ivanpah solar facilities, the power circle is complete. Desert Sunlight, a photovoltaic site, providing enough energy to serve the needs of about 160,000 average California homes all while displacing approximately 300,000 metric tons of carbon dioxide (CO₂) per year—the equivalent of taking about 60,000 cars off the road. The three plants at Ivanpah generate sufficient energy to serve more than 140,000 homes in California during the peak hours of the day.

Ivanpah’s BrightSource system uses proprietary software to control thousands of tracking mirrors known as heliostats to directly concentrate sunlight onto a boiler filled with water that sits atop a tower. When the sunlight hits the boiler, the water inside is heated and creates high temperature steam. Once produced, the steam is used either in a conventional turbine to produce electricity or in industrial process applications, such as thermal enhanced oil recovery. This complex will reduce carbon dioxide (CO₂) emissions by more than 400,000 tons per year with the added enhancement of energy storage. Since Ivanpah generates steam in the more traditional sense, amplicons for corrosion resistant materials should make the use of titanium as an attractive addition to the mix.

An additional desalination process is also worth mentioning. Coinciding with the now 10-year drought in the Western United States, WaterFX, in a July 15, 2015 online press release, stated its California subsidiary HydroRevolutionSM will build a commercial solar desalination plant in the Panoche Water and Drainage District in California’s Central Valley. Once constructed, HydroRevolutionSM will provide a highly sustainable water source to local water districts by using solar energy to recycle salt impaired water into freshwater.

HydroRevolutionSM will ultimately...
be able to generate up to 5,000 acre-feet of water per year, enough water for 10,000 homes or 2,000 acres of cropland. The HydroRevolutionSM plant will utilize technology developed by WaterFX™, which employs a concentrated still that uses large solar arrays to capture and heat mineral oil that then flows to a conventional MED system. What is interesting about the process is that over 90 percent of the freshwater is recovered in this process while the briny remainder can be further treated to produce minerals and salts as useable solid co-products. Furthermore, the evaporative brines should be a likely candidate for the use of titanium materials in this typically corrosive environment.

Notwithstanding the much ballyhooed greenhouse gas reduction (NOx and Sox) discharged from a highly efficient simple cycle or CCGT power generating unit, this type of RO located on the sea coast could provide additional opportunities for corrosion resistant titanium that should be used on any once-thru, sea water or brackish water cooled steam surface condenser. There are detractors to desalination systems, where energy is consumed to produce the final product. Emissions from fossil fuels, regulatory issues, plant footprint limitations, environmental and ecological impact concerns, brine disposal, sea water chloride concentration, impact on marine environment and the NIMBY (Not in My Backyard) principle all apply in some form to the activist’s platform. To combat this and elucidate potential concerns by educating the public as to the merits of desalination, conferences are being organized to address this very issue. As an example, the Ocean Sciences Conference New Orleans, a gathering which will be held in February 2016 (https://osm.agu.org/2016/), will address the impacts of seawater desalination on the marine and coastal environment.

Recent New York Times articles contained some of these paraphrased and abbreviated headlines: Major effort in Israel to desalinate Mediterranean Sea water and recycle wastewater has provided country with enough water for all its needs, even during times of drought; Australia’s largest naval base will help run desalination plant that produces about one-third of base’s potable water supply; construction of a $1-billion desalination plant in Carlsbad, CA, to supply San Diego County with potable water is the first time a major metropolis in state has turned to ocean for its water supply; the New York State Public Service Commission orders United Water New York, which provides water to most of Rockland County to drop plans for desalination plant on Hudson River urging company to explore conservation methods and locate other water sources instead.

It is imperative that the titanium industry position itself within striking distance of this ever-changing desalination industry to properly identify existing and new opportunities where “black sand” can emerge as the material of choice. The use of existing technologies including MSF, MED and its variants will continue to offer opportunities beyond traditional applications. Indeed, replacing OEM-installed yellow metals with titanium in MSF and MED plants can offer opportunities where, initially, for economic reasons, the family of heavier wall brass alloys was chosen as cheaper and a perceived resistance to saline brine conditions. Changing water conditions, sulfate and MIC attack have dramatically reduced the expected material life span of these materials. RO and photovoltaics appear to be expanding and future opportunities for movable parabolic collector plates, specialized trough design and innovative tower concepts to process updated heat-transfer fluids, mineral oil, molten salt brine and other medium will require the use of both titanium and/or specialized stainless steel materials.

Controversy is omnipresent and while replete with its detractors, progress continues to be part of the movement in promoting the process of desalination. Education must replace myopia and urgency must replace complacency. With good engineering practice and a high level of planet sensitivity, the development of desalination technologies associated with the use of renewable and other environmentally sensitive energies can evolve as a highly attractive, cost effective and environmentally sound solution.

(Editor's note: Dennis J. Schumerth, an ASME fellow, is the founder and owner of Titanium Tubular Consultants, Anaheim, CA (www.titaniumtubularconsultants.com), a consulting company that specializes in the design and improvement of cooling system materials for power plant heat exchangers.)
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Effort by ITA’s Industrial Sub Group Looks to Remove Restrictions on Grade 12 Titanium to Expand Applications

The Industrial Sub Group of the International Titanium Association (ITA), part of the ITA’s Applications Committee, has achieved a significant first step in a project to remove restrictions on the use of Grade 12 titanium on the NACE MRO 175 specifications—a standard for the petroleum and natural gas industries regarding the use and performance of industrial materials in a corrosive, hydrogen-sulfide work environment. The hope is that removing certain restrictions will open up significant business opportunities for the titanium alloy.

Rob Henson, chair of the ITA’s Industrial Sub Group, said the key development to move the project forward involves working with the Corrosion Centre of Exova Group Plc, West Midlands, U.K., which will conduct testing on titanium Grade 12 and present the findings to Houston-based NACE, formerly known as National Association of Corrosion Engineers. Henson described Exova as “the perfect choice” to work with NACE, given Exova’s track record in such projects.

NACE standards, such as MRO 175 (maintenance, repair, and overhaul), are determined through a collection of laboratory experimental data and field experience. The MRO 175 standard addresses an industrial material’s ability to withstand stress cracking in a hydrogen sulfide environment, also known as a “sour service” or “sour gas environment.” Founded in 1943, NACE serves 30,000 members in 116 countries and is recognized globally as the premier authority for corrosion control solutions.

Henson, business development manager, VSMPO-Tirus US, said the Industrial Sub Group selected this task because removing restrictions on the use of Grade 12 titanium under the NRO 175 specification “will impact the titanium industry globally. It is a tangible deliverable to advance the cause of removing barriers to the use of titanium. This is a first step, but it’s a significant first step. We want to demonstrate that we are focused and on task for this project.”

Having established a roadmap for this program with Exova, Henson guessed that the process to have titanium Grade 12 fully approved under NACE’s MRO 175 (also known as ISO 15156, the international designation of the standard) will take about two years. Titanium Grade 12, an alloy that includes nickel and molybdenum, is very resistant to hydrogen sulfide industrial environments and represents a perfect application for this material, according to Henson. However, he pointed out that titanium Grade 12 currently is “not in harmony” with the MRO 175 specification, originally written in the 1980s, in areas such as basic mill practices, plate hardness and heat-treating techniques. He was confident Exova would demonstrate titanium Grade 12 can meet the corrosion testing requirements of the specification without limiting mill production parameters and at higher hardness levels.

Applications for titanium Grade 12 in oil and gas production would include valves, pipes, fittings and heat exchangers. Such components, under MRO 175, must be certified to resist “catastrophic cracking” and failure when operating in a corrosive hydrogen sulfide environment. Henson pointed out that, in addition to being corrosive, hydrogen sulfide is a lethal gas.

“MRO 175 is a legally binding specification,” Henson said. “There can be no exceptions as far as meeting the specification. If an industrial material is being considered by an engineering company for use as a component in a hydrogen sulfide environment, and there are any exceptions to the MRO 175 standard, then that material will automatically get a red line through it.”

He said that nickel alloys are currently the material of choice under the MRO 175 standard for use in hydrogen sulfide environments for the oil and gas industry. However, if the restrictions on use of titanium Grade 12 are removed from the NACE standard, Henson said this will create an important business opportunity for the titanium alloy, as it is less expensive than nickel alloys while offering equal or enhanced in-service performance properties.

In addition to Henson, other members of the ITA’s Industrial Sub Group include Regis Baldauff, Titanium Industries Inc.; Rockaway, NJ; Bill Brownlee, Titanium Fabrication Corp; Fairfield, NJ; Mitch Dziekonski, Titanium Engineers Inc., Sugar Land, TX; Jim Grauman, Titanium Metals Corp (TIMET); Dallas; Ron Schutz, Alcoa Titanium & Engineereed Products (formerly RTI International Metals, Inc.), Pittsburgh; Mike Stitzlein, Tricor Metals; Conroe, TX; and Chris Wilson, Uniti Titanium: Pittsburgh.

According to information posted on its website (http://www.exova.com), Exova is a leading laboratory-based testing group, with “over 4,400 global experts operating from 143 facilities in 32 countries to support our 30,000 customers worldwide.” Exova provides testing, calibration and related services in customer sectors such as aerospace, oil and gas, environmental and construction. Exova’s testing capabilities—materials selection, performance and failure analysis—employs destructive and non-destructive testing.
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International Titanium Association is pleased to support of the International Tele-Mentor Program (ITP). The International Tele-Mentor Program starts with schools comprised of students as young as 12 years old. Through their mentors, they are taught how to map out a STEM-related education and career path, guided by professional networks that help to implement and fine tune these plans over time.

David Neils, executive director of ITP, said that professional mentors from over 22 countries have supported over 47,000 students during the last 20 years.

Tele-mentoring is a process that combines the proven practice of mentoring with the speed and ease of electronic communication, enabling busy professionals to make significant contributions to the academic lives of students. Through mentoring by industry professionals, a corporation helps students develop the skills and foundation to pursue their interests successfully and operate at their potential. “Although research shows that face-to-face mentoring programs can have a variety of positive impacts, many top professionals believe they simply don’t have the time to make that kind of commitment. By investing about 30 minutes per week, mentors can help students achieve academic excellence and explore their education and career futures.”

Guided by their mentors, students document the quality of various project outcomes against a rubric or standard. They discuss gaps, if any, between their work and that standard and how they plan to fill the gap. Students also share with mentors how they can leverage the mentor’s help throughout the project and provide insights on how they could have improved as collaborators—a means to continually fine-tune and upgrade the mentoring process.

Speaking on behalf of ITP, David Neils explains “the preference is to start the Tele-mentor process at the middle school level, when students are humble, transparent and eager to learn.” The goal is that by the time a student graduates from high school they have in place a continuing education plan, a career plan, and a professional mentoring network. “They’ll know how to recognize high-quality work. These plans are something that should happen for every student.” he said.

In many cases, the mentor/student relationship becomes a long-term, reciprocal program of education and friendship—enriching professional and private lives through the mentoring partnership. It changes the trajectory of lives and serves as a learning experience for both parties. In many ways, the relationship brings to mind an old adage of education: “When I was a student, I learned from my teachers; when I was a teacher, I learned from my students.”

For the titanium industry, the ITP program complements an ongoing thrust to cultivate students as future engineers, designers, executives, and metallurgists worldwide. ITA’s WiT committee is pleased to engage in the promotion of

EXECUTIVE PROFILE; WOMEN IN TITANIUM

Wollerman Brings Human Resource Skills to ITA’s Women in Titanium Executive Committee

Earlier this year, Heather Wollerman, the director of human resources at ATI Specialty Materials, Monroe, NC, was tapped to be a member of the executive board of the International Titanium Association’s (ITA) “Women in Titanium” (WiT) committee. Wollerman’s professional background should fit well with the mission of the WiT committee to encourage high school and college female students to consider a career in the titanium industry.

In her role as the director of human resources for ATI Specialty Materials, Wollerman develops employee mentoring programs and leadership training. She said she looks forward to redeploying those managerial skills to serve the needs of the WiT. In fact, she recently was involved in an “engineering” camp for girls and young women—an event that took place in Union County (where Monroe is located) to promote women in technical careers. The Union County region is a North Carolina hub for aerospace manufacturing.

Wollerman also is involved in ATI programs that sponsor STEM (science, technology, engineering and mathematics) career training for prospective female employees. A goal of the WiT committee is to support women involved in STEM curriculum in high schools and colleges. The STEM education movement has gained traction in the United States in recent years, offering students technical career skills needed to succeed in 21st century manufacturing and engineering fields.
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mentoring programs available and in attracting students as future leaders of the industry.

Once ITP has accepted this year’s projects students will be working on, the projects will be opened up to mentors who apply to participate. There will be opportunities for mentors in 22 countries, representing every time zone. The sooner ITP receives applications from prospective mentors, the greater the selection of projects mentors will have to choose from.

There are 61 opportunities for mentors at this time: http://www.telementor.org/new-projects.cfm

Mentors may apply here: http://www.telementor.org/mentors.cfm

Please feel free to contact David directly with any questions you have about the programs as follows:

David Neils, Founder and Director
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Thank you for your continued support and interest in this program and please be sure to tell them the International Titanium Association referred you.

Dawne S. Hickton is the 2015 ITA President & WiT Chair, Former CEO RTI International Metals, Inc.

Michelle Pharand, Director Sales & Business Development for Dynamet Inc. is WiT Vice Chair.

Executive Profile (Cont.)

As a human resources professional, Wollerman knows that designing programs to recruit and train young women for careers in the titanium industry is only half the challenge; the other half is creating mechanisms for the long-term retention of valuable employees. She said retention is a management field that involves leadership coaching, career mentoring, and specific job performance training. It required companies to truly “invest” in the careers of its employees (women or men) by engaging in ongoing talent reviews and succession planning.

Retention also involves having company management policies that are sensitive and supportive of employee family needs. This is especially true for women with children. (Wollerman has two daughters, Emma and Abby, ages four and five.)

“People need to be challenged to be the best they can be,” Wollerman explained. She said succession planning requires a company to think strategically to analyze the strengths and weaknesses of individuals in order to prepare them for career opportunities that unfold within the organization—a management discipline currently referred to as “assignment-tology.” She currently takes part in a leadership development cohort at ATI, a year-long program that involves cross-functional teams, which focus on leadership coaching. Again, these are human resource skills that Wollerman hopes to bring to the table in her role on the WiT’s executive committee.

Wollerman grew up in the rolling green hills of Wisconsin and graduated in 2001 from the University of Wisconsin-Madison, with a degree in management and human resources. She was recruited for a leadership program at Goodrich Corp. where she spent 10 years at various company locations throughout the United States. At the time she was part of Goodrich management teams that were involved in the aerospace industry—a skill set that provided her with an initial awareness of the titanium sector. During this period she earned her MBA from Wake Forest (in 2007).

Three years after receiving her master’s degree, Wollerman joined ATI where she immersed herself in the company’s leadership and employee development programs. Eventually she was given an assignment to assess and refine the company’s executive recruiting programs and processes.

During her days at Goodrich, ATI served as a supplier of titanium ingots and billets for the Goodrich aerospace manufacturing operations. “I’m interested in the manufacturing side of the business and plan to learn more about the technology and engineering that goes into titanium,” she said. Her learning curve also will involve analyzing the rapid growth of titanium’s global supply chain.

Dawne S. Hickton, who last year was tapped as the first female president of the executive board for the ITA, announced plans to establish the committee during TITANIUM USA 2014, which was held in Chicago last September. The WiT committee will hold its first committee during TITANIUM USA conference.

In addition to Wollerman and Hickton, members of the WiT executive committee include Michelle Pharand, WiT vice chair and director of sales and business development at Dynamet Inc.; Holly Both, vice president of marketing at Plymouth Tube Co.; Cindy Heatherington, vice president, human resources at Titanium Metals Corp. (TIMET); Dr. Kathryn Jackson, senior vice president and chief technology officer at RTI International Metals; Polina Sparks, editor, Argus Metal-Pages.com; and Jill McGibbney, medical products manager, Metalwerks PMD Inc.
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Brett S. Paddock, President & CEO of T.I. (Titanium Industries, Inc.) is the 2015 Chair of the ITA Grant Committee.

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Christopher Higgins, the Cecil and Sally Drinkward Professor of Structural Engineering in the School of Civil and Construction Engineering at Oregon State University, is the recipient of the 2015 International Titanium Association’s (ITA) Titanium Application Development Award. Higgins, working with Perryman Co., Houston, PA, was cited for his role in developing a novel titanium application for repairing highway infrastructure. Higgins will be presented with the prestigious award at the ITA’s TITANIUM 2015 Conference and Exhibition, which will be held Oct. 4-7 in Orlando, FL.

Brett Paddock, the president and chief executive officer of Titanium Industries, Rockaway, NJ, served as the chair of the ITA’s Titanium Application Development Award committee. Jennifer Simpson is the executive director of the ITA.

The Oregon Department of Transportation (ODOT), Salem, OR, selected a repair concept by Higgins—a titanium “staple” to reinforce fractures in the reinforced concrete—which was deployed by ODOT on the Mosier Bridge, an “overcrossing” of Interstate 84, which is a major east/west corridor for the state. Higgins designed the idea of the staple and the requirement of a surface treatment that would allow titanium alloy bars to be used to strengthen concrete bridges. Perryman Co. manufactured the titanium staples and developed the methods to produce the surface treatment. Oregon State tested alternatives and selected the final pattern.

Frank Perryman, president and chief executive officer of Perryman Co., said repair work, using the titanium staples, was completed in June 2014. More than 70 staples were used for the project. As a result, this is believed be the first titanium-reinforced concrete bridge in the world.

Mosier Bridge, located above milepost 69.65 of Interstate 84, is a four-span reinforced concrete, deck-girder bridge, which originally was built in 1950 and widened in 1959. According to information posted on the Oregon state government website (http://www.oregon.gov/ODOT/HWY/REGION4/Pages/184-MosierBridgeStrengthening.aspx), a routine bridge inspection in May 2013 identified significant cracking in the bridge’s girders and determined a number of crossbeams were “structurally deficient.”

After making these observations, ODOT contacted Higgins. He reviewed the plans and independently determined “that the bridge members had little reserve strength and the loads on it were close to the calculated collapse load. This was verified by tests of full–size replicas of the bridge girders in the lab. I recommended they close, post and/or shore it up until it could be fixed.”

By coincidence, Higgins said that, at the time, he and the students in his laboratory were doing research work on using “non-traditional metallics” to remedy deteriorating infrastructure. Going through his network of business associates, Higgins was introduced to Warren George, an Oregon-based Perryman Co. engineer. After several meetings, Perryman Co. executives became involved in the discussions.

Based on research at Oregon State, ODOT called for the use of titanium staples to fortify the bridge. Higgins explained that carbon fiber typically is the material of choice for such repair work. However, he gave credit to ODOT for not being intimidated to consider an innovative alternative: the titanium staples produced by Perryman Co. The titanium approach prevailed and, in addition to providing design and structural advantages to carbon fiber, it proved to offer an overall cost savings of 30 percent.

The Oregon government website indicated that repairing this bridge was a “high priority for ODOT” because the load restrictions impacted local businesses in the area. As a result, “strengthening of the bridge was put on an accelerated schedule.” Higgins praised ODOT for recognizing the concept of a “total life-cycle cost system approach” for the bridge project. He also applauded Perryman’s “pristine operations,” which offered “very precise material properties compared with other civil engineering materials. The people at Perryman spent a considerable amount of time and energy on this project with us. They really cared about what we needed to successfully repair this bridge,” he said.

Jim Perryman Sr., the founder of the company, “took this bridge project to heart and was the driving force,” according to his son, Frank Perryman, the company president and chief executive officer. “We began the program by listening rather than talking. This was truly a team approach to achieve the desired goal, having our people work with Professor Higgins and the ODOT. It was an exciting process for us.” In particular, he complimented the work of the Perryman Co. technical, engineering and manufacturing staff members.

Frank Perryman described the titanium staples as “near-surface mount” components that reinforce the concrete structure. The staples were fabricated at different lengths, depending on distance needed to span the beams. Each staple, a titanium aerospace-grade 6/4 alloy, was designed with surface grooves along the length of each staple to enhance their “holding characteristics.” He pointed out that one important design advantage for the titanium staples, compared with carbon fiber bars, was the ability to incorporate L-shape end hooks, which anchored the staples in the reinforced concrete.

As an integrated titanium melter
and contract manufacturer, Perryman Co. handled the entire production of the staples in house—from start to finish. Perryman engineers then went on site to collaborate with repair contractors selected by ODOT for the installation of the staples.

Even though the project has won accolades and garnered the ITA’s Application Development Award, Frank Perryman was candid and cautious with regard to proclaiming infrastructure applications as a new hot market for titanium business opportunities. “It’s too premature,” he admitted. “I’m not ready to say that this is the next big thing for titanium.” Perryman said that while this particular application is likely to peak interest in the titanium industry, he noted that infrastructure is a complex market with many cost variables to consider, such as state budget restraints. “People in the infrastructure industry certainly will find it interesting and may choose to explore it.”

Cost variables and budget constraints aside, many people are well aware of the aging infrastructure dilemma facing the United States and the need to do something about it. Eight years ago, these concerns went under a spotlight with the horrifying collapse of the I-35W Bridge in Minneapolis, which killed 13 people, injured more than 140 others, and was recorded by roadway video cameras.

When it comes to infrastructure, cost must be weighed against public safety. Higgins said that cost is always an issue, but the hardest part is getting past the “too-expensive” first reaction when it comes to specifying a material like titanium. “You’re not buying a construction material by the pound; you’re buying it by its performance and long-term, life-cycle costs,” he said. “There are lots of needs when it comes to infrastructure, but there are limited dollars to pay for projects. My discipline (civil engineering) is a very conservative field. If cost is a critical issue, then we must spend wisely with the money that is available. This means that instead of replacing and rebuilding a bridge, we’ll need to find ways to better maintain and strengthen existing structures.”

Given its properties of strength, ductility and the ability to be impervious to weather and corrosion from roadways that are salted during winter months, Higgins said cost issues actually could favor titanium for future infrastructure applications. He said there are many ways to measure cost, such as the inconvenience and drop in productivity from closing an important road system, as well as and the time and effort it take to complete the repair work.

According to information posted on the Perryman website (http://www.perrymanco.com), the company has three manufacturing campuses in Pennsylvania as well as sales offices in Indiana, California, the United Kingdom and Asia. The company was founded in 1988 and in 1997 unveiled a fully automated titanium hot-rolling facility. In 2007 the company added melting facilities. It diversified its manufacturing portfolio three years ago with the acquisition of Perryman Forge and Fabrication, which expanded the company’s capabilities to produce finished parts from metal and plastics. Perryman Co. has an employee headcount of 420 people and estimated annual revenues of $210 million.

Bridge Strengthening Approaches

- Jacketing
- Post-tensioning
- Wrapping/confining
- Carbon fiber reinforced polymer (CFRP) laminate
- Near-surface mounted (NSM)
  - Carbon fiber reinforced polymer rod/strip
  - Glass fiber reinforced polymer (GFRP) rod
  - Stainless steel bar
- CFRP rods and laminates rarely achieve full material strength due to bond and anchorage
  - Limited research on metallics due to concerns with corrosion at surface
- Explore environmentally insensitive metallics with high strength and mechanical anchorages

Stainless Steel and Titanium

Mosier Connection over Hwy 002

- Overcrossing of Columbia River Highway (I-84)
- Built in 1952
- Serves a nearby quarry

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ITA Lauds Career of Walter Herman
With Lifetime Achievement Award

The International Titanium Association has selected Walter E. Herman as the recipient of its prestigious 2015 Lifetime Achievement Award, honoring his many accomplishments during a distinguished 60-year career in the titanium industry.

Herman's resume traces the early development of the titanium industry, from the Cold War days of the 1950s and through the decades of commercial development. Those that nominated him for the Lifetime Achievement Award provided glowing reviews of his extensive contributions to the titanium industry. Gordon Armitage, president, Hi Tech Alloys Inc., Walnut Creek, CA, cited Herman's contributions related to development of the first industrial electron beam cold hearth melting process (EBCHM) for removal of high- and low-density inclusions from recycled titanium as one the highlights in Herman's career.

"Walt played a key role in the development of EBCHM to minimize the occurrence of melt-related defects in titanium alloys. This was extremely important to the aerospace engine industry due to some rather spectacular failures of disks on aircraft engines."

As for new and imaginative uses for titanium, Armitage pointed to Herman's work in the development of corrosion applications for titanium used in the chemical and metal finishing industry. "One of the most significant technical achievements Walt achieved was the development of corrosion applications for titanium for the plating industry."

Born May 6, 1928, Herman grew up in Kinsman, OH, just a stone's throw from the Pennsylvania border. After a stint in the Army he enrolled in the University of Cincinnati and graduated in 1953 with a Bachelor of Science degree in metallurgical engineering. After graduating, Herman landed a job as a metallurgist at Mallory Sharon Titanium, which was based in Niles, OH, and doing early work in titanium production. There were various iterations of the Mallory Sharon Titanium business, thanks to partnerships with other industrial companies like U.S. Steel and National Distillers. Not long after Herman came on board, National Distillers brought a titanium and zirconium sponge plant into the corporation. In addition to titanium, the company, which became known as Reactive Metals, began processing both metals. All of this activity in Niles served as a precursor to the eventual formation of RTI International.

In an effort to broaden titanium's businesses opportunities, Herman became involved in non-aerospace commercial applications, such as the chemical processing industry. Working in commercial market development for RMI, Herman said he's especially proud of his accomplishments in developing titanium components for the highly corrosive nickel plating process.

He stayed with RMI for nearly 24 years, last serving as manager of customer technical services. In 1977 he accepted a position with Viking Metallurgical and moved to Verdi, NV, where the company was exploring EBCHM technology as a system to recycle valuable titanium machine turnings.

Herman retired in 1992 and said he still follows the titanium industry. He feels supply chain consolidation, which has unfolded in recent years, is a positive development. "I think the titanium industry is going in a good direction," he observed.

Mr. Herman will be presented with the 2015 Lifetime Achievement Award on October 5th in Orlando, Florida at the TITANIUM Conference, the 31st annual meeting of the International Titanium Association.

Edward Sobota is President of TSI Titanium and is the 2015 Awards Committee Chair of the International Titanium Association. 2015 Committee Members: Stanley Abkowitz, John Andrews, Paul Bania, Rodney Boyer, Robert Hill Jr., Harry Rosenberg, Max Schlienger, Stanley Seagle, James Williams.
ITA Safety Committee Makes Major Additions to ITA Website - Now Available

The International Titanium Association (ITA) will host a Safety Committee meeting at the 2015 TITANIUM Conference and Exhibition. The Safety Committee meeting, (Wednesday, October 7th at 1:30 pm), is open to all the conference delegation and participation is encouraged.

Robert G. Lee, chair of the ITA Safety Committee and president of Accushape Inc., Portland, OR, said the ITA will provide a substantial expansion of safety resources for members, users and first responders, with an emphasis on fire prevention. Lee explained that, following an approved committee charter and plan, the Safety Committee has created a major addition to the ITA Web site which compiles a list of agencies and resources regarding the safe use and storage of titanium.

"Every producer, distributor and user must develop their own safety plans to meet the conditions unique to their use of titanium, especially the generation and storage of titanium fines that may present a fire or explosion hazard," Lee stated.

Lee said that the mission of the ITA safety committee is to bring awareness to all items of safety when handling and working with titanium. All members of the ITA are invited to participate in Safety Committee meetings at any time, and the committee provides an open forum for safety issues concerning titanium melting and powder.

The current scope of the Safety Committee includes: disseminating existing published resources to suppliers and users of titanium products through Titanium Today magazine, committee meetings, ITA website and TITANIUM Conferences; providing a referral list of safety related services and products through the Titanium Resource Center; developing online awareness programs from existing published resources; encouraging safety committee members to participate in other organization standards and compliance groups; and hosting regular meetings where the industry may have a forum to discuss occurrences and to discuss how to prevent such incidents from happening in the future.

Speaking on the topic of fire prevention and general plant safety in the titanium industry at TITANIUM 2014, which was held in Chicago, Lee urged conference attendees to “understand how your materials react and how your processes can create ignition conditions.” He pointed out that there are at least 10 different types of titanium powders and fines and at least a dozen factors that influence their potential flammability and ignition. He said static electricity is a “likely culprit” of spontaneous ignitions. Avoiding water sprinkler systems inside plants were titanium is stored or processed is very important, from his perspective.

Lee goes on to explain that in his opinion, “the most dangerous forms of a combustible metal like titanium, are dust, powders, and “swarf.” Swarf is a term used to describe fine scrap. Swarf is also known as chips or by other process-specific names (such as turnings, filings, or shavings), comprised of pieces of metal, wood, or plastic that are the debris or waste resulting from machining, woodworking, or similar subtractive (material-removing) manufacturing processes. According to Lee, “Swarf and dust and powders represent major fire hazards because they are susceptible to ignition, while large titanium castings and ingots generally are not combustible under ordinary conditions.”

Kevin Kreitman, the recently retired fire chief of Redding, CA, provided an overview on National Fire Prevention Association’s (NFPA) Combustible Metal Standard (NFPA 484). Kreitman, who has written technical papers on combustible metals and metal dusts and is an instructor at the U.S. National Fire Academy. NFPA 484 was created in 2002 by incorporating the requirements of six individual combustible metal standards, including NFPA 481 Standard for Titanium, into a single document. The six individual standards became chapters in the new standard.

Kreitman said the updated 2015 standard for combustible metals could be considered very important to all titanium companies as it provides guidelines for the production, processing, finishing, handling, recycling, storage and use of titanium alloys in a form that is capable of combustion or explosion, especially metal dust and powders. The various chapters in NFPA cover administration, reference publications, definitions, determination of combustibility, advice on facility management to minimize hazards, fire prevention and emergency response, general housekeeping” rules, and suggestions on the control of ignition sources and dust collection.

According to Kreitman and Lee, metals in a combustible form, including titanium, can present fire and explosion hazards. Improper handling of these materials in fire incidents, place personnel and responders at great risk, these risks however can be minimized through proper pre-planning, engineering, facility housekeeping, and training. Preventive actions are important to minimizing potential fire and explosion hazards. Knowledge of the risks associated with the metal and the form it is in along with proper housekeeping will greatly reduce risks and likelihood of an incident.

However, should an incident occur, how the incident is handled is critical to a safe outcome. The proper handling of fires involving titanium and metals in a combustible form does not occur by happenstance. Lee said “One of the most important items is to ensure that pre-planning with emergency responders on the risks and hazards associated with titanium and other metals in a combustible form has taken place prior to the incident, to ensure proper actions are taken in the handling of the emergency.
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Life Cycle Costing Session Demonstrating True Long-Term Value of Titanium

Life cycle costing has long been put forth as a favorable metric to demonstrate titanium’s “good value” as a material of choice in a host of industrial applications. However, despite the math and logic that supports the use of titanium compared with competing materials, industry executives admit that this argument, despite its merits, falls short. In some cases, titanium is passed over due to short-term budget constraints for so-called “less-expensive” metals. It’s fair to say titanium’s durability and affordability as a long-term investment for infrastructure or industrial projects simply doesn’t convince everyone.

Barry Benator is looking to address that entrenched mindset and will provide titanium executives and sales representatives the tools they need to make a more convincing case to win business. Benator, the founder and president of Benetech Inc., Roswell, GA, a leadership and management consulting and training firm serving clients throughout the United States and internationally, produces an online seminar on life-cycle costing for the energy industry, and now looks to impart that knowledge to the titanium sector.

ITA has organized a ½ day session at the upcoming TITANIUM USA 2015 conference and exhibition to be held this October 4th – 7th in Orlando, Florida USA. Barry wants to give the titanium industry the “ammunition” it needs to prove to potential customers how and why titanium can be a more affordable investment over the long term, even if there is an initial, higher “up-front” price tag compare with other metals.

Simply put, Benator defines life-cycle costing as a calculation to determine the long-term payback for an investment, taking into account the savings and cost over the entire life of a product or system. “The basic idea is: do I spend a bit more now to get a better system for the long haul,” Benator explained. “Customers are always concerned about their return on investment. A lot of this is intuitive, but some people have to understand it and ‘see’ it before they truly believe it. I try to put together the rationale behind the numbers.”

Businesses and governments make important decisions based on financial benefits (and risks) to their organizations. For industrial projects like desalination installations, heat exchangers, and chemical or food processing, factors such as annual maintenance costs, reliability, production speeds and long-term performance come into play. And of course, material costs are factored into the front end of the equation. Benator said his course will provide ITA members with practical tools to help explain and prove the financial benefits of titanium, especially when the application calls for corrosion resistance and high strength.

The course will focus on sound financial comparisons of the strength, durability and other benefits of titanium.

Rob Henson, Manager, Business Development for VSMPO Tirus US is the 2015 Chair of the ITA Committee for Industrial Applications.

Safety Committee Additions to Website (continued)

which is critical to a safe outcome”.

“Developing a close working relationship with the facility and working closely with facility personnel is a must to minimize risks for the facility and emergency responders.” Lee continues, “Incidents involving a fire at a titanium plant or other facility involving metals in combustible form may very well present additional risks based on the form of the material involved, such as powders, dusts, molten metal, as well as the potential involvement of chemicals that may be associated with the processing of the metal”.

The ITA Safety Committee underlined the following important disclaimer regarding the safety information it provides on the website: The safety information provided on the ITA website is not intended to replace applicable laws and regulations already in effect and currently being enforced by federal, state, and other rule-making authorities, but should only be read as helpful information for members of the ITA for the reasonable and effective implementation of safety standards already in existence. The ITA has not endeavored to promulgate safety standards or analyze the efficacy of existing standards. The ITA does not have the power to enforce and ensure industry wide compliance with the information contained herein; therefore, in no event will ITA be held liable for any damages whatsoever, including but not limited to damages to person or property from any use of the ITAs safety information. The ITA makes no representation that it has located and listed all such regulatory agencies that may be applicable.

The ITA does not make specific recommendations regarding safety because the precise conditions are not known to ITA. Producers and users are responsible for conducting their own research and establishing appropriate policies and procedures for the safe operation of their facilities and use of titanium. The ITA does not report on or comment about news stories, or reports about specific incidents as ITA has no way of verifying the accuracy or applicability of such information.

Robert G. Lee, President of Accushape, Inc. is the 2015 Safety Committee Conference Chair.
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Kevin Kreitman

Fire Chief-Redding CA & Safety Consultant

Chief Kreitman has 34 years’ experience in the fire service beginning his career as a firefighter in Albany Oregon. Chief Kreitman worked as a firefighter/paramedic and held his paramedic certification for 28 years; he was promoted to the rank of Battalion Chief in 1989, Assistant Chief in 1994, and was promoted to Fire Chief for the City of Albany in 1999 until accepting the Fire Chief’s job with the City of Redding, California in September 2008. During Chief Kreitman’s time in Albany Oregon he worked closely with the numerous metals industries in the area, and wrote a research paper on the proper handling of titanium and zirconium metal fires. Kevin is a consultant available to provide assistance to the titanium industry & others seeking information on the safe handling of combustible metals.

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The Olin Research Group is a specialized firm that offers MARKET UPDATE REPORTS for various carbon steel, stainless, specialty materials (titanium & nickel-based alloys), and aerospace company executives. We do this by leveraging our network of industry contacts (distributors, mills, producers, and buyers) and 18-years of experience in the investment world. Together, we can provide unique insights from a “top-down” or “bottoms-up” perspective. Our partners have an edge versus the competition -- for planning and up-to-date market share analysis.

The “value-add” in our research comes from the combination of charting momentum and/or highlighting inflection points. We do this by using data gathered from quarterly surveys. We provide a twist in our reports by incorporating industry models, channel sentiment
gauges, and the feedback we are getting from the larger, publicly-traded companies. Our goal is to provide customers with a different perspective on each metal/aero category, also gauging the relative health of main end-markets. We believe this gives our customers an enhanced ability to navigate through any market challenges and/or opportunities. Our data collection or indexes can also be measured against peers. Track your company’s performance versus an anonymous sample group. See where you stand (by region or product category).

Perhaps you are looking for specific market intelligence? Our research team can assemble a survey that fits your needs and answers your questions.

www.olinresearchgroup.com

Epner Technology, Inc.

We are a 105 year old family owned High Tech engineering shop that does plating of pure titanium and all of its alloys. We specialize in applying MIL Spec coatings of Gold/Nickel/Silver to titanium and alloys. We are also a general contact plater.

www.epner.com

Tekna.

Tekna has been the world leader in the design and development of integrated inductively coupled plasma systems for the past 25 years. These systems are used in a variety of industrial processes, from the synthesis of nanomaterials to the production of micrometric spherical powders. As a new product for 2015, Tekna is proud to launch a high quality spherical Ti-6Al-4V (grade 23) on the market; specifically engineered for additive manufacturing, coating and molding.

www.tekna.com

Pat Mooney, Inc.

Pat Mooney Saws is a 3rd generation family owned and operated business that has been innovative in serving the metal sawing industry since 1949. We specialize in the sales, support, and service of metal sawing machinery and saw blades. We are the exclusive North American Sales and Service center for the following saw manufacturers: Danobat High Production Bandsaws, Ishijima CNC Carbide Cutoff Systems. FMB Precision Miter Gear Driven Bandsaws, PMI Aluminum and Non-ferrous Sawing Systems, and OMP Precision Tube and Bar Sawing Systems. Pat Mooney Saws has over 500 saw installations in North America.

www.patmooneysaws.com

Standard Die.

Standard Die is a full-service metal stamping and drawing company. We specialize in small parts made from a wide range of specialty metals ranging from coppers to refractory metals and other exotic materials. Our service, product quality and speed are unmatched in the industries we serve. We cultivate partnerships with our customers and you can work one-on-one with our design engineers and enjoy an active role in the design and manufacturing of your product.

www.standarddie.com
YOUR SETUP AND CHANGEOVER TIMES ARE NEXT TO NOTHING.
YOU'RE RUNNING 24/7 WITH EASE.
NO WONDER THROUGHPUT NUMBERS ARE OFF THE CHARTS.

Modular, automated pallet systems and 24/7 machining capabilities are opening whole new doors of productivity. And opportunity. With the Makino MMC2 and MAS A5 cell controller, you know you're working with the industry standard for virtually eliminating setup and changeover times. While helping you manage what matters most: production schedules, costs and throughput.

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WHEN YOU MAKE WHAT MATTERS
IN ACQUIRING AEROMETALS & ALLOYS, ACNIS INTERNATIONAL IS REINFORCING ITS POSITION IN THE AERONAUTICS INDUSTRY

On 5th August 2014, ACNIS International, a major supplier of titanium and high performance metals for the medical and aeronautics industries, assumed control of AEROMETALS & ALLOYS, specialists in the distribution of advanced metals in the aeronautics sector.

The purchase of this company has enabled ACNIS International to move forward with a longstanding strategic plan to reinforce its presence in these markets. Not only has the company been the leading name in the independent distribution and supply of titanium to the medical sector in Europe, but it has also been present for some twenty years in the aeronautics industry.

From now on, customers of the ACNIS Group will benefit from an enhanced selection of high value added goods and services thanks to the synergy between both companies.

In order to express its new positioning, momentum and ambition, the Group has renewed its visual identity and adopted a new strapline:

Ready to drive forward to the future

Founded in 1991 by Paul-Etienne CARRILLON, ACNIS International is based in Villeurbanne (69) and relies on its team of some 30 multilingual specialists to export its products around the world and to guide and assist its customers in their provision of supplies through its Service Centres.

Since it was created, the company has built a reputation based on both of its areas of specialization. On the one hand it is known for supplying titanium to industry and the medical and aeronautics sectors, and on the other, for its extended range of advanced materials for use in orthopaedics.

By taking over AEROMETALS & ALLOYS, the ACNIS International Group has provided itself with the means to bring strong added value to the aeronautics industry in offering not just titanium, but a wide range of high performance metals and service solutions.

The Group is thus aiming to quickly double its annual turnover and the number of customers on its books.

The added value of service

ACNIS International and AEROMETALS & ALLOYS will from now on be working together to meet the most demanding requirements of its customers by harmonizing their skills.

ACNIS International brings to the table its international exposure, financial independence, multiple partnerships and its policy of working closely with its customers and service-minded culture.

AEROMETALS & ALLOYS on the other hand not only brings its expertise and accreditations with some of the major players in the aeronautics sector, but also its cutting machines (rotary cutting, laser cutting, plate cutting and pre-machining saws) that enable it to provide a global solution supplying titanium in varying forms to businesses in France and around the world. These cutting machines aim to reduce the rate of fall and optimize different formats so that manufacturers can receive goods according to their specifications and machining techniques.

A new Chief Operating Officer has been appointed at AEROMETALS & ALLOYS to assist with the implementation of the new service centre. This will enable more flexibility and responsiveness for just in time deliveries and unfinished piece deliveries on short and medium term contracts.

The teams from ACNIS International and AEROMETALS & ALLOYS will be present at the SIANE trade fair from 22nd to 23rd October 2014 in Toulouse, France, Hall 5, stand K40.

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Tel. +33 (0)4 72 33 85 85
TITANIUM & TITANIUM ALLOYS

BAR, SHEET, PLATE, TUBE AND PIPE
Titanium Grade 1, 2, 3, 4, 7, 9 / 6AL4V / 6AL4V ELI / 6AL7Nb
Management Systems according to ISO 9001, EN ISO 13485 & EN 9120/AS 9120A
WESTMORELAND MECHANICAL TESTING & RESEARCH SIGNS
LONG-TERM CONTRACT WITH BÖHLER SCHMIEDETECHNIK

Youngstown, PA USA, June 15, 2015 – Westmoreland Mechanical Testing & Research, Inc. (WMT&R), a leading international materials testing specialist, has signed a five-year contract with BÖHLER Schmiedetechnik. Böhler, headquartered in Kapfenberg, Austria, is a manufacturer of forged parts for aerospace, power generation, and other advanced applications. BÖHLER Schmiedetechnik is a 100% subsidiary of the Special Steel Division of the Austrian voestalpine Group, a steel-based technology and capital goods group that operates worldwide.

Under the agreement WMT&R is recognized by BÖHLER Schmiedetechnik as a preferred supplier of a diverse range of materials testing services. WMT&R will provide testing services on Böhler’s high grade forged alloy components.

The agreement extends the successful working relationship WMT&R and BÖHLER Schmiedetechnik have had since 2004.

“We are pleased to extend our relationship with BÖHLER Schmiedetechnik,” stated WMT&R Vice President Michael Rossi. “The agreement represents our commitment to being a world leader in materials testing, and maintaining close relationships with our customers in order to provide them with the highest quality service.”

Thomas Kornfeld, Managing Director of BÖHLER Schmiedetechnik, commented, “We are very pleased to have WMT&R as materials testing company. Our alloys undergo rigorous testing to meet the industry’s high standards for quality and WMT&R provides the superior testing capacity and capabilities to meet these demands. Especially in the high demanding aerospace industry, this partnership empowers us to fulfil the supply guarantee towards our customers.”

About Westmoreland Mechanical Testing & Research
Westmoreland Mechanical Testing & Research, Inc. (WMT&R) is a world leader in materials testing. Founded in 1967, WMT&R serves a broad range of industries including aerospace, automotive, medical, and nuclear. WMT&R’s testing expertise includes: Mechanical Testing, Composites, Fatigue, Stress/Creep Rupture, Fracture Mechanics, Metallography, Chemical, Heat Treat, Thermal Analysis, and Physical Properties Testing.

WMT&R is headquartered 40 miles east of Pittsburgh in Youngstown, PA USA. Our UK subsidiary, WMT&R Ltd., operates a full-service materials testing facility in Banbury, UK. For more information, please visit www.wmtr.com or email us.sales@wmtr.com.

About BÖHLER Schmiedetechnik GmbH & Co KG
BÖHLER Schmiedetechnik GmbH & Co KG was founded in 1991 and is a 100% subsidiary company of the Special Steel Division of voestalpine AG. The company is a global development partner and leading supplier of high-quality aerospace closed-die forgings in titanium, nickel-based superalloys and specialty steels. As a leading designer and manufacturer of custom-engineered, performance-critical forgings, the company produces precision high performance parts for the aerospace and energy industry as well as other high-tech industries and supplies more than 200 technologically advanced customers worldwide.

For the aerospace industry, BÖHLER Schmiedetechnik, situated in Kapfenberg, Austria, produces high quality applications such as highly stressed aerospace structural parts, wing components and pylon parts, landing gear components, engine mounts and forgings for aerospace engines.

ROLLED ALLOYS RECEIVES SILVER BOEING PERFORMANCE EXCELLENCE AWARD:

Cincinnati, Ohio – Rolled Alloys announced that it has received a 2014 Boeing Performance Excellence Award. The Boeing Company issues the award annually to recognize suppliers who have achieved superior performance. Rolled Alloys maintained a Silver composite performance rating for each month of the 12-month performance period, from October 1, 2013 to September 30, 2014.

The award reinforces Rolled Alloys’ commitment to quality and service in the aerospace industry, as well as other markets served. This is the result of continual reinvestments in equipment, personnel and process analysis in order to achieve ongoing improvements in all aspects of business.

Rolled Alloys is one of the largest suppliers of nickel, cobalt, titanium and stainless steels in the world with 13 locations throughout North America and Asia. For additional information about the company, please visit www.rolledalloys.com.
...Offering **One-Stop Shopping** for VANADIUM-ALUMINUM and Specialty Master Alloys

**Exceptional EVRAZ Stratcor facilities meet the critical quality needs of the Aerospace Industry**

Evraz Stratcor production facilities focus on producing all the Master Alloys, Vanadium and other elements; that meet the demanding quality needs of the Titanium and Aerospace Industries. The facilities focus on:

- **Production in a modern, state-of-the-art plant.** All operations meet the ever increasing quality requirements of the aerospace industry.

- **Multiple Inspections that verify quality.** Vanadium Aluminum and other critical-quality master alloys undergo various inspections; including white-light, black-light and x-ray inspections. We are certain to be sure the products meet customers’ quality requirements.

- **A 50% expansion of high-quality vanadium-oxide capacity.** Evraz Stratcor vanadium oxides are the highest purity in the world.

- **Supervised production by an experienced quality-driven team.** All ISO procedures used to produce EVRAZ Stratcor vanadium-aluminum have been approved and are monitored by both partners.

For vanadium-aluminum as well as molybdenum, niobium, chromium, zirconium, and specialty alloys, contact EVRAZ Stratcor – the source for all your master-alloy needs.
SUPPLYING TOP QUALITY TITANIUM SINCE 1973

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From the Wire (continued)

ISGEC & TITAN CREATE JOINT VENTURE MANUFACTURING OPERATION

July 1, 2015: Isgec Heavy Engineering Ltd., of Yamunanagar, Haryana, India, and TITAN Metal Fabricators, Camarillo, CA USA have announced the establishment of a new joint venture manufacturing operation: ISGEC TITAN Metal Fabricators Private Limited.

Combining world-class, heavy equipment fabrication expertise demonstrated by Isgec with TITAN’s cutting-edge reactive metal and high nickel alloy equipment design and fabrication technology, the new ISGEC TITAN addresses the increasing need for the manufacture of corrosion-resistant process equipment to serve the specialized needs of the Chemical, Petro Chemical, Oil & Gas, Fertilizer, Mining, Power Generation, Pharmaceutical, and Steel Manufacturing industries.

In a joint statement, Aditya Puri, Managing Director of Isgec Heavy Engineering Ltd. and Steven Muscarella, President of TITAN Metal Fabricators, Inc. said, “Our intention with ISGEC TITAN Metal Fabricators is to serve as a comprehensive industry resource for top-tier corrosion-resistant processing equipment. Through advanced design, engineering, and manufacturing practices, ISGEC TITAN will provide the next generation of reactive alloy equipment to our global customers.”

About Isgec Heavy Engineering Limited

Isgec Heavy Engineering Ltd. is a public company with a diversified portfolio of engineering products & services. It has been providing engineering solutions to customers across 84 countries for the past 80 years. The company has the following business verticals - Process Equipment, Presses, EPC Power Plants, Boilers, Sugar Plants & Machinery, Castings, Air Pollution Control Equipment and Contract Manufacturing. With a staff strength of over 4000, including over 700 qualified engineers and a similar number of technical personnel, Isgec has its engineering plants and design offices spread across India. http://www.isgec.com/

About TITAN Metal Fabricators, Inc.

TITAN is one of the world’s foremost fabricators of corrosion-resistant equipment for the process industries. The company’s core business is custom-design engineering and manufacture of Heat Exchangers, Pressure Vessels, Columns, Reactors, and Piping using reactive metals (Titanium, Zirconium, Tantalum, and Niobium) and high nickel alloys (Duplex, Hastelloy, Inconel, Monel, and others) specifically for use in corrosive applications within the Chemical, Petro Chemical, Oil & Gas, Fertilizer, Mining, Power Generation, Pharmaceutical, and Steel Manufacturing industries. TITAN has manufacturing operations in USA and China, as well as sales facilities in 35 countries. http://www.titanmf.com

NORSK TITANIUM APPOINTS CHRISTOPHER E. KUBASIK CHAIRMAN OF THE BOARD

Norsk Titanium AS (NTi), a global leader in manufacturing premium quality titanium components for industrial applications, today announced the appointment of Christopher E. Kubasik as Chairman of the NTi Board of Directors. Kubasik is expected to formally assume chairmanship in January 2016. John Andersen, Jr., who has been serving as the Executive Chairman of NTi since November 2014, will remain on the Board.

“We are very pleased that such an experienced industry leader as Chris will chair the NTi Board as our company enters a new, ground-breaking chapter in its history with the establishment of a U.S.-based manufacturing facility,” said John Andersen, Jr. “Since Chris joined the Board in June 2013, he has made many contributions to NTi through his extensive professional network and in-depth knowledge of the Aerospace & Defense (A&D) industries. We look forward to his continued leadership.”

Christopher E. Kubasik heads New York-based Seabury Advisory Group as President & Chief Executive Officer. Seabury is a leading professional services firm serving the Aviation, Aerospace & Defense industries. Kubasik previously was President & Chief Operating Officer of Lockheed Martin Corporation.

“I look forward to my new position as we advance our quest to deliver a revolutionary disruptive technology across the globe,” commented Christopher E. Kubasik. “The titanium component manufacturing market is undergoing rapid growth, and I am delighted to continue to take NTi to the next level as we begin to deliver significant benefits to the global A&D sectors through affordable titanium components at the highest quality levels.”

In addition to Christopher E. Kubasik and John Andersen, Jr., the NTi Board of Directors includes Bart van Aalst (Forty2 Capital Limited), Jan Magnussen (Scatec), Shan Ashary (Limestone Capital), Tim Lintott (independent legal advisor), and Warren Boley Jr. (NTi President & Chief Executive Officer).
RETECH SYSTEMS LLC ANNOUNCES ACQUISITION OF EQUIPMENT & PROCESS PATENTS FROM AJAX TOCCO MAGNETHERMIC CORPORATION

Retech Systems today announced the acquisition of a series of patent families from Ajax TOCCO Magnethermic. The patent portfolio forms a comprehensive package of technologies & processes pertaining to the design of hearth melting systems. Specifically, this portfolio of intellectual properties provides greater flexibility in the configuration, production & operation of hearth melting furnace systems aimed at a range of materials & applications, resulting in higher productivity.

“This portfolio of patents allows us greater flexibility in addressing a broad range of customer needs” comments Nathaniel Slinkert, Director of Sales for Retech. “The acquisition represents a significant step forward in Retech’s objective to provide truly unique hearth melting solutions that enable increased productivity, while maintaining industry-driven product qualification standards.”

Retech intends to build upon the exclusive rights granted by this portfolio, originally filed by Scott Jackson, formerly of Lectrotherm Inc, & Dave Warren, formerly of both Lectrotherm & Retech, with its own expertise in hearth melting technology so as to provide the most up-to-date exclusive and patented solutions to the industry.

About Retech Systems LLC
Retech, a subsidiary of SECO/Warwick, is the most fully integrated, custom furnace manufacturer in the world providing processes & technologies used in melting, refining & casting reactive as well as refractory metals, such as Titanium & Titanium alloys, super alloys & rare earth metals. Retech delivers world class experience & service, with complete R&D, engineering & manufacturing.

www.retechsystemsllc.com
Contact
Nathaniel Slinkert, Director of Sales
+1 (707) 467-2924
ENSlinkert@retechsystemsllc.com

SOLAR ATMOSPHERES OF CALIFORNIA ADDS ADDITIONAL LARGE FURNACE CAPACITY

Fontana, CA. – April 28, 2015 – In response to increasing large furnace capacity demand, Solar Atmospheres of CA (SCA) has added additional large furnace capacity to complement their current facility equipment arrangement. Uniquely designed for SCA, Solar’s new furnace offers new features and characteristics that will enhance SCA’s ability to process a multitude of diverse processing parameters that currently exist in the vacuum heat treating industry. It will also allow SCA to prepare for future material advancements and specification modifications that require strict adherence to process controls to include Heating/Cooling Rates, Process Vacuum Levels, Temperature Uniformity and Mistake-Proof Processing.

Key Performance Characteristics:
• 84” diameter x 144” long hot zone
• Maximum operating temperature of 2650°F
• Hearth to support in excess of 30,000 lbs.

• Energy efficient all graphite hot zone
• Solar Manufacturing’s state-of-the-art Furnace Control Package – SolarVac 5000

President Derek Dennis states, “Solar CA is very excited to add this versatile piece of equipment to our consistently growing vacuum furnace inventory. SCA has worked very closely with our sister company Solar Manufacturing to design this furnace in order to best meet the needs of our expansive customer base on the west coast. We feel that this furnace will add a competitive advantage by allowing Solar to expand our vacuum processing capabilities in the large parts market. We’re excited to get the furnace online on May 1st and put her to work.”

For more information about Solar Atmospheres of California, please contact Mike Drakeley at (866) 559-5994 ext. 1303, or miked@solaratm-ca.com, and visit us at www.solaratm.com.
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TRICOR METALS HIRES JACOB WHITESIDES, PROJECT MANAGER

Tricor Metals announced today that Jacob Whitesides has joined their project management team. Jacob has over 11 years’ experience in the titanium industry for the chemical, mining, electro-chemical, paper and maintenance applications.

Jacob’s responsibilities will include project management, estimating and will involve considerable customer contact. He will report to Pete Philippon and will work from Tricor’s Texas Division in Conroe, Texas.

Jacob was previously employed by PT-MAT in technical sales and Tico Titanium in sales and fabrication project management.

About Tricor Metals:

Tricor Industrial, Inc., established in the 1980’s, is a woman-owned small business, involved in industrial product distribution, retail & rental products, and metal fabrication. The company is headquartered in Wooster, Ohio with other facilities in Wooster, OH, Morristown, OH, Conroe, TX, Plymouth, MI and Oxnard, CA.

Tricor Industrial is a premium quality Industrial supply and rental business in Wooster, Ohio and Morristown, Ohio. They provide Ohio and the surrounding areas with durable machining tools and supplies. They stock a full line of industrial products including fasteners, hand & power tools, drills, taps, cutting tools, safety supplies, and precision instruments, industrial and janitorial supplies. Tricor Rental, in their Morristown, OH facility, rents a variety of equipment such as; lighting towers, portable power generators, pressure washers, small and mid-sized excavators, floor sanders, lawn equipment, and more to support small and medium-sized contractors in the region that work for oil & gas, landscaping, and mining markets.

Tricor Metals, serving the world’s titanium needs, has earned a world-wide reputation as a leading titanium metal service center maintaining one of the world’s largest stocks of premium performance metals including titanium, tantalum, zirconium, nickel-based alloys, and duplex stainless steels for corrosion resistant applications. They are also known as a premier fabricator of ASME code quality specialty process equipment such as: pressure vessels, custom shell & tube heat exchangers, pipe spools, plate and frame heat exchangers for chemical, mining, refining and process industries. Tricor Heat Exchangers supplies spare parts and refurbishing of for plate heat exchangers. Tricor’s reactive and specialty metal welding repair services are mobilized world-wide.

Tricor Alloys, launched in 2014, supplies high performance UltraGrade™ welding wire for aerospace, power, and challenging applications. Tricor Alloys supplies titanium mill products to aerospace and medical.

For more information contact Ron Krajcik at 330.264.3299 x2114 or ron@tricormetals.com.

Jacob Whitesides, Project Manager, Tricor Metals
JWhitesides@tricormetals.com 800-421-5141 x2425

PERRYMAN COMPANY ENHANCES REVERT CAPABILITIES WITH ACQUISITION OF SPECTRALLOY, LLC

Houston, Pennsylvania, September 15, 2015 – Perryman Company announced today it acquired titanium revert processor Spectralloy, Co., LLC. Located in Goodville, PA, Spectralloy is engaged in the recycling of titanium revert raw material for use in various titanium melt processes in the manufacture of titanium ingots. Spectralloy is ISO 9001: 2008 certified and has both premium and standard quality approvals.

“This acquisition further strengthens our position to manage the revert supply stream to our operations”, commented Frank Perryman, President and CEO. “The addition of Spectralloy to our organization complements our current raw material processing supply chain.” Perryman will now have in-house solid feedstock processing capabilities to add to its in-house titanium chip processing. Spectralloy has been a long time supplier of recycled titanium to the titanium industry and has been a strategic supplier to Perryman for many years.

Over the past several years Perryman has expanded its manufacturing footprint and increased capacity to support strategic growth initiatives. The company forecasts an increased need for its titanium products in the 2016-2020 timeframe. “As demand for our products continues to grow it is imperative that we strive to be as efficient as we can in all that we do. Through this acquisition we are enhancing our ability to manage our feedstock. It’s a natural integration step for us and, along with our recently added manufacturing capacities, allows us to better support our customers as they grow” stated Perryman.
TITANIUM SOLUTIONS FOR THE GLOBAL AEROSPACE, MEDICAL DEVICE AND INDUSTRIAL MARKETS

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AS 9100 & ISO 9001 Certified | Lean Quality Management

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Sheet | Plate | Bar | Block

VMI will work with you to customize an inventory management or supply chain solution. With our FIRSTCUT® Services and a focus on Lean systems, Vulcanium Metals is committed to freeing up your critical resources, reducing your manufacturing bottlenecks, and reducing your scrap costs—resulting in an overall reduction of your supply chain costs.

FOR MORE INFORMATION:
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PRAXAIR TO MARKET FINE TITANIUM POWDERS FOR THE ADDITIVE MANUFACTURING INDUSTRY

INDIANAPOLIS AUGUST 4, 2015—Praxair, Inc. (NYSE: PX) today announced its Praxair Surface Technologies business will begin marketing fine, spherical titanium powder for use in 3-D printing by additive manufacturers serving the aerospace, automotive, industrial and medical markets.

3-D metal printing with titanium, in which components are built up by depositing the material in layers, can lower manufacturing and raw material costs, improve fuel efficiency and enable the design of the most advanced parts, from aerospace brackets to biomedical implants. This enables the benefits of titanium’s strength, light weight and corrosion resistance to be further adopted in advanced applications.

“Until now, there’s been limited availability of fine, titanium powder in the marketplace to create parts,” said Dean Hackett, vice president of advanced materials and equipment for Praxair Surface Technologies. “That won’t be the case for long as we move into full-scale production of aerospace-grade, fine, spherical, titanium powder starting in the third quarter of 2015. In addition to supplying the powder, Praxair also offers the associated industrial gases to the additive manufacturing industry.”

Praxair’s ability to produce large-scale volumes of titanium powders designed for additive manufacturing is rooted in its more than 50 years of experience producing gas atomized powders for the thermal spray coating industry. In recent years, research and development efforts have focused on the production of metal powders, including cobalt, iron and nickel, for 3-D printing purposes. Further development of a proprietary atomization process designed specifically for titanium allows the company to make some of the largest batches of fine, titanium powder in the world.

“What makes our production of titanium powders different from those currently on the market is that we use close-coupled, high-pressure gas atomization to produce fine, spherical titanium powder in large quantities,” said Andy Shives, additive manufacturing marketing manager for Praxair Surface Technologies. “Adding titanium powder to our portfolio enables us to better support the manufacturing needs of aerospace and other industries.”

Praxair is currently working with major aerospace original equipment manufacturers (OEM) by providing limited quantities of its fine titanium powder to further OEM research and development efforts ahead of Praxair’s full commissioning of its gas-atomized titanium powder line.

Praxair Surface Technologies offers a comprehensive array of high-performance coatings, materials and technologies to aviation, energy, and other industries. By continuously advancing coating and material technologies, Praxair Surface Technologies helps customers improve environmental performance, decrease energy consumption, extend component life, improve productivity, minimize downtime, reduce operating costs and produce high-quality products.

Contact: Wendy Chance, +1 317 240 2172, Wendy_Chance@Praxair.com
Anson “Andy” McCurdy, 75

Anson (“Andy”) McCurdy, 75, of Portsmouth, RI, formerly of Shrewsbury, MA, passed away peacefully in Newport, RI on July 11, 2015.

Born in Worcester, MA, Andy was the son of the late Archibald and Grace McCurdy. He is survived by his wife of 51 years, Barbara, his son James and his wife Elizabeth, his son David and his wife Laura, and his grandchildren Nathan and Camille.

Andy graduated high school in 1957 from St. John’s Preparatory School in Worcester, MA. He studied marketing at Clark University in Worcester, MA where he met his wife Barbara. After graduating from Clark University in 1962, Andy served in the U.S. Army in Germany where he and Barbara were married. He then began a 35 year career at Wyman-Gordon Company in North Grafton, MA. He was a Sales and Marketing Manager of Turbine Products. Andy was a respected leader in the titanium industry, serving as both a Director and President of the International Titanium Association.

A long time sailor, Andy enjoyed sailing with his family on Narragansett Bay. When he retired, he volunteered to teach sailing to the disabled in the ’Shake-a-Leg’ program in Newport. He was an active member of the Ida Lewis Yacht Club, where he often volunteered as a Principal Race Officer.

Andy enjoyed traveling with his wife and was a devoted father and grandfather. He was active in the St. Barnabas Parish where he volunteered as a Lector.

Gus Gustin
Gus Gustin retired from TIMET as Director Sales, Military Land Systems and Marine. He joined TIMET in August, 1997 after working 21 years at Lukens Steel Company where he held various sales, purchasing and management positions.

Martin Vonmoos
Martin Vonmoos retired from BIBUS METALS. He joined BIBUS in February, 1981 until 31st May 2015 (34 years). He is still Member of the Board. Since the year 2000, Mr. Vonmoos built up and founded subsidiaries in Poland, Hungary, Romania, Bulgaria, Ukraine, Russia, China, Czech Republic and UK.

Leroy Leland
Leroy Leland retired from Retech as Vice President Emeritus, Sales. Having been with Retech since 1978, Leroy began as the company’s first sales representative. Over the years he helped grow the customer base and define Retech’s product line through expansion of business activities, both domestically and internationally. Eventually becoming Vice President of Retech’s Sales and Business Development activities, Mr. Leland oversaw the Business Development department and served as an integral part of Retech’s longstanding relationships with customers around the globe. Leroy retired in July of 2015 after 36 years, though he has been retained as an adviser for special projects. Prior to coming to Retech, Mr. Leland served as the Regional Sales Manager (Midwest territory) for Ingersoll-Rand, covering Chicago/Mid-West area, from 1973 to 1978. Mr. Leland holds a Bachelor of Science degree in Plastics Engineering from California University, Chico.
The Olin Research Group

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Our Snapshot Reports Offer Insights Into These Titanium Industry Drivers:

- Quarterly Demand Growth.
- The Consensus Full-Year Outlook & Early Reads For 2016.
- Gauging The Strength Or Weakness On 14 Key End-Markets.
- Updated Inventory Intentions Within The Distribution Channel.
- Average Mill Lead Time Calculations.

The Olin Research Group is a specialized firm that offers MARKET UPDATE REPORTS for various carbon steel, stainless, specialty materials (titanium & nickel-based alloys), and aerospace company executives. We do this by leveraging our network of industry contacts (distributors, mills, producers, and buyers) and 18-years of experience in the investment world. Together, we can provide unique insights from a “top-down” or “bottoms-up” perspective. Our partners have an edge versus the competition -- for planning and up-to-date market share analysis.

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- We gauge the relative health of key end-markets.
- Customers get an enhanced ability to navigate through any industry challenges and/or opportunities.
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Awards

Roger Jones Receives 2015 HTS George H. Bodeen Heat Treating Achievement Award

Souderton, PA. May 28, 2015 – Roger Jones, Corporate president of Solar Atmospheres, Inc., Souderton, PA, is the recipient of the 2015 George H. Bodeen Heat Treating Achievement Award. Established in 1996, the award recognizes distinguished and significant contributions to the field of heat treating through leadership, management, or engineering development of substantial commercial impact. Roger is recognized “for advancing the thermal processing industry through technological developments in fixturing materials, methods, and the application of partial pressure atmospheres in vacuum furnaces for ferrous, stainless steels, and brass alloys.”


Roger has been a member of the ASM Philadelphia Liberty Bell Chapter since 1983, and served as chapter chair from 1993-1994. He was chair of the ASM Heat Treating Society (HTS) Immediate Needs Committee and the HTS Education Committee, served on the Nominating Committee for two terms, and is a member of the HTS Technology & Programming Committee. He was elected to the HTS Board in 2005, served as vice president (2011-2013) and is the current president of HTS. He received the chapter’s William Hunt Eisenman Award in 2001 and Distinguished Service Award in 2004. Under his leadership, Solar Atmospheres received the chapter’s “Outstanding Company Support Award” in 1996 and 2006.

The Bodeen award will be presented at the HTS General Membership Meeting on Wednesday, October 21, at the ASM

Career Announcements

Vincent Rocco, Sales Manager – Ametek Specialty Metal Products July 2015
Robert Wnek, General Manager – Castle Metals June 2015
Melissa E. Martinez, Vice President, New Product Development – ATI June 2015
Ian Harris, Technical Director, Aerospace and Strategic Initiatives – EWI June 2015
Hans Heiden, Bandsaw Business Development Manager - SNA Europe June 2015
Brian Drummond, Principal – Argos Enterprises, LLC June 2015

Work Anniversaries

Daniel Barber 10 years at Perryman Company
Richard Freeman 5 years at TWI
Michael Feior 2 years at Perryman Company
Pedro Palma 3 years at Roskill Information Services
Ruby Su 2 years at Shaanxi Xingsheng Metal Co., Ltd.
Scott Steele 11 years at Titanium Industries, Inc.
Edward Newman 1 year at Cronimet/United Alloys
Mike Kaufman 22 years at Medart, Inc.
Chuck Berry 2 years at TMS Titanium
Jeff Sasek 7 years at Carpenter Technology Corporation
Emily Zhang 7 years at Baoji Jinheng Metal Material Co., ltd
Jeff Massengill 25 years at HDR Engineering
Cindy Chen 1 year at Baoji Qicheng Non-ferrous Metals
Steve Meredith 12 years at North American Alloys

John Hamulak 10 years at United Technologies Aerospace
Bruce Whetzel 9 years at Metal Works of Ohio, LLC
Ulf Edling 26 years at Sandvik
Nicholas Oliver 2 years at elg Utica Alloys
Brian Bishop 9 years at EWI
Paul Godown 5 years at CRONIMET
Cindi Richter 26 years at Selmet Inc
Greg Rollins 8 years at Titanium Specification Metals
Thomas Zucarini 13 years at Carpenter Technology/Dynamet
David Provan 6 years at West Penn Testing Group
Eric Bender 6 years at TZMI
Francisco Vega 1 year at Norsk Titanium
Gary Nemchock 18 years at Architectural Titanium
Taras Lyssenko 27 years at A and T Recovery
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ADMA Products Inc. is AS9100 registered fully integrated manufacturer of ADMA Hydrogenated Titanium Powder, ADMATAL® net shape and near net shape powder metallurgy titanium and titanium alloy products. These products, produced by ADMA under its proprietary and patented “solid state” (non melt) consolidation processes, meet all critical specifications and standards, including Aerospace Materials Specifications (AMS). Components made from ADMA Hydrogenated Titanium Powder are characterized by high purity, refined microstructures, low oxygen content, excellent “weld-ability”, low energy input, almost 100% “buy to fly ratios”, low cost, and performance that is superior to those of titanium ingot based products. ADMA additionally specializes in stainless steel, nickel, niobium, zirconium and other advanced materials produced by powder metallurgy processes.

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+49 6181 307 0
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info@ald.vt.de

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ALD is a worldwide leading supplier of advanced furnace systems for melting, casting, coating and heat treatment of metals under vacuum. ALD furnaces are used for the production of especially pure and specially alloyed metals, materials and parts. Our customers are comprised of the leading manufacturers of materials used in aerospace, energy, semiconductors, medical and commercial markets for a variety of applications that require those super-alloys, reactive and refractory materials as well as rare earth and powder materials.

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Titanium Buyers Guide (continued)

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www.chinabti.com.cn

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Blaser Swisslube is an independent and family-owned Swiss company founded in 1936. Blaser Swisslube is represented in about 60 countries, close to its customers. The company develops and produces high-quality cutting and grinding fluids and its customers produce, with great success, a wide range of products from the tiniest of components to large, critical and structural components in all manufacturing industries.

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Bonatech Metal Research Institute (BMRI) is a leading research institution in China specializing in research and development, technical transfer and technical service of metal material and automated control equipment. BMRI was jointly established in 2004 by a private enterprise, a prestigious domestic university and a professional research academy. It is supported by a group of top science and technology and expert team in the fields of metal, mechanical and electric control, automated control and mineral dressing. At present, BMRI has 50+ researchers, including eight engineers with senior professional titles, two researchers with PhD degrees, five professionals with master degrees, and others with college or bachelor degrees.

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China Huaxia Special Metal Limited
0086-21-58770128
www.nonferrous-metal.com;www.csmhuaxia.com
helen@nonferrous-metal.com;
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China Huaxia Special Metal Limited is one of the largest manufacturers of titanium, nickel & nickel alloy, stainless steel/duplex & supper duplex with forms at sheet/plate, seamless tube/pipe, bar/rod, wire, welded pipe, seamless & welded fitting, flange, valve, clad material etc. With the logo CSM (China Special Metal), we hope to be the best one of special metal manufacturer in China. CSM always treat the quality as our life, CSM invest the quality and future. CSM material have been widely used in oil&gas industry, chemical industry, construction industry, sports industry etc, many big companies in these field have approved CSM material. CSM took the pride in CSM titanium sheet used in 2012 London Olympic Village decoration, CSM has the mission to be the enterprise to improve the position of Chinese titanium products in the international market.

China Steel Corporation
+866-7-802-1111
www.csc.com.tw
China Steel Corporation (CSC), located in Kaohsiung, Taiwan, was founded in December 1971. with annual production (in terms of crude steel) around 10 million tones, CSC produces a range of products that includes plates, bars, wire rod, hot and cold rolled coils, electrogalvanized coils, electrical steel coils, hot-dip galvanized coils, and Ti/Ni-base alloys. The domestic markets takes roughly 65% of CSC’s production and the exports take the remaining 35%. CSC is the largest steel company in Taiwan, enjoying more than 50% of the domestic market. Major export destinations are Mainland China, Japan, and Southeast Asia.

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Cleveland Research Company is an independent equity research firm headquartered in Cleveland, Ohio. We pride ourselves on a disciplined research process that has us regularly engaged with the companies we cover. We are focused mainly on uncovering inflection points via rigorous digging in the channel. We limit the distribution of our proprietary research and findings to 125 of the largest institutional investors in the US, a discipline which allows us to provide a high level of service to our partners. Our firm is comprised of intellectually curious, highly motivated individuals who are all striving to build the best equity research firm in the business. Chris Olín is the head of the specialty materials & aerospace-related research team. Each quarter, we offer a free update report on the visible trends in key markets (like titanium and nickel-based alloys) for any company/person that completes our quarter survey(s). We also host a series of webcasts to highlight the interesting themes and potential topics.

Consarc Corporation
+1-609-267-8000
www.consarc.com
Consarc Corporation, an Inductotherm Group Company, is a manufacturer of vacuum furnaces for the titanium forging and casting industry. Consarc custom designs and manufactures Reactive Vacuum Arc Melting (RVAR) furnaces for primary electrode melts of compacted sponge titanium and titanium alloys, and secondary melt furnaces for remelting fully dense electrodes. Consarc also designs and manufactures fully customized Induction Skull Melting (ISM) systems for melting titanium in a refractory free environment for casting or ingot withdrawal. Consarc is ISO 9001-2008 certified, and with operations on 5 continents, is well equipped to tackle fully customized furnace projects globally.

Continental Steel and Tube Company
+1-954-332-2290
www.continentalsteel.com/Titanium/default.asp
Continental Steel and Tube Company is one of the world’s leading value added volume suppliers of quality metals. With an outstanding global reputation, our team of expert sales associates can source a comprehensive inventory of metals to meet any application requirements.
Continental Steel supplies a wide range of metals including, titanium, stainless steel, nickel, steel, aluminum, hot/cold rolled, galvanized, and stainless and electrical steel in carbon and alloy grades. Our long list of Titanium Grades includes Ti 6AL-4V ELLI. Our materials are available in coils, sheets, strips, plates, angels, bars, rounds squares, hexagons, and other custom shapes. Continental also offers tubing or pipes in welded, DOM and seamless.

Cristal Metals Inc.
+1-815-221-2281
www.cristalmetals.com
itp.billing@cristal.com
Cristal Metals was formed in 1997 as International Titanium Powder (ITP) to develop and commercialize Armstrong Process® patented and proprietary technology for high purity metal and alloy powders with specific emphasis on titanium. Armstrong Process® technology is intended to lower the production cost of powders suitable for direct consolidation, to lower the manufacturing costs of titanium products through powder metallurgy processing, and to reduce the environmental impact of titanium production.
CSIRO High Performance Metal Industries
+61 3 9545 8644
www.csiro.au/TitaniumTechnologies

The High Performance Metal Industries Program, is engaged in applied R&D across the metal value chain, specialising in novel metal production techniques, interfaces/corrosion, metal forming, and additive manufacturing / 3D printing, particularly for Titanium and its alloys. HPMI partners with commercial industry in applied research or to develop new technologies as well as provides consulting services use of specialized facilities, and aims to be a global leader in the knowledge and application of fundamental metals technologies. The Commonwealth Scientific and Industrial Research Organization (CSIRO) is Australia’s primary national research body, with over 5,000 researchers active over a wide range of fundamental and applied research challenges.

Cyril Bath Company
+1-704-289-8531
www.cyrilbath.com

Cyril Bath produces titanium air frame components by Hot Stretch Forming HSF® titanium profiles in lengths up to 30 feet long. Most of these air frame components are provided as machined and finished, ready for airplane assembly installation. We purchase titanium in extrusion or rolled product forms.

Danieli Corporation
+1-724-778-5400
www.danieli.com

Danieli Centro Maskin combines Swedish, North American and Italian technology together with know-how gained through our experience of 55 years of activity in the field of Surface Conditioning, NDT Inspection and Finishing Lines for the titanium industry. Danieli Centro Maskin surface conditioning, drawing, straightening, peeling, centerless grinding, cutting, and tube finishing lines, incorporate the most modern engineering and design technologies.

Danieli Wean United is recognized worldwide as a leader in the field of engineering and manufacturing of complete hot and cold mill complexes for ferrous and non-ferrous metals."

Danobat S. Coop
http://www.danobatgroup.com/en

Danobat, S. Coop. Ltda. engages in the manufacture of machine tools and production systems in Spain. It offers lathes, grinders, laser cutting machines, punching machines, automatic bending machines, plasma cutting and drilling units, equipment for the railway industry, band saw machines, and boring/milling products; and develop, training, upgrade, and maintenance services. The company serves aerospace, automotive, capital goods, general engineering, oil and gas, railways, and wind power industries in North America, South America, Africa, Europe, Asia, and Oceania. Danobat, S. Coop. Ltda. was founded in 1954 and is based in Elgoibar, Spain. Danobat, S. Coop. Ltda. operates as a subsidiary of Mondragon S. COOP.

DGA
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www.defense.gouv.fr/dga

The preparation for the future of defence systems involves imagining possible futures, anticipating threats and risks, advancing technology and developing European partnerships. Its aim is to provide France with the means necessary for its defence and security policy with the desired level of autonomy and respect for its international commitments. To prepare for the future, the Armaments Procurement Agency (DGA) ensures continual access to the necessary industrial and technological base by developing strategies for research and technology, industry and cooperation.

DHL Drawback Services
+1-585-328-7130
www.dhldrawback.com

DHL Drawback Services is a licensed Customhouse broker specializing in duty drawback matters. With offices in Houston, Texas and Rochester, New York, we have over 20 years experience obtaining the maximum in allowable duty drawback refunds and excise tax credits for our clients in a compliant, timely, thorough, and professional manner that imposes the least amount of administrative burden on our client’s time and resources.

DKSH Switzerland Ltd.
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www.dksh.com
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Pioneers in sourcing of Titanium bars and plates from Japan and China: DKSH Advanced Metals is part of a Swiss group with 140 years of experience in bridging Asia and the West. For the last 30 years, we have been instrumental in introducing high quality titanium and titanium alloys from top quality Japanese and Chinese producers to European, US and South East Asian customers. We serve stockists as well as end users in the Medical, Aerospace, Automotive, Chemical, Oil & Gas and other high tech industries. Our wide range of services includes access to a comprehensive stock of Ti semi finished products, advanced supply chain management such as vendor managed inventory and subcontracting for machining and forging, tailor made financing solutions and metallurgical expertise. Our deeply rooted knowledge of sourcing and subcontracting markets coupled with our Swiss sense for premium quality ensures that we remain at the forefront of innovation when it comes to serving your needs.

Dufereco SA
+41 91 822 56 00
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Dufereco Group is the ultimate shareholder of Vanchem Vanadium Products (Pty) Ltd. (“Vanchem”). Vanchem is one of the world’s top five vanadium producers and its assets comprise mining activities and various vanadium oxide, ferro-vanadium, and vanadium chemical production facilities. Visit our websites at www.vanchemvanadiumproducts.com and www.dufereco.com
Service Steel Aerospace is a customer-oriented stocking distributor of high performance stainless steel, titanium, allow steel, nickel based super alloy, Maraging steel and Invar. We are committed to providing quality products to the aerospace industry and other critical application industries throughout the world. SSA performs a wide array of value-added processing services designed to meet the specific needs of our customers. Our commitment to quality and service has made SSA a leader in the industry for over 35 years.

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www.cartech.com/dynamet

Dynamet Incorporated was founded in 1967 to produce titanium wire and bar for the aircraft fastener industry. Purchased by Carpenter Technology Corporation in 1997, Dynamet has become a leader in the development of high performance titanium long products for the aerospace, medical, motorsports, recreation and consumer industries. As a supplier of fastener wire, bar, precision shapes, fine wire, and weld wire, Dynamet offers unmatched flexibility in manufacturing custom sizes, chemistries, and quantities to meet demanding customer specifications and production needs.

Edge International
+1(937) 395-7222
www.edgeintl.com
metals@edgeintl.com

Edge International, located in Dayton, Ohio, is an ISO 13485-certified stocking distributor of raw materials, specializing in medical grade Cobalt-alloys, Stainless Steels and Titanium for the forging and machining of components for the orthopaedic, spine and trauma markets. Edge works with its customers to provide cost-effective solutions that satisfy pricing requirements and materials support for its strategic products. Value-added services include precision grinding, precision sawing, non-standard grades and sizes, and just-in-time inventory programs. The company conducts business internationally with customers around the globe.

EFC Systems, Inc.
+410-939-7155
www.efcusa.com

EFC - Electrostatic Finishing Components and Systems, Inc., an American engineering and manufacturing firm serving both the domestic and international markets, is a complete systems supplier for advanced spraying technologies. We design, fabricate, and repair electrostatic finishing components - turbine and spray gun systems - at our headquarters in Havre de Grace, Maryland.

ELG Utica Alloys, Inc.
+1-315-574-1680
www.elguticaalloys.com

EUA is one of the world’s largest Titanium, Nickel and Cobalt alloy recycling companies. We operate under the tightest quality standards, utilize the latest equipment, offer unparalleled service, are fed by over 40 sister yards worldwide and have the financial backing of ELG Haniel GmbH.

Evraz Stratcor, Inc.
+1-312-533-3650
www.evrazstratcor.com

EVRAZ Stratcor offers titanium producers one-stop shopping for all their master-alloy requirements. Using a state-of-the-art, ISO approved production facility that is focused on meeting the ever-increasing quality needs of the aerospace industry, we can provide a full range of vanadium and other master alloys, including innovative and customized specialty alloys that are marketed and managed by EVRAZ Stratcor, Inc. based in Chicago, Illinois.

EWI
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EWI is the leading engineering and technology organization in North America dedicated to developing, testing, and implementing advanced manufacturing technologies for industry. Since 1984, EWI has offered applied research, manufacturing support, and strategic services to leaders in the aerospace, automotive, consumer electronic, medical, energy, government and defense, and heavy manufacturing sectors. By matching our expertise to the needs of forward-thinking manufacturers, our technology team serves as a valuable extension of our clients’ innovation and R&D teams to provide premium, game-changing solutions that deliver a competitive advantage in the global marketplace. To learn more, visit www.ewi.org, email info@ewi.org, or call 614.688.5000.

FAE S.A.
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FAE is an Argentinean company that it is proud to announce that had been qualified by Airbus for supplying hydraulic titanium Ti-3Al-2.5 tubing for Family 320. Also it is the first Latin-American company in getting a tier one contract with EADS group. One of its main activities, apart from aerospace, is the manufacturing of seamless commercial pure titanium and titanium alloy tubes for heat exchangers which are up to 35 meters long. It also produces ingots and bars in titanium alloys and bright annealed finish seamless instrumentation titanium tubes (O.D ¼” up to 5/8”). FAE is certificated according UNE EN 9100: 2009, ISO 9001: 2008, ISO 14001: 2004, OHSAS 18001: 2007, PED 97/23/EC & CSA N285.0 standards. Its products are exported to countries all over the world and they are used in aerospace and corrosion resistant applications. Now also NADCAP certified company for hat treating and non destructive test.
Fine Tubes
+44 (0)1752 876416
www.finertubes.com
www.supieriotube.com

Fine Tubes is a leading global manufacturer of precision tubing in titanium, stainless steel, nickel and zirconium alloys. The company manufactures tubes in both seamless and welded forms used in mission critical applications across a range of specialty markets including oil and gas, aerospace, nuclear, power generation, chemical process and medical devices.

Titanium tubing expertise:
- Seamless titanium tubes from 1 mm (0.040”) OD to 50 mm (2”) OD. Straight lengths up to 18 ft.

Fine Tubes has achieved NADCAP approval for Ultrasonic Testing, Heat Treatment and Fusion Welding and offer a comprehensive portfolio of titanium products in the following alloys: Ti CP (Grade 1), Ti CP (Grade 2), Ti 6Al/4V (Grade 5), Ti 3Al/2.5V (Grade 9), Ti 5Al/4V and Ti 4Al/2.5V.

Proudly based in the United Kingdom, Fine Tubes operates a number of state-of-the-art titanium processing facilities including:
- Pilger Rolling Mills
- Draw Benches
- Vacuum Furnace Heat Treatment
- Chemical Processing
- Conditioning & Degreasing

Along with its US-based sister mill, Superior Tube, Fine Tubes is a unit of AMETEK Specialty Metal Products, a division of AMETEK, Inc., a leading global manufacturer of electronic instruments and electromechanical devices.

Fort Wayne Metals
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www.fwmetals.com
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Fort Wayne Metals has a long history of producing precision wire and wire components for demanding applications. For many years, our efforts focused exclusively on the medical device industry. But eventually we realized that our unique skills can be valuable to other industries, as well. After all, there are many non-medical applications that depend on wire to save lives – from TT straps in helicopters made from MP35N® or 35N LT® and brush seals from L-605 or C276 to Titanium aerospace wire.

No matter what your application may be – when you source your wire from Fort Wayne Metals Specialty Products, you know you’re dealing with a company that understands the critical importance of quality. And that means we uphold the highest standards throughout our entire production process. In fact, we are 9100C and ISO 9001 certified and maintain a A2LA - ISO/IEC 17025 compliant Materials Testing Laboratory.

FRIEDRICH KOCKS GmbH & Co KG / KOCKS PITTSBURGH COMPANY
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FRIEDRICH KOCKS GmbH & Co KG was founded in 1946 by Dr.-Ing. Friedrich Kocks. We have been successfully operating worldwide in the field of rolling mills for tube, wire rod and bar as independent, medium sized family owned company.

By a consistent and future-oriented development of our products, our technology has acquired a leading position on a global scale. KOCKS rolling mills are the benchmark for creative application oriented solutions as well as first class competence in engineering and manufacturing. Following its policy, KOCKS will pursue these constant innovations so that KOCKS will provide tomorrow’s technologies today.

Friggi N.A.
+1-519-421-9291
www.friggiamerica.com
info@friggiamerica.com

Friggi N. A. Inc., provides premium metal and aluminum cutting solutions to the North American market. With over 70 years manufacturing experience we now offer large vertical plate and block saws, high-speed carbide saws, plasma, and waterjet cutting solutions. Within our product line, we offer specialized equipment to cut challenging materials like Titanium or exotic metals with extreme precision and performance. Our plate saw capacity is over 20 feet and our Gantry models will cut blocks up to 140” with minimal material handling. Machines are available in automatic or semi-automatic version to cover any requirement. We service many key market segments including aerospace, automotive, defense, oil and gas, steel service centers, forging and mold makers. Whether
Producers, Distributors, Fabricators, OEM’s, & Vendors to the Industry

the application is to cut ferrous or non-ferrous metals for ingot, bar, block, or plate we offer the best solution for our clients’ production needs.

G&L Manufacturing, Inc.
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G&L manufactures welded tubing in a full range of corrosion resistant and high temperature alloys including stainless steels, nickel alloys and titanium. From demanding heat transfer applications, to safety critical fuel delivery systems, to life supporting medical applications G&L’s tubing has been exceeding customer expectations for over 30 years. G&L’s proprietary tube forming and welding technology is designed to deliver precise dimensional control and consistent weld integrity. G&L tubing is offered in cut to length, level wound and loose wound coil, as well as custom shapes. With 100,000 SQ FT of manufacturing space in Cookeville TN, USA and 30,000 SQ FT in Nanjing, China, G&L is well positioned to serve the global industrial market. G&L Manufacturing, Inc., 1975 Fisk Rd., Cookeville, TN 38506

G&S Titanium, Inc.
+1-330-263-0564
www.gs-titanium.com

G&S Titanium manufactures many grades of titanium in the form of round and hex bars, fastener wire, spring wire, weld wire, precision ground medical bars, and fine wire. This includes the standard grades such as CP Gr. 1-2-3-4, 6AL-4V, 6AL-4V Eli, as well as hard to find alloys such as 3-8-6-4-4, 13-11-3, 6-2-4-2, 8-1-1, Gr. 7, Gr. 9, Gr. 12, 21S, 230, 679, 829, etc.

Gautier Steel Ltd.
+1-814-691-6050
www.gautiersteel.com

Gautier Steel Ltd. has the capabilities to turn your ideas into reality. Our 3 rolling mills allow us to provide a broad range of shapes and sizes, whether you desire a non-standard section or a special length. We satisfy the most demanding customer specifications. From the engineers in our on-site Roll Shop to the highly skilled craftsmen who operate our mills, Gautier is experienced, knowledgeable and versatile. We begin with a flow sheet determining the number of passes it will take on the mill to roll your shape. Our advanced wire EDM machine, templates are cut with exacting tolerances – down to less than .001”. These templates are used for operation of tracer lathes and as inspection fixtures. This same system produces programs for turning rolls on our CNC lathe. When it comes to quality at Gautier Steel, you are in control.

GeoCorp, Inc.
+1-419-433-1101
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Manufacturer of thermocouples and thermocouple wire with an ISO 17025 accredited temperature calibration lab. All of our products meet the requirements of AMS 2750 Rev. E & BAC 5621K. Custom built thermocouples ship in days-not weeks. We offer material with a maximum temperature tolerance not to exceed +/- 2°F or .2% whichever is greater. This tighter tolerance allows for easier furnace testing during surveys and/or system accuracy tests. GeoCorp has a tenured staff that attends annual Nadcap meetings. We also attend the AMEC (committee that writes AMS 2750 Rev. E) meetings to work on updating specifications and addressing any customer issues with AMS 2750 Rev. E or Nadcap. Call today if you have any questions about thermocouples or wire as they pertain to Nadcap.

GfE Metalle und Materialien GmbH
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GfE, founded in 1911, is a leading manufacturer and global supplier of high performance metals and materials. During the last 40 years GfE has gained valuable expertise in the production of master alloys. As part of the AMG Advanced Metallurgical Group N.V., GfE offers a wide range of high quality products that meet the highest technical requirements for the aerospace industry. GfE’s master alloys are used in titanium and nickel based super alloys, to produce special parts for aircraft engines, land based turbines, off-shore drilling applications, and exterior shields.

Furthermore titanium as high-purity HDH powder is produced by GfE for thermal spray coatings. Its specific characteristics offer an advantageous material for porous layers on medical implants.

GfE is certificated in accordance to ISO 9001, EN 9100, ISO 14001 as well as BS OHSAS 18001 and operates an accredited laboratory according to DIN EN ISO/IEC 17025.

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The Industrial Division of GIE Media publishes four manufacturing and design B2B magazines: Aerospace Manufacturing and Design, Today’s Medical Developments, Today’s Energy Solutions, and Today’s Motor Vehicles. All four publications are manufacturing and design oriented and provide insight into the latest developments in material selection, production processes, equipment, tooling/ workholding, quality/metrology, and automation.
ZIROM offers high quality level titanium and titanium alloys ingots by VAR and EB melting and forged products using Free forging process. Our company is certified according to international standards: AS 9100 / EN 9100, ISO 9001, ISO 14001.

From Zirom Romania to Titanium World!

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Producers, Distributors, Fabricators, OEM’s, & Vendors to the Industry

Global Titanium Inc.
1-313-366-5300
www.globaltitanium.com

Global Titanium is a leading producer of ferrotitanium, titanium scrap products, and titanium HDH powder. Located in Detroit, Michigan, Global Titanium serves the steel, stainless steel, aluminum, and titanium industries. Global Titanium is an ISO 9001:2008 registered company with a strong commitment to safety, quality, and customer service.

GNB Corporation
+1-916-395-3003
www.gnbvalves.com

GNB has a proven track record of manufacturing high quality, reliable vacuum products since 1968 and is known as America’s leading manufacturer of large vacuum valves. In addition, GNB offers a diverse range of vacuum products and services, including: inline chambers, slit valves, gate valves, pendulum valves, angle valves, vacuum chambers, liquid nitrogen traps, custom flanges and fittings, viewports, bellows, multi-coolant baffles, throttle plates, and much more. With our expert group of engineers, GNB can efficiently customize our clients’ products. Extensive experience combined with an outstanding reputation for high quality products and customer service, GNB is the valued resource for your next vacuum system.

Goldman Titanium, Inc.
716.823.9900
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info@goldmani.com

Goldman Titanium, Inc. purchases and processes scrap titanium in order to supply the highest quality finished product to our customers. As a pioneer in the titanium industry, our company was first established in 1955, and we have continuously expanded our business over the years. Titanium is the only metal we handle, making us experts in our field.

Goldman Titanium is certified to ISO 9001: 2008 and AS9100:2009, Rev. C, complying with the rigorous requirements of the aerospace and defense industries. Our company’s products have been approved by major U.S., European, and Asian melters, as well as by master alloy producers, steel and stainless steel producers, and ferro titanium producers.

Grandis Titanium
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GRANDIS TITANUM is a major worldwide supplier of titanium products like Titanium Bars, Sheets, Plates and Wire for Industrial and Chemical applications. Company maintains warehouses in Los Angeles and Rotterdam, and sales offices in USA: California, Ohio and Oregon, also in South Korea, China, Russia, Belgium and Italy.

Haynes International Inc.
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www.haynesintl.com

Haynes International, Inc., headquartered in Kokomo, Indiana, USA, is a leading developer, manufacturer and marketer of high-performance nickel- and cobalt-based alloys used in corrosion and high-temperature applications. Our highly-trained staff and technicians provide superior customer service, worldwide technical support and one-on-one consultation in selecting the proper alloy for the application. In addition to stocking our standard product forms, our global service centers offer value-added services to shorten your cycle time, reduce material waste and increase your operation’s efficiency. Haynes International is a partner in your entire material management system and provides value far beyond the alloys themselves.

Hempel Special Metals GmbH
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www.hempel-metals.com

Hempel Special Metals in Germany is one of the largest stockists for Titanium, Nickel Alloy and Zirconium in Europe with companies in England, Poland, Switzerland, Italy and various sales representatives. Our main businesses are chemical process industry, flue gas desulfurization, oil & gas, medical and watch industry. Beside all standard titanium grades we stock special grades (Grade 4, 5, 5-ELI, 7, 9) in bars, sheet/plates and tubes. Our services include individual stocking, cutting, sawing, plasma, laser- and water jet cutting, individual bar marking and turning. We supply material tailor made and in packages for special projects.

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Your HiTech Alloys team understands the new standards of the world.

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We will accommodate your needs.

We also will make any alloy to your specifications.

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High Performance Alloys, Inc. has a GFM radial forge for producing bar. The GFM uses 4 dies to produce more force to the center of the bar than rolling or drawing methods. Our GFM produces 120 tons of force per die, 900 times per minute. Rolling mills have difficulty with some of the more difficult (Beta) alloys at lower processing temperatures. Our process produces a more refined grain structure due to the 360 degree directed force and the high forging forces.

H.P.A. is a secondary producer of the high performance alloys. We process small to medium lots of materials; excellent for prototype
Hogue Metallography
http://hoguemet.com/

Services Include:
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Industrial Problem Solving
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Training Courses Offered

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Horie Corporation is the world leader at surface engineering of Titanium such as precision coloring, etching, grain controlling and the solution provider to complex titanium fabrications. Horie has developed its original titanium technology using Horie’s electro-chemical technology and surface treatment technology. Our titanium knowledge provides our customers with unequaled solutions in titanium. Horie will continue to develop many new products and search the unlimited possibilities and beauty of titanium.

Independent Forgings & Alloys Ltd
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Independent Forgings & Alloys ltd is an open die forge with expertise in titanium, nickel and steel alloys. Processing ingots to billets, rolled/ hammer forged rings and flat bars through our onsite capabilities which include a 1600 tonne open die press, 2 x ring rollers, 3 forging hammers, NADCAP approved heat treatment and machining facility.

Inductotherm Corp. -
Long Products Division
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www.inductotherm.com
sales@inductotherm.com
President: Bernard Raffner
General Manager: Bert Armstrong
Director – Sales: Andrew Procopio

PRODUCTS and SERVICES - Inductotherm manufactures a complete line of induction heating and boosting systems for titanium slabs, billets, blooms, bars and rods prior to rolling. Other products include vacuum induction melting, holding, pouring, heating and coating equipment for thermal applications in air or controlled atmospheres for the metals industry. Coreless and channel furnaces with capabilities up to 500 tons; power supplies up to 42,000 kW; automatic pouring systems with vision control; computer controls and charge handling systems.

Invera
+1-610-325-0124
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Invera is the leading supplier of ERP software for the metal distribution industry. Our STRATIX software provides advanced functions for sales, inventory control, production, shipping and outside processing of specialty metals.

Metal Specifications, Mill Test Certs and third party certificates can be controlled within STRATIX and as required emailed to customers upon shipment.

Full product traceability enables companies to have complete control and accountability of all material purchased, processed and shipped to customers.

Invera also provides INVEX for eCommerce and Customer Web Service options over the internet. Coupled with the INVEX-CRM applications companies can optimize the sales process by recording quotes, activities and tasks.

Because STRATIX was designed from the ground up for metal distributors and processors the inventory can be accessed using metal industry nomenclature. A complete solution tailor made for titanium metal companies.

Jiangsu Hongbao Group Co., Ltd.
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Hongbao is an ISO, PED, Lloyd’s, DNV and NORSOK approved manufacturer in China. We melt titanium sponge and produce titanium ingot, bar, plate and tube. We are exporting to USA, U.K., Germany, France, Sweden and Korea etc. and the total quantity is more than 800 tons per year. E-Mail: export@hongbao.com
KamaticsRWG
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KamaticsRWG, designer, tester, and manufacturer of the highest performing bearings and flight critical parts in the industry have recently developed a new technology called TDH (Titanium Diffusion Hardening). TDH is a titanium thermal diffusion process that consistently yields a high hardness case layer with an affected depth that is unmatched by other titanium surface engineering processes.

In applications that require low overall weight, titanium alloy is a popular choice for bearing material. For years customers using these bearings struggled with the fact that at very high bearing loads, titanium alloys tend to exhibit less-stable dynamic friction coefficients. Titanium alloy bearings can also be subject to surface distress. KamaticsRWG wanted to eliminate the problem for customers in search of a highly efficient lightweight bearing. In 2011 KamaticsRWG initiated a formal R&D phase-gate project. The project focused on improving the general wear and friction properties of titanium-base alloys for improved performance in self-lube bearing systems at high loads.

KamaticsRWG ran several tests on TDH treated products including high-load wear testing, high-load product testing, tensile testing, impact testing (Charpy V-Notch), compact tension testing, and erosion testing. The TDH treated journal bearings successfully passed high-load wear test requirements at four times the required cycles with one-tenth the allowable wear. The TDH treated spherical bearings successfully passed high-load product testing. In comparison the liner wear results were proportionate with standard all-stainless spherical bearings.

KASTO, Inc.
1-724-325-5600
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KASTO, Inc is the world’s only COMPLETE supplier of Metal Cutting Machinery offering all available Metal Sawing methods. These include Band Saws, Plate & Block Saws, Cold Circular Saws & Hacksaws. Customers benefit from un-biased recommendations about which Metal-Cutting Equipment is best for their application. We also offer complete Storage and Retrieval Systems!

Kevin Kreitman, EFO
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klkreitman@gmail.com

Kevin Kreitman has 36 years’ experience in the fire service beginning his career as a firefighter in Albany, OR. He was Fire Chief with the City of Albany from 1999 until accepting the Fire Chief’s job with the City of Redding, CA in Sept. 2008. Kreitman developed significant experience during his time in Albany dealing with the numerous metal industries handling materials that presented unique fire hazards. Based on those hazards, Kreitman wrote a paper on the proper handling of titanium and zirconium metal fires.

He’s a member of National Fire Protection Association (NFPA) Combustible Metals committee and has been active in the standard process with emphasis on the development of the Fire Prevention, Fire Protection and Emergency Response Chapters. He has written articles on dust & combustible metal hazards and conducted presentations at national conferences; he has assisted NFPA and the National Institutes for Occupational Safety and Health on investigations and publications dealing with combustible metal hazards, and was an author of the Combustible Metals chapter in NFPA’s recent 9th Edition of the Fire & Life Safety Inspection Manual.

Keywell Metals, LLC
+1-773-572-6173
www.Keywell.com

Keywell Metals, LLC is the industry leader in specialty steel recycling and a worldwide purchaser, processor and seller of titanium scrap metal for ingot formulation, alloy additions and ferro-titanium production. In addition to the complete range of processing capabilities, Keywell Metals, LLC operates the largest and most modern fully equipped on site analytical laboratory in the scrap metal industry. Every product shipped from Keywell Metals, LLC is fully certified and guaranteed to meet Customer Specification.

Kings Mountain International (KMI)
+1-704-739-4227
www.kmiinc.net

Kings Mountain International (KMI) is an ISO 9001:2008 / AS9100C certified precision grinding company.

KMI processing includes:
• Flat / Tapered / Contoured precision thickness machining
• Tolerances to +/- .001” (.0005” upon request)
• Sizes up to 110” x 360: larger sizes upon request
• Weight control for Aerospace applications
• Thin sheet grinding to .010”
• Surface Finishes from 250 RMS to 12 RMS and finer
• Polishing of sheet and plate to #3, #4 or #8 mirror. Non-directional also available

Benefits:
• State of the art measurement instrumentations
• Experience with all types of metals
• Plate / Sheets arrive clean, damage free and ready for fabrication
Industries we serve:
• Aerospace / Defense / Energy / Commercial Aircraft / Architecture

L.C.M.A.
+352 26 55 43-1
www.lcma.lu

Founded in 1996, LCMA is now a fully integrated producer, processor and distributor of a wide range of semi-finished titanium and titanium alloy products for aerospace, medical, petrochemical and industrial applications.

We work with several manufacturers based in Ukraine and Europe who convert our Grade 1 to 5 ingots in forged and rolled bars, sheets, plates, coils, spools, electrodes, tubes and more. LCMA is ISO 9001:2008 and EN9100:2009/AS9100:2009 aerospace approved.
**Producers, Distributors, Fabricators, OEM’s, & Vendors to the Industry**

Being part of a vertical structure, LCMA controls quality at all production processes and all products are US, EC and HB tested. We deliver to customers all over the world and our Quality, Experience, Flexibility, Short lead time, Large stock and Competitive prices make us one of the key players on the market. Please contact us at fax: +352 26 55 13 45 or Email: lcma@pt.lu

**Laboratory Testing Inc.**
800-219-9095
www.labtesting.com
sales@labtesting.com

Lab Testing Inc. (LTI) provides Materials Testing, Nondestructive Testing and Calibration Services with accurate results, fast turnaround, and cost efficiency. LTI is Nadcap accredited, A2LA accredited and ISO/IEC 17025 certified. Since 1984, LTI has been serving businesses in the aerospace industry with test results and certified reports to meet their quality and regulatory requirements. The Lab’s technical experts and support team help clients get their jobs done and find the answers they need. With a nearly 100,000 sq. ft. facility, Lab Testing, near Philadelphia, PA, is one of the largest independent testing laboratories in the USA and fully capable of handling and testing materials of all shapes, sizes and quantities. We constantly strive to live up to our motto, “Exceeding your expectations with quality, service and delivery.”

**LHI Metals**
+1-866-949-1699
www.LHImetals.com

Combining the strengths of Alloy Metals, Supra Alloys & Tico Titanium, LHI Metals offers the convenience of “one-stop” shopping with a variety of inventories and value-added services. Satisfying customers for a combined 75+ years, our knowledgeable and courteous sales staff is dedicated to meeting and exceeding our customers’ requirements, from small quantity or specialty items to thousands of pounds of mill products. LHI Metals is ISO 9001 registered, with AS 9120, Pratt & Whitney LCS/MCS, and specialized medical approvals to better serve the aerospace and medical markets. We specialize in titanium for Medical Devices. Plate, sheet, strip, foil, billet, bar and wire. Bar inventory is centerless ground to +/-0.0005” and to precision tolerances of +/-0.00025” or better. Inhouse sawing, shearing and waterjet capabilities. Ti 6Al4VELi in various rectangular bar sizes. Inventory certifiable to ASTM F136, F67, F1472 specifications. Testing and certification provided for other OEM specifications.

**Lord Steel Industry Company Limited**
+86-512-62861001
www.lordsteel.com

Lord Steel Industry Company Limited (LSI) is a global leading solution provider and manufacturer in Tube & Pipe of Stainless Steel, Nickel Alloy, Copper Alloy and Titanium since 1990. LSI has a registered office in Hongkong as the Financial Center, another office located in Suzhou Industry Park (Lord Steel International Co., Ltd. - Sales & Marketing Center), hold two green and nice factories located in Taiyuan LSI WTNM, and in Nanjing (LSI WORD partial shareholder). LSI People not only see our products as normal Industry products, we take them as artwork with high quality value. In every LSI people’s heart, Quality is always first. High service level shall be our added value in the products. Competitive price and our promise in the lead time shall Strengthen the mutual Trust relationship between LSI people and our clients.

**LOTERIOS S.p.A., a TIMET Company**
+39-02-9648281
www.loterios.com

LOTERIOS S.p.A. core business: TIMET Italian Service Center (sheets, plates, bars, forgings, etc.) and leading fabricator of titanium pipe, fittings, shell and tube heat exchangers and vessels as required.

**Lucideon**
+1-518-382-0082
www.lucideon.com

Lucideon is a leading global expert in materials development, testing and assurance. Expertise includes chemical analyses, metallurgical evaluations, mechanical testing and failure analysis. Industries served include: Aerospace & Defense Automotive & Transportation Construction Electronics Industrial Equipment, Components & Metal Fabrication Materials Manufacturing Medical Devices Nuclear Energy Power Generation

**Mair Research S.p.a.**
+39 0445 634 444
www.mair-research.com
salesdept@mair-research.com

Since 1977, MAIR Research has offered specialized equipment and services to the steel industry, specifically helping tube and bar producers to create profitable and efficient production processes in a safe environment. The highest levels regarding innovation and quality are achieved through young and well experienced technical personnel, for the electrical design, software programming and the pre and after sale service.

Single stand alone equipment or customised complete and integrated finishing lines are developed by an experienced team of technicians and are entirely manufactured in two modern production facilities covering a total surface area of 36000 sqm.

Mair Research has gained significant experience in the field of finishing lines for ERW and Seamless tubes by supplying turnkey solutions to customers in over 45 nations. Recently a great number of producers of OCTG tubing have chosen Mair Research as supplier.
of their finishing lines taking the tube from the mill and delivering it in a bundle after having undergone the required finishing and testing operations (e.g. ID beam removal, chamfering, hydrotesting, visual and NDT inspections, coating, automatic bundling and strapping).

Data management and tube tracking are all features developed by our staff and integrated in the lines. The range of Mair Research comprises also Bar finishing equipment with the possibility to supply fully integrated lines (e.g. peeling, straightening, multicutting, chamfering, automatic bundling and strapping).

Makino

+1-513-573-7200

www.makino.com

A world leader in advanced CNC machining centers, Makino provides a wide range of high-precision metal-cutting and EDM machinery, including horizontal machining centers, vertical machining centers, 5-axis machining centers, graphite machining centers, and wire and Ram EDMs. Our flexible automation solutions provide reduced labor costs and increased throughput in a variety of production volumes and designs. With Makino engineering services, we offer industry leading expertise for even the most challenging applications across all industries. For more information visit makino.com.

Materials & Electrochemical Research (MER) Corporation

+1-520-574-1980

www.mercorp.com

The technologies MER pursues includes: Rapid Additive Manufacturing, Titanium Powder and Fabrication by Additive Manufacturing, Metal and Carbon Matrix Composites, Electrochemical Systems, Porous Materials, Coatings, Spinel and Nanotechnology. MER develops processing to produce titanium more economically that includes lower cost than sponge and downstream additive manufacturing processing to produce low cost titanium components. These technologies include producing titanium powder directly from ore/TiO2 at a cost substantially lower than that of Kroll sponge, engineering the Kroll process entirely in one reactor at a reduced cost, producing titanium alloy powder from ore/TiO2 and one-step production processing near net shape alloy components at a cost of under $10/lb.

Medart, Inc.

+1-724-752-2900

www.medartglobal.com

sales@medartglobal.com

Medart designs and manufactures centerless bar peelers, coil to coil peelers, coil to bar peelers, straighteners, fastener wire pay-off systems, take up systems, plane straighteners and engineered material handling equipment. Purpose built processing equipment for the titanium industry.

Mega Metals, Inc.

+1-602-258-6677

www.megametalsunlimited.com

Mega Metals Inc., is a globally recognized high quality processor of Titanium Turnings and Solids. We are certified by major mills and casting houses for prepared aerospace grade material. Our philosophy is to unite the highest quality in customer service with the highest quality of our materials, in order to serve the expanding international demands of the metals recycling industry.

MetaLinx Material Management, Inc.

www.MetaLinx.com

MetaLinx Material Management, Inc. announces the opening of a MetaLinx® Technology Demonstration Site situated near DFW Airport in Carrollton, Texas. The MetaLinx® System, an internationally patented and proven technology, assures complete transparency and accountability of recyclable materials. By this unique means, a high degree of material management and control is achieved from scrap creation through material sale when full containers are released by the system. MetaLinx® identifies system containers and tare weight; continuously monitors content weight and records all variance; automatically transmits action alerts by e-mail, fax, text and voice messaging; issues transaction reports/invoices computed by index-based price formula; and produces real time and stored inventory data and reports accessible via the MetaLinx® Web Portal. To arrange a demonstration at your earliest convenience; please contact Dr. Bert Erdel at berte@metalinx.com or David H. Jones at davidj@metalinx.com

METALVALUE

+33680562848

metal@honhart.fr

METALVALUE provides strategic consulting services and invests into selected industrial companies.

Metalwerks PMD, Inc

+1-724-378-9020

www.metalwerks.com

Metalwerks PMD, Inc. produces a wide variety of specialty metals, superalloys and developmental alloys in Iron, Nickel and Cobalt based alloys. We melt current and developmental titanium alloys in ingot form from 400 grams to VAR ingots weighing up to 5000 pounds. We also convert these ingots into mill products for use by our customers.

Metalysis Ltd.

+44 (0) 1709 872 111

www.metalysis.com

kartik.rao@metalysis.com

Metalysis is a UK-based technology company, which has developed a proprietary process to produce metal powders at low cost using electrolysis. It is currently focused on the production of tantalum and titanium alloy powders for use in conventional and additive
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manufacturing, with a variety of applications in industries including aerospace, electronics, bio-medical, petro-chemical and automotive.

MetCon, LLC
+1-724-888-2172
www.metalconditioning.com

MetCon provides conditioning and finishing services for both intermediate and finished products, including bloom, billet, bar, plate, sheet, and machined or fabricated components employing a patented “Green” electrochemical technology. Product yields and costs are dramatically improved when compared to conventional processing. The technology can also provide alpha case removal, precise gauge removal, and ultra-bright micropolishing. MetCon is based in Monaca, PA, 30 miles northwest of Pittsburgh.

METRACO NV
+32 56 234400
www.metraco.be

European traders of ferro-alloys and non-ferrous metals. Specialized mainly in ferro-titanium, titanium sponge and manganese metal. Supplying all grades of FeTi 70 % and buyers of titanium scrap and low grade sponge for FeTi production. Supplying steel grade sponge directly to steelmills and masteralloy producers worldwide.

MetSuisse Distribution AG
+41 44 586 02 74
www.metsuisse.com
info@metsuisse.com

MetSuisse reflects the precision and high quality products the industry requires. Being the first metal distribution company specializing in the medical and watch industry, MetSuisse has been able to specialize in sourcing for these industries. The stringent and precise requirements found in the medical & watch industry have given us the experience and abilities required to meet the various requests. Next to our experience we are the first metal distribution company specialized in the medical industry, and operate strictly according to ISO 13485 (Medical) and the GDP standards valid for pharmaceuticals (besides ISO 9001). Currently, we are specialized mainly in the metals titanium, zirconium, CoCrMo, medical stainless and tungsten alloys. However, you can contact us with any of your sourcing requests. We work with dedicated partners worldwide. MetSuisse has a unique grinding facility allowing:

- precision grinding of titanium foils, sheets and plates
- technology applied for the Swiss watch industry
- no min. quantities for CP Grade 1, 2, 4 and Ti6Al4V Eli
min. 0.09 +/- 0.015 mm
(= in inch 0.003543307” +/- 0.000590551”)

Mid-West Machine
+1-205-663-0732
www.vulcangroup.com
sales@vulcangroup.com

Mid-West Machine™ provides metal conditioning equipment and systems for the Steel and Titanium industries. This includes both bonded wheel and coated abrasive belt grinders. We offer Traveling, Stationary, Gantry, Overhead, and Ingot End Grinders as well as material handling equipment for processing slabs, billets and rounds through the grinders.

Monico Alloys
(310) 928-0168
www.monicoalloys.com
info@monicoalloys.com

Monico Alloys specializes in the processing of titanium scrap in the form of solids and turnings. Monico is a Global Mill processor for Titanium Scrap metal ISO 9001:2008 and approved by every major titanium melter. Monico Alloys prepares bulk-weldable solids, feedstock, cobbles, and turnings to rotor quality specifications. Monico Alloys remains the industry leader by utilizing only the latest scrap processing technology. Monico Alloys offers a wide variety of Titanium Alloy inventory which includes CP, 6-4, 6-2-4-2, 6-6-2, 3-2.5, and others.

MoTiV Metals, LLC
+1-412-200-5832
www.motivmetals.com

MoTiV Metals, LLC is an independent sales and marketing company supplying molybdenum, titanium, vanadium and other products to the global steel, titanium and chemical industries. The company has a vast array of expertise and knowledge in domestic and international sales, logistics and supply chain management.

MoTiV Metals LLC offers Master Alloys to the Titanium industry, through its relationship with BHN Special Materials Ltd, including V-Al, Mo-Al, and other alloys.

nanoPrecision Products, Inc.
+1-310-597-4991
www.nanoprecision.com

nanoPrecision Products is a designer, developer & manufacturer of precision products with applications in the telecommunication, data communications, consumer electronics, mil/aero and bio & medical device markets. We employ various metals in our products including titanium. The products we are introducing to the market that utilize titanium are anticipated to consume large volume of material.

North American Alloys
+1-800-985-2250
www.northamericanalloys.com
steve@northamericanalloys.com

of excess inventory materials in titanium, cobalt or nickel alloys and specialty metals such as tantalum, columbium, zirconium and beryllium. Contacts: Michael Shulimson – President, Steve Meredith, Director of Sales and Peter Rockefeller, Warehouse Manager.

Nu-Tech Precision Metals
+1-613-623-6544
www.nutechpm.com

Nu-Tech Precision Metals manufactures by hot extrusion seamless pipe, tube, fittings, bar, rod and shapes for nuclear, aerospace, military, medical, offshore, mining, chemical, sub-sea and corrosive environments. Shapes, especially those for the aerospace industry, fit within a 12” (300 mm) circle size. Our extrusion process creates a near-net shape that reduces material and machining costs overall. Our ability to alpha-beta process results in improved fatigue resistance over beta extrusions…contact us to learn more about how this process will benefit your extrusion requirements. Seamless pipe schedules from 1.5” (40 mm) to 14” (350 mm) plus specialty sizes and wall thickness. Custom extrusions in all grades of Ti-Zr Nb Ni Cu Hf Ni, specialty stainless, carbon steels, copper, and high purity aluminum alloys. Bi-metal extrusions such as titanium clad copper, copper clad niobium tubes for RF cavities, nickel clad steel, etc are extruded resulting in a metallurgical bond. Sputtering tubes and backing tubes are our specialty!

Oak Ridge National Laboratory
+1-865-241-8113
www.ornl.gov

ORNL is a multiprogram science and technology laboratory managed for the U.S. Department of Energy by UT-Battelle, LLC. Scientists and engineers at ORNL conduct basic and applied research and development to create scientific knowledge and technological solutions that strengthen the nation’s leadership in key areas of science; increase the availability of clean, abundant energy; restore and protect the environment; and contribute to national security.

“Titanium Valley” Special Economic Zone”
OJSC
+7-343-378-45-83
http://titanium-valley.com/
welcomet@titanium-valley.com

Titanium valley is the special economic zone (SEZ), based in Russia, Sverdlovsk region, where unique conditions for production organization and development are created. The territory of the SEZ is located close to the OJSC “VSMPO-Avisma” Corporation”, the world’s largest titanium producer, supplier of raw materials, forgings and finished production for Boeing, Airbus, Rolls Royce, Goodrich, Embraer, GE. Thus, the territory is known after the name “Titanium Valley”. The companies investing in the SEZ get prepared sites with all the necessary utilities. Moreover, they are exempted from customs duty on import of capital goods, VAT as well as from the corporate profit for the first 10 years. The total area of the territory of a special economic zone “Titanium Valley” is more than 580 hectares. The main object of the SEZ is investors’ attracting whose purpose is manufacturing of value-added and high technology products.

The Olin Research Group
(216) 246-0221
www.olinresearchgroup.com
chrisolin@olinresearchgroup.com

The Olin Research Group is a specialized firm that offers MARKET UPDATE REPORTS for various carbon steel, stainless, specialty materials (titanium & nickel-based alloys), and aerospace company executives. We do this by leveraging our network of industry contacts (distributors, mills, producers, and buyers) and 18-years of experience in the investment world. Together, we can provide unique insights from a “top-down” or “bottoms-up” perspective. Our partners have an edge versus the competition — for planning and up-to-date market share analysis.

The “value-add” in our research comes from the combination of charting momentum and/or highlighting inflection points. We do this by using data gathered from quarterly surveys. We provide a twist in our reports by incorporating industry models, channel sentiment gauges, and the feedback we are getting from the larger, publicly-traded companies.

Our goal is to provide customers with a different perspective on each metal/aero category, also gauging the relative health of main end-markets. We believe this gives our customers an enhanced ability to navigate through any market challenges and/or opportunities. Our data collection or indexes can also be measured against peers. Track your company’s performance versus an anonymous sample group. See where you stand (by region or product category).

Perhaps you are looking for specific market intelligence? Our research team can assemble a survey that fits your needs and answers your questions. @OlinResearch

OSAKA Titanium technologies Co., Ltd.
+81 3 5776 3103
www.osaka-ti.co.jp

OSAKA Titanium technologies Co., Ltd. manufactures premium quality titanium sponge mainly for aerospace use, high-purity titanium billet and polycrystalline silicon for semiconductor industry, titanium powder for powder metallurgy and addictive manufacturing, and other titanium-silicon related products.

Oscar Production Group Ltd.
+380 56 770 1234
www.oscar-tube.com.ua
mail@oscar-tube.com.ua

Manufacturer of cold and hot formed seamless titanium tubes and rods.

Overon Group
4043641799
www.overongroup.com
info@overongroup.com
Producers, Distributors, Fabricators, OEM’s, & Vendors to the Industry

The company has been producing valves and equipment details from titanium for more than 50 years.

Usage of high quality rolled, casted and forged blank details as well as most modern machining, welding and heat-treatment equipment provides guaranteed quality of produce. Production process of every detail is being controlled by all necessary destructive and non-destructive methods.

Paris Saint-Denis Aero
http://www.psdaero.com

Our Quality Management System meets the IAQG’s series requirements. PSD AERO is one of the main suppliers of key players in the aviation sector, that’s why it is qualified by most major customers: AIRBUS, SNECMA, EUROCOPTER, DASSAULT AVIATION, etc.

With their experience and rigor acquired during the last few decades, the two companies consist of 50 staff members that have enabled them to increase their turnover 10 times over in 10 years.

Parker, Messana & Associates, Inc.
+1-253-926-0884
www.pma-engr.com

PMA Engineering brings a broad and extensive depth of engineering and operating experience in titanium to work for you. Our understanding of the critical requirements of the RG/PG world opens the door for us to benefit your organization. Our experience and ability to assist across all facets of an operation, including sponge, sponge processing, scrap and scrap handling, scrap processing, blending, melting, finishing, flattening, and other operations, allows for comprehensive solutions.

We can work with you to Optimize Processes and assist with reviews of your operations in regards to RG/PG standards and expectations. We will utilize our experience to upgrade or replace equipment to improve or increase your production capabilities. We can provide Facility Audits, Feasibility Studies, FEED Studies, and Detailed Engineering for new process and manufacturing facilities, including the integration of your control and data systems for reporting, chronological documentation and MIS reporting. And, we can audit your processes against industry quality standards and provide paths for continuous quality improvement.

We partner to make you better.

Perryman Company
+1- 724-746-9390
www.perrymanco.com

Perryman Company is a vertically integrated producer of specialty titanium products. From melting, forging, and fabrication to finished product, Perryman’s quality and technical expertise is unmatched. Perryman supplies and services customers in the aerospace, medical, consumer, and recreation markets worldwide. Approvals include ISO9001:2008; AS9100, and NADCAP. Perryman Company is headquartered in Houston, Pennsylvania. Company offices are located in Philadelphia, Warsaw, IN, Los Angeles, London, Zurich, Tokyo, and Xi’an.

Plymouth Engineered Shapes
800-718-7590
www.plymouth.com
jlake@plymouth.com

Plymouth Engineered Shapes is the premiere provider of near-net extruded shapes for a large variety of applications. All customers want to squeeze more cost out of their parts and Plymouth Engineered Shapes offers the solution in Titanium, Stainless steel, Alloy steel, or Nickel-based alloys. Our Engineers are capable and willing to work with your design engineers to develop the most optimum near-net shapes possible to make your finished parts. No other manufacturer in North America offers so much experience in special shape technology, or provides so many value-added options to meet your product specifications.

Praxis Powder Technology, Inc.
+1-518-812-0112
www.praxisti.com
info@praxisti.com

Praxis Technology specializes in the design, engineering and manufacture of small, complex titanium components for the medical, aerospace and consumer sectors via powder metallurgy. Praxis Technology is an ISO-13485 and AS9100C certified manufacturing company and also holds an FFL. We have been pioneers in the development of the titanium metal injection molding (TiMIM) process and have perfected our proprietary process to provide high-performance parts for a variety of demanding applications. To date, Praxis has developed the only known qualified TiMIM process in the world.

President Company Ltd.
+886-227411-190
www.presico.com.tw
presico@presico.com.tw

President Co., Ltd., established in Taiwan in 1969, is one of the largest titanium stockists in the Asia. Our business focus on the trading of high quality titanium with diverse stocks. Besides, our product includes titanium slabs, sheets, bars, wires, pipes, fasteners, castings, etc. We commit to supply the most satisfying high quality titanium materials for users with quick lead time and favorable after sales service. Currently, our sales network is well deployed all over China, Taiwan and South-East Asia countries.
President Titanium Co., Inc.
+1-800-225-0304
www.presidenttitanium.com
sales@presidenttitanium.com

President Titanium has the largest inventory of domestic 6Al/4V, 6Al/4V ELI, and Grade 4 titanium bar, sheet & plate in the country. We have been serving the aerospace, military and medical industries since 1973. Most orders shipped in 1-2 days, call for our free booklet.

Prolog Titanium Corporation Co. Ltd.
+66-2-920-4046
www.titanium.co.th
sales@titanium.co.th

Prolog Titanium Corporation is Thailand’s largest supplier, distributor and stockiest of high quality titanium metal products. With its unique combination of strength, light weight, corrosion resistance and other metallurgical properties, titanium is used in hundreds of diverse aerospace, defense, medical, chemical, electrical, automotive and other industrial applications where no other metal is as reliable or economical, especially on a life cycle costing basis. We can supply to other high performance reactive metals such as Niobium, Molybdenum, Tungsten, Zirconium and Tantalum which have best properties to resist extremely corrosive, abrasive and ultra high temperature.

Quad Engineering Inc.
+1-416-391-3755
www.quadeng.com

Quad Engineering is a well established company supplying engineering services and equipment for the metals industry, including the titanium industry. Quad provides process engineering for rolling of titanium shapes and flat product.

Quad designs and supplies rolling mill equipment for titanium production. This includes rolling mill stands and auxiliary equipment; roller tables; transfers; cut to length lines; induction heating lines. Quad also provides installation engineering services including foundations, buildings, piping.

Quebec Metallurgy Center
+1-819-376-8707
www.cmqrtr.qc.ca

The Quebec Metallurgy Center is a technology transfer center located in Trois-Rivieres, Quebec, Canada. Our activities focus on supporting the technological development of manufacturing companies in the metallurgical sector. CMQ has developed a broad expertise on the transformation and development of advanced alloys such as titanium, zirconium, aluminum and nickel. Our semi-industrial metalworking facility is equipped for short series production with controlled atmosphere or vacuum melting; permanent mold, shell mold and sand mold casting; welding, thermal spraying, ultrasonic welding, LENS laser additive manufacturing, vacuum heat treating and hot isostatic pressing.

Reactive Metals Studio, Inc.
+1-928-634-3434
www.reactivemetals.com

Founded 1981, a supplier of exotic metals to include titanium and niobium to the jewelry and decorative arts market. We consult, teach and supply anodizing equipment. We supply jewelry components, chain and findings in titanium. We are small order specialists catering to the medical, crafts and arts community. RMS distributes MULTI-ETCH, a user friendly titanium etch. Multi Etch prepares titanium jewelry, medical & dental components for bright, smooth anodizing without the dangers of Hydrofluoric acids.

ReMelt Scientific, Inc.
+1-330-440-0402
www.remelting.com
sales@remelt.net

ReMelt Scientific is a global supplier of Titanium Chip Melt Preparation Systems and Weigh and Blend systems. We specialize in titanium and high temperature alloy chip crushing, centrifuging, aqueous wash and solvent cleaning, thermal drying, fines screening, and magnetic and gravimetric separation to prepare chips to for melting. We also specialize in Weigh and Blend systems that weigh and blend titanium chips, sponge, master alloys, aluminum, iron, and TiO² to achieve customer specified chemistry requirements.

Renton Coil Spring Company
+1-425-255-1453
www.rentoncoilspring.com
info@rentoncoilspring.com

Renton Coil Spring Co. (RCS) is a world-class spring manufacturer for aerospace and performance markets and has been providing superior quality parts and performance since 1949. Design and material capabilities, along with complete performance solutions has lead RCS to become a top supplier of quality springs, wire forms, assemblies, and flat metal parts with thousands of applications across the world.

Rettech Systems LLC
+1 (707) 462-6522
www.retechsystemsllc.com
sales@retechsystemsllc.com

Rettech is the world’s leading supplier of Electron Beam (EB) and Plasma (PAM) Cold Hearth furnaces for melting and refining titanium and titanium alloys. Rettech advanced vacuum metallurgical systems also include Vacuum Arc Remelt (VAR), VAR Consumable (Skull) Casting, EB and PAM Consolidation furnaces, Plasma Welders, Vacuum Induction melting (VIM), Precision Investment Casting (DS/SC/EQ), Cold Wall Induction melting and casting, Vacuum
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Heat Treating, and Gas Atomization for metal powder production. All our furnaces are available in various sizes and configurations, from simple laboratory-scale to large, custom engineered systems. Further, we provide customer access to a wide range of in-house resources, including technology, material and process development. Identifying customer needs, as well as understanding the importance of producing relevant, viable, and cost-effective technologies, is the foundation upon which Retech is built.

Rex Heat Treat
+1-215-855-1131
www.rexht.com
chris.constable@rexht.com

Rex Heat Treat is a family owned and operated business that was founded in 1938. We take pride in our ability to partner with our customers to gain insight regarding their future needs. We are a leader in customer service and quality for the heat treating industry. We have 3 locations in Eastern United States.

Roll Forming Corporation
+1-502-633-4435
www.rfcorp.com

Roll Forming Corporation’s Aerospace division offers Inline custom welding solutions and advanced fabrication applications. RFC’s highly skilled and experienced laser welding team is NADCAP approved for a range of aerospace welding and laser welding processes. Additionally RFC offers in house NDT, CWI and NADCAP accredited inspection.

Roll Forming Corporation has taken the initiative in technical development, and collaborating with our customers to find creative solutions to overcome many program hurdles. Our laser welders put us at the forefront of the Aerospace industry in-line laser welded fabrications, RFC continues to lead the way as our inline custom welding solutions, and advanced fabrication applications are RFC’s core competencies. For more information call (502) 633-4435 ext. 338.

Rolled Alloys
+1-800-321-0909
www.rolledalloys.com
sales@rolledalloys.com

Rolled Alloys is a global supplier of specialty alloys for commercial aviation, defense and space exploration. Our comprehensive inventory includes titanium, nickel alloys, cobalt alloys and stainless steels. We offer a full range of titanium products in plate, sheet and bar. In addition, we forge material to customer specific dimensions and specifications. Rolled Alloys holds many quality approvals and several certifications for special processing from prominent aerospace companies. Our many global inventory locations are each equipped with state-of-the –art processing equipment, supporting just-in-time and cut-to size contract requirements.

Roskill Information Services Ltd.
+44 (0)208 417 0087
www.roskill.com

Roskill global market reports include the latest information on supply, demand, end-use applications, trade and prices for a wide range of metals and minerals including titanium, molybdenum and vanadium. Roskill reports also provide informed forecasts of future trends.

Roskill’s expert researchers make a thorough and objective analysis of all available data, from sources across the globe. This includes a large and invaluable network of contacts including the key industry players on these markets, making Roskill’s research unrivalled in terms of breadth, depth, accuracy and expertise.

To build on this wealth of data, Roskill also offers bespoke consultancy services that can help to explore and understand any specific scenarios or analysis requirements you may have.

S-Tech Corp.
+886-6-6235143 ext. 3100
www.s-tech.com.tw
maggielee@gmtc.com.tw

STC is the only one non-ferro alloy manufacture in Taiwan, was beginning from the research team of Gloria Material Technology Corporation. Our main products are non-ferrous alloys which include titanium alloys, nickel alloys, and specialty alloys which strength widely used in a variety of application in key industries such as the chemical industry, aerospace industry, oil & gas Industry, medical industry and energy industry. In-house capability includes consist of forging, rolling, heat treating, finishing and supplying forged and machined components by customers’ requirement. To reach your requirements, we put tremendous efforts on quality improvement and on-time delivery by 6-Sigma and lean manufacturing management. STC is your reliable partner for high performance specialty alloys needs. Certification System ISO 9001 / ISO 13485 / ISO 17025 / AS 9100 / NORSOK / PED / Baker / Westland / Hitachi / EGAT

S. Letvin & Son, Inc.
+1-310-327-0590
www.titaniumscrap.com

S. Letvin & Son, Inc., specialists in processing high temperature scrap metals, has been in business since 1947. We prepare a high quality 6/4 titanium feedstock package that meets AMS 4928 Chemistry specifications. We have developed a unique and proprietary process to return mixed 6/4 titanium fasteners to specification 6/4 titanium. The final product is 6/4 titanium “Rotor Grade” feedstock; heavy, dense, clean and extremely consistent in chemistry and gases. Our 6/4 titanium feedstock package is approved and desired by most major titanium mills, as well as many smaller investment casters worldwide.
Producers, Distributors, Fabricators, OEM’s, & Vendors to the Industry

S+D Spezialstahl Handelsgesellschaft mbH
+49-211-230999-11
www.s-dspezialstahl.de

The S+D Spezialstahl / S+D Speciality Metals Group is one of Europe’s largest stockists for semi-finished high-performance materials like titanium and titanium alloys, special stainless steel for aviation and aerospace or nickel and nickel alloys.

We supply into the following markets:
Aviation and Aerospace / Motor Sports / Defence Technology / Medical Technology

Offshore / Petrochemical / Chemical and Process Engineering / Plant and Equipment Manufacturing / Electroplating / Turbine Manufacturing / Marine Engineering / Energy Industry / Automotive Industry / Universities and Research

Institutes
We deliver just in time any time. At S+D we are able to cut all our materials according to our customer’s exact requirements utilising our “state of the art” bar saws and plate saws. We also offer precision water jet cutting. Our just in time service provides our customers with cost savings and security of supply. S+D is aerospace approved according to EN 9120 issued by DNV GL

Sandinox Comercio, Importação e Exportação LTDA
+ 55 15 3335 3565
www.sandinox.com.br

Established in 1986, Sandinox is the largest medical distributor for the Brazilian market, offering a full range of products in titanium, cobalt, and stainless steel alloys for the medical industry. Our goal is the constant search for technologically advanced products and materials that will ensure quality and the desired satisfaction of our customers.

Sandvik Materials
Technology Product Unit Special Metals
+46-26-260000
www.smt.sandvik.com

Product Unit Special Metals with two manufacturing locations (Sweden and USA) belongs to Sandvik Materials Technology and is a long term experienced manufacturer of seamless tubes and complementary products in Titanium, Titanium alloys and Zirconium based materials for a broad range of industrial applications as well as applications within nuclear, aerospace and medical industries.

The full scale commercial manufacture, which started in 1964 is fully integrated from VAR-remelting of Titanium resp. Zirconium sponge up to finished product.

Schaffer Grinding Co., Inc.
+1-323-724-4476
www.schaffergrinding.com
tom@schaffergrinding.com

SCHAFFER GRINDING CO. is a toll processor of aerospace alloy materials including: Titanium, high temperature alloys, nickel based alloys, and ferrous materials. Processes include: Precision sheet and plate grinding (90” X 240”), band saw cutting, planer milling, rotary and surface grinding. Schaffer Grinding offers its customers coast to coast service with production facilities in California and Ohio.

Montana Precision Products
+1-360-653-9388
www.seacast.com

SeaCast operates four full service investment casting foundries which cast a wide range of alloys including stainless steel, nickel-based superalloys, titanium and aluminum. Foundries in Marysville, WA, Seattle, WA, East Greenwich, RI and Butte, MT offer extensive in-house support services such as CNC machining, heat treat, NDT and assembly. The company serves a wide variety of industries including aerospace, defense, industrial pumps, industrial gas turbines, medical, transportation and computer hardware. SeaCast’s manufacturing processes have earned ISO9000, AS9100 and NADCAP certifications.

Sector3 Appraisals, Inc.
+1-718-268-4376
www.sector3appraisals.com

Sector3 Appraisals, Inc. is a metals and chemicals valuation company offering a complete portfolio of asset valuations and advisory services regarding inventory, machinery and equipment and risk management.

Service Steel Aerospace
+1-800-426-9794
www.ssa-corp.com
sales@ssa-corp.com

Service Steel Aerospace is a customer oriented stocking distributor of high performance stainless steel, titanium, alloy steel, nickel based super alloy, and managing steel. We are committed to providing quality products to the aerospace industry and other critical application industries throughout the world. SSA performs a wide array of value added processing services designed to meet the specific needs of our customers. Our commitment to the quality and service has made SSA the leader in the industry for over 40 years.
Solar Atmospheres provides vacuum thermal processing for titanium material, parts, forgings, and weldments. With the world’s largest vacuum furnaces, 12, 24 and 36 feet long, Solar is capable of vacuum processing furnace loads of bar, billet, sheet, and plate up to 150,000 pounds under 1x10-6 torr vacuum levels. Specific heat treat services provided are: degassing, beta annealing, homogenizing, age hardening, creep forming, hydriding/dehydriding, stress relieving and Florescent Penetrant Inspection. Solar is Nadcap, ISO9001:2008 and AS9100C Registered and Boeing approved in heat treating, NDT (Non-destructive testing) services and BASCA (Beta Anneal Slow Cool Age). Solar Atmospheres serves customers with plants located in Pennsylvania, South Carolina, and California.

Solar Manufacturing, Inc.
+1-267-384-5040
www.solarmfq.com

Solar Manufacturing designs and manufactures all types of vacuum heat treating, sintering, carburizing, and nitriding furnaces, as well as offers replacement hot zones and spare parts for various vacuum furnace brands. Our vacuum heat treating furnaces are designed to be the most energy efficient, cost effective, highest performing and most technically advanced furnaces on the market. With models ranging from compact laboratory size furnaces to mid-size horizontal production furnaces to huge car-bottom vacuum furnaces, we design for heat treat processes such as hardening, annealing, sintering, stress relieving, normalizing, and tempering. Our furnaces feature improved graphite insulation materials, curved graphite heating elements, tapered gas nozzles, high velocity gas quench systems, SolarVac® 4000 and 5000 interactive control systems, and a ConserVac energy management system.

Specialty Metals Co is the major shareholder of UKTMP (Ust Kamenogorsk Ti Mg plant) located in Kazakhstan. UKTMP produces Ti sponge, CP and alloy ingots and slabs.

Specialty Metals Processing, Inc.
+1-330-656-2767
www.specialtymetalspro.com
ajd@specialtymetalspro.com

SMP has been a toll processor for twenty years serving OEM’s, End Users, Mills, Service Centers, Fabricators and Job Shops in the non-ferrous flat rolled industry; including sheet, plate, slab, square billet and coil. We specialize in assisting you with your most demanding surface critical applications: from 0.13” light gauge coil to 10” + thick slabs. Centrally located in Ohio, SMP has the largest abrasive belt grinding operation in the US. Make us your reliable source for polishing, precision grinding, surface finishing and reconditioning. In addition, we uniquely offer cut-to-length, slitting, coil grinding/polishing and coil buffing for a complete package on coil processing. Assisting customers in reducing freight and production costs and turn around times.

- Precision grinding up to 72” wide and 244” long
- Providing #3, #4, #6, #7, #8, brushed or matte finishes or custom matched abrasive belt finishes, one or two sides.
- Ability to polish/grind/recondition plate/slabs up to 12’ wide by 100’ long

Specialty Metals Processing, Inc.
+1-330-656-2767
www.specialtymetalspro.com
ajd@specialtymetalspro.com

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ajd@specialtymetalspro.com

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- Ability to polish/grind/recondition plate/slabs up to 12’ wide by 100’ long

Solar Atmospheres
+1-855-934-3284
www.solaratm.com
info@solaratm.com

Solar Atmospheres provides vacuum thermal processing for titanium material, parts, forgings, and weldments. With the world’s largest vacuum furnaces, 12, 24 and 36 feet long, Solar is capable of vacuum processing furnace loads of bar, billet, sheet, and plate up to 150,000 pounds under 1x10-6 torr vacuum levels. Specific heat treat
**Spectore Corporation**

+1-954-481-8422  
[www.spectore.com](http://www.spectore.com)  
info@spectore.com

Spectore Corporation was founded in 1983 to reinvigorate the 3,000 year-old traditions of the jewelry industry with its introduction of titanium as a new noble element. New technologies were perfected to manipulate this extremely tenacious and non-traditional metal. The company’s ambitious designers and R&D team have persistently explored the potential of titanium to create truly unique collections. This resulted in being awarded the 2010 Titanium Development and Advancement Award by the ITA. Today Spectore remains dedicated to the development of new methodologies for the design, engineering and manufacturing of high-end consumer products made of titanium. Spectore Corporation designs and manufactures for a range of world class brands focusing on consumer products from household, sporting, technology, apparel, corporate gifting and jewelry. Spectore Corporation has also developed their own in house designer brand, Edward Mirell which has won a wide range of national and internationally recognized design awards.

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**Spemet Company Limited**

+1-886-225-857681  

Spemet was established since 1987. We emphasis on various usage of Titanium. We have all kinds of raw materials and parts on stock to supply customer’s need. We respect each customer’s need. Besides, cooperating with leading companies to develop superior products, we are also willing to work with customer to elaborate specific products. We believe that improving technology of production and quality is the way to face the challenges of the market.

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**Starrag USA Inc.**

+1-859-534-5201  
[www.starrag.com](http://www.starrag.com)

Starrag is a leading producer of machining centers for flexible machining concepts. The Starrag Group machining centers can fully machine a work piece on five sides using their four or five highly dynamically controlled axes. For very large and heavy work pieces, the Starrag Group can offer efficient machining solutions using portal-design and gantry-type machining centers. Starrag Group’s comprehensive range of technologies give customers the ability to optimize each of their machines individually to the required process. Starrag is a publicly listed company located in Rorschacherberg Switzerland. Its shares are freely traded on Swiss stock exchange in Zurich.

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**Tenova Core Inc.**

412-262-2240  
[www.tenovacore.com](http://www.tenovacore.com)  
core@tenova.com

Tenova Core designs and supplies advanced melt shop equipment and industrial reheating, heat treating and specialty furnaces for the metals industry. Custom furnace designs include car bottom, roller hearth, tip-up, rotary hearth, box type, bell type, walking hearth as well as vacuum type furnaces. Tenova Core also provides a complete range of technical services including equipment revamps/upgrades, tune-ups, inspections, maintenance evaluations and training as well as energy savings, environmental, reliability and productivity studies.
Titanium Buyers Guide (continued)

Producers, Distributors, Fabricators, OEM’s, & Vendors to the Industry

The Council for Scientific and Industrial Research (CSIR)
+27-128412600
www.csir.co.za

The Council for Scientific and Industrial Research (CSIR) is South Africa’s leading national research and development organization. The Titanium Centre of Competence (TiCoC) within the CSIR has a mandate to develop technology building blocks needed to establish a new South African titanium industry. The TiCoC is developing a suite of complementary technologies to add value to South Africa’s vast resources of titanium. This programme primarily focuses on the development and commercialisation of cost-effective processes for primary titanium metal production and its conversion into finished and semi-finished products. The recently established Titanium Pilot Plant situated on the CSIR campus, is an important milestone in this entire process. Parallel to this the TiCoC is developing and adapting technologies to consolidate “low-cost” titanium powders into products. Formal collaboration agreements have been signed between the CSIR and global companies such as Boeing, Airbus and EADS. These mutually beneficial agreements support South Africa’s long-term economic development goals that include the supply of titanium to many industries, including aerospace.

Thermo Scientific
www.thermoscience.com/pai

Thermo Scientific delivers best-in-class handheld and mobile x-ray fluorescence (XRF), near infrared (NIR), Fourier Transform Infrared (FTIR), and Raman-based analytical instruments to meet customers’ most demanding applications. Our Niton XRF analyzers serve metal processing, manufacturing and recycling customers in more than 75 countries, with more than 40,000 units installed worldwide. A culture of innovation and a distinguished history of breakthrough achievements have defined our instruments, since we released the first handheld XRF analyzer in 1994. Now, with the introduction of the Thermo Scientific Niton XL5, the fastest, most accurate and smallest XRF analyzer has arrived. Part of the Niton family of industry-leading instruments, Niton XL5 offers energy, metal fabrication and automotive industries performance, portability and speed never before seen in a handheld analyzer. In addition, the new Niton XL2 100G complements the instrument portfolio by providing rapid general metals identification in a value platform, giving customers cost-efficient, reliable, real-time results right where they’re needed.

TiFast
+39 0744 736 307
www.tifast.com
info@tifast.com

TiFast is a European producer of titanium ingots, slabs, billets, bars and wires for medical, aerospace and industrial markets worldwide. TiFast is fully integrated with a melting plant (3 furnaces including a new VAR), a rolling mill, a bars precision finishing shop, laboratories and R&D facilities.

TiFast is certified ISO 9001, AS 9100, ISO 14001 for environmental, AEROSPACE NADCAP, TUV ADWO and PED for pressure equipment.

TiMax International LLC
+1-724-493-4200
Providing Products and Services to the Titanium and Superalloy Industry since 1980.

Timesavers International B.V.
+31 (0) 113 239910
www.timesaversint.com
timesaversint@timesaversint.com

Manufacturer of wide-belt grinding and brushing machines for stainless steel sheet and coil finishing; laser cut, punched, routered and flame cut deburring and edge radius; cast iron, ferrous, non-ferrous and titanium high precision calibration. Timesavers is based in Goes, The Netherlands, with regional offices around the globe in Shanghai (China), Taichung (Taiwan), Kuala Lumpur (Malaysia) an Timesavers Inc, in Minneapolis (USA). Worldwide the company has more than 200 employees supported by a network of local dealers and partners.

TIMET, Titanium Metals Corporation
+1 610 968 1300
www.timet.com

Titanium Metals Corporation (TIMET) is one of the world’s largest fully integrated titanium producers. Since 1950, TIMET has been leading the industry in mill and melted products, supplying nearly one-fifth of the world’s titanium. We convert rutile ore into sponge; melt and refine ingot and slab; and manufacture mill products. TIMET has a global network of service centers supported by its seven primary melting or mill facilities in Henderson, Nevada; Toronto, Ohio; Morgantown, Pennsylvania; Vallejo, California; Witton, England; Waunarlwydd, Wales; and UGINE, France. With products ranging from sophisticated high temperature alloys used in jet engines, to advanced corrosion resistant alloys used in the chemical industry, TIMET’s reach spans the breadth of the titanium applications, and has the technical depth to support developments across a wide range of applications. TIMET’s fully integrated supply chain, dedicated research facilities, and decades of experience make us the partner of choice for titanium.

TIODIZE Company, Inc.
+1-714-898-4377
www.tiodize.com

Titanium Anodize, Aluminum Anodize, Dry film Lubricants, Corrosion Coatings, Paints & Primers, Teflon Coatings, Manufacturers of Composite Parts (Carbon & Glass)
Producers, Distributors, Fabricators, OEM's, & Vendors to the Industry

Tipro international co Ltd
+86 29 89181603
www.tipro-international.com
terry@tipro-international.com
Tipro produce aerospace titanium bars and wires for many years and signed LTA with some famous aerospace companies. As a AS9100 and EN 9100 approved company, We can supply titanium products as follow: AMS 4921;AMS 4928 ; AMS 4965; AMS 6931; AMS -T-9047 ; BS TA11 ;

TITAL GmbH
+49-2904-981-160
www.alcoa.com/app/tital
alcoa.tital@alcoa.com
We are an industry leader in the manufacture of titanium and aluminum investment casting products. From our headquarters in Bestwig, Germany, we supply customers around the world in the fields of aerospace, electronics, optics, industrial and medical systems, Formula 1 racing, and general motor sports.

Titan Metal Fabrication
http://www.titanmetalfab.com/
TITAN is one of the world’s foremost metal fabrication companies for corrosion-resistant equipment for the process industries. Our business is the manufacture of equipment – Heat Exchangers, Pressure Vessels, Columns, Reactors, Pipe and Piping Systems – from corrosion-resistant alloys including Titanium, Tantalum, Zirconium, Niobium, Hastelloy, Monel, Inconel, High Nickel Alloys, Duplex Stainless (Steel), Super Stainless (Steel) and Lean Duplex Stainless (Steel).
Since the company’s founding in 1998, building equipment with these metals has been TITAN’s only business – it is our specialty.
We are extremely proud that TITAN’s innovative approach to mechanical design, our lead in thermal design and TITAN’s extreme commitment to quality have set what are now considered to be highest standards in our industry.

TITANUM Consulting & Trading S.r.l.
+39-055-642543
www.tct.it
info@tct.it
Certified UNI EN ISO9001:2008 and UNI EN 9120:2010. With 20 years of experience, Titanium Consulting and Trading, based in Florence, Italy, with a distribution center in Milan and affiliated offices and distribution centers in both Germany and England, is a privately owned stockist/distributor of titanium mill products. Being a major supplier in the European market for titanium mill products and its alloys, we can guarantee a prompt delivery for products including ingots, slabs, round bars, hexagonal bars, profiles, welding wire, plates, sheets, coils, tubes and pipes, as well as fasteners, forgings, flanges and fittings. Most ex-stock materials are shipped the next working day with full traceability for all items supplied.

Products supplied are employed in a wide range of applications, including aerospace, medical devices, industrial, chemical. In 1996, Titanium Consulting & Trading further expanded its operations by setting up dedicated facilities to manufacture finished products on request. Processes available include cutting, welding, forming, turning, heat treatment and finishing.

Titanium Engineers, Inc.
+1-281-265-2910
www.titaniumengineers.com
Titanium Engineers Inc. supplies Titanium Bar, Seamless Tubing, and Finished Components for oilfield and other industrial markets. Our capabilities include the expertise to process titanium to meet demanding and unique customer specifications. We specialize in bar, seamless titanium tubing and also offer products manufactured by: forging, rolling, and machining using common ASTM grades of titanium including: Titanium Grade 5, Titanium 6-2-4-6, Titanium Beta-C. With our metallurgical background we will support your team from design, through prototyping, and finally into full-scale production of components.

Titanium Fabrication Corporation
+1-973-808-4961
www.tifab.com
A World leader for over 40 YEARS in the application, design and fabrication of quality titanium and zirconium process equipment, whether solid or clad construction. Extensive experience in rotating, offshore, marine or ordnance equipment. Most extensive titanium field welding/erection service capability in the world. Mill products available from stock. For more information email bbrownlee@tifab.com.

Titanium Finishing Company
+1-215-679-4181
www.titaniumfinishing.com
metal@titaniumfinishing.com
Titanium Finishing Company specializes in Titanium Anodize; Hardcoat Anodize of Aluminum; IVD Aluminum Coating; and Application of Solid Film Lubricants. We are a small, women owned business, and have been family owned and operated since 1970.

Titanium Industries, Inc. (T.I.)
+1-973-983-1185
www.titanium.com
sales@titanium.com
Titanium Industries, Inc. (T.I.) is the global leader in performance of titanium products.
Titanium International Group SRL
+39-051-6814893
www.titanium.it
tig@titanium.it
We are a service provider for Aerospace, defense, automotive, medical, racing, packaging and special applications. We store and sell titanium, nickel, steel & cobalt alloys and services. We have water-jet machines and more than 30 cutting centers. We offer a wide range of product forms full size, cut to size and tailored services. We can also machine and heat treat your items. We are EN9100 & EN9120 approved. Our job is to supply standard and non-standard materials and solutions, on spot and contract businesses, integrating all your non-core activities.

Titanium Processing Center
+1-888-771-9449
www.titaniumprocessingcenter.com
Titanium Processing Center is a stocked supplier and distributor of a wide range of titanium products, from bars and billets to sheets and plugs. We’re focused on providing high-quality products and services on top of fast turnaround and delivery.

Our experienced staff provides value-added services, including sawing, sheering, turning, waterjet and plasma cutting, drilling, and more. We have no minimum order requirements, so whether you order a single, small part or a batch of a thousand large components, we can deliver the materials or fully fabricated products you need. Get an instaQuote Today!

Titanium Products and Consulting, Inc.
+1-412-779-6358
www.titaniumproductsandconsulting.com
The focus of Titanium Products and Consulting, Inc. is primarily in two areas. The first is a consulting role for titanium and titanium alloy products, processes and applications. The second is to provide manufacturing and conversion capability with value added properties to enhance your applications performance and lower the overall cost. The ultimate goal is to provide enhanced customer service and technical assistance to make it easier and cheaper for new applications to be developed.

TMS Titanium
+1-858-748-8510
www.tmstitanium.com
info@tmstitanium.com
TMS Titanium is a leading supplier and stocking distributor of titanium mill products to a variety of industries including, aerospace, medical, racing and commercial. By combining product and industry knowledge, commitment to specialty industries, access to titanium and reliable inventory, TMS is able to consistently provide titanium to its customers in order to keep their production moving forward. TMS works with their trusted network of suppliers, finishers and fabrications to fulfill their customers’ specific titanium needs, while producing the best quality products available.

Toho Titanium Co., Ltd.
+81 467 87 7023
www.toho-titanium.co.jp
Toho Titanium Company, Ltd. manufactures titanium metals such as premium quality titanium sponge for aerospace and other applications, titanium ingot (CP and Alloy), high purity titanium ingot/billet for semiconductor industry and electronic materials including high purity titanium dioxide and ultra-fine nickel powder etc.

Torresin Titanio s.r.l.
+39 049 88 44 873
www.titanio.com
Torresin Titanio s.r.l is a leading Stockist and Service Center of Titanium and Nickel Alloys semi-finished mill products. We stock plates, sheets, wire, bars, coils, tubes, pipe and fittings. All material is according to ASTM, ASME and NORSOK standards. Our Service Center is equipped with 4 water jet cutting machines, saw cutting, guillotine and slitters. ISO 9001:2008 certified company.

Total Metal Recycling
+1-618-877-0585
www.tmrusa.com
Total Metal Recycling is an ISO 9001:2000, ISO 14001:2004, OHSAS 18001 & R2 (E-Scrap) certified scrap metal processing facility located just east of St. Louis, Missouri in Granite City, Illinois. Total Metal Recycling specializes in the processing and recycling of various types of scrap materials including nonferrous metals, ferrous metals, hi-temp alloys, titanium, precious metals scrap, and turnings &residues of all types of metals as well.

Trepplanning Specialties, Inc.
+1-562-633-8110
www.trepplanningspec.com
Trepplanning & machining services. Specializing in hollow bar conversions to pipe, tube, ring and sleeves. Size capacity up to 55” O.D., 21” I.D yielding a 26” core & can saw cut up to 22”. Work with stainless steel to more “exotic” high temperature materials like Titanium, as well as non-metallic materials such as plastic and wood. Full machine shop offering trepplanning, gundrilling/BTA, turning,
saw-cutting, facing & specialty emergency services. We offer blind shipments. Material can be provided. Family run and Veteran owned since 1973. Contact us via phone (562)633-8110 or email: trepan spec@yahoo.com.

Tricor Alloys
Division of Tricor Metals
330.264.3299
www.tricoralloys.com
info@tricoralloys.com

Introduction

We are a woman-owned, small business with facilities in Wooster, OH, Conroe, TX, Plymouth, MI and Oxnard, CA with over 25 years’ experience in the supply of titanium mill products, titanium forgings and fabrication of ASME Code equipment for the petrochemical, pharmaceutical, mining, aerospace, and bio-medical served markets.

What we do
We provide quick-ship service center sales and processing of titanium mill products, titanium forgings, design and build fabricated process equipment built with the most advanced corrosion resistant metals, provide reactive metal and high alloy welding repair services, and supply high performance welding wire.

Where are our facilities
Our fabrication and distribution facilities are in Wooster, Ohio and Conroe, Texas. We also operate technical sales facilities in Plymouth, MI and Oxnard, CA.

Tricor Alloys - Welding wire and titanium for aerospace
We stock, clean, process, and package UltraGrade™ high performance welding wires for aerospace, power, and turbine engines. We stock AMS-grades of titanium sheet, plate, bar and billet for aerospace and bio-medical served markets.

Titanium mill products & custom forgings
We maintain one of the world’s most complete inventories of titanium mill products in ASTM grades for corrosion including sheet, plate, pipe, fittings, bar, billet, wire, tubing, and fasteners. And we maintain staged billets for custom forgings. We offer advanced processing including water jet cutting, saw cutting, and shearing. We provide custom parts manufacturing and just-in-time inventory for ‘blanket’ order processing to meet our customer’s needs.

Fabrication of advanced corrosion resistant metal
In our ASME code shops in Ohio and Texas we build custom process equipment including: tanks, towers, pressure vessels, piping spools, shell & tube heat exchangers, plate and frame heat exchangers, and custom welded parts. We specialize in advanced metals for solving corrosion such as titanium, tantalum, zirconium, niobium, nickel alloys, duplex stainless and stainless steel.

Field and factory weld repairs
Our repair teams can be mobilized globally for field work. Or we can repair in our facilities. We specialize in welding of advanced corrosion resistant metals like titanium, tantalum, zirconium, niobium, nickel alloys, duplex stainless and stainless steel. Available with 24 hour notice for emergency repairs.

Tzimet Titanium & Alloys s.r.l.
+39-0382-914401
www.tzimet.it

Tzimet Titanium & Alloys srl, is an Italian private Company specialized in the PROCESSING & PREPARATION of reactive and refractory metal scraps: Titanium and its Alloys, Zirconium, Niobium and Tantalum. These scraps, of different alloys, are dedicated after preparation, to be remelt in vacuum process from our customer:

Titanium CP Gr. 1-2-3-4, 6 Al-4 V, 6 Al-4 V eli, Ti Pd (Gr. 7-11-16-17), Ti Gr. 12, IMI 367 (Ti 6 Al 7 Nb), Ti 15-3-3-3, Zirconium, Niobium, Tantalum

Tzimet Titanium & Alloys buy and sell these scraps: Titanium and Titanium Alloys, Zirconium, Niobium, Tantalum. Tzimet Titanium & Alloys has acquired in August 2014 the Certification ISO 9001:2008

Tzimet Titanium & Alloys srl is supplier of scrap for domestic market normally Ti CP and foreign market (USA, Germany, Russia, England), the material supplied is used for production of ingots Ti and its alloys and Fe-Ti for: Petro-chemical application (Ti CP, Ti Gr.12, Grade 7-11-16-17), Surgical application (Ti 6Al 4 Veli, IMI 367), Fe-Ti (steel-factory) oreglia@titanium.tzimet.it

TZMI, Inc.
+1 281 956 2500
www.tzmi.com
marketing@tzmi.com

TZMI is an independent consulting company that works with a wide range of global clients to provide insight and expert advice on opaque mineral, metal and chemical sectors. Our uniqueness is that TZMI contains technical and operational experience, together with strategic and commercial competency, to provide a full service offering to our clients.

As trusted advisors, our reputation is underpinned by having an experienced cross-section of technical specialists around the globe. TZMI partners with clients from the private and public sectors to provide bespoke solutions across markets and strategic services; and also technical and engineering services. Our clients range from the world’s 500 largest companies through to mid-sized companies and small businesses.

TZMI regularly releases market reports and periodicals on relevant subject matters which support the consulting activities and ensure up-to-date, high quality and comprehensive data, analysis and information is provided. TZMI annually hosts the largest titanium and zircon industry conference. Email: marketing@tzmi.com
Ulbrich Stainless Steels & Special Metals, Inc.
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Ulbrich Stainless Steels & Special Metals, Inc., is a leading processor of a variety of different alloys including, but not limited to: stainless steels, PH grades, nickel and nickel alloys, cobalt alloys, niobium, zirconium, titanium and titanium alloys. Commercially Pure Titanium: Grade 1, Grade 2, Grade 3, Grade 4, and Titanium Alloys: Grade 9 (Ti 3-2.5), Ti 15.3.3.3 and 21s (Ti Beta21s), as well as the aforementioned metals are available in strip, foil, flat, round and shaped wire. Nitinol, Grade 5 (Ti 6-4) and Ti 6.2.4.2. are available in limited widths at Ulbrich. Please inquire for more detail on all of our product offerings.

United Alloys & Metals, Inc.
+1-562-273-7004
www.uametals.com

United Alloys & Metals is one of the World's leading processors of all grades and forms of Titanium Scrap for all Titanium applications. Both our Santa Fe Springs, CA and Columbus, OH plants have full processing capabilities and are certified to ISO 9001:2000 standards.

Uniti Titanium
+1-412-424-0440
www.uniti-titanium.com

Uniti Titanium brings together two major global titanium producers with complimentary manufacturing and technical capabilities, Allegheny Technologies Incorporated (ATI) of the United States, and VSMPO-Avisma (Verkhnyaya Salda Metallurgical Production Association - Berezniki Titanium - Magnesium Works) from Russia, to create a joint venture focused on titanium mill products for industrial and other non-aerospace, non-military and non-medical markets. Uniti Titanium integrates the synergistic use of raw material, melting, hot rolling, finishing, research and technology resources of the two companies.

Universal Technical Resource Services, Inc.
+1-856-667-6770
www.utrs.com

Engineering services company, primarily focused on delivering services to the US Government. UTRS maintains a research and development facility working with material science projects, specifically with titanium and titanium alloys.

University of Northern Iowa
+1-319-273-7085
www.mcc.uni.edu

UNI’s metal Casting Center, established in 1989, has achieved unique stature as the premiere not-for-profit US research and development facility specializing in manufacturing technologies and materials for the metal casting industry. The MCC testing laboratory and pilot-plant demonstration facility are the most advanced of their kind. The center’s primary mission is to assist the foundry industry by developing technical solutions to keep this primary industry competitive in a global economy.

UTC Aerospace Systems
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Provide, Manufacture and Assemble landing gear for the aerospace industry.

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Valence Surface Technologies is the largest independent surface treatment company serving highly technical and complex industries such as aviation, military, space, satellite, medical device and semiconductor. We offer the most comprehensive set of surface technology and special processing capabilities for high-value, mission-critical parts.

Our state-of-the-art facilities are located in key aerospace and high-tech manufacturing hubs throughout the U.S. These facilities, coupled with our comprehensive approvals and breadth of capabilities, allow us to successfully service customers around the world with premium quality and service, optimal lead times, streamlined supply chain logistics and lower costs. Each of Valence’s 10 sites offer titanium and hard metal special processing.

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Vallourec Heat Exchanger Tubes is leader in the manufacturing of titanium and stainless steel welded tubes for heat exchangers serving energy, process and desalination markets. Our products include not only bare, straight tubes but enhanced surface tubes, such as low fin and corrugated tubes as well as u-bent tubes for special applications. The highest level of quality and safety in the market is guaranteed by stringent control procedures and unchallenged technical experience. The best testimony of product quality is the long list of references, worldwide. Our R&D teams develop ambitious innovation and research programs to enhance the performance of the tubes in the toughest environments. We have high manufacturing capacities, with production mills on three continents, Asia, North America and Europe, (namely in China, France, India, South Korea, the USA) as well as a secured access to superior quality titanium strip.
VDM Metals
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www.vdm-metals.com

VDM Metals has been developing high-performance materials for particularly demanding applications and processes for decades. Our product portfolio of titanium, nickel, zirconium and special stainless steels is wide and varied – it includes:
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We focus on the specific demands of very different industries. Our strength is the development of tailored material concepts. In many key technologies, our materials are an indispensable prerequisite for the industrial-scale implementation and reliable control of important processes: in aerospace, energy and environmental engineering, electrical and electronic engineering, the automotive, chemical and petrochemical industries, offshore and marine engineering, and in industrial furnace construction.

In an ever more complex market with all its different demands and expectations, we have made it our principle to always develop new material solutions together with our customers.

Verichek Technical Services, Inc.
+1-412-854-1800
www.verichek.net


VSMPO – AVISMA
+7-34345-55764
www.vsmpo.ru

VSMPO-AVISMA, the world’s largest producer of titanium, holds more than 300 international quality certifications and approvals at major aerospace OEMs and medical device companies. VSMPO-Tirus operations in the US, the UK, Germany and China provide regional sales, distribution and service center processing.

VSMPO - Tirus, US
+1-720-746-1023
www.vsmpo-tirus.com

VSMPO-Tirus, US is the North American sales and distribution division of VSMPO-AVISMA, the world’s largest producer of titanium, holding more than 300 international quality certifications. VSMPO-Tirus US distributes ingot, forgings, slab, sheet, plate, bar, and billet to the aerospace, medical, and consumer products industries. VSMPO-Tirus US also manufactures small diameter bar and coil for medical and aerospace fastener applications.

VSMPO - Tirus China Ltd.
+86 10 8455 4688
www.vsmpo-tirus.com

VSMPO Tirus China Ltd. is the Chinese sales and distribution division of VSMPO-AVISMA, the world’s largest producer of titanium, holding more than 300 international quality certifications. VSMPO-Tirus China distributes ingot, slab, sheet, plate, bar and billet to the aerospace, medical, and consumer products industries.

VSMPO TiRus GmbH
+0049 69 905477-25
www.vsmpo.de

VSMPO TiRus GmbH is responsible for the sales and distribution of titanium semi-finished products in Europe (except the UK), Brazil and Israel to the aerospace, medical and automotive industries. The company was established in 1999 in Frankfurt/Main. The German affiliate of the largest vertically integrated international titanium producer VSMPO-AVISMA offers optimum service, including custom-made processing of semi-finished products as well as a comprehensive transport service. We offer cut-to-size material (bars, billets, sheets and plates) to meet our customers’ individual operational needs. TiRus GmbH also distributes electrodes, ingots, rolled rings and different types of forgings.

VSMPO Tirus UK Ltd.
+0(0) 1527 514111
www.vsmpo-tirus.co.uk

VSMPO Tirus UK Ltd. is the UK’s sales and distribution division of VSMPO-AVISMA, the world’s largest producer of titanium, holding more than 300 international quality certifications. Tirus UK distributes ingot, forgings, sheet, plate, bar, and billet to the aerospace, medical, and consumer products industries.

VSMPO Titan Ukraine Ltd.
+380 562 313092
www.tw-vsmpoavisma.com

VSMPO Titan Ukraine Ltd. is fabricator of seamless tubular products from titanium and its alloys. It is a part of the world’s largest producer of semi-products and finished titanium products - JSC Corporation VSMPO-AVISMA (Russia) which supplies billets and bars to the plant. It is guarantee of quality competitiveness of manufactured production for the customers. Annual production capabilities of the enterprise is 700 tons of cold-finished titanium tubes (diameter 3-134 mm and wall thickness 0.2-9 mm), and in cooperation additionally 200 tons of hot-finished titanium tubes (outside diameter 169-325 mm and wall thickness 7-30 mm). Engineers and technical specialists are developing new technologies of titanium tubes production and new types of products. For example, octahedral and ribbed tubes, special kind of thin tubes for siphons, technologies of long-length tubes production, etc. VSMPO Titan Ukraine Ltd. has all equipment necessary for different tests and QA inspections. It allows manufacturing not only according to the international and national standards, but meeting any customer’s requirements.
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**Vulcanium Metals International**
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Vulcanium Metals International, a leading distributor and processor of titanium and high performance alloys, serves global aerospace, medical device and industrial markets. VMI’s fully operational facilities in the US and UK carry a complete line of inventories in titanium sheet, coil, plate, bar and forged block products of CP, Ti-6AL-4V and Ti-6AL-4V ELi grades as well as CCM and 316L stainless round bar. FIRSTCUT+® services offer a comprehensive suite of first-stage processing including precision shearing and sawing, machining, chamfering and facing, deburring and finishing, leveling, slitting, and laser and water jet cutting. VMI also offers inventory management solutions to save its customers supply chain costs and reduce manufacturing bottle-necks. Vulcanium is a specialty division of United Performance Metals, one of more than a dozen companies comprising O’Neal Industries, Inc. (onealind.com), parent company of the USA’s largest, family-owned group of metal service centers. AS9100 & ISO 9001 LEAN Quality Management

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Weber Metals, Inc. specializes in Aluminum and Titanium open and closed die forgings for the Commercial and Military Airframe, Air and Land Turbine, Nuclear and Semiconductor industries. Our press sizes range in size from 1200 to 33,000 tons. We have capabilities to perform heat treatment, non-destructive and destructive testing in house. Our forgings range in size from 1 pound to 11,000 pounds.

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We supply and distribute Titanium Sponge and Titanium Powder. We represent the largest Titanium sponge and powder producers in China. We can also supply other non-ferrous metals which are of Chinese origin with approved quality. The Titanium Sponge producer is ISO9001:2008 certified and sponge quality is approved by world main consumers.

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West Penn Testing Group is a full-service, independent testing laboratory with diverse inspection and testing capabilities since 1952. They provide an extensive array of non-destructive, chemical, metallographic, failure analysis and mechanical evaluation services, serving customers in these industries: aerospace, medical, power generation, commercial, military, raw materials, refractories, oil and gas, and the automotive industry. They have three locations in New Kensington, Pennsylvania and Richburg, South Carolina and perform testing nationally and internationally. Their 79,000 sq. ft. facilities accommodate parts up to 20,000 lbs. www.westpenntesting.com

**Western Smelting & Metals, Inc.**
+1-503-623-8341
www.westernsmelting.com

Western Smelting & Metals Inc in Dallas, OR is a third generation metal recycling business with almost 60 years of experience in the industry. We are the most preferred locally owned metal recycling service provider with 30 year of experience in titanium processing. Our experts provide valuable information to the clients to help them make a right decision about the formulation of materials. Whether it is blending, sizing or sorting of metals, our experts ensure that we deliver fast and exceed our clients’ expectations. Depending upon the clients’ needs, we also provide aluminum, cobalt and nickel alloys.
Western Superconducting Technologies Co. Ltd.
+86-29-8651-4505
www.c-wst.com
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Western Superconducting Technologies Co., Ltd. (WST), located in Xi’an, the capital city of Shaanxi Province, China, is a leading corporation for the production, R&D, and marketing of titanium ingot, billet, bar, wire, slab, plate, etc. Especially from the ingot to bar and wire, WST has the most advanced and integrated production line and quality assurance system in the world. The production capacity for bars is 4000 tons per year, and 6000 tons for ingots. WST is an ISO 9001:2008, AS 9100C and Nadcap approved company and the products are widely used in the aerospace, medical, offshore, sporting, car and petroleum chemical market.

Westmoreland Mechanical Testing & Research Inc.
+1-724-537-3131
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Westmoreland Mechanical Testing & Research is a world leader in materials testing. Founded in 1967, WMT&R serves a broad range of industries including aerospace, automotive, medical, and power generation. We support our customers with our highly-skilled staff and advanced facilities. Our turnaround time is unrivaled, and with over 300,000 square feet of accredited production and testing space, we have the capacity and equipment to handle any materials testing project. WMT&R’s testing expertise includes: Mechanical Testing, Composites, Fatigue, Stress/Creep Rupture, Fracture Mechanics, Metallography, Chemical, Heat Treat, Thermal Analysis, and Physical Properties Testing. For more information, please visit www.wmtr.com or email us.sales@wmtr.com.

Xi’an Metals & Minerals Import & Export Co., Ltd.
+0086-29-88210716
www.tiwmo.com

As a leading manufacturer and distributor of Titanium, Molybdenum and Tungsten products in China, Xi’an Metals and Minerals Import & Export Co. Ltd., has joined into manufacturing, researching and competing in Titanium industry. We supply Titanium and its alloys in various forms as per ASTM, AMS and other main internationally recognized specifications. Our advantage is the most competitive prices as well as guaranteed high quality! Our products are exported worldwide, and gained high reputation because of their excellent performance.

Yunnan Titanium Industry Co., Ltd.
+86 13888217035
www.ytico.com.cn

Yunnan Titanium Industry Co., Ltd (Yunti) is specialized in the production and processing of titanium strip and coil and dedicated to technology research of titanium industry in China, which has manufactured ability from titanium slab to cold rolled titanium strip and coil with minimum thickness of 0.5 mm, Yunti has rich technical resources and innovation ability, Yunti has established the standard quality management system, Occupational Health and Safety & Environment management and systems based upon international standards. Yunti has a production capacity of 5,000 tons titanium coils per year.

Its products range from 800 ~ 1400 mm in width, 0.5 ~ 10 mm in thickness, 2000kg ~ 8000kg in weight, the quality and performance of titanium strip is stable. The surface is of good consistency, and mainly used for the manufacturing of titanium welded pipe, anodizing plate, plate heat exchanger etc.

Zak, Incorporated
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www.zakinc.com

Zak Incorporated is a fully integrated design, fabrication, machine, and test facility. We engineer, manufacture, and refurbish crucibles, liners, molds, and accessories for the remelting and production of specialty metals. Our manufacturing and consulting experience has contributed significantly to the VAR, ESR, Plasma, EB, C.C., and EBPVD processing industries. This experience, along with our precision CNC machining capabilities, will extend your product life cycles and improve the reliability of your process. Our ISO 9001-2008 certified services include a full range of dual pallet, multi-axis CNC machining centers with live tooling; MIG, TIG, and stick welding of copper and other dissimilar metals; hydro, helium, X-ray and other available NDT services. For more information about Zak Incorporated, please visit us at www.zakinc.com

Zirom SA
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www.zirom.ro
zirom@zirom.ro

Zirom SA came into prominence, over the last decades, as one of the largest producers of titanium and titanium alloys in Europe. Ever since the foundation, a permanent emphasis has been laid on its development, through technological optimization and through development of the technology for melting titanium and zirconium recycle material, by combining EB and VAR technologies, and further, the development of free forging process.

The products manufactured, ingots and forged products, are intended both for cutting edge fields (aviation and nuclear areas) and various fields (metallurgy, chemical industry, medical technique and devices).
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Zaporozhye Titanium-Magnesium Combine (ZTMC) located in Zaporozhye city industrial zone, Ukraine, is one of the first in the work and unique in Europe titanium sponge manufacturer. It works since 1956. During this period production facilities were modernized and rebuilt more than once, which allowed to modernize technological processes and to increase titanium sponge production volume. ZTMC as a reknowned sponge manufacturer has been investing in the new technologies to increase both its capacity and allow us to supply high quality sponge to various customers around the globe. The wide range of ZTMC products are represented by titanium sponge, titanium ingots, titanium casting, refined titanium tetrachloride, ferrotitanium, titanium slag, casting. The quality of ZTMC products is guaranteed by a certified quality management system in accordance with the requirements of the International Standard ISO 9001:2008. Currently works underway to create and implement the requirements of the management system for Aviation standard EN 9100.
The strongest evidence of Alcoa’s ongoing transformation lies in aerospace. Already an historic global innovator, partner and multi-material solutions supplier, Alcoa is growing and diversifying with U.S. expansions and the acquisitions of Firth Rixson, TITAL and now RTI International Metals.

*Alcoa powers the skies—nose to tail and wingtip to wingtip.*
*If it flies we’re on it, now more than ever.*

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