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It is my pleasure to chair the Global Industrial Applications committee on behalf of the International Titanium Association. I am the Business Development Manager/Metallurgist for Tricor Metals in Wooster, Ohio --- responsible for the sales and marketing of fabricated specialty metals products. I have over 40 years’ experience in the sales and marketing of technical products, including specialty metals fabrications, roll clad metals, electrical contact materials, and copper flat rolled products and tubing.

I want to thank Rob Henson – VSMPO Tirus US, my committee chair predecessor, for doing an outstanding job in forwarding the goals of the committee and ITA over the last two years. The industrial applications group’s mission is to facilitate the expanded use of titanium products in existing and new market sectors/applications, to contribute to the growth of the overall titanium industry and to promote the selection of titanium as a competitive material, while also communicating this information to industrial customers as well as to the other ITA committees in support of their annual objectives.

We are pleased to announce the first International anTi Corrosion Conference, hosted by the International Titanium Association. The full day event will be held Wednesday, October 11, 2017 in conjunction with the 33rd annual TITANIUM Conference & Expo taking place at the Diplomat Spa & Resort near Miami, Florida.

Distinguished speakers from the chemical processing and other industries using Titanium and other Corrosion Resistant Alloys will discuss topics of interest to owners, purchasing managers, design, plant, maintenance, reliability and quality assurance engineers. Everything from how to specify materials of construction to how to ensure long lasting equipment and how to inspect CRA materials during operations. There will be ample time for networking with experts in the industrial market that will allow you to develop information that can be immediately used in your specific plant or market. Specific speakers and topics will be publicized soon.

In addition to the International anTi Corrosion Conference, the global industrial committee will host a general session at the upcoming TITANIUM EUROPE 2017 conference in Amsterdam this May; we will continue to support the ASME code training being mentored by Rick Sutherlin; we continue to make progress on changes in NACE Standard MRO 175; and will exhibit at a variety of trade shows in 2017 including the WorkBoat Show in New Orleans this November. All of these programs are made possible by the ITA Membership and we thank you for your continuing support.

If you are interested in joining the Global Industrial Applications committee, please contact the ITA. The committee will be hosting a meet & greet during the 2nd evening reception at TITANIUM EUROPE in Amsterdam on May 18th. I hope you will stop by to learn more about our activities to see how you may become involved. We need members from around the world to make this committee truly “Global”.

Charles Young
ITA Industrial Markets Committee Chair
Business Development Manager / Metallurgist
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Numerous executives in the titanium industry, along with industry observers and analysts, have been patiently waiting for signs of an encouraging uptick in the sluggish oil and gas business sector. The oil patch, as a bellwether for global titanium business conditions, has seen slumping oil prices, declining rig count numbers and extensive cuts in personnel, all of which reflect the tepid environment. During the last two years, various speakers at TITANIUM conferences in North America and Europe, sponsored by the International Titanium Association, have identified the downward trends.

However, moving into the second quarter of 2017, there are indications of improving conditions in the oil and gas market, as predicted by business analysts and titanium industry executives. The New York Times, in its Feb. 20 edition, reported that oil production is “galloping upward to nine million barrels a day, from 8.6 million in September (2016). Nationwide, with a bit more than one-third as many rigs operating as in 2014, production is not even down 10 percent from record levels.”

The Times story went on to say that the price of oil was hovering at around $53 a barrel, but that advances in automation and information technology would mean fewer jobs for engineers, rig operators and technicians. “The result is improved production and safety, but also a far smaller workforce, and one that is increasingly morphing from muscle to brain power.”

The Wall Street Journal, in a Feb. 15 story, reported that the U.S. Energy Information Administration said crude stockpiles rose by 9.5 million barrels, reaching the highest level in data going back to 1982. A Jan. 13 online article posted by the Times reported that the South American country Guyana “is poised to become the next big oil producer in the Western Hemisphere, attracting the attention and investment dollars of some of the biggest oil companies in the world.” The story said it’s estimated that Guyana’s offshore fields could contain 1.4 billion barrels of oil mixed with natural gas. Bloomberg News, in a Feb. 15 online story, reported that India has approved awarding rights for 31 small discovered oil and gas fields in its first auction in six years as it seeks to boost local production. “India’s $2-trillion economy imports more than 80 percent of its crude requirement and a heavy reliance on imports risks its status as the fastest-expanding major economy in the world,” the Bloomberg story said. “The International Energy Agency expects the country to be the fastest-growing crude consumer in the world through 2040.”

Chris Olin, senior research analyst, Longbow Research, Independence, OH, during his presentation at TITANIUM USA 2016 in Scottsdale, AZ, observed that oil and gas has gained some momentum since mid-2016 and that “there could finally be light at the end of the tunnel” for non-aerospace global industrial markets.

Interviewed in early 2016 following a conference call to discuss his outlook for titanium business conditions, Olin said “we’ve been seeing weakness in the industrial categories, everything non-aerospace,” a list that he identified as including desalination, oil and gas, power generation, general industry and infrastructure, chemical processing, ocean and naval, and nuclear power. The main problem, he said, was the collapse in oil and gas prices. At the moment, there really are no positive outliers in industrial markets for titanium business.” As a result, he said titanium distributors “have been hedging away from the industrial sectors and adjusting their inventory levels accordingly.”

Olin said he did see the potential for a rebound for titanium in industrial markets in by mid-2017, picking up momentum in 2018. He said the titanium supply chain and overall inventory levels are now in “a much better balance” com-
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pared with recent years. “The inventory levels of distributors are now lean. The major headwinds for industrial markets have died down and there’s much less inventory pressure coming from distributors.” Olin added that oil must recapture a level of at least $50 per barrel to jump start a new wave of capital investments, which would have a cascading effect among various industrial markets. “This would spark capital investment dollars,” he said. Several online news articles in early March reported that ExxonMobil announced it would boost its 2017 capital expenditures to $22 billion, nearly 16 percent above the previous year. The reports indicated that much of the oil giant’s capital investment will focus on “upstream development.”

For offshore drilling, the potential advantage in using titanium for a drilling riser, which could yield a “system approach” cost advantage. Marvel said that if titanium is used for a drilling riser, this would drop the weight, which would, in theory, reduce the size of the overall offshore drilling rig. According to information found on the Tenaris website (www.tenaris.com), a producer of seamless and welded steel tubular products for the energy industry, a riser is a system of vertical concentric pipes, a conduit that connects an offshore drilling rig to the sea floor for drilling. “Risers are considered to be the most critical product in an offshore pipeline development, taking into account the dynamic loads and sour service conditions they need to withstand.”

In his presentation at TITANIUM USA 2016, Marvel pointed out two keys for titanium to increase its usage in the oil industry. First, educating engineers is needed to demonstrate the benefits of lightweight materials in drilling applications. Second, “system thinking” is needed. “You need to have system engineers that design systems, not components. To be cost competitive, you have to understand and change the entire drilling system from the rig to the equipment in the sea and in the hole.” As such, he recommended that the lightweight metals industry, which includes aluminum and titanium, should form a consortium of operators, service companies, and lightweight material companies. “Lightweight materials are not as well known, are not proven and lack industry understanding (by both the operators and suppliers).”

Addressing the current business environment for the oil and gas sector and how it affects the titanium market, Timothy Marvel, industry consultant, said companies involved in oil and gas exploration do have interest in the use of lighter weight metals like titanium and aluminum alloys, compared with steel. Wellsite Automation, Downers Grove, IL, is a provider of products, intelligent productivity tools and related automation software for the energy sector. Because there is a greater emphasis on horizontal drilling technology these days, torque, drag, friction and pipe weight are becoming critical issues, Marvel said.

Marvel said there are a select number of titanium alloy and aluminum alloy offshore drilling risers in production, but a significant amount of education, outreach and system thinking is needed in order to make titanium a stronger material of choice. As for system thinking, titanium industry leaders need to underline titanium’s long-term system advantages in terms of reducing operational and maintenance costs.

Reviewing Chemical Processing Activity
Kevin J. Cain, the president of Uniti Titanium LLC, Moon Township, PA, concurred that, approaching the mid-year point of 2017, the oil and gas business does appear to be on the rise, compared with the slack conditions of 2015 and 2016. As business conditions improve, capital investments will be directed to reinvigorate drilling and refining operations. “Titanium will be a contender for this business,” he said, along with other specialty metals such as nickel alloys, stainless, and specialty steels. Much like Olin, Cain uses the $50-per-barrel mark as an indicator to trigger capital investments.
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“If oil prices remain at current levels, then we’ll see some rebound,” he said. Cain also sees titanium inventories in the supply chain as being in balance and in line to meet demand needs. He did point out that the “complex” offshore drilling market may not fully recover until 2019.

Cain said many down-hole operations have been capped or only partially completed due to the recent downturn.

“We’ve witnessed a two-year decline in oil and gas,” he said. The take-away today is that we believed we’ve reached bottom and should see moderate growth in the coming months.”

A joint venture between VSMPO and ATI, Uniti utilizes the capital assets of both partners to focus its efforts on titanium applications for the global industrial sector, according to Cain. Uniti is a provider of titanium sheet, coil, tube, pipe, plate, long products and wrought/unwrought mill products. As such, Cain addressed a wider perspective on business conditions in the industrial sector. While the state of the oil and gas does have a domino effect on downstream industrial markets, Cain stated that chemical processing, with overlap in the petroleum sector, also deserves a close review.

“Chemical processing is a driver for products used by the housing, construction and automotive industries,” he said. “We’re seeing good business activity in chemical processing and have in recent years,” which translates into demand for critical titanium components such as storage tanks and heat exchangers, and tight-tolerance pipe, tube, and valves. Titanium has a well-established track record as a material of choice in chemical processing, given the metal’s inherent corrosion resistance properties, he said. Commercially pure titanium grades 1 and 2, along with Grade 7 and Grade 12, are the workhorse materials for these applications.

Power generation, especially gas turbine power plants, is another sector tracked by Cain. Overall, he described it as a good, active market, but not robust, for titanium business. He indicated that near-term growth opportunities in power generation can be found in India, China and other Asian countries, such as Vietnam. In addition, he said there are power plants now under construction in the United Kingdom.

Cain also addressed the global desalination market during his presentation at TITANIUM USA 2016, saying that while the titanium industry put together three consecutive positive shipment years (2015-2017), there are no “signature” thermal desal projects forecasted for 2018. New business in desal is forecasted for 2019.

When it comes to the industrial market, Cain said that once titanium is specified for a given application, typically remains in place due to its performance and cost advantages. “From a life-cycle cost perspective, titanium, hands down, is the best choice for industrial applications,” he declared. And because titanium is half the density of steel and nickel alloys, titanium is highly competitive on a cost per-square-foot basis. During his presentation at TITANIUM USA 2016, titled “Industrial Titanium Demand Forecast 2016,” Cain assessed the major, global industrial sectors that consume titanium. The overall global forecast for industrial titanium demand in 2020 is anticipated to exceed 25,000 metric tons, just above the estimated 2016 level.

ITA’s Industrial Markets Committee has announced plans to host a full-day anTi Corrosion Conference on Wednesday, October 11th in conjunction with the TITANIUM USA 2017 Conference and Exhibition which will be held at the Diplomat Spa & Resort near Miami, Florida.

It is estimated that corrosion represents an annual worldwide cost of $3 trillion for infrastructure and industry—the cost to repair, replace and maintain critical systems. In the United States, the cost for corrosion control and repair represents about 3.3 percent of annual gross domestic product (GDP) or well over $300 billion.

Titanium Industry Detects Long-Awaited Uptick in the Oil and Gas Industry Sector (continued)
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A specialty materials marketing analysis update, compiled and published by Chris D. Olin, vice president, senior research analyst, Longbow Research, Independence Ohio, indicates that titanium survey data points “are now at the strongest levels recorded since 2011.” Olin’s research determined that industrial-related numbers for titanium “have finally turned positive,” while commercial aerospace orders remain steady.

Olin explained that titanium essentially has been a “zero growth” market in recent years. However, factors such as a much better inventory position, continued aerospace strength, and renewed energy-related activity all signify a turn for 2017-2018. Longbow’s newly introduced industry model calculated a 40-percent overall global consumption improvement potential by the year 2020, which includes the following outlook for individual business categories: aerospace (up 8 percent); industrial (up 1 percent); military (up 4 percent); medical (up 4 percent); and consumer and “other” (up 6 percent).

Longbow’s reading of market conditions reflect a more positive business environment for titanium used in industrial markets (chemical processing, heat exchangers, corrosion-resistance applications, power generation, desalination, etc.), compared with the lackluster business conditions for titanium in this sector during the last two years.

According to Olin’s research forecast, the outlook for overall Western World titanium demand in 2017 is estimated at 185 million pounds, up 5 percent from the previous year (the “Western World” forecast excludes business activity in Russia and China). “Underlying trends for the specialty materials (titanium and nickel-based alloys) peer group have improved considerably over the past three months,” Olin wrote in the Longbow newsletter analysis, dated March 21, 2017. “Feedback from titanium and nickel-based alloy producers, distributors, and fabricators indicate a much healthier downstream demand backdrop with early pricing leverage.”

Among the “demand takeaways” in Olin’s report, the average shipment growth rate for peer companies improved to four to five percent, “which is up from the 2 to 3 percent environment evident...
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over the past four quarters. Titanium is currently showing the strongest “comps” (year-over-year volume growth), up 6 percent in the first quarter of 2017.”

Providing insights to the market update, the end-market analysis for 13 of the 14 individual customer groups surveyed showed “sequential order strength in first quarter, suggesting a broad-based recovery,” according to Olin. “On an absolute basis, the strongest three markets were jet engine, fasteners, and large airframes; the weakest were desalination, oil and gas, and nuclear.” In addition, the market survey also detected “positive momentum at the raw material and mill level.”

The report’s industrial-related demand analysis for titanium observed that key indicators have turned more positive for the end-markets tied to industrial and energy business sectors. The average comp for these channels improved up to 2 percent, “following an extended period of weakness or even contraction. There was a broad-based sequential improvement in customer orders, with many sub-groups showing 3-percent growth in the first quarter, up from the flat environment in late 2016.”

As for pricing dynamics, specialty alloy prices “have finally started to inch higher, albeit from depressing levels. This is the first evidence of upward movement inflection since 2011. We believe the reset spot transaction levels are a function of rising raw material costs (e.g., titanium scrap, commodity nickel, and aluminum). The benchmark products we track are 6/4 titanium ingot and 718 nickel-based-alloys. About 15 to 20 percent of pricing is conducted through open market transactions, while 70 percent of volumes are priced on annual or long-term contracts.”

Assessing real-world risks, the Longbow market update stated that, as with all publicly traded metals and mining companies, “the greatest risks involve any downward adjustments to spot-market prices, new capacity or foreign supply introductions, or rapid changes to customer inventory intentions.” Olin listed four variables that could affect business conditions: the need to raise additional capital or pension funding changes; continued strength in the U.S. dollar, which would create increased competition within certain specialty alloys markets; a precipitous decline in commodity nickel prices; and downward revisions for delivery schedules for aerospace giants Boeing or Airbus, especially for the single-aisle aircraft market.

For additional information or to obtain an online copy of the survey, contact Olin via email at colin@longbowresearch.com. According to information posted on the Longbow website (http://www.longbowresearch.com), the company, established in 2003, provides institutional equity research in fields that include industrial and construction materials; capital equipment; transportation and logistics; and industrial technology.
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In a spirit of professional stewardship, leaders of the International Titanium Industry (ITA) continue to reach out and provide support to a new generation of engineers, procurement managers and technical sales representatives, all of whom are eager to establish their place in the titanium industry. One example of this interactive outreach is a new program that will involve Rick Sutherlin, a paid technical consultant of ITA, who will be mentoring young mechanical engineers with the ASME code work, especially as it relates to industrial applications for titanium.

A registered professional engineer, Sutherlin, who retired in 2015, spent many years at Wah Chang Corp., which was based in Albany, OR. (Wah Chang, following various acquisition moves, became part of the Specialty Alloys division of Allegheny Technologies Inc.). He has served on various committees with the American Society of Mechanical Engineers (ASME) for over 20 years with a focus on reactive and refractory metals (titanium, zirconium, niobium and tantalum). His resume lists committee work with the American Welding Society (AWS), and he also is a general member of the National Association of Corrosion Engineers.

The first mentoring meeting was held in February in Atlanta, coinciding with an ASME non-ferrous subcommittee gathering. It’s expected that Sutherlin will provide training sessions for the ITA on a quarterly basis. Even though he is still formulating an outline for this mentoring program, he said that topics related to titanium will include: how ASME standards committees work; the process for an technical inquiry into an ASME code; the use of the “design allowables” in the ASME code; how to get a new titanium material into the design code; and how to make titanium alloys more competitive with other materials by using “H” grades.

According to Sutherlin, the phrase “design allowables” typically is used to describe allowable stress values, which are tables showing the maximum stress (pressure) that you can safely design pressure vessels at a specific temperature (vessel operating temperature). The allowables are calculated using mechanical test values of the specific material to be used in pressure vessel construction. There are also other factors used when a material is considered for pressure vessel construction.

Sutherlin pointed to the use of “H” grades of titanium for pressure vessels. According to online information posted by ASTM (www.astm.org/Standards/B265.htm), a titanium H grade material “is identical to the corresponding numeric grade (Grade 2H is equal to Grade 2), except for the higher guaranteed minimum UTS (ultimate tensile strength) and may always be certified as meeting the requirements of its corresponding numeric grade.” Grades 2H, 7H, 16H, and 26H are intended primarily for pressure vessel
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use. He said the H designation is another way to distinguish between the standard ASME design strength (Ti-2) as opposed to the higher design strength material (Ti-2H). “The H grades were first approved for use in ASME boiler and pressure vessel construction (through a code case) in 2006,” he said.

When it comes to specifying titanium for various industrial applications, Sutherlin said he has expertise in critical aspects of ASME’s boiler and pressure vessel codes. He will provide written reports to ITA of ASME actions on all reactive metal actions and any other code actions that are not confidential to the ASME, and titanium filler-metal requirements.

ASME supervisory boards are responsible for pressure vessel technology, nuclear installations, safety codes and standards, standardization and performance test codes and conformity assessment. “The supervisory boards in turn have standards committees, each responsible for an area of standards development. The advisory boards deal with strategic initiatives, energy and environmental standards, hearings and appeals and council operations,” he said.

Sutherlin indicated that, during the last 20 years, he has been one of the few knowledgeable individuals working on the ASME committees supporting reactive metals like titanium and zirconium, which are both ASME pressure vessel materials of construction. “We would like to have more trained engineers join the standards committees and begin to support these important materials of construction in the ASME code committees.”

What’s the essential “take away” from these training programs being offered under the auspices of the ITA? The basic answer, according to Sutherlin, is to “protect the interests” of the titanium industry. During his 40-plus years in the business, he has seen many experienced engineers retire and new ones come on board. “There’s always a concern with the transfer of experience,” he observed. “Experience makes a big difference. We don’t want to lose that experience, especially when it comes to ASME codes. People need to have that knowledge.”

For example, he said that for individuals making decisions on specifying a material for a given industrial application, their experience, for whatever reason, may not include a comprehensive knowledge on titanium alloys. Designers and engineers involved in industrial projects tend to “fall back” on materials that they know. They may not know about titanium’s properties or the relevant ASME codes. “People may choose the ‘safe route’, but that might not be the best choice for specifying a material,” he said. “They may not know about titanium.”

When it comes to a critical application like a pressure vessel for the chemical processing industry, Sutherlin said engineers and designers must know about specific titanium alloys in order to make informed decisions.

To learn more about Sutherlin’s mentoring program, call the ITA at (303) 404-2221 or visit the website (titanium.org).
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The TITANIUM series is hosted by International Titanium Association (ITA). A non-profit trade group established in 1994, the ITA’s mission is to connect the public with Member organizations who may provide technical and sales assistance. Over 200 international organizations with more than 1,600 individuals worldwide comprise the membership of the Association.

Presenting the International anTi Corrosion Conference

ITA is pleased to host our first anTi Corrosion conference in conjunction with the TITANIUM event. Distinguished speakers from the chemical processing and other industries using Titanium and other corrosion resistant alloys will discuss topics of interest to owners, design, plant, maintenance, reliability and quality assurance engineers.

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The following chart provides a quick overview of the features and advantages of TFC's coating processes:
Corrosion Awareness

The New York-based World Corrosion Organization (website: http://corrosion.org) points out that Corrosion Awareness Day (held this year on April 24) is intended “to educate the public, industries and government agencies of the deleterious effects of corrosion on our infrastructures worldwide.” The organization estimates that corrosion represents an annual worldwide cost of $3 trillion for infrastructure and industry—the cost to repair, replace and maintain critical systems. In the United States, the cost for corrosion control and repair is estimated at over $300 billion. George Hays, an international authority in the field of corrosion and an officer with the World Corrosion Organization, served as a keynote speaker at the 2015 TITANIUM conference.

Steps for Successful Field Repairs

For the speaker panel, a presentation by Chuck Young, business development manager with Tricor Metals, Wooster, Ohio, offered “Five Steps to Successful Field Repairs,” which addressed on-site field welding of corrosion resistant alloy equipment. Young identified “scope definition” as the first of the five steps, which involved work to be performed; scheduling and timing of work; field weld locations and number of welds identified; and repair options. Next, he outlined the “review of job and bidding” that includes a pre-bid walk through; contractor requirements; quality control procedures and material management; and safety certifications required.

Step three is “safety requirements,” which considers grinding and cutting operations; working on scaffolding and elevated platforms; and welding inside a reactor. Number four on Young’s list is “vendor selection,” where he pointed out that the lowest price is not always the best option. Finally, he touched on “post-award coordination,” which encompasses the submittal of procedures and certifications for welders, safety requirements and contractor scheduling, “to make sure parties are in sync to hit the ground running on setup day.”

Using Zirconium

A talk by Keith F Briegel of the Dow Chemical Co., Midland, MI, explored “Design, Fabrication, Operation and Maintenance of Zirconium 702 Equipment in Hot Dilute Sulfuric Acid Service.” Briegel said zirconium has found a valuable niche in Dow’s sulfuric acid-based processes, with temperatures as high as 300 F (150 C). Briegel said zirconium 702 has 40-plus years of experience in hot sulfuric acid/organic/H2O systems. Heat treatment after welding is critical to prevent long-term weld heat-affected zone (HAZ) corrosion, according to Briegel.

Separate from Briegel’s presentation, information in an online abstract of a technical paper titled “Explosion Clad-
Zirconium is a commonly used material for containment of corrosive media by the chemical process industry (CPI), offering exceptional corrosion resistance in a broad range of aggressively corrosive environments.

Explosion cladding has enabled CPI companies “to cost effectively benefit from the superior performance features of zirconium in heavy-wall pressure vessels and heat exchangers,” the ASTM paper stated. Explosion cladding is a unique technology that uses the energy of an explosive detonation to produce a metallurgical bond between metal plates. Zirconium clad has become a broadly accepted material of construction for a significant range of CPI equipment, used to manufacture an extensive range of chemical products or intermediates such as nitric acid, acetic acid, urea, and various organic acids.

Condenser Retubing

Kim Massey, vice president for the Condenser Services division of Philadelphia-based Day & Zimmerman, addressed the topic of “One for One Titanium Condenser Retubing.” Massey began her talk by saying that “successfully performing a condenser retubing with new titanium tubes requires advanced planning, extensive expertise in condenser design and operation, and superb project execution.” She listed various points for considering the retubing of a condenser, such as when 10 percent or more of the total amount of tubes are either plugged and/or have failed; severe wall loss; or if existing tube material leaches out onto components (turbine, feedwater heaters, etc.) or deposits unacceptable chemicals into the cooling water source.

Massey said titanium is a material of choice for retubing because of its immunity to contaminants from cooling water, chloride attacks, and under-deposit pitting. For project planning, she pointed out that, on average, most condenser retubing programs require four to six weeks to complete. She recommended that companies “determine the scope of work and schedule/time available to perform retubing, and outline those responsible for providing what services, materials, tooling and equipment.”

She also reviewed the topic of vibration and uplift analysis, noting that when changing existing tube material to titanium, which is a lighter weight from most metals and generally a thinner wall thickness, the following analyses are recommended: uplift analysis is performed to determine if modifications are required in the anchoring areas; while vibration analysis is performed to determine whether the existing support plate spacing (taking into consideration the new condenser tube material) exceeds the maximum allowable spacing in accordance with Heat Exchange Institute (HEI) standards.

Regarding uplift analysis considerations, she said that with the installation of thinner and lighter tubes, analysis is required to monitor the potential effects on the vacuum uplift of the condenser. “Condensers experience an upward force due to the vacuum created in the condenser. It is possible that too much weight has been removed and additional restraints need to be added to ensure the condenser will not move relative to the many attachments found on most condensers.”

Massey concluded that with proper planning in advance of the project, the selection of a qualified retubing contractor, and performing the required/recommended analyses and testing, retubing project can be completed with minimal setbacks, on time and in accordance with
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the project schedule and budget forecasts.

Large-Diameter Vessels
Greg Dunn, corporate sales director at Titanium Fabrication Corp., Fairfield, NJ, provided information on “Large-Diameter Titanium Vessel Fabrication – Shop and Field Considerations.” The title of the presentation reflects a well-established area of expertise for Dunn’s company.

Regarding design considerations for industrial, large-scale titanium vessels, Dunn advised that project managers consider basic logistical and manufacturing capabilities. The modes of transportation, truck or boat shipment, must be reviewed for items such as truck permit loads, which vary for different states, the requirements for state police escorts, and the configuration of vessel shipment (in a vertical or horizontal position). For boat transportation, the critical checkpoints include the size of the ship, and whether the titanium vessels will be transported on the top deck or below deck.

For design considerations, Dunn suggested the use of solid titanium plate flanges to reduce weight and the need for repads. He also said that the use of flanged connections for large-diameter titanium vessels greatly reduces field welding.

Life Cycle Costing
Benator defined life-cycle costing as a set of calculations to determine the long-term financial benefit for an investment, taking into account the savings, benefits, maintenance and cost over the entire life of a product or system. Putting it into layman’s terms, he said the basic idea is: do I spend a bit more now to get a better and more cost-effective system for the long haul. 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.

In previous interviews, Benator noted that, in some cases, for industrial projects, titanium is passed over for so-called “less-expensive” metals due to short-term budget constraints. Titanium’s durability and affordability as a long-term investment for infrastructure or industrial projects simply doesn’t convince everyone, he acknowledged. 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 processing, factors such as annual maintenance costs, reliability, production speeds and long-term performance come into play, and material costs are factored into the front end of the equation.”

Members of the ITA’s Industrial Committee include Michael Stitzlein and Chuck Young of Tricor Metals; Rob Henson of VSMPO-Tirus US; Regis Baldauff of Titanium Industries Inc. (TI); Bill Brownlee of Titanium Fabrication Corp.; Jim Grauman of TIMET; Bill Bieber of Webco Industries; Mitch Dziekonsk of Titanium Engineers; Ron Schutz of Arcconic Manufacturing Co.; Chris Wilson of Uniti Titanium; and Milton Scaturro of M.R. Scaturro and Associates. Jennifer Simpson is the executive director of the ITA, based in Northglenn, CO.

According to information posted on the organization’s website, NACE International, headquartered in Houston, was established in 1943 by 11 corrosion engineers from the pipeline industry as the “National Association of Corrosion Engineers.” NACE serves 36,000 members in over 130 countries and is recognized globally as the premier authority for corrosion control solutions. The organization offers technical training and certification programs, conferences, industry standards, reports, publications, technical journals, and government relations activities. In addition to Houston, NACE maintains offices in California, Malaysia; China, Brazil and Saudi Arabia.

Update on Evaluation of NACE Standard MRO 175

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.

ITA’s Industrial committee is conducting preliminary work to evaluate if modifying NACE Standard MRO175 may lead to a fairly abbreviated path in accomplishing this goal.

Sarah Standlee, Corrosion Engineer with Exova Houston and new ITA Industrial committee member reported to the Committee earlier this month on the status of the testing. Exova has 3 heats of materials from different places in the world. Exova needs to run some hardness measurements to collect the heat treatment route. Sarah provided a slide presentation to the committee on the progress of the testing and a copy is available to all ITA Members by contacting the ITA. There has been nothing but very positive results so far, no signs of cracking whatsoever, including the test result which had a slightly lower PH.

When committee members approached the NACE maintenance committee in 2016 to ask for guidance, they suggested the addition of elemental sulfur which is a more severe requirement within the NACE standard. Exova is in the process of having their autoclaves retrofitted and the new projection for testing completion is 4th Quarter 2017. ITA Members will continue to receive updated reports as soon as updated information becomes available.
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  - In Chlor-Alkali / PTA / Refineries / Mining / Fracking / Water Recycling
- Fabrication & Design / Welding / Life Cycle Cost Analysis
- Inspection & Repair / NDE Monitoring / Welding in the Field / Quality Assurance
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ITA is pleased to offer anTi Corrosion delegates with the opportunity to attend the TITANIUM Conference & Expo at no added charge. Come as early as you wish, stay as long as you like. Meet with over 90 exhibitors and attend general session presentations including Special guest speakers; World Demand Trends; 3D Printing; Market Economic Drivers; Ti in Medical Technology; Commercial Aerospace and more. Optional Golf Classic, 5K Fun Run/Walk, Continuing Education & Professional Development programs also offered.

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Titanium is a reactive metal, meaning it spontaneously forms a natural oxide film (mainly TiO2) in the presence of any oxygen. Whenever there is any amount of air or water in a process stream or environment, the oxide film forms and protects the metal from corrosive attack. If the film is scratched or damaged, the metal surface repairs itself instantly. The highly adherent film is exceptionally resistant to a broad range of acids and alkalis, as well as natural, salt and polluted waters. Titanium's corrosion resistance together with its low density, high strength and erosion resistance, make it ideal for numerous chemical processing and marine uses, as well as architectural applications. Delegates find this annual event a one stop shop to come and meet with experts from the global titanium industry all in one week.

ITA Industrial Markets Planning Committee Members

In a spirit of professional stewardship, leaders of the International Titanium Industry (ITA) continue to reach out and provide support to a new generation of engineers, procurement managers and technical sales representatives, all of whom are eager to establish their place in the titanium industry.

One example of this interactive outreach is a new program that will involve Rick Sutherlin, a technical consultant of ITA, who will be mentoring these mechanical engineers with the ASME code work, especially as it relates to industrial applications for titanium.

The first mentoring meeting was held in February in Atlanta, coinciding with an ASME non-ferrous subcommittee gathering with only one ITA member company represented. It’s expected that Sutherlin will provide training for the ITA on a quarterly basis.

Topics related to titanium will include how ASME standards committees work; the process for a technical inquiry into an ASME code; the use of the “design allowables” in the ASME code; how to get a new titanium material into the design code; and how to make titanium alloys more competitive with other materials by using “H” grades.

Any ITA Member organization may participate in this program. Contact Jennifer Simpson for more details.

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**ASME Boiler Code Week**

May 7-12, 2017

Hilton Anchorage, Alaska

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**Speaking Engagement Opportunity**

The Caribbean Water & Sewerage Association Inc. is seeking a titanium expert to present at the upcoming CAWASA Operator Conference in Dominica on June 29-30, 2017.

Interested presenters who are interested should contact Jerry Matteo at the CAWASA (758)458-0601 or by email at info@cawasa.org
DENVER, Colorado — International Titanium Association (ITA), has issued a “Last Call for Papers” to be presented at the International anTi Corrosion Day to be held in conjunction with TITANIUM USA 2017, on Wednesday October 11, 2017 at the Diplomat Resort & Spa, Hollywood Florida. TITANIUM USA 2017 is hosted by the International Titanium Association and the anTi Corrosion Day is sponsored by organizations representing ITA’s Industrial Markets Committee.

The ITA Industrial committee is seeking presentation abstracts including all reactive metals for this full day of programming.

Abstracts for market oriented and technical papers alike specifically covering the topics of:
- Field Fabrication / Perceptions (Subset: Repair & Refurbishment)
- Thermal Desalination
- Failure Analysis (Subset: Metallography)
- Corrosion Environment Onshore Vs. Near Shore
- Challenges to Titanium Industry from Shipyards
- Metallurgy in Industrial Markets

Abstract Submission Requirements/Guidelines:

MS Word containing presenter’s Abstract should be 500 words or less. File name must be saved and submitted as SurnameFirstNameAbstractCorrosionDay2017.doc for easy organization.

Abstracts must contain preferred panel of topic, keywords, and any co-authors with contact information for the conference proceedings. Only abstracts in English will be considered.

Digital Photograph of presenter must accompany abstract. Acceptable formats include jpeg, jpg, eps, png. File name must be saved and submitted as SurnameFirstNamePhotoCorrosionDay2017.jpg for easy organization.

“Corrosion Day” will host slide presentations and will not require formal written papers from speakers. Questions may be directed to Jennifer Simpson, ITA 1-303-404-2221 Telephone or ita@titanium.org Email

The Call for Papers Deadline has been extended to May 31, 2017.

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awarded multiyear contracts for our seamless extruded pipe and near net shape products with various aerospace companies and have several parts currently flying such as on the new Boeing 787 Dreamliner and 777X. We proudly have Boeing’s highest Quality and On Time Rating of Gold Status – one of the few materials suppliers to hold this distinction.

Another new area for us within the last year or so has been acceptance by a medical component maker where we supply a titanium implant for the spine. Recently we were awarded a contract to produce pipe in a new material for us (Copper Nickel) and have just shipped the first product to the US Navy (now there is an exporting challenge trying to get a Canadian product into the US Navy shipyard!).

A new product for us within the past year is a thin walled tube that makes up the arm on the shuttle that brings supplies to the space station - fortunately we don’t have to export it to the final destination!

Meanwhile we continue to support our ongoing work for nuclear, aircraft, military, medical, mining, water treatment, chemical, marine and pipe for other corrosive environments.

While we rarely drop below 50 people on staff, when nuclear contracts are awarded we can employ almost 75 people for years at a time. A new contract is on the horizon and we have just begun to add to our staff. Many of our employees made the original tubes for reactors that are now being re-tubed 25 years later....we have employees celebrating almost 40 years with us! Nuclear contracts also increase our sales dramatically and we’re proud our employees live locally and boost our local economy as we’re located in small town Arnprior, pop. 8500. We have two plants, side by side, with approx 185,000 sq ft of manufacturing and processing area.

It is such a great recognition for the hard working employees to see a small business, from a small town, who have survived the ups and downs of the business market win an award the recognition for the company and the employees is well deserved. The employees take pride in the products they make take pride in the fact that the products are world class and are used in locations around the world, above the world (aerospace) and beyond (space station) so to have someone acknowledge this means someone acknowledges our success.

New Employee at Vulcan Engineering Co. - Joshua Schaffer

Vulcan Engineering Co. (Helena, Alabama, USA) announced that Joshua Schaffer has been named Sales Engineer to our Engineering/Capitol Equipment lines. His position will entail developing and maintaining foundry solutions while fostering relationships with customers both domestically and internationally. Josh graduated from Middle Georgia College and started his career in the Aerospace field before entering the US industrial/foundry market and now has over 13 years of experience in the industry.

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Ulbrich Stainless Steels & Special Metals, Inc., headquartered in North Haven, Connecticut, is a 4th generation, family-owned precision re-roller and distributor of stainless steel and special metals strip, foil, shaped & fine wire, sheet, plate and bar products for use in the medical, automotive, nuclear and aerospace industries. Ulbrich offers twelve locations in five countries across North America, Europe and Asia, with additional sales representation world-wide.

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Phone: +40 346 566 905, Fax: +40 372 870 586
E-mail: zirom@zirom.ro, www.zirom.ro
Tricor Metals, of Wooster, OH hires Dennis Hamm, Jr. – Wire Marketing Manager

Tricor Metals announced today that Dennis Hamm, Jr has accepted the position of Wire Product Marketing Manager. Dennis reports to Ron Krajcik, Marketing Director – Tricor Metals & Astrolite Alloys.

Dennis will be responsible for business development of Tricor’s Astrolite® and UltraGrade™ welding wire product sales and will work closely with Rick Barnes, GM of Astrolite Alloys to develop sales and marketing of Astrolite® and UltraGrade™ high performance welding wire for aerospace, power, commercial and challenging applications.

Dennis is a graduate of Auburn University with a B.A. degree in Psychology / Management Minor. Dennis brings proven track record marketing wire to aerospace, medical, chemical, industrial, and additive manufacturing served markets. Prior to joining Tricor, he was Sales Development Manager at ATI Specialty Alloys & Components (formerly ATI Wah Chang) in Huntsville, AL and Frackville, PA. Earlier Dennis worked in sales & marketing positions at Alabama Tube, Fastenal, and Scottsboro Aluminum.

Dennis will work from his home office in Scottsboro, AL and can be reached at dhamm@astrolite.com, ph. 256-647-3687.

O’Neal Industries Merges Four Affiliates to Form Integrated High Performance Metals Company

BIRMINGHAM, Alabama (January 2, 2017) — O’Neal Industries (ONI) is pleased to announce the merger and operations integration of four affiliates: Aerodyne Alloys, Plus Ten Stainless, United Performance Metals and Vulcanium Metals International, to form high performance metals company, United Performance Metals (UPM).

“The integration of these four high performance metals companies creates a scenario that is not only consistent with our long-term strategic vision, but more importantly places us in a better position to service a larger portion of our customers’ requirements,” says Chairman of ONI Craft O’Neal.

As a result of the merger and operations integration, UPM’s inventory will include stainless steel, duplex stainless steel, Prodec®, nickel alloys, cobalt alloys, cobalt chrome moly, titanium, aluminum and alloy steel in coil, sheet, strip, plate, bar and near net shapes. The newly formed high performance metals company serves a broad range of customers in industries including, but not limited to: aerospace, fastener, medical, power generation, oil and gas, and semi-conductors among others.

“We are committed to long-term success for the customers and markets we serve,” says UPM President Tom Kennard. “The merger of our companies allows us to offer a broader range of products and services through integrated sales and operations, providing quality solutions to each customer we serve.”

UPM uses proprietary FIRSTCUT+® Processing Services that include cut-to-length, leveling, slitting, edging, chamfering & facing, shearing, laser cutting, laser gauge measurement, water jet cutting, plasma cutting, sawing, precision cold saw cutting, precision blanks, first stage machining, heat treating, ultra-sonic testing, boring, trepanning, and deburring.

Headquartered in Cincinnati, Ohio, UPM has facilities in: Oakland, California; Los Angeles, California; Hartford, Connecticut; Chicago, Illinois; Cincinnati, Ohio; Greenville, South Carolina; Houston, Texas; with international facilities in Singapore, Hungary, and Northern Ireland.
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Product Evaluation Systems, Inc. (PES) is a fully accredited, independent leader in titanium materials testing for aerospace and other applications. With a dedicated, experienced staff and state-of-the-art testing facilities, we offer full-service capabilities for all of your titanium testing needs, including:

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To request a free quote for your titanium testing needs and to see a full list of capabilities, please visit our website at www.PES-Testing.com or call 724-834-8849.
Ultra Clean Vacuum Furnace Commissioned
At Solar Atmospheres of Western PA

February 7, 2017, Hermitage PA – Solar Atmospheres of Western PA recently added a very unique piece of equipment to its fleet of furnaces – a brand new, state of the art all molybdenum hot zoned vacuum furnace. The all stainless steel chamber with a 24” wide x 24” high x 36” deep hot zone rated at 2500°F is equipped with an oversized pumping system. Unlike other vacuum furnaces, this pumping system has a series of isolation valves which concentrates the critical vacuum levels within the location that matters most – the vacuum chamber. Hence, this furnace was built exclusively for the critical materials often encountered in the aerospace, medical, and semiconductor arenas that are sensitive to vacuum levels and the potential contact of carbon particles. To enhance the unshielded processing of critical parts at vacuum levels lower than 5X10-6 Torr without any contamination, Solar Atmospheres will construct an environmentally controlled room surrounding this furnace. The room will be temperature, humidity, and positive pressure controlled which will aid in eliminating water vapor, dust, and debris (FOD) concerns. New and clean dedicated fixturing will be used exclusively for this furnace, never leaving the premises.

Bob Hill, President of Solar Atmospheres of Western PA states: “This brand new furnace and environs will enable us to guarantee bright clean work while eliminating the safety hazard of handling razor sharp stainless steel foils. Now that this furnace is fully operational, in 2017 we look forward to adding the MedAccred medical accreditation to our ever expanding list of approvals. I would like to thank our sister company Solar Manufacturing for designing and constructing this outstanding, pristine furnace that will enable us to produce parts that will significantly add even more value to our customer’s operations.”

For additional information about Solar Atmospheres, visit us at www.solaratm.com, or call 1-855-WE-HEAT-IT.

Karl Lindblom appointed General Manager of Arcam EBM

To effectively drive the continued growth of Arcam, the company’s EBM-business will be separated from Arcam AB and placed in a new unit, Arcam EBM. Head of Arcam EBM is Karl Lindblom, who begins on April 3.

Arcam EBM, based in Mölndal, Sweden, comprises development, manufacturing, sales and support for Arcam’s EBM systems products. In addition to the Mölndal facility, Arcam EBM has sales and service operations in England, Germany, Italy, USA and China. The EBM organization includes about 150 employees. Karl Lindblom has more than 25 years’ experience with Swedish based international, industrial businesses, most recently as CEO of Hägglund Drives and Head of Bosch Rexroth Nordic. In addition to a solid background in corporate management, Karl brings experience from sales, product management and support as well as experience from working in large international organisations. Karl Lindblom has a M.Sc. from the University of Linköping.

“We are very pleased to welcome Karl to Arcam EBM. Karl strengthens our management to further accelerate and grow our EBM business”, says Magnus René, CEO of Arcam.

For further information:
Magnus René, CEO and President, Arcam
Cell: 46 702 79 89 99 or 1 781 266 6957
E-mail: magnus.rene@arcam.com
Arcam Group provides cost-efficient Additive Manufacturing solutions for production of metal components. Arcam’s Electron Beam Melting (EBM®) technology offers design freedom combined with excellent material properties and high productivity. Arcam is, through its solution orientation and comprehensive product offering, an innovative partner for advanced manufacturing, primarily for the aerospace and medical industries. Arcam offers EBM systems through Arcam AB in Sweden, powder metals through AP&C in Canada and implant contract manufacturing through DiSanto in the U.S. The company is listed on Nasdaq Stockholm and the Head Office is located in Mölndal, Sweden.
Introducing DeltaV-Seal™, the World’s First DnV GL Type Approved Gasket

The Challenge. Sealing leakages between flanges is a well-known problem in all industries resulting in high costs and downtime for gasket replacement. Studies show that sealings between flanges are frequently the weakest part of a piping connection.

The Solution. DeltaV-Seal’s patented metallic sealing technology is the definitive answer to an age-old problem. Brought to you by the Norwegian award-winning inventors of QuickFlange, DeltaV-Seal technology from OTECHOS Technology Group promises to change gasket technology in a big way.

FEATURES

• Leak proof metal-to-metal multiple sealing. One primary, two secondary.
• All metal, one piece gasket. In equal material or a galvanic compatible material to the flange itself, galvanic corrosion is eliminated.
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• Type approved in accordance with ASME B16.5 and EN-1092-1 standards.
• One universal gasket, applicable for a full variety of liquids and gases.
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• Fire test approved (API 6FB).
• TA-Luft Helium test approved (VDI 2440).
• Leakage helium test approved (EN 13555).
• Leakage & burst / vibration & pressure tests approved by DNV GL.
• High mechanical stress and vibration resistant
• Standard assembly procedure.
• No fragmentation, easy to clean flange faces.
• Long lifetime—long service intervals—low lifecycle cost.
• Easy and cost effective storage and logistics.
• References include ConocoPhillips, Statoil, GE Healthcare, and Saint-Gobain.

<table>
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<th>FLANGE STANDARD</th>
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<td>ASME B16.47</td>
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<td>Up to CL 900</td>
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Metallography of Titanium and its Alloys
May 17, 2017 - Amsterdam, NL
Dec. 7, 2017 - Los Angeles, CA

Metallography is the science and art of preparing a metal surface for analysis by grinding and polishing, and etching to reveal the structure of the specimen. This full day presentation will include a discussion of the microstructures of currently important commercial titanium alloys, along with an explanation of terminology commonly used for describing titanium microstructures. Discussion of alloy systems and metallographic procedures will also be included.

How to Weld Titanium Workshop
June 15, 2017 - Columbus, OH

Five hours of classroom study includes instructions on the correct welding equipment and work area needed for a successful titanium weld, proper joint design, anti-contamination procedures, and how to evaluate procedures and techniques. Three hour hands-on exercises will follow for a full day workshop. Welders should bring helmets if they want to work on their technique.

The Fundamentals of Titanium Workshop
May 17, 2017 - Amsterdam, NL
Oct. 8, 2017 - Miami, FL

This comprehensive workshop will provide attendees with detailed information on the types, uses, and properties of common titanium alloys. Attendees will leave with an understanding of applied titanium metallurgy fundamentals. Ideal for anyone new coming into the titanium industry or to use as a refresher. Sales and technical professionals alike will benefit from this 1-day lecture.
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Welcome New Members

Materials research conducted by iMatSE students and faculty lead to advances and discoveries that become the building blocks of tomorrow. Through formal coursework in small classes and participation in cutting-edge sponsored research, students in the Intercollege Graduate Degree Program in Materials Science and Engineering enjoy a graduate education that prepares them well for their future careers.

iMatSE students receive full funding (stipend and tuition) in the form of fellowships or research assistantships. Program Highlights:

- Penn State ranked #1 in funded materials research in the US (NSF)
- Thesis-based Ph.D. and M.S. degrees
- Multi-disciplinary research programs and centers
- Over 50 MatSE and affiliated faculty members
- Approximately 150 current graduate students
- Specialized laboratories and shared facilities

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Structure Medical is a leading manufacturer of medical implant products that are used by orthopedic surgeons to treat disorders of the musculoskeletal system. Orthopedic surgeons use these medical devices to treat trauma, sports injuries, degenerative diseases, tumor and congenital conditions.

Structure Medical was founded in Naples, FL in 2004 and established a second facility in Mooresville, NC two years later. The company uses the most advanced machine tooled available around the world to produce products that meet the highest quality standards.

Baoji JHY Titanium Industry Co., Ltd was founded on 25-09-2002. It is a professional manufacturer for titanium and titanium alloy fasteners and machined products. We can produce them according to different standards, like GB, ISO, DIN, ANSI and JIS etc. They are widely used in petroleum, metallurgy, chemical, pharmacy, marine engineering, racing car, motorcycle, bicycle, yacht, outdoor camping and sports equipment.

Our company insist the “Quality First” strategy rather than “Low priced” one to earn trust from customers, which has been proved correct after 15 years in this industry. Now over 85% our products are exported to Japan, United States, United Kingdom, Germany, Netherlands and other European countries.

Jiangsu Tiangong Technology Company Ltd was founded in 1981, Our company stared in 2012 to produce titanium products, including rods, tubes, plates, and wire materials. Products in full compliance with GB/T3621, ASTM B265, ASTM B338, ASTM B348 standard, related technical indicators have reached the advanced level in the industry, meeting the user’s application requirement.

Products are widely used in the petrochemical, sait. Offshore industry, energy generation and other related industries, typical applications: Titanium and titanium alloy bar for hot-rolling; Medical devices; Titanium alloy standard parts; Various types of titanium equipment; Ion-exchange membrane, divide slot; Titanium and titanium alloys used in construction board.
A leader in Metallurgy

The Quebec Metallurgy Center is located in Trois-Rivières, Quebec, Canada. Our focus is to support the technological development of manufacturing companies in the metallurgical sector.

CMQ provides an incomparable knowledge base on metallic and ceramic materials as well as on metallurgical processes. CMQ conducts research and development activities on advanced alloys such as titanium, zirconium and nickel.

Main research areas and services:
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- Hot isostatic pressing
- Rammed graphite casting
- Heat treating
- Welding
- Thermal spraying
- Custom alloy development


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With over 30 years' experience as the World’s preferred supplier of acid management equipment, our knowledge, experience and equipment offers the producer the ability to achieve productive, efficient and cost effective finishing operation. Our solutions have consistently proven themselves across a wide range of pickling, etching and milling applications for all wrought and cast forms.

Scanacon understands that ease of use, low maintenance requirements and efficiency is key to designing process equipment that delivers value, day after day. No two producers or applications are exactly alike. Delivering value requires a knowledge that can only be gained by experience and is why Scanacon continues to be the chosen supplier for acid management system by all major producers, worldwide.

Welcome New Members

Luoyang Hexin Titanium Industry Co., Ltd was founded in 2014. Our company produces titanium products since 2014, including rods, tubes, plates.

Products are widely used in petrochemical, sail. Offshore industry, energy generation and other industries. Typical applications include: Titanium and titanium alloy bar for hot-rolling; Titanium alloy standard parts; All kinds of corrosive fluid transmission pipeline system; Titanium bicycle tube; automobile exhaust pipe; Offshore aquaculture

NobelClad is the world leader in the field of explosion welding. We have more than half a century of expertise, and we are the one company with the most global resources and infrastructure committed to clad, offering bi-metallic solutions for complex industrial markets, including oil and gas, chemical, and transportation. We work with global partners across the supply chain not only to deliver the highest-quality, most cost efficient clad materials on time, but to inform and help develop project specifications from the onset. Our design ingenuity, technical proficiency, and unparalleled dependability make us an invaluable resource for process architects, engineers, and fabricators alike. That's why our clad materials are the preferred specification for high stakes industrial infrastructure applications all over the world. Specialties: Explosion Welded Clad, Longitudinally Welded Pipe, Pressure Vessels, Heat Exchangers, Structural Transition Joints, Electrical Transition Joints, Cryogenic Transition Joints, Flat Plates & Cylinders, Heads, Tube Sheets.
Colleague Announcements

• Dennis Hamm has a new job. Wire Marketing Manager at Astrolite Alloys / Tricor Alloys
• Matthew Grasson has a new job. Production Supervisor at US Endoscopy a Division of Steris
• Craig Culaciati has a work anniversary. Celebrating 3 years at PRV Metals
• Kathleen Robinson has a new job. Supply Chain Analyst at ATI Specialty Materials
• Grant Wellwood has a work anniversary. Celebrating 1 year at Jenike & Johanson
• Andrew McElwee has a work anniversary. Celebrating 5 years at VSMPO-Tirus, US
• Andrew Bayne has a work anniversary. Celebrating 14 years at TIMET
• Jeff Simons has a work anniversary. Celebrating 3 years at O’Neal Flat Rolled Metals
• Alfonso Mariotti has a work anniversary. Celebrating 4 years at Alenia Aermacchi
• Georg Erbers has a work anniversary. Celebrating 12 years at Allegheny Technologies
• Jennifer Lopata has a work anniversary. Celebrating 9 years at TSI Titanium, a PRV Metals
• Dave Ochar has a work anniversary. Celebrating 16 years at Bodycote.

In Memoriam

William “Bill” Parker Cloyes passed away early on Friday, March 17, 2017, at his home in Maryland in the Asbury Solomons Island retirement community. His death was confirmed by his wife of 38 years, Dolores (Nelson) Cloyes. He was 95 years old.

Bill Cloyes was born in Springfield, Massachusetts on December 8, 1921, in a paternal family that dates back to 1655. His grandfather, William Oscar Cloyes, was highly decorated for the major role that he played in saving the Union’s Iron Clad Monitor “Montauk” during the Civil War. After the premature death of his father at the age of 47, Bill, aged five, and his brother, John Henry Cloyes, aged three, were moved to the Masonic Home in Utica, New York. In 1939, Bill Cloyes graduated from the Thomas R. Proctor High School in Utica, New York. In 1944, he graduated from Rensselaer Polytechnic Institute in Troy, New York, with a five-year Bachelor of Chemical Engineering degree. At Rensselaer, he was elected to Pi Delta Epsilon, the national journalism honorary fraternity.

A member of the first US Naval ROTC unit at Rensselaer, Bill Cloyes served in World War II as a commissioned officer, beginning in 1942, and received several awards as a Lieutenant Junior Grade in the US Navy in the Pacific fleet, including the Presidential Unit Citation for extraordinary heroism. He was one of the officers instrumental in saving the USS Essex when the aircraft carrier was attacked by a Japanese Kamikaze on November 25, 1944.

After the war, Cloyes began a career with NL Industries (formerly National Lead Co.) that spanned 36 years in various senior management positions, the first 17 of which were spent with NL’s affiliate, Titanium Metals Corporation of America. Cloyes is recognized as a pioneer in NL’s commercial production of titanium metal in the United States, the production and quality control of titanium extrusions for the Lockheed Aircraft SR-71 supersonic reconnaissance plane used by the US Airforce, and Titanium Metal’s first titanium metal plant in Henderson, Nevada. He also expedited the construction and start-up of NL’s rutile mine in Queensland, Australia, and its first magnesium plant near the Great Salt Lake in Utah.
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5ME is a technology company entirely focused on Manufacturing Efficiency. One of the core components within its solution portfolio is Cryogenic Machining Systems. 5ME has developed a unique, multi-patented solution for routing liquid nitrogen through a machine tool as well as inside the cutting tool to provide the most efficient means of removing heat from the metal cutting process. By taking the cutting tool to -321°F, 5ME’s technology is an enabler for processing difficult to machine materials - like Titanium, up to 5 times faster than what is possible with traditional water or oil-based coolants. It also has significant benefits with respect to part quality as white layer, grain boundary distortion, residual stress, and burr formation are all dramatically reduced. Additionally, it offers environmental benefits by eliminating coolants from the metal cutting process.

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4. Neat end-cut - Our wires are neat end-cut, shiny and homogenous color too.

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Among our wide product range, we offer bars, sheets, tubes, flat, hexagonal and square bars, tubes, welding wire and fasteners. We serve our customers from our head office in Lyon-France, but also from our 3 service centers located in Paris (Aerometals & Alloys®), Brazil (Acnis® Do Brasil) and China (Acnis® Asia).

Acnis® Group distributes high quality Titanium from world renowned producers. Certified ISO 9001, ISO 13485, EN 9120. For further information, please visit our website www.acnis-titanium.com

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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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Titanium Buyers Guide (continued)

ALD Vacuum Technologies – High Tech is our Business

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.

ALD Vacuum Technologies also is the industry leader in EB PVD Thermal Barrier Coating Systems and our Precision Casting Systems are used for super-alloy, Titanium and Ti Aluminide cast parts. Our expertise in heat treatment furnace technologies and sintering furnace technologies are utilized by leading automotive manufacturing companies as well as the tool manufacturing industries for highly critical parts in gear case and fuel injection systems and specialty tools.

ALD has worldwide representation and services through wholly owned subsidiaries in North America, Japan, Russia, Mexico, India, Thailand, Poland, France and China. With more than 20 representatives across the globe, working together with nearly 400 employees at our corporate headquarters in Hanau, Germany ALD is able to provide timely and knowledgeable services and support.

ALD is part of the AMG, Advanced Metallurgical Group N.V., Netherlands, a public listed technology company with leading market position and interesting growth potential.

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Todd.Tomczyk@timet.com

AlloyWorks, a TIMET company, specializes in plasma cold hearth melting titanium aluminides, standard titanium alloys, and cp. AlloyWorks products are used to produce parts in aerospace, industrial, and military applications. AlloyWorks is AS9100, ISO 9001 certified and holds approvals from several leading engine companies.

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Ampere Scientific is the manufacturer and distributor of the VARmetric measurement system, seamlessly integrating existing process measurements and passive sensor technologies to monitor and visualize arc locations during the melting process. VARmetric couples with standard process signals to evaluate process dynamics and correlate this data with product quality measures. Thus, for the first time ever, the VARmetric system allows the user to visualize and act upon deleterious operating conditions, conditions that are not apparent in traditional VAR monitoring systems, during melting, conditions that could lead to safety related operations or defect formation.

American Prosthetic Components

American Prosthetic Components is a manufacturer of prosthetic components.

American Titanium Works LLC
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American Titanium Works LLC is completing plans to build a new, green-field, integrated, world-class titanium manufacturing facility in the southeast of the United States. ATW is targeting the defense, industrial, commercial, consumer and emerging markets with a range of products and services including alloy and commercially pure titanium plate, bloom, billet, slab, and ingot.

Applications for our products will include defense ballistics and general military equipment construction, chemical processing equipment, oil & gas systems, pulp & paper production facilities, medical implants, and a wide and growing range of consumer goods.

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AMETEK - Reading Alloys is a manufacturer of high quality master alloys comprised of Vanadium, Molybdenum, Niobium, Chrome, and Aluminum alloy ingredients. Master alloys are used for rotor grade titanium, aerospace grade and non-aerospace grade titanium, commercial metals, and super alloy metals applications. Reading Alloys also manufacturers high purity titanium powders for thermal spray coatings as well as additive manufacturing. In addition, a series of gas atomized specialty powders for hard facing, brazing, and thermal spray further compliment the product offerings. We can offer toll melting, cold isostatic press, hydride/dehydride and other services. Our quality system is certified to ISO 9001:2008 and AS9100C and we have a fully accredited lab that is Nadcap certified. Visit AMETEK - Reading Alloys via our website at www.ametekmetals.com.

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Titanium Buyers Guide (continued)

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Arconic (NYSE: ARNC) creates breakthrough products that shape industries. Working in close partnership with our customers, we solve complex engineering challenges to transform the way we fly, drive, build and power. Through the ingenuity of our people and cutting-edge advanced manufacturing techniques, we deliver these products at a quality and efficiency that ensure customer success and shareholder value. For more information: www.arconic.com. Follow @arconic: Twitter, Instagram, Facebook, LinkedIn and YouTube.

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India’s leading Stockholder of Titanium, Nickel Alloys & Stainless Steel Mill Finished Products, Re-Usable & Scrap.

ARIES Manufacturing
+1 704-289-8531
www.aries-manufacturing.com

ARIES Manufacturing: ARIES Manufacturing, formerly marketed as The Cyril Bath Company and ACB Company, is part of an International corporation known as the ARIES Alliance. This group of aerospace focused businesses provides innovative metal forming and joining solutions to the aerospace industry. The foundation of its technologies is stretch forming of aluminum alloy sheet for fuselage skins, as well as aluminum and titanium profiles for airframe structure components. The company's stretch presses are equipped with the latest CNC control systems, designed and developed by its in-house software engineers. Our stretch forming customers include the leaders in commercial and business aircraft manufacturing, in addition to their complete supply chain network. ARIES Manufacturing has developed a very innovative Hot Stretch Forming process, or HSF®, to contour titanium profiles for airframe component applications. This high temperature forming process precisely stretch forms titanium extrusions to the exact part design contour. The hot stretch formed part is then machined and finished into a critical airframe component. This valuable forming process saves starting titanium weight by offering a near net profile solution; contoured in a controlled, repeatable process, with minimal residual stress. In addition, under ARIES Manufacturing, we hot form and superplastic form titanium sheets for applications in nacelle and pylon components. Our facility in Nantes, France operates 12 hot forming/Superplastic Forming presses of varying sizes. Additionally, we can laser or machine trim, spot weld, hot brake form, and perform assembly work. All of our hot presses are designed and built within our corporation businesses. Finally, ARIES manufacturing has a facility in Grenoble, France that can perform pocket milling and final trimming on large aluminum alloy fuselage skins. This contract manufacturing work utilizes our internal expertise and design engineering of a very innovative “mirror milling” type CNC machining center.

Avon Metals Ltd.
+44-1452-874500
www.avonmetals.com

Avon Metals are a primary & secondary aluminum smelter manufacturing high performance aluminum-based master alloys and alloying products for the wrought aluminum, titanium and superalloy industries. We are actively engaged in the strategic sourcing & trading of primary and scrap metals for industry including Titanium CP &90/6/4 solids & turnings, Titanium sponge, Strontium Metal, Electrolytic Manganese Flake, Silicon Metal, Aluminothermic Chromium Metal, Primary Magnesium, Hafnium Crystal Bar and ingot, Zirconium/Zircalloy, SHG Zinc, Pure Tin ingot, Pure Lead Shot, Rhenium Pellets, Tantalum and Niobium.

BAHCO
+1-800-446-7404
www.snapon.com/industrialbrands
industrialbrands@snapon.com

Bahco’s 3860 Multi Chip Carbide bandsaw blade has been developed specifically for cutting Titanium Alloys. The 3860 Multi Chip Carbide blade improves and optimizes Bandsaw operation with a World leader in Cutting Technology. In the 1980’s Bahco developed and Patented the first “Set Tooth” Carbide Bandsaw blade to provide fast, efficient cutting of exotic alloys and have led the way in this sector ever since.

Bahco is a registered trade name of Snap-on Incorporated a leading global innovator, manufacturer and marketer of tools, diagnostics, and equipment, software and service solutions for professional users. Products and services are sold through the company’s franchisee, company-direct, distributor and Internet channels. Founded in 1920, Snap-on is a $2.8 billion, S&P 500 Company headquartered in Kenosha, Wisconsin. Our Mission - The most valued productivity solutions in the world. Snap-on Incorporated P.O. Box 1410 Kenosha, WI 53141-1410, U.S.A. 262-656-5200.

Banner Medical
+1-800-323-9732
www.banner-medical.com
dsimak@banner-medical.com

Banner Medical is a strategic business unit of Banner Service Corporation. Banner Medical specializes in providing complete single-source cold finished bar and supply chain solutions for the medical, dental, and aerospace industries. We carry over 1 million pounds of raw and finished goods inventory to service our customers quickly. Our complete offering of stainless, titanium, aluminum, alloy, nickel and cannulated products coupled with unique value added services sets Banner Medical apart. Some of these unique value added services
Titanium Buyers Guide (continued)

include:
- Custom supply chain management solutions
- Complete traceability from melt source to finished product
- In-house non-destructive testing
- Vendor managed inventory (service) and JIT programs
- Line marking
- Niton Gun material analysis
- Near-net shape machining
- Precision saw cutting
- Waterjet cutting

Quality Throughout
Banner Medical has developed and implemented a proprietary Quality Management System that assures we meet or exceed the stringent standards required by the medical and aerospace industries. Each Banner facility is ISO 9001:2008 certified. Medical production facilities are ISO 13485:2003 certified. Our Carol Stream facility is also AS9100C: 2009 certified.

Baoji JHY Titanium Industry Co., Ltd
+86 917 3372 996
stella@ti-bolts.com

Baoji JHY Titanium Industry Co., Ltd was founded on 25-09-2002. It is a professional manufacturer for titanium and titanium alloy fasteners and machined products. We can produce them according to different standards, like GB, ISO, DIN, ANSI and JIS etc. They are widely used in petroleum, metallurgy, chemical, pharmacy, marine engineering, racing car, motorcycle, bicycle, yacht, outdoor camping and sports equipment.

Our company insist the “Quality First” strategy rather than “Low priced” one to earn trust from customers, which has been proved correct after 15 years in this industry. Now over 85% our products are exported to Japan, United States, United Kingdom, Germany, Netherlands and other European countries.

Baoji Titanium Industry Co., Ltd.
+86 917 3382 075
www.baoti.com
iedept@baoti.com

Baoji Titanium Industry Co., Ltd (Baoti) is the biggest manufacturer of titanium mill products and titanium alloys in China. An integrated production system that includes melting, forging, rolling, drawing and fabricating enables Baoti to manufacture various products such as titanium sponge, ingot, billet, bar, wire, plate, sheet, tubing, forging, casting of all grades of CP titanium and most titanium alloys as well as many down-stream products in accordance with AMS, ASTM, MIL, ASME, ISO, DMS, AWS, JIS specification. These products are widely used in every kind of industry ranging from aerospace and automotive to sports, medical, chemical and petrochemical industries. Baoti is an ISO9001 and NADCAP approved company.

Baosteel Special Metals Co., Ltd.
+86-021-26032903
www.baosteel.com

Baosteel Group is the largest and most advanced integrated steel company in China. Baosteel Special Metals Co., Ltd grew out of Shanghai No. 5 Steel Works, and started manufacturing of titanium alloys since 1968. The main titanium products include: ingot, slab, billet, bar, plate, coil, stock, isothermal forging and so on.

Beijing Hongda Titanium Science & Trade Co., Ltd
+86-10-82274866
www.chinabti.com.cn

Beijing Hongda Titanium Science & Trade Co., Ltd was established in 2002, and is located in Beijing, China. We are a professional manufacturer of titanium and titanium alloy. Our products mainly include sheets, plates, bars, strips, rods, wires, forgings, and processing titanium. As a leading corporation of titanium in China, we always stick to “Quality First”. We have ISO 9001:2008 quality certificate. We sincerely hope to establish long and friendly business relations with clients from all over the world.

BIBUS METALS
+41 44 877 54 11
www.bibusmetals.com
info@bibusmetals.ch

BIBUS METALS Group is 100% Swiss owned and has over 37 years of experience as leading distributor and stockholder of Titanium (CP and Titanium alloys) as well as Nickel based alloys, Cobalt-Chromium and 316LVM (1.4441) in Europe and Asia. BIBUS METALS Group is a supplier for different applications in medical, chemical, aerospace, automotive, oil & gas, power generation industries and offers:

- Sheets/Plates; Wire/Bars; Tubes/Pipes; Strip/Clip; Welding wire; Screw/ Nuts; Profiles

The fully integrated Service Centres are located in Switzerland, Germany, Czech Republic, Poland, Hungary and China to ensure reliable and rapid service for customers worldwide. Where necessary the entities of the Group are certified according ISO 9001, EN/AS 9120 for aerospace and EN ISO 13485 for medical. Quality, flexibility and tailored solutions are of great importance for the whole BIBUS METALS Group.

For further information please email to info@bibusmetals.ch

Blaser Swisslube Inc.
+1-845-294-3200
www.blaser.com
mailboxusa@blaser.com

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.

Blaser Swisslube’s goal is to optimize its customers’ manufacturing processes with the liquid tool and to improve their economic efficiency, productivity as well as the machining quality. In close cooperation with the customers, Blaser Swisslube presents the possibilities to fully exploit
The potential of machines and tools by using the right metalworking fluid which becomes a liquid tool. This promise is backed by excellent products, customized services, competent experts and its long experience in the metalworking industry. For more information please visit www.blaser.com.

**Bodycote**
+1-310-604-8000  
www.bodycote.com

With more than 170 locations in 21 countries, Bodycote is the world’s largest provider of thermal processing services. Through heat treatment, metal joining, surface technology and Hot Isostatic Pressing (HIP). Bodycote improves the properties of metals and alloys, extending the life of vital components for a wide range of industries, including aerospace, defense, automotive, power generation, oil & gas, construction, medical and transportation. Customers in all of these industries have entrusted their products to Bodycote’s care for more than 30 years. For more information, visit www.bodycote.com.

**Bonatech Metal Research Institute**
+86-13-810777433  
www.bonatech.cc

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. Over the past years, we have been focusing on the industrialization of key technologies in light metal and alloy. Significant achievements have already been made in terms of industrialization of energy-saving light metal (i.e., titanium & aluminum) electrolysis and smelting equipment.

**Busch LLC**

Busch Vacuum Pumps and Systems is one of the largest manufacturers of vacuum pumps, blowers, and compressors in the world. Our products are at the forefront of vacuum and low pressure technology.

The Busch product range offers the largest selection of industrial vacuum pumps available in the world today. We offer more than 50 years of experience and expertise in vacuum system manufacturing, and can provide customized solutions for a variety of vacuum applications.

**Butech Bliss**
330-337-0000  
www.butechbliss.com  
sales@butech.com

Butech Bliss is a designer and manufacturer of capital equipment, repair components and engineering and field services for metals producers and processors that roll, forge, melt, flatten, stretch, shear and extrude metals of all types. Butech Bliss is located in Salem, Ohio and is home to one of the largest manufacturing facilities in the industry. With over 50 engineers on staff, 400,000 sq. feet, 100+ machining centers, full fabrication and assembly departments, 200 ton crane capacity and a dedicated rail spur, Butech Bliss is equipped to handle any project. Butech Bliss product offerings include copper crucibles, liners, molds, hearths, etc. for VAR, ESR, PAM and EBM Re-melting equipment as well as Rolling Mills, Forging and Extrusion Press upgrades and Coil, Plate and Sheet processing equipment for all metals. Butech Bliss is comprised of Butech Inc., E.W. Bliss (Bliss-Salem), Loewy Machinery and Lombard Industries.

**Caledonian Alloys**
http://www.pccforgedproducts.com/brands/caledonian_alloys/

Caledonian Alloys is the world leader in the management of nickel and cobalt base superalloy and titanium alloy recycling for the aerospace, land-based turbine, and chemical industries. The company transforms revert, through rigorous process, into material which can be re-melted, to produce new nickel, cobalt, or titanium alloys. Revert consists of excess alloy material which can arise from high performance component manufacturing, from decommissioned parts, and from the melting process.

Caledonian Alloys provides customers with a range of tailored revert management services designed to enable them to optimize the use and value of their own revert material.

Accredited with all major vacuum and high temperature melters worldwide, Caledonian Alloys supplies fully processed nickel and titanium revert material to the melting industry. We also purchase revert material from a wide range of industrial customers throughout the world.

**CEFIVAL SA - SIDERVAL S.p.A**
CEFIVAL +33 1 39 37 12 25  
SIDERVAL +39 342 67 41 11  
www.cefival.fr  
www.siderval.it  
commercial@cefival.fr  
siderval@siderval.it

CEFIVAL and SIDERVAL manufacture special sections and tubes with hot extrusion process to obtain near net shape Profiles. The shapes are studied and manufactured according to customer’s requirements in a wide range of solid and hollow sections. Our manufacturing process improves the fly to fly ratio. Main grades are titanium, inconel, carbon steel alloys, super alloys, stainless steels and other on requirement. Main application fields are aeronautics for aircraft ring engines (CFM56, GE90, GP7000, CF6-80, SM146, Gen X) and structural parts (such as seat tracks, floor and wings stiffeners, door hinges...), Power Generation for nuclear (ia drive rods) and conventional applications, medical and food industry.

**Chaoyang Jinda Titanium Co., Ltd.**
+86 421 2976177  
www.jinda.cc

Chaoyang Jinda Titanium Co., Ltd.(Jinda Titanium )was founded in August, 2006.The main products are Jinda brand titanium sponge(famous brand products in Liaoning Province) and titanium ingot and other processed products. Production ability per year for titanium sponge is 10,000 tons, for ingot is 2000 tons and 40,000 tons for
Titanium Buyers Guide (continued)

anhydrous magnesium chloride.


The quality of Jinda titanium sponge is stable. Self R & D MHT-90 high-quality titanium sponge and small size titanium sponge have become the preferred raw materials of aerospace and defense, marine engineering and other high-end usage of titanium industries.

Jinda Titanium is a member of the International Titanium Association, the vice managing director of Chinese non-ferrous metal industry association titanium zirconium Hafnium Branch, the vice managing director of Titanium Industry Progress and the director of Baoji Titanium Association. Jinda Titanium comprehensive ranks forefront in titanium industry.

Chesapeake Industrial Cleaning Products, Inc.
+1-410-340-9052
www.chesapeakeindustrial.com

Chesapeake Industrial formulates and supplies manufacturing chemicals and degreasers to titanium recyclers and processors. Cleaners for removing oil from turnings, dirt and oil from scrap, cutting fluids from formed products and other typical operations are our expertise. Chesapeake provides a wide range of formulated products from general cleaners to high spec materials made at facilities in several US locations. Products specifically designed for individual operations can be formulated for costs often lower than ‘off-the-shelf’ materials. Chesapeake has served customers in the titanium industry for over 10 years. Drums, Totes and Bulk deliveries of materials are all available.

China Huaxia Special Metal Limited
0086-21-58770128
helen@nonferrous-metal.com  csm@nonferrous-metal.com

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.

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 ELI. 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
leon.prentice@csiro.au

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 providing 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 Organisation (CSIRO) is Australia’s primary national research body, with over 5,000 researchers active over a wide range of fundamental and applied research challenges.

BHN Special Materials Ltd.
+86 411 8924 9999 ext 8088
www.bhn-materials.com
sales@bhn-material.com

Dalian BHN Special Materials Ltd. is one of the state-of-the-art manufacturers and suppliers of high-grade master alloys for applications in the Titanium, steel and Aluminum Industries.

BHN is a customer-oriented company focused on R&D, process and product improvement.

BHN is certified according to EN9100:2009 and ISO 9001:2008.

Danobat S. Coop
+34 943 748 177
www.danobatbandsaws.com danobatgroup.com
salessaws@danobat.com

Sixty years have gone by since DANOBAT manufactured its first machine. Nowadays, DANOBAT Sawing Division does not simply make saws, but innovates in the field of machine tools.

DANOBAT strategy is to offer custom solutions for highly complex sawing applications on high-tech products offering bandsaws and circular saws. The aerospace, automotive, railway, wind power, oil and gas sectors and outsourcing workshops are the main trading sectors.

The technological leadership of DANOBAT in the development and manufacture of horizontal and vertical saws makes it possible to offer leading-edge and highly effective sawing solutions to our customers. DANOBAT provides solutions for solid bars, pipes and plates with the highest accuracy.

Automatic band saw machines, wagon style or gantry for large dimensions, vertical plate bandsaws and circular saws are the solutions offered by DANOBAT.

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.
+41 44 386 72 72
www.dksh.com
ti@dksh.com

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.

Duferco SA
+41 91 822 56 00
www.duferco.com

Duferco Participation Holding is the ultimate shareholder of Vancham 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. Production is now idle. Duferco SA is also the exclusive distributor of the vanadium products made by Hesteel Chengde. Visit our website at www.duferco.com.

Duisburg Tubes Production AG
+49 203 6003 315
www.dtp-ag.eu
sales@dtp-ag.eu

The Duisburg Tubes Production AG is a German manufacturer and developer of high quality seamless tubes made of zirconium, titanium and nickel-based alloys with over 50 years of experience.

As a supplier of cladding tubes for fuel rods for the nuclear industry the DTP AG is the reliable partner for all demanding applications. To fulfill all quality requirements is the second nature.
Titanium Buyers Guide (continued)

The range of application is as mentioned before the nuclear industry. Moreover the use in all kinds of tubular heat exchangers, in the aviation industry, in the chemical industry, in the oil and gas industry, in the food processing industry and many other demanding environments.

The cold pilger mill seamless tube production is a special form of cold rolling and guarantees high precision and close tolerances. The combination of pilger know-how and the sophisticated annealing knowledge leads to an extraordinary product quality.

The quality management system is conform to ISO 9001, ISO 5001, ISO 14001 and EN 9100.

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 manufacture of implants and instruments for the orthopaedic, spine and trauma markets. Edge works with its customers to provide cost-effective solutions and concentrates on the medical market to ensure the highest level of compliance, quality and service. Value-added services include precision grinding to size and tight tolerances, precision sawing, non-standard grades and sizes, and just-in-time inventory programs. Edge conducts business internationally, supplying to customers around the globe.

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
+1-614-688-5000
www.ewi.org
info@ewi.org

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.
54-11-63261493/94/95
www.fae.com.ar
fae@conuarfae.com

FAE is an Argentinian company qualified by Airbus for supplying hydraulic titanium Ti-3Al-2.5 tubing for Family 320. Also 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 straight or U bend for heat exchangers which are up to 35 meters long. These tubes are also made in nickel alloys 690 & 800 for steam generators for nuclear power plants. The nuclear business is the origin of the company and the Zirconium cladding tubing for the nuclear fuel elements constitutes the main product of the company. 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 certified 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 heat treating and non-destructive test.

FE Mottram Ltd.
+44 1142446723
www.femottram.com

UK manufacturer of tailor-made and high grade ferro titanium.

Fine Tubes
+44 (0)1752 876416
www.finetubes.com
sales.finetubes@ametek.com

Fine Tubes is a leading global manufacturer of precision tubing in high performance 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 aerospace, oil and gas, nuclear, power generation, chemical process and medical devices.

TITANIUM TUBING EXPERTISE
Seamless titanium tubes from 1 mm (0.040 in) OD to 50 mm (2 in) OD. Straight lengths up to 5.5 metres (18 ft.)

TITANIUM ALLOYS
Fine Tubes offers a comprehensive portfolio of titanium tubing 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. The tube mill has achieved NADCAP approval for Ultrasonic Testing, Heat Treatment and Fusion Welding.
WORLD CLASS FACILITY
Proudly based in the United Kingdom, Fine Tubes operates several state-of-the-art titanium processing facilities including:

- Pilger Rolling Mills
- Draw Benches
- Vacuum Furnace Heat Treatment
- Chemical Processing
- Conditioning & Degreasing

Our metallurgical and engineering experts are ready to support your teams in developing competitive solutions for your most demanding technical challenges.

Along with its US-based sister mill, Superior Tube, Fine Tubes is a unit of AMETEK Specialty Metal Products, a division of AMETEK, Inc.

Forecreu

World leader in high speed steel hollow bars for drills and coolant fed taps.

World leader in cannulated bars in stainless steel and titanium for surgical tools and implants.

Fort Wayne Metals
+1-260-747-4154  
www.fwmetals.com  
info@fwmetals.com

Fort Wayne Metals has a long history of producing precision titanium bar, wire and wire-based components for demanding applications. For many years, our efforts focused exclusively on the medical device industry. But our skills are just as valuable in many other critical applications.

After all we understand the critical importance of quality: our employees have experience producing materials for applications designed to save lives. We uphold the highest quality standards throughout our production process – beginning with melting material in our own furnace. We are 9100C and ISO 9001 certified, and maintain a A2LA - ISO/IEC 17025 compliant Materials Testing Laboratory.

Available diameters:
- Wire: 0.001” (0.0254mm) to 0.062” (1.5748mm)
- Coil: 0.040” (1.016mm) to 0.500” (12.70mm)
- Bar: 0.0787” (2.0mm) to 0.500” (12.70mm)

Available grades:
- Commercially pure Titanium (ASTM F-67 • ASTM B348 • ASTM B-863 • ISO 5832-2)
- Grades 1 - 4
- Alloyed Titanium
  - Ti-6Al-4V ELI (ASTM F-136 • ASTM B-348 • ASTM B-863 • ISO 5832-3)

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 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&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 EII, 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, 685, 829, etc.

Gautier Specialty Metals, LLC
814.535.9200  
www.gautierspecialty.com  
sales@gautiersteel.com

Gautier’s premier plate mill provides rolling capacity for advanced high performance metals to a variety of industries.

At its heart is a 58" wide 4 High Mesta Reversing mill, capable of rolling the most difficult of specialty metals. The mill is expandable to 110” wide in the future. Building on Gautier’s long legacy of short lead times and excellent customer service, GSM will be able to provide high quality alloy, tool and stainless steel as well as advanced nickel based and titanium alloys.

Large Alloy Selection: Alloy & Tool Steel, Stainless Steel, Nickel Based Super Alloys and Titanium
Titanium Buyers Guide (continued)

Built for Conversion on a quick turnaround.

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GfE Metalle und Materialien GmbH
+49 911 9315 299
www.gfe.com
alloys@gfe.com

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 products 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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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.

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Goldman Titanium, Inc.
716.823.9900
www.goldmanti.com
info@goldmanti.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.

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Grandis Titanium
+1-949-459-2621
www.grandis.com
titanium@grandis.com

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.

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Haynes International Inc.
+1-765-456-6000
www.haynesintl.com
rburke@haynesintl.com gspalding@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. Additionally, Haynes produces HAYNES® Ti-3Al-2.5V alloy which is used for aircraft hydraulic systems. Our seamless Grade 9 titanium tubing is produced to AMS 4943, AMS 4944, AMS 4945, SB 338/B 338Gr9 and UNS R56320.

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Hempel Special Metals GmbH
+49208 6204 0
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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Hi Tech Alloys
+1-925-937-3836

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Hogue Metallography

Services Include:
- Metallographic Services
- Sample Preparation - metals and non-metals
- Documentation - macro and micro
- Interpretation of Microstructures and metallographic
- Failure Analysis
- Industrial Problem Solving
- Litigation
- Laboratory Design
- Equipment selection
- Selection of optimum consumables
- Layout
Titanium Buyers Guide (continued)

Consulting may be performed on site, in the field, or at my laboratory. Training Courses Offered.

HORIE Corporation
+81-256-66-2237
www.horie.co.jp
a-tanabe@horie.co.jp

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.

Hudson Metals & Alloys, llc

Independent Forgings & Alloys Ltd
+44-114-234-3000
www.independentforgings.com
sales@independentforgings.com

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
+609-267-9000
www.inductotherm.com
sales@inductotherm.com

President: Bernard Raffner
General Manager: Bert Armstrong
Director – Sales: Andrew Procopio
National Sales Manager: Kevin Bertermann

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.

Industrial Metals International Ltd.
+1-631-981-2300
www.industrialmetals.com

IML is a supplier of bar, sheet, tube, wire, rings and forgings in aluminum, titanium, nickel stainless steel, alloy and bronze products. In business for over 40 years, IML is approved by companies such as Rolls Royce, Boeing, Airbus, UTAS, GE, and Pratt and Whitney. Located near JFK Airport in NY, IML is able to offer same day shipping to countries worldwide with no minimum order charge for stock items.

Inteco
www.inteco.at

Being a supplier and partner to the steel and general melting industry since 1973, INTECO is proud to be until today the only single source supplier worldwide who offers and has already put into operation all production processes for the liquid treatment of steel, ferroalloys and super alloys such as:

- Melting (EAF, SAF)
- Refining (LF, VOD/AOD, RH & Auxiliaries)
- Casting (CC, IC etc.)
- Special Melting & Remelting (VIM, ESR, Pressure ESR, ESRR, VAR) and Titanium Production Technologies
- Automation & Level 2 Systems (incl. Titanium-Workshops)
- Consulting Services

Invera
+1-610-325-0124
www.invera.com
peterd@invera.com

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 Tiangong Technology Company Ltd.

Jiangsu Tiangong Technology Company Ltd was founded in 1981. Our company started in 2012 to produce titanium products, including rods, tubes, plates, and wire materials. Products in full compliance with GB/T3621, ASTM B265, ASTM B338, ASTM B348 standard, related technical indicators have reached the advanced level in the industry, meeting the user’s application requirement.

Products are widely used in the petrochemical, sail. Offshore industry, energy generation and other related industries, typical applications: Titanium and titanium alloy bar for hot-rolling; Medical devices; Titanium alloy standard parts; Various types of titanium equipment; Ion-exchange membrane, divide slot; Titanium and titanium alloys used in construction board.
Titanium Buyers Guide (continued)

KASTO, Inc.
1-724-325-5600
www.kasto.com
sales@us.kasto.com

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
530-921-1711
kkkreitman@gmail.com

Chief 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.

Kropp Forge
www.kroppforge.com

Kropp Forge opened as a job forging shop in 1901. Output was limited to flat die work produced on three small hammers. Today, Kropp Forge is an industry leader, producing high quality forged materials in over 450,000 sq. ft. of production space using small and large hammers as well as hydraulic presses. The plant produces a wide variety of forgings ranging from 3,000 pounds to parts weighing just a few pounds. Our Markets include: Military and Commercial Aerospace, Power Generation, Oilfield/Petrochemical, Construction Equipment, Heavy Truck and other General Industrial forgings. Materials Forged include: Titanium, Nickel Based Alloys (Inconel), Stainless Steel, Steel and other forgeable grades of material. We furnish product as forged, Heat Treated, Rough Machined and/or Finish Machined and are equipped for Non-Destructive and/or Destructive Testing.

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

Mr Otis Claeys – CEO - claeys@lcma.lu
Mr Thomas Mitidieri – Production Manager - Thomas@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 and is PED97/23EC certified.

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 makes us one of the key players on the market.
Titanium Buyers Guide (continued)

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

The Materials Testing, Nondestructive Testing and Calibration Services offered by Laboratory Testing Inc. (LTI) help businesses deliver the highest quality products and meet stringent quality requirements. Our test results provide information necessary for product development, material verification, production control and other important business decisions.

The Lab is fully qualified:
  • Nadcap and A2LA accreditation
  • ISO/IEC 17025 certification
  • Approved by primes and other leading companies
  • Over 30 years’ in the business providing certified reports
  • Offering the full range of services at one convenient location
  • Testing performed to industry standards, including AMS, ASME, ASTM, MIL, NAS

Technical experts and a service-focused support team help clients get their jobs done quickly and find the answers they need. With a 104,000 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. Call or visit www.labtesting.com for a fast quote.

LAI International
+1-518-273-3912
www.laico.com/industrial

LAI International (formerly 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 EBPV 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.laico.com/industrial.

Laube Technology
(888)-355-2823
www.laubetitanium.com
tsales@laube.com

Laube Titanium Mill Products is a division of Laube Technology. Laube began its long history of quality and service in 1948 as a Chicago based warehouse distributor of steel mill products. Anticipating the growing influence of the Pacific Rim countries in supplying product to the United States, Laube’s corporate offices were moved to the west coast in 1961. Strategically poised, Laube became an industry leader, pioneering the importation of metal products from Asia and elsewhere. Today the Laube group consist of three separate divisions. Those are: Titanium Mill Products; Offering titanium forms of sheet, plate, bar, tube, pipe, and coil from both domestic and foreign mills. The Custom Metal Parts division, which specializes in providing the industry with unique metal components usually designed for a specific use; and Electronic Components and Assemblies Division. This department supplies all types of custom control panels and keyboard assemblies. Laube is a privately held, family run company and continues in its proud heritage of providing decades of quality product at competitive costs.

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

Lord Steel International Co., Ltd. (LSI SIP), belong to LORDSTEEL, is a global leading solution provider and manufacturer agent in Tube & Pipe of Stainless Steel, Nickel Alloy, Copper Alloy and Titanium. We are specializing in high performance condenser tubes, heat exchanger tubes, high purity stainless steel tubings, Titanium alloy & Cu/Ni Alloy Tubings. We end up many year’s control of UNS S44660/UNS S44735 super ferritic stainless steel condenser tubes supplied by US and European Manufacturers.

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.loteries.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.

Louyang Hexin Titanium Industry Co., Ltd

Luoyang Hexin Titanium Industry Co., Ltd was founded in 2014. Our company produces titanium products since 2014, including rods, tubes, plates.

Products are widely used in petrochemical, oil, offshore industry, energy generation and other industries. Typical applications include: Titanium and titanium alloy bar for hot-rolling; Titanium alloy standard parts; All kinds of corrosive fluid transmission pipeline system; Titanium bicycle tube; automobile exhaust pipe; Offshore aquaculture.

Louyang Titanium Group (LTiG)

Luoyang Titanium Group, Inc. (LTiG) is the exclusive North American Representative of Luoyang Sunrui Wanji Titanium Industry Company Limited (Sunrui Wanjii). Sunrui Wanjii primarily produces high-quality (pure and near pure) titanium sponge for the domestic (Chinese) and international markets. In our capacity as North American Representative, LTiG is responsible for Sunrui Wanjii’s entrance into the North American titanium market.

Since its inception, the evolution of the black sand has been a global
effort that has inspired scientists, scholars and entrepreneurs alike. We live in a global economy where free-flowing-resources, pursue global opportunities and titanium is arguably one of the best example of a global commodity, fulfilling the growing demands of a multi-nation audience of consumers. Luoyang Titanium Group Inc., along with our global partners, sees our existence and opportunity for growth, as an extension of the global titanium phenomena.

For more information about our products and services; email corporate@LTiGus.com or by calling 707-787-LTiG.

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 customized 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, hydro testing, 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, multi-cutting, chamfering, automatic bundling and strapping).

Makino
+1-513-573-7200
www.makino.com

A world leader in advanced CNC machining centers, Makino is committed to providing high-performance, leading-edge machining technologies and innovative engineered process solutions that enable manufacturers to focus on making what matters. Makino offers 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 sinker EDMs.

Makino’s flexible automation solutions provide reduced labor costs and increased throughput in a variety of production volumes and designs. Makino’s engineering services offers industry-leading expertise for even the most challenging applications across all industries. For more information, call 1-800-552-3288 or visit makino.com.

Manufacturing Technology Inc.

Developing customized friction welding solutions utilizing Titanium and other precious metals for customers in many different industries and countries has helped position MTI as a global leader. We have over 800 friction welders on six continents, purchased by satisfied customers who include research centers dedicated to the promotion and development of innovative uses of friction welding. MTI continues to be at the forefront on how to use force and motion for advances in near net shape manufacturing. Please visit our website for full detail examples. We also provide on-site manufacturing welding services from our headquarters in South Bend, Indiana and our location in Kingswinford, England.

We are here to help you with complete technical solutions and manufacturing support by providing everything from Weld Development to Process Design, Manufacturing Services to Next Generation Manufacturing, Machine Specifying to Machine Build, Installation, and Service—a true “one stop” shop. Our approach is about working closely with your team to solve your manufacturing problems. This approach allows us to provide you seamlessly integrated manufacturing cells that meet your production needs.

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.

METALVALUE
+33680562848
metal@honnart.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 manufacturing, with a variety of applications in industries including aerospace, electronics, bio-medical, petro-chemical and automotive.

MetCon, LLC
+1-724-888-2172
www.MetConLLC.net

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.

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.

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 has 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.

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.monicaloys.com
info@monicaloys.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.
**Titanium Buyers Guide (continued)**

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.

**Nanoscale Powders LLC**  
www.nanoscalepowders.com

Nanoscale Powders LLC produces a range of refractory and light metal powders, including titanium and titanium alloy powders. The company is a startup and deploys patented sodium reduction technology to manufacture commercially pure products.

**NEOTISS**  
+33 1 70 98 30 05  
www.neotiss.com  
contact.fra@neotiss.com

NEOTISS is leader in the manufacturing of titanium and stainless steel thin welded tubes serving all demanding industry markets from power generation to desalination, process, automotive and more. Our products include not only bare, straight tubes but enhanced surface tubes, such as low fin, helix 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.

**NF&M International**  
www.nfm-titanium.com

NF&M International, Inc., subsidiary of VSMPO-Tirus US, is a producer of premium quality triple melted and standard grade titanium bar and billet products for the aerospace market and manufacturer of small-diameter precision tolerance bar and seam free coil products for aerospace fastener, automotive and medical applications. NF&M also provides a wide range of conversion services, including intermediate grinding and finishing of bar/billet, heat treating, straightening, bar peeling, bar polishing, picking and inspection. NF&M's Nadcap approved laboratory performs room temperature tensile, hardness, hydrogen analysis and micro/macrostructure evaluation.

**NobelClad**

NobelClad is the world leader in the field of explosion welding. We have more than half a century of expertise, and we are the one company with the most global resources and infrastructure committed to clad, offering bi-metallic solutions for complex industrial markets, including oil and gas, chemical, and transportation. We work with global partners across the supply chain not only to deliver the highest-quality, most cost efficient clad materials on time, but to inform and help develop project specifications from the onset. Our design ingenuity, technical proficiency, and unparalleled dependability make us an invaluable resource for process architects, engineers, and fabricators alike. That's why our clad materials are the preferred specification for high stakes industrial infrastructure applications all over the world. Specialties: Explosion Welded Clad, Longitudinally Welded Pipe, Pressure Vessels, Heat Exchangers, Structural Transition Joints, Electrical Transition Joints, Cryogenic Transition Joints, Flat Plates & Cylinders, Heads, Tube Sheets.

**Norsk Titanium AS**  
+47 97 42 22 00  
www.norsktitanium.com  
info@norsktitanium.com

Norsk Titanium AS is the world’s pioneering supplier of aerospace-grade, additive manufactured, structural titanium components. The company is distinguished in the aviation industry by its patented Rapid Plasma Deposition™ (RPD™) process that transforms titanium wire into complex components suitable for structural and safety-critical applications. The Norsk Titanium research and development team is committed to displacing the age old and inefficient forging process with a precision wire deposition technology embodying substantial savings for aerospace, defense, and commercial applications. www.norsktitanium.com.

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


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. Extruded shapes, especially those for the aerospace industry in 6Al-4V, 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 from 1.5” (40 mm) to 14” (350 mm) plus specialty sizes and wall thickness. In-house finishing options including OD grinding or machining, ID honing or boring, hot straightening, pickling, non-destructive testing and electron beam welding are a few of the services we offer.

“Titanium Valley” Special Economic Zone” OJSC
+7-343-378-45-83
www.titanium-valley.com
welcome@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. For the moment there are 8 resident companies, organizing their production in different industrial spheres at the SEZ. The key resident is LLC “Vsmpo-New Technologies”, that will start their production of machined titanium components for aerospace companies, mostly for Boeing, in 2017.

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.

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 additive 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.

Ospray™ Fire Suppression.

Ospray™ Fire Suppression is the manufacturer of Aquaxera™ Fire Suppression Agent. Aquaxera™ is a dual acting agent that is able to extinguish Titanium fires in seconds, returning the remaining material to ambient temperature. Aquaxera™ also acts as an inerting agent, reducing the ignitability of surrounding material during extinguishment. Ospray™ also does specialty sprinkler system design and system conversion from existing water sprinkler systems.

Overon Group
404-364-1799
www.overongroup.com
mikhailspb2010@gmail.com

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 for raw materials products of key players in the aviation sector, like for example AIRBUS, SNECMA, EUROCOPTER, DASSAULT AVIATION, etc.

With our 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.

Pat Mooney, Inc.
www.patmooneysaws.com

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, ishijimax 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.

PCC Metals Group
www.precast.com/

The PCC Metals Group joins together PCC’s metals companies: TIMET, a vertically integrated titanium supplier; and Special Metals, a leader in nickel alloy development. With over 200 years of collective experience, each organization is an original stronghold and remains a leader in their respective industries by developing and producing specialty alloys to meet customer demands. By uniting the unique capabilities of each company, the PCC Metals Group is able to better serve customers in the specialty metals market and bring successful product solutions to market.

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

Perryman Company is a vertically integrated producer of specialty titanium products. Our operations include melting, forging, and fabrication to finished products, Perryman’s quality, technical expertise, and customer service is unmatched. Our Spectralloy facility is engaged in the recycling of titanium revert raw material for use in various titanium melt processes in the manufacture of titanium ingots. Perryman supplies and services customers in the aerospace, medical, consumer, recreation and 3D printing/additive manufacturing markets worldwide. Approvals include ISO9001:2008, AS9100, and NADCAP. Perryman Company is headquartered in Houston, Pennsylvania. Company offices are located in Philadelphia, Los Angeles, London, Zurich, Tokyo, and Xi’an.

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

PMA Engineering / Design Group
253-926-0884
www.pma-engr.com

PMA Engineering/Design Group brings a broad and extensive depth of engineering and operating experience in titanium to work for you. With our expanded resources, and 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 integrated, comprehensive solutions.

We can partner 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.

PM International Suppliers
(863) 644-6300
www.PMfirst.com
info@pmfirst.com

We supply pipe and fittings, tubing, valves, flanges, bars, sheet and forgings with numerous worldwide sources for limitless applications. PM International Suppliers specializes in providing products in exotic materials such as duplex, super duplex, 6% molybdenum stainless-steels, titanium, copper nickel and nickel alloys.

Industries we serve:
- Offshore Petrochemical
- Geothermal
- Chemical Manufacturing
- Aerospace
- Desalination
- Power Plants
- Water Treatment Facilities
- and more!

PMIS customers are worldwide, and we handle everything from one-off emergency deliveries to complex, long-ranging project installations.

Praxair Surface Technologies
www.praxairsurfacetech.com

We engineer gas atomized metal powders in a wide range of standard alloys for all your additive manufacturing techniques and applications. We’ve also developed a proprietary atomization process specifically designed for titanium. Out cobalt, iron, nickel and titanium metal powders for additive manufacturing flow easily and deposit evenly, resulting in successive layers with consistent density and uniform build rates. Ultimately, this helps products meet the mechanical, performance and final part specifications of 3D printed parts. Out powders are custom-engineered for specific industries – including aerospace, automotive and medical – and our chemistries and particle sizing can be modified to ensure customer’s finished products performance and surface finish needs are met.

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 & and 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.

Product Evaluation Systems, Inc.
724-834-8848
www.PES-Testing.com
Mic@PES-Testing.com

Product Evaluation Systems, Inc. (PES) is an independent testing laboratory, specializing in mechanical, metallurgical, chemical and nondestructive testing and analysis. Since 1979, PES has been proud to offer exceptional personalized response to customer needs. The company includes a team of key personnel with 20-40 years of individual experience in machining, testing and metallurgical evaluation. PES is both NADCAP and ISO 17025 accredited and holds multiple customer accreditations such as GE Aviation, Pratt & Whitney (MCL), Rolls-Royce Aerospace and ATI Nuclear. Accreditation awarded to PES covers mechanical testing, test specimen preparation, metallography, chemical analysis and nondestructive evaluation. Industry sectors include, but are not limited to, Aerospace, Power Generation, Oil & Gas, Mining and Recovery/Reclamation.

Quebec Metallurgy Center
+1-819-376-8707
www.cmqtr.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 casting, induction skull melting, plasma arc melting, permanent mold, shell mold and sand mold casting; advanced welding, thermal spraying, heat treating, hot isostatic pressing, additive manufacturing (directed energy deposition, binder jetting and ultrasonic welding) and nondestructive testing.

RathGibson
+1-608-754-2222
www.rathgibson.com
inquiry@pccenergy.com

RathGibson is one of the world’s leading manufacturers of precision welded tubing and pipe in both stainless and specialty alloys. From straight lengths to coil, welded and drawn, or seamless tubing and pipe, our products can be made from any of our 40 high-performance alloys so that they will reliably perform no matter how demanding or corrosive the application. At RathGibson, a successful technical process to meet any customer requirements is a priority, so that only the finest and most high quality tubing is delivered. That is why RathGibson invests in unique capabilities to develop customizable products for industries including power generation, renewable, oil and gas, petrochemical, food and dairy, beverage, pharmaceutical, and general commercial.

ReMelt Scientific, Inc.
+1-330-440-0402
www.remeltinc.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.

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.

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

Retech is the world’s leading supplier of Electron Beam (EB) and Plasma (PAM) Cold Hearth furnaces for melting and refining titanium and titanium alloys. Retech advanced vacuum metallurgical systems...
Titanium Buyers Guide (continued)

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 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.

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 solutions, and advanced fabrication applications. 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, a global leader in specialty alloys, offers a comprehensive inventory in titanium, stainless steels, nickels alloys and cobalt alloys. We offer extensive processing capabilities, in-depth knowledge of material specifications, supply chain management support, and metallurgical expertise.

Roskill Information Services Ltd.
+44 (0)208 417 0087
www.roskill.com
info@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 in 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. 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 US titanium mills, as well as many smaller investment casters worldwide.

S+D Spezialstahl Handelsgesellschaft mbH
+49-211-230999-10
www.s-d-group.com
d.verhoeven@s-d-group.com

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
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.

Scanacon, Inc.

At Scanacon, our mission is to help stainless, titanium, zirconium and specialty alloy finishers achieve efficient, high quality production at the lowest cost. With over 30 years’ experience as the World’s preferred supplier of acid management equipment, our knowledge, experience and equipment offers the producer the ability to achieve productive, efficient and cost effective finishing operation. Our solutions have consistently proven themselves across a wide range of pickling, etching and milling applications for all wrought and cast forms.

Scanacon understands that ease of use, low maintenance requirements and efficiency is key to designing process equipment that delivers value, day after day. No two producers or applications are exactly alike. Delivering value requires a knowledge that can only be gained by experience and is why Scanacon continues to be the chosen supplier for acid management system by all major producers, worldwide.

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 maraging 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.

Shaanxi Lasting Titanium Industry Co., Ltd.
00 86 29 89651035    00 86 29 89651082
www.lastingtitanium.com
sales@lastingtitanium.com    titanium01@263.net

Shaanxi Lasting Titanium Industry Co., Ltd. is the leading Titanium manufacturer and exporter in China. With more than 20 years’ experience, we own two mills in Baoji -The Chinese Titanium City. We are mainly engaged in melting, forging, rolling and machining manufacturing line in titanium and titanium alloy, with an investment of USD 50 million. Exported 3000 mt ingots, 2500 mt forgings and 5000 mt machined parts annually. Our main products include titanium ingots, slabs, bars/rods, plates/sheets, pipes/tubes, forgings, fittings, wire, powder, standard parts, non-standard equipment and other corrosion resistant metals such as zirconium, tantalum, tungsten, molybdenum, niobium.

Sierra Alloys / TSI Titanium

Sierra Alloys / TSI Titanium
PRV Metals Companies
+1-626-969-6711
www.prvmetals.com

Manufacturer and supply forged and rolled products in Titanium alloys, nickel-cobalt base alloys, precipitation hardened stainless and high alloy steels from small rectangular and round bar to large section size open die forged bar and stock.
**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 commercial vacuum furnaces up to 48 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 Fluorescent Penetrant Inspection. ISO9001:2008 / AS9100C Registered, Nadcap Accredited for heat treating and NDT (Non-destructive testing), MedAccred Accredited for heat treating, 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.solarmfg.com
info@solarmfg.com

Solar Manufacturing designs and manufactures high performance, technically advanced and energy efficient vacuum heat treat furnaces. Models range from compact R&D size furnaces to mid-size horizontal production furnaces to huge car-bottom vacuum furnaces for large heavy workloads. 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 ConserVac energy management system. We design for vacuum heat treat processes such as hardening, brazing, annealing, stress relieving, normalizing, tempering, sintering, low pressure carburizing and vacuum gas nitriding. Solar knows vacuum heat treating inside out. Our engineers and metallurgists bring decades of expertise to the design side of the business and our knowledgeable technicians provide world-class manufacturing keeping Solar in the forefront of vacuum furnace innovations. As an ITA member company, Solar welcomes the opportunity to assist our customers in choosing the right vacuum furnace, replacement hot zone, spare parts and service for your needs.

**Specialty Metals Company**
+32- 2645-7670
www.uktmp.kz
Sylvain.gehler@specialtymetals.be
Danielle.vanoverschelde@specialtymetals.be

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
bwilson@specialtymetalspro.com

Specialty Metals Processing (SMP) is a leading processor of titanium plates, slabs, sheets and coil. Located in northeast Ohio, SMP has one of the largest abrasive belt grinding and polishing operations in the U.S. Our 170,000 sq. ft. facility houses multiple processing lines. We are your reliable source for precision grinding where we can accommodate widths up to 72”, material thickness up to 10” and lengths up to 240”. We are your reliable source for gantry grind services where we can accommodate widths up to 144”, material thickness up to 24” and lengths up to 1200”. In addition, we are your reliable source for pinch roll grinding, alpha case removal and reconditioning.

- Precision grinding up to 72” wide and 244” long
- Ability to polish/grind/recondition plate/slabs up to 12’ wide by 100’ long
- Providing #3, #4, #6, brushed or matte finishes or custom matched abrasive belt finishes, one or two sides.
- Providing #7 and #8 buff finish on stainless coil
- Offering special inspections, packaging, line marking & PVC options
- ISO 9000 certified since 1996
- Offering one stop shopping on many orders
- Same day quoting on most inquiries
- One sheet or truck load quantities, no order is too big or too small

Please visit our website at www.specialtymetalspro.com

**Spectore Corporation**
954-481-8422
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.

**Standard Die**
www.standarddie.com

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.
Starrag USA Inc.
+1-859-534-5201
www.starrag.com
ussales@starrag.com

Starrag Group is a global technology leader in manufacturing high-precision machine tools for milling, turning, boring and grinding of small, medium-sized and larger workpieces of metallic, composite and ceramic materials.

Principle customers are internationally active companies in the Aerospace & Energy, Transportation & Industrial Components and Precision Engineering sectors. In addition to its portfolio of machine tools, Starrag Group provides integrated technology and maintenance services that significantly enhance customer productivity.

Starrag Group products are marketed under the following strategic brands: Berthiez, Bumotec, Dörries, Droop+Rein, Heckert, Scharmann, SIP, Starrag, TTL, and WMW. Headquartered in Rorschach/Switzerland, the Starrag Group operates manufacturing plants in Switzerland, Germany, France, the UK and India and has established a network of sales and services subsidiaries in numerous other countries. Starrag Group is listed on the SIX Swiss Exchange (Symbol: STGN).

Strohecker Incorporated
+1-330-426-9496
www.strohecker.com

Well-established specialist in the fabrication and repair of copper crucibles, hearths and related equipment used in VAR, ESR, EBM, PAM, as well as various similar processes. Serving producers of the reactive metals and alloys, nickel alloys, refractory metals, and steel alloys.

Structure Medical, LLC

Structure Medical is a leading manufacturer of medical implant products that are used by orthopedic surgeons to treat disorders of the musculoskeletal system. Orthopedic surgeons use these medical devices to treat trauma, sports injuries, degenerative diseases, tumor and congenital conditions.

Structure Medical was founded in Naples, FL in 2004 and established a second facility in Mooresville, NC two years later. The company uses the most advanced machine tool available around the world to produce products that meet the highest quality standards.

Sumitomo Corporation Of Americas
+1-847-384-5275
www.sumitomocorp.com
shinya.kuriyama@sumitomocorp.com

Sumitomo Corporation of Americas (SCOA) is a wholly-owned subsidiary of Sumitomo Corporation, which is one of the leading trading companies in Japan. SCOA is an integrated global trading firm with diversified investments in a wide variety of industries, products and services.

Supra Alloys, a division of Titan Metal Fabricators
805-388-2138
www.supraalloys.com
sales@supraalloys.com

Supra Alloys offers a fully-stocked Titanium Service Center with the convenience of extensive in-house processing capabilities, with a Management System certified to AS 9100 C & ISO 9001:2008. Located in Camarillo, California USA, Supra routinely provides Titanium for applications in the aerospace, chemical processing, medical, metal finishing and sports/recreation industries throughout the world.

TE Wire & Cable
+1-201-845-9400  1-888-4TE-WIRE
www.tewire.com
sales@tewire.com

TE Wire & Cable LLC, a Marmon Wire & Cable/Berkshire Hathaway Company, is a premier thermocouple and specialty wire and cable manufacturer that was formed from the Wire and Cable Division of the Thermo Electric Corporation. Since 1941, the company has been manufacturing high-quality wire and cable solutions for the thermosensing and temperature measurement markets. TE Wire & Cable manufactures a full line of thermocouple wire and cable—from iron and nickel-based alloys to copper instrument and control cable. The company maintains an in-house ISO17025 Accredited laboratory directly certified by the National Institute of Standards and Technology (NIST), allowing it to calibrate its own wire. This results in a higher quality product at a lower cost and with improved performance. TE Wire & Cable is highly regarded as the industry leader and has maintained a reputation for providing high-quality temperature measurement wire and cable products with short lead times and competitive prices. TE Wire’s thermocouple wire and thermocouple extension cable solutions can be used for several metallurgy applications, including heat treatment, component testing, furnace surveys and metals production.

Tekna Plasma Systems
www.tekna.com

Tekna offers spherical titanium powders specifically engineered for additive manufacturing applications.

These powders are produced by inductively-coupled plasma, a proprietary technology developed by Tekna which leads to high-purity powders having high density and flowability.

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 products that meet the highest quality standards.
Common calculations for TiAl-alloys:  
- Formation of minor phases such as Ti5Si3  
- Formation of the B2 phase  
- Partitioning of alloying elements between α and β phases  
- Volume fraction of α and β  
- Sensitivity of Tβ to impurity content of O, C and N  
- α transus temperature  
- α2+γ eutectoid temperature  
- Formation of the B2 phase  
- Formation of minor phases such as Ti5Si3

Thermo Scientific

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 alloy 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.

TiFast

+39 0744 736 307  
[www.tifast.com](http://www.tifast.com)  
[info@tifast.com](mailto:info@tifast.com)

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

TiFast can supply bars in a full range of titanium grades with a lot of possibilities of finishing: close tolerances (from h7), surface finishing, straightening...

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

Timesavers International B.V.

+31 (0) 113 239910  
[www.timesaversint.com](http://www.timesaversint.com)  
[timesaversint@timesaversint.com](mailto: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 radiussing; 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](http://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,
Titanium Buyers Guide (continued)

Titanium Consulting & Trading S.r.l.
+39-055-642543
www.tct.it
info@tct.it


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
+1-281-265-2910
www.titaniumengineers.com

TITANIUM ENGINEERS 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 45 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 ordinance 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 Industries, Inc. (T.I.)
+1-973-983-1185
www.titanium.com
sales@titanium.com

T.I. (Titanium Industries Inc.) is the global leader in performance metal solutions for the aerospace, medical, industrial and oil and gas markets. We are the largest independent distributor of Titanium and Specialty Metals stocked throughout our global service center network. We maintain and are continually expanding our state of the art research facilities, and decades of experience make us the partner of choice for titanium.

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 ;

Titanium Anodize
Aluminum Anodize
Dry film Lubricants
Corrosion Coatings
Paints &Primer
Teflon Coatings
Manufacturers of Composite Parts (Carbon &Glass)

Titanium Finishing Company
+1-215-679-4181
www.titaniumfinishing.com
melanie@titaniumfinishing.com

Metal finishing services include: 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 Buyers Guide (continued)
Titanium Buyers Guide (continued)

processing and near net shape capabilities, such as water jet cutting, saw cutting, and shearing. We provide tailored supply chain solutions through our T.I. Materials Management methodologies and Program Management competence. We continuously focus on lean and process improvements while maintaining AS9100 and ISO9001 certifications at all locations worldwide. Our award winning sales team has been providing dependable quality driven solutions to customers since 1972.

Titanium International Group SRL
+39-051-6814893
www.titanium.it
tig@titanium.it

TIG is an European stockist and distributor of Titanium, Nickel alloys and Steels for Aerospace, Medical, Automotive and other high demanding end use markets.
TIG is EN9100 and EN9120 certified and has several customers approvals. TIG provides cut to size services with more than 30 saw cut machines and 3 dynamic waterjet cut machines.

Contact us for a quotation! Your mission is our priority!

Titanium Processing Center
+1-888-771-9449
www.titaniumprocessingcenter.com

AS 9100 and ISO 9001 certified, Titanium Processing Center is your go to source for quality titanium products. Titanium Processing Center is a stocking distributor of a wide range of titanium mill products. Our standard inventory of titanium bar, sheet, plate, tubing and pipe is complimented with specialty fasteners, fittings, forgings and fabrications. In-house capabilities include waterjet & saw cutting, shearing, turning and drilling.

All material is mill certified and fully traceable to the original manufacturer. Our dedicated staff is committed to providing our customers with the courteous and prompt attention that they deserve. Delivering quality products on-time and in compliance with your requirements remains our priority at Titanium Processing Center.

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.

Trepanningspecialties, Inc.
+1-562-633-8110
www.trepanningspec.com

Trepanning & 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 trepanning, 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 Metals
330.264.3299
www.tricormetals.com
info@tricormetals.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 ASTM and AMS grades of titanium mill products and titanium forgings. We also 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.

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,
Titanium Buyers Guide (continued)

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. We stock AMS-grades of titanium sheet, plate, bar and billet for aerospace and bio-medical served markets.

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.

Astrolite® Alloys - Welding wire and titanium for aerospace
We stock, process, clean, process, and package UltraGrade™ high performance welding wires for aerospace, power, and turbine engines.

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

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.

United Performance Metals
888.282.3292
www.upmet.com  www.upmet.uk
sales@upmet.com  sales@upmet.uk

United Performance Metals (UPM), an O’Neal Industries affiliate company, is a global distributor of high-performance metals serving customers in a variety of industries, including aerospace, fastener, medical, power generation, oil and gas, semiconductor and many others.

UPM offers a comprehensive inventory of products, including stainless steel, duplex stainless steel, Prodeco®, nickel alloys, cobalt alloys, cobalt chrome moly, titanium, aluminum, and alloy steel in coil, sheet, strip, plate, bar and near net shapes.

FIRSTCUT+® Processing Services include cut-to-length, leveling, slitting, edging, chamfering & facing, shearing, laser cutting, laser gauge measurement, water jet cutting, plasma cutting, sawing, precision cold saw cutting, precision blanks, first stage machining, heat treating, boring, trepanning and deburring.

Our certifications include AS9100, AS9100 Belfast, ISO 9001, ISO 9001 Belfast, ISO 13485, GE S1000, Pratt & Whitney LCS, And Laser Machining/Cutting Approvals NADCAP AC7116, GE-S422 and Pratt & Whitney PWA 119.

United Performance Metals is headquartered in Cincinnati, OH and maintains sales and stocking locations in Oakland, CA, Los Angeles, CA, Hartford, CT, Chicago, IL, Greenville, SC, Houston, TX, Belfast, Northern Ireland, Budapest, Hungary and Singapore. For more information, visit www.upmet.com.

O’Neal Industries (ONI), the largest family-owned group of metals service centers in the United States, is the parent company of United Performance Metals. With sales of approximately $2.1 billion in 2016, ONI is based in Birmingham, Alabama, and has more than 80 specialized facilities throughout North America, Europe and Asia.

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-
Titanium Buyers Guide (continued)

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

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) 1527 514111

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 silphons, 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.

Webco Industries  
+1-918-245-2211  
[webcotube.com](http://www.webcotube.com)  

titanium@webcotube.com

Webco delivers North America’s widest range of tubular products, rapidly fulfilling urgent orders and helping customers avoid costly unscheduled shutdowns and production delays. Customers in the aerospace, automotive, chemical processing, industrial, oil & gas, power generation and other industries, rely on Webco’s strength, agility, and innovation to deliver solutions for their most challenging requirements. In fact, Webco manufactures and distributes millions of feet quality tubing made to meet today’s most demanding specifications.

Our welded and seamless titanium tube products are available in variety of grades and sizes, standard/off-the-shelf or tailored to meet customers’ unique requirements.

Webco maintains a culture for relentlessly pursuing process and product excellence, enabling ever-improving productivity/product quality. For a current list of our ISO, TS, PED, and other certifications as well as ASME, ASTM, and other specifications offered, visit [webcotube.com](http://www.webcotube.com)

Weber Metals, Inc.  
+1-562-602-0260  
[webermetals.com](http://www.webermetals.com)

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. Our aluminum stress relieved forgings are some of the most stable products in the industry for machining.

Wellmet International Inc.  
+1-909-594-9639  
[wellmetusa.com](http://www.wellmetusa.com)

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.

West Penn Testing Group  
+1-724-334-1900  
[westpenntesting.com](http://www.westpenntesting.com)

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](http://www.westpenntesting.com)

Western Smelting & Metals, Inc.  
+1-503-623-8341  
[westernsmelting.com](http://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.wstitanium.com](http://www.wstitanium.com)  
dxh@c-wst.com

Western Superconducting Technologies Co., Ltd. ( WST ), founded in 2003, is headquartered in Xi’an, China. WST is leading supplier of titanium and its alloys material including Ti6Al4V, Ti6Al4V ELI, Ti6242, Ti6246, Ti662, Ti811, Ti38644, Ti1023, Ti6Al7Nb, NbTi in the forms of ingot, billet, forging, slab, bar, rod, wire and profile in the domestic & oversea market. Our products are mainly used in aerospace, medical, automotive industries and other critical industries.

WST possess most advanced 10 tons VAR furnaces and series of high speed forging presses to manufacture 6000 tons ingots and 4000 tons bars per year. We have gotten the certificate of ISO 9001, AS 9100, NADCAP and ISO 14001, strict quality control system make largest assurance for our high quality products. WST’s titanium alloy bars hold over 85% domestic aerospace market and also WST has good cooperation with large international aerospace companies like UTAS, Eton etc. and medical companies like Biomet, Smith & Nephew, Medtronic etc.

Westmoreland Mechanical Testing &Research Inc.  
+1-724-537-3131  
[wmtr.com](http://www.wmtr.com)  
us.sales@wmtr.com

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

Zirom can also provide a series of services like melting the secondary recycle materials, turning/grinding/cutting/milling the surface of products, full chemical and mechanical analyses, LP, US + Eddy testing.
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Integrated Solution for Titanium

With the five decades of experience, Baoji Titanium Industry Co., LTD is the largest professional manufacturer in China specialized in mill products of titanium and its alloys.

An integrated production system including melting, forging, rolling, drawing and fabrication, enable us manufacture various products including ingot, slab, bar/billet, rod/wire, sheet/plate, coil, tube/pipes, forging, casting etc. of all grades of CP titanium and most titanium alloys as well as downstream products. And we also can supply Zirconium, Nickel etc. materials.

Baoji has got ISO9001, AS9100, ISO14001, OHSAS18001, PED, TUV, Norsok, NADCAP certificates, and also hold many AEROSPACE approval.

With the capabilities and capacities, Baoji is ready to support your growth.

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Titanium Fabrication Corporation (TiFab) is the world’s largest fabricator of reactive metals including titanium, zirconium and high nickel alloys fabrication. With three facilities in North America, Titanium Fabrication serves a broad range of industries including Chemical/Petrochemical, Oil & Gas, Pulp & Paper, Mining, and the Military. Primary materials of construction are titanium and zirconium, but we also fabricate with high nickel alloys including Hastelloy®️, Inconel®, Monel®️ and more.

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