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Thank You To Our Photo Contributors

A Ning Liu from Baoji China Titanium City creates a variety of titanium handicrafts including this beautiful titanium lighter.

B This set of CP Titanium wind chimes is “Chimes of Remembrance” having been made very shortly after the 9/11 Twin Towers attack in 2001. There is a small model of the Twin Towers on the chime strike with angels on the hexagonal dome. The chimes are 1 1/2” diameter Titanium tubing producing the sound of church bells. Designed by Jeff Hise

C Stiletto Tool Company designs innovative, lightweight, ergonomic, productive, and professional tools. Premium titanium hand tools that span numerous trades such as framing, remodeling, finish work, siding, demolition, concrete, and drywall. These include hammers, nail pullers, utility/pry bars and grips. Stiletto cites Titanium tools also produce 10 times less recoil shock. These features help reduce carpal tunnel syndrome and tennis elbow which means less downtime, more productivity, and most importantly LESS PAIN while working. Visit [www.stiletto.com](https://www.stiletto.com/)

D Titanium’s low modulus means excellent flexibility and strong spring back characteristics. This promotes its use in various springs for aircraft and valves, where a modulus half that of steel, but a strength equivalent to steel allows a titanium spring to be half as large and heavy. This property also benefits recreational gear (golf clubs, tennis racquets, mountain bikes and skis). Litespeed quotes on their website they “take the highest quality titanium available and makes it better.” Litespeed offers premium cold-worked, cycling-specific tubesets. Visit [www.Litespeed.com](https://www.Litespeed.com) to learn more about their titanium technology.
Big Bertha is the name given by Callaway Golf to a number of its lines of golf clubs. The name was chosen to evoke the famous German Big Bertha howitzer. The original Big Bertha driver was launched in 1991. At the time, its design was considered highly modern and a radical departure from older drivers: it was crafted entirely of stainless steel and the head had a volume of 190 cm$^3$ (12 cu in). Most other drivers were still made of persimmon wood and had smaller heads. (By way of comparison, many drivers of recent years have head sizes up to the USGA legal maximum of 460 cm$^3$ (28 cu in) and are made of more exotic materials such as titanium.). Since the introduction of the original Big Bertha, Callaway has introduced further clubs and lines of clubs with similar names, such as the “Great Big Bertha”, the “Biggest Big Bertha”, and titanium versions of the clubs. In 2003, they introduced the “Great Big Bertha II,” and in 2004, the “Big Bertha 454.” They have also introduced two lines of irons using the name.  
http://cmp.callawaygolf.com

This is the front of the Gittler Guitar, showing the frets and the tuning gears. Because the frets are cylindrical, the contact point of string on fret is less than 0.001 inch. Every Gittler guitar is hand-crafted. Construction begins with a heat treatment in which the titanium is put through a special process where it is “annealed to dead soft and stress relieved.” Then a machinist carefully shapes the backbone for perfect flatness and precise curvature, and cuts multiple notches for the frets. The piece is bent backward around a custom jig to open up the notches, and compression-fits the cylindrical frets into the notches. Then several microwelds at the notch corners are made to retain flatness and consistency. More information about the Gittler titanium guitar is available at www.gittlerninstruments.com

Citizen offers their Super Titanium watch citing their improved titanium-processing technology, they make it possible for their designers to deliver a wide range of great designs. Advances in our surface hardening technology has also allowed CITIZEN to create watch models with higher resistance to scratches in a wide range of colors with stronger hypoallergenic properties.  

Fishing Fly reels by L. H. Design are made almost totally of pure titanium. They use conventional machines for most parts, but hand tools are frequently used both in the making process, assembling and in the finishing process. L. H. Design strives to create titanium fly reels as functional objects but also as “works of art”. See more at https://www.lhdesign-flyrodreel.com/fly_reels.html
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In the spirit of Titanium Today becoming the premier online vehicle for sharing up-to-date information about the global titanium industry, it is with great pleasure we launch this edition featuring our new “Industry Spotlight” series, a new communications and information tool for the titanium industry.

The first Industry Spotlight features Melanie Cunningham, the president of Titanium Finishing Company, based in East Greenville, Pennsylvania USA. Titanium Finishing does anodizing work on titanium components. I hope you will watch our Industry Spotlight on page 20 where Melanie demonstrates how her organization creates coatings through an anodizing process, which imparts lubricity, color and other surface properties.

In upcoming editions, you will experience more interactive features within Titanium Today including educational webinars, industry spotlights, committee highlights and more. I hope you will enjoy the experience of reading, clicking and viewing our video segments and I look forward to hearing your feedback.

Interested in learning about ITA Committees? Click above to view ITA YouTube channel
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ITA Medical Technology Committee Examines 3D Dynamics in Supply Chain

By Michael C. Gabriele

The International Titanium Association’s (ITA) Medical Technologies Committee has revised its strategic plan for assessing business in the global medical market, with a focus on 3D/additive manufacturing as well as underlining the importance of distributors as the key players in the supply chain.

Even though medical applications for titanium, most notably in the field of joint replacements, bone reinforcements and dental applications, has been gaining momentum for a number of years as a growth market, the Medical Technologies Committee—led by co-chairs Viv Helwig, the founder of Vested Metals Inc., and Stephen R. Smith, the president of Edge International—sees its updated strategic plan as a way to re-evaluate the medical field as an emerging market. The thrust behind this fresh perspective is to explore 3D/additive manufacturing as a means to develop “customized” implants when and where they’re needed.

Helwig explained that the committee will explore 3D/additive manufacturing technology, which offers the potential for continued growth for titanium in the medical sector. The additive process will provide the means for the use of new alloys and smaller material lots to target the needs of specific medical applications, such as implants that enable greater osseointegration and bio-compatibility.

Distributors seek to add value for customers by providing specific alloy grades and servicing the subcontract manufacturers, Helwig said. As always, the challenge for titanium distributors is to deliver consistent material in the supply chain, with the realization that the titanium industry and its primarily markets can be cyclical in nature with long lead times and occasional supply constraints. Titanium also competes with stainless/cobalt alloys for medical implants. Helwig said distributors have the capability to maintain the correct type and level of inventories to service their customers. He added that Vested Metals’ primary focus is the North American supply chain.

Information posted on the Vested Metals website (www.vestedmetals.net) states that Helwig founded Vested Metals in late 2014 and serves the company in the role of president, overseeing all of the company’s activities. Their focus is on hard-to-find grades, alloys, sizes, and overall raw material metals requirements within the markets they serve. Vested Metals is based in St. Augustine, FL.

Smith agrees with Helwig regarding the potential for 3D/additive manufacturing technology in medical implants and devices. He said that, as the leaders of the ITA’s Medical Technologies Committee, he and Helwig will look to promote and educate the market on the opportunities for 3D/additive manufacturing. While titanium enjoys a strong position as a material of choice for orthopedic and trauma implants, external prosthetics and instrumentation, Smith sees the potential for titanium to be expanded in applications for spinal implants and facial/cranial implants, especially in jaw reconstruction. Smith said titanium will remain a strong player in the medical market for the foreseeable future given its inherent properties of light weight, resistance to body fluids, biocompatibility and being a non-ferromagnetic metal (for MRI safety).

As a speaker at the TITANIUM ASIA 2018 conference and exhibition, which was held last February in Singapore, Smith gave a presentation on “Titanium Technology in Medical Applications.” He estimated that the global growth for titanium medical devices for “head to toe” biomedical implants, such as internal fixation (bone plates, screws and pins), prosthetics, extremity and joint replacements, dental implants, inner body devices, and surgical instruments will see a compound annual growth rate of 3 to 5 percent during the next 10 years, with North America, Asia and Europe all expected to be competitive markets. He estimated the total medical devices market for Titanium to be 5/7,000 metric tonnes.

“The future for medical grade titanium looks bright,” Smith said. “The aging baby boomer demographic wants to stay active. The health industry is pushing all ages to lead more active lives. Growth for medical grade raw materials is projected to be three to five percent per annum over next five years. Medical industry will continue researching new and innovative uses for titanium. Distributors play a key role in the medical grade titanium supply chain.”

He also provided his insights during an earlier presentation to the ITA on “The Role of the Distributor for Medical Grade Raw Materials.” Smith’s list of medical grade raw materials included as cobalt-based biomaterials (CoCrMo; L605); plastics (ultra-high molecular weight polyethylene, polyether ether ketone) specialty metallic biomaterials (ceramics); specialty steel (Stainless 316L; 455; 17-4PH); and titanium-based biomaterials (commercially pure and Ti6Al-4V).

As for the customers for medical grade raw materials, Smith said there are five major original equipment manufacturers (OEMs), representing 59 percent of the worldwide market (as of 2016, down from 61 percent in 2015), with their own in-house manufacturing, supplemented by contract manufacturers. By comparison, he said there are fewer than 100 smaller OEMs with limited in-house production capabilities, which predominantly use contract manufacturers to produce the component parts.

“Distributors play a key role in the medical grade raw material supply chain,” Smith declared. He noted that distributors provide value-added services such as just-in-time delivery to manage inventory costs, precision grinding and sawing, small quantities for prototyping, and supplying non-standard grades of material.

Defining the role of the distributor, Smith urged OEMs to “work with a distributor on blanket orders whenever possible. This commitment enables the distributor to negotiate long-term price agreements and raw material hedge contracts with the mills, thereby enabling the distributor to offer firm pricing, with material always available on the shelf, for delivery as you need it to meet your production schedule.”

(Continued on pg 14)
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According to information on its website (http://www.edgeintl.com), Edge International, based in Dayton, OH, is a division of Titan Metal Fabricators Inc. Edge is a stocking distributor of medical grade raw materials for the manufacture of implants and instruments used in the orthopaedic, spine and trauma sectors of the medical device industry. Titan Metal Fabricators, headquartered in Camarillo, CA, a reactive metal design, fabrication and metals distribution organization, acquired the assets of the metals division of Edge International in April 2017.

Other voices also recently contributed their expertise on titanium’s business opportunities in the global medical sector. Don Urbanowicz, principal at Urbanowicz Consulting LLC, appearing at the TITANIUM USA 2017 gathering, held last October in Florida, presented a talk on “Market Dynamics Impacting the Orthopedic Industry.” According to Urbanowicz’s market overview projections, orthopaedic product sales—(joint reconstruction, spine, trauma, arthroscopy/soft tissue and orthobiologics)—will reach an estimated $49.8 billion in 2017, $51.5 billion in 2018, and will climb to $57.3 billion by the year 2021, all of which presents an attractive growth-market opportunities for titanium (and other metal competitors).

He also pondered the near-term role of additive/3D printing as a viable technology to produce titanium orthopaedic products. Urbanowicz said 3D printing would be appealing to surgeons for solving complex trauma and joint replacement cases. He also wondered whether 3D printing might “disrupt the current business model by eliminating off-the-shelf implants and instead be printed by hospitals.”

Prabhu Gubbi, Ph.D., materials scientist/research manager for Zimmer Biomet Dental, discussed “The Role of Titanium in Implant Dentistry.” Citing a study by Grand View Research Inc., Gubbi said the global dental implants market is expected to reach $6.8 billion by the year 2024.

He confirmed that titanium is the “de facto metal of choice in implant dentistry,” due to its superiority in resisting corrosion and toxicity in tissues, lack of allergic reaction and mechanical strength. “Commercially pure titanium has the highest resistance to corrosion and is often regarded as the most biocompatible metal due to its stable/inert oxide layer,” Gubbi said. “Over 50 years of clinical research with higher than 95 percent overall success/survival rate make dental implants the best option for replacement of missing teeth.”

Dean Hutchinson, product manager, Arthrex Shoulder Arthroplasty, spoke about the “Opportunities for Materials Innovation in Orthopedics.” Hutchinson said the typical cost of an arthroplasty procedure—the surgical reconstruction/replacement of a joint to relieve pain and restore range of motion—is $40,000 for a hip; $35,000 for a knee; and $21,000 for a shoulder.

Hutchinson emphasized titanium’s properties as being perfectly matched for on-growth fixation to bones. Clinicians and original equipment manufacturers are “truly passionate” about this advantage for titanium. He suggested that producers of titanium implants should consider forming alliances with coatings suppliers to develop products with enhanced antimicrobial properties and on-growth compatibility with bones.

Jan Palan of Comtes FHT, a speaker at TITANIUM EUROPE 2017, held last May in Amsterdam, the Netherlands, shared thoughts on the “Development of Pure Titanium-Based, High-Strength Wires; Possibilities for the Medical Industry.” Palan began the talk first by stating the importance of the topic, noting that pure titanium is considered the most biocompatible metal for medical implants (resistance to corrosion from bodily fluids, bio-inertness, capacity for osseointegration, and high fatigue limit).

However, for some applications, he pointed out that commercially pure (CP) titanium doesn’t have sufficient mechanical properties. “One way to improve mechanical properties is by adding alloying elements, but this could negatively affect biocompatibility. Another way to increase the mechanical properties is to refine the structure to the level of nanometers using Severe Plastic Deformation (SPD).” Utilizing SPD is a method to “refine the structure to the level of nanometers, thus improving mechanical properties.”

Comtes FHT’s “Conform SPD” technology, typically used for continuous extrusions of various profiles from nonferrous alloys, is used for the production of nanostructured, high-strength wires. Palan said the company has developed a system for combining Conform SPD with equal-channel angular pressing (ECAP), which provides a process for the cold extrusion of titanium. As a result, the nanostructured CP titanium retains its biocompatibility combined with even higher strength than a Ti6Al4V alloy.

Achieving improved mechanical properties, combined with titanium’s inherent biocompatibility, enables designers to create smaller, stronger medical implants, according to Palan. “This is a product with high added value, where the use of nanostructured (CP) titanium delivers improved properties, and therefore increases the price,” he said. “However, the effect of the higher material prices on total manufacturing costs will be minimal.”
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When shopping for a friend on a given special occasion (a holiday, birthday, career promotion or anniversary) the question arises: what to get for the man or woman who has everything? If you're looking for a consumer product that's hot, high-tech, ergonomically designed, stylish and functional, then you might consider purchasing a titanium comb. (Yes, a titanium comb!)

In recent years, several companies, at least one in Japan and two in the United States, have ramped up production of titanium combs, a specialty consumer product that, for the most part, is marketed and purchased through online channels. The sales pitch is to a youthful demographic (Millenials and Gen X and Y types) who have a leading-edge sense of cool style, an appreciation for "hipster" sensibilities, and seek a distinctive personal-care/grooming item that makes a fashion statement and serves as a conversation piece.

One can imagine that, a young woman or man, mingling at a café, a dance club, or an art gallery reception, would select a choice moment to take out their titanium comb for a quick hairstyle touch up—catching the eyes of all those around them. The impromptu, ice-breaker conversation might begin with a question, something like: "Hey, what kind of comb is that?" The cool, confident hipster reply would be: "This is my brand new titanium comb."

The comb manufacturers confirm that they are capitalizing on titanium's cachet as valuable, durable material, spanning a variety of applications and consumer products, such as camping gear, eyeglass frames, jewelry and home improvement tools. The marketing strategy here is to translate and extend titanium's prestige to a personal care item, like a comb.

Five years ago Nara Seiko Inc., Sakurai, Nara, Japan, began developing titanium combs for pet care products and recently launched a personal care version of the comb. A company spokesman, responding to email "interview" questions, said Nara Seiko uses the workhorse aerospace alloy Ti-6A1-4V for combs with a range of sizes, shapes and comb pin configurations.

When asked why the company chose titanium for the comb product line, the spokesman said the Nara Seiko selected titanium as a benefit for pet groomers. Using combs in the repetitive task of trimming and cleaning pets all day long can be taxing and cause tendon inflammation in the arm and wrist. Titanium offers the advantage of light weight and strength compared with stainless steel and plastic, and produces less static electricity than plastic or steel.

As for the manufacturing process used by Nara Seiko, the spokesman said titanium combs are produced via traditional machining processes, along with various polishing techniques and the laser welding for the comb pins.

Nara Seiko sells the titanium combs throughout Japan and is now considering introducing the product to export markets, including North America. The spokesman said the company's comprehensive marketing plan for the combs is "on the anvil," meaning it's under review in terms of how it will be shaped. The combs are designed for women and men, with a sales strategy that will include offering the product through retail chains as well as via online. Based on the favorable reviews of its comb, Nara Seiko is considering the development of other titanium personal care and pet care products, such as scissors.

(Continued on pg 18)

Metal Comb utilizes a... “heavy dose of time, effort and elbow grease. We do not outsource the critical finishing process.”

Figure 1. Chicaco Comb Titanium Comb

Figure 2. Nara Seiko titanium combs
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- Ti 6Al/4V (Grade 5)
- Ti 3Al/2.5V (Grade 9)

www.ametekmetals.com
Titanium Combs Provide an Upscale Product & a Cool Fashion Statement for Consumers (continued)

Founded in 1968, the company (website: www.nara-seiko.co.jp/english) has 47 employees, a machine tool fleet of 40 CNC lathes, seven machining centers and other production equipment. Nara Seiko designs and manufactures titanium product lines for the medical, aerospace and transportation markets. 

In the United States, two companies (Chicago Comb Co. and Metal Comb Works) produce and market titanium combs. Chicago Comb (website: www.chicagocomb.com), founded in 2010 and based in its namesake city, is the creation of co-founders and long-time friends John Litwinski and Tedd Strom. Litwinski said Chicago Comb’s marketing efforts involve putting a spotlight on titanium as an upscale material, a notoriety that American consumers embrace and fully understand.

However, as a “luxury” personal care product, he said titanium’s upscale reputation in America also translates well with consumers in China, Russia and Canada—three countries that represent part of Chicago Comb’s online customer base. He said titanium offers advantages for combs in terms of design, ergonomics and functionality when compared with alternative metals such as stainless steel.

Litwinski said Chicago Comb’s manufacturing system involves obtaining commercially pure (CP) titanium sheet from a mill in Ohio. Triton Industries Inc., a metal fabrication company based in Chicago, does the laser cutting of the sheet. Another job shop, also located in Chicago, does the metal polishing, while Chicago Comb, with its four employees, does the finishing and engraving.

A 2001 graduate of Georgetown University Law Center, Litwinski said he worked for a law firm for several years, but then began to contemplate a career change when he “felt a need to make stuff.” That feeling may have been a seed planted by Litwinski’s father, who worked as a mechanical engineer. Strom, Litwinski’s partner, is a 1998 graduate of the University of Iowa and has worked in the marketing field throughout his career.

Jeff Grant launched Metal Comb Works, San Marcos, CA (website: http://www.metalcombworks.com), in 2013. He also serves as the president of Coating Services Group LLC, Lakeside, CA, which specializes in physical vapor deposition (PVD) titanium nitride coatings for aerospace, firearms and medical components. Grant said he hatched the idea for Metal Comb with his son, Nathan, to create a product that would be “new and cool” and appeal to a young demographic.

Father and son decided to explore the development of an “everyday carry item,” a grooming product that would fit a lifestyle need. After doing research and test marketing product ideas with Nathan and his friends, the stylish titanium comb won rave reviews. Grant then sought funding through Kickstarter, a “crowd funding” company based in New York, to establish Metal Comb Works. According to its online mission statement (www.kickstarter.com), Kickstarter “helps artists, musicians, filmmakers, designers, and other creators find the resources and support they need to make their ideas a reality.”

Metal Comb sources its titanium sheet (Ti-6Al-4V) from a San Diego metal service center/distributor then sends the metal blanks to a laser cutting operation in Anaheim, CA. Grant’s sons Nathan and Kyle, along with several part-time employees, then do a 17-step process to finish and polish the combs at the San Marcos headquarters. According to information on its website, Metal Comb utilizes a Burr King belt grinder and a Baldor polisher, along with a “heavy dose of time, effort and elbow grease. We do not outsource the critical finishing process.” The array of Metal Comb’s titanium combs feature creative designs and iconic images, such as a skull and crossbones or the insertion of silver U.S. dimes, which show a profile of the mythic god Mercury.

The two U.S. comb producers have similar approaches to business. Both proudly trumpet they are American manufacturers with a hip entrepreneurial spirit, and are well aware that consumers recognize titanium as a quality material. Both have a keen focus on how their products are marketed to convey functional design advantages as well as a fashion statement, especially among younger consumers, and make use of social media to communicate with their target customers.
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ITA shines a ‘Spotlight’ on Titanium Industry

The International Titanium Association (ITA) is launching its “Industry Spotlight” series, a new communications and information tool for the global titanium industry.

ITA associates will interview executives of member companies, creating a short video profile of the company’s operations. During the interview segment, executives will talk about the company’s genesis and history, their current business strategies, as well as the products and services they offer as part of the global titanium supply chain. The videos are online for ITA members, industry observers and stakeholders and will be included in the quarterly online editions of Titanium Today.

The first Industry Spotlight segment features Melanie Cunningham, the president of Titanium Finishing Co., based in East Greenville, PA. Founded in 1970, Titanium Finishing does anodizing work on titanium components. Cunningham explained that the anodizing process creates coatings that impart lubricity, color and other surface properties.

ITA is currently scheduling video interviews for the Industry Spotlight series for the remainder of 2018. To learn how your company may be included in this series, contact Jennifer Simpson, ITA
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Architectural Titanium, Quite Literally, Glistens as a High-End Application on the Global Stage
By Michael C. Gabriele

Whether it’s a high-end department store in Canada, or lavish palaces in the Middle East, or a grand variety of commercial, industrial and residential structures in the Netherlands, India, Hong Kong or the United States, architectural titanium is well established as a showcase application on the global stage. And for over 20 years, the company, aptly named Architectural Titanium, based in Lawrence, KS, has served as a consultant to help usher titanium onto that stage.

Gary Nemchock, the president and founder of Architectural Titanium, is a familiar face as a guest speaker at many TITANIUM conferences, organized by the International Titanium Association. As outlined on its website (www.architecturaltitanium.com), the company’s mission involves offering “a full range of products and value-added services specifically designed for architectural applications. Advanced processes and cutting-edge technologies are utilized to provide architects, designers and artists with distinctive design solutions.”

The company unveiled details of a recently completed project that represents the range of capabilities and properties of titanium as an architectural material of choice. Vicki Eudaly, vice president of Architectural Titanium, outlined specifics of large, exterior titanium “blades” that create a striking aesthetic design statement for the façade of La Maison Simons, a venerable fashion store located in Alberta British Columbia, Canada. Eudaly said LeMay Michaud of Quebec, the building’s architect, created a cascading series of torqued blades made of commercially pure (CP) titanium Grade 2. Uniti Titanium LLC, Corapolis, PA, supplied the torqued blades, 343 in all, at a thickness of 1.5 mm (0.060 inches), ranging in length from 16 to 41 feet and weighing in at 14,000 pounds.

Eudaly said the blades have a G1 roller-embossed matte finish. Leder Steel Ltd., Acheson, Alberta Columbia, Canada, did the installation and even built custom-designed crates to ship the titanium blades. She explained that each vertical blade is torqued to a specific point and locked in place with steel bolts into a steel exterior frame. Moving along the building, the blades catch the changing sunlight and create the distinctive appearance of movement. “The titanium seems to completely change color depending on the light—sunrise reflection makes it appear golden,” Eudaly said. “The visual effect produced is a dance of light and shadow that recalls the natural phenomenon known as the Aurora Borealis. The subtle reflectivity of the titanium produces a variety of spectral colors as the lighting conditions change. The blades cover all three sides of the department store, located at the end of a shopping mall.” She said that the owner of the fashion department store visited the iconic, titanium clad Guggenheim Museum in Bilbao, Spain, designed by Frank Gehry, which opened in October 1997. As a result, Mr. Simons so loved the look of titanium on the museum that he used the metal for stores.

Interviewed three years ago, Nemchock estimated the current global market for architectural titanium is 500 tons. However, Eudaly pointed out that the architectural titanium market is subject to the vicissitudes of international economic trends. Building contracts that specify the use of titanium typically require long lead times and involve numerous design changes. She did say that the draw for using titanium for structures is almost equally divided between exploiting the metal’s aesthetic characteristics and its physical/mechanical attributes of low maintenance and corrosion resistance. As an example of this range, Eudaly said the company currently is involved in the use
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Architectural Titanium, Quite Literally, Glistens As a High-End Application on the Global Stage
(continued)

aesthetic application of architectural titanium for the buildings of Spiritual University, Punjab, India, and Sun Plaza Shopping Center in Jakarta, Indonesia, as well as an industrial pumping station in the Netherlands, which manages the safe passage of fish populations.

In the United States, two noteworthy structures have incorporated architectural titanium. First is the Houston-based headquarters of international shipping company Chipolbrok America Inc., designed by Ted Trout Architect and Associates Ltd. Completed in 2011, the four-story office building has a main entrance that features architectural titanium. Second is the Denver Art Museum, designed by Daniel Libeskind, which opened in 2006 and has over 230,000 square feet of titanium on its exterior surfaces.

Asia is home to many modern buildings and structures that feature the extensive use of architectural titanium. Recent examples, all competed in 2011, include Tokyo’s Haneda Airport D Runway Pier; the Hefei Lakeside International and Convention Center in China; and the Saemangeum Exhibition Center in Korea.

Since it was established in 1997, Eudaly said Architectural Titanium has promoted the use of titanium for diverse architectural applications including exterior cladding, curtain walls, roof cladding, column covers, soffits, fascia, canopies, interior cladding, light fixtures as well as art, sculpture and monuments. According to company literature, titanium provides a “combination of corrosion resistance, strength, light weight, and durability gives it the longest life span of any metal, under any conditions, with minimal maintenance. Its unique reflectivity is unmatched by any other metal. And with innovative designs that exploit its attributes, titanium is highly practical, especially when life cycle issues are considered.” The metal offers the ability to create a spectrum of colors, reflectivity and textures through anodizing and industrial finishing techniques. Titanium offers a low coefficient of thermal expansion (similar to glass and concrete), is environmentally friendly (will not erode, corrode or leach metal ions), and has a life cycle warranted for 100 years against through-wall corrosion.

Eudaly also underlined the company’s signature product line: Crystal Titanium®. As described on the Architectural Titanium website, Crystal Titanium “is a proprietary custom metal, patented and manufactured by Architectural Titanium. Mill-finish titanium sheets or plates are secured in custom fixtures in a specialized furnace where the vacuum is equivalent to outer space. The furnace is gradually heated to near the (metal’s) melting temperature (around 3000˚F). During this precision controlled cycle, the titanium’s natural crystal structure begins to enlarge and reorient. The crystals grow in a columnar pattern across the thickness of the titanium. A transition from hexagonal to cubic crystal alignment creates the uniquely faceted, specular orientation of crystal growth and size. The resulting visual aesthetic is unmatched by any other metal and is only available in titanium.” Architectural Titanium developed the closely guarded surface-treatment system.

As detailed in a previous interview, Gary Nemchock’s journey into the realm of architectural titanium began in the late 1960s, when he was trained as a goldsmith designer in Copenhagen. Originally from Chicago, became a professor at the University of Kansas from 1971 to 1986. He became involved in the architectural metals industry in 1986 and became Architectural Titanium in 1997 when hired by TIMET as a consultant to develop the architecture market.

(Continued on pg 26)
The following chart provides a quick overview of the features and advantages of TFC’s coating processes:

<table>
<thead>
<tr>
<th>substrates</th>
<th>advantages</th>
<th>benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium</td>
<td>Stable base for other coatings &amp; adhesive bonding; appearance; color coding</td>
<td>Prevents fretting &amp; galling</td>
</tr>
<tr>
<td>Titanium Alloys</td>
<td></td>
<td>Natural, reproducible colors</td>
</tr>
<tr>
<td>Aluminum</td>
<td>Non-toxic;</td>
<td>Corrosion-resistance</td>
</tr>
<tr>
<td>Steel</td>
<td>Non-hazardous;</td>
<td>No hydrogen embrittlement</td>
</tr>
<tr>
<td>Alloys</td>
<td>Nonpolluting</td>
<td>High operating temperature (1100°F)</td>
</tr>
<tr>
<td>Titanium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>Hardness; eliminates burning &amp; dissolution of parts</td>
<td>Allows aluminum application where wear, corrosion or other factors would otherwise exclude its use</td>
</tr>
<tr>
<td>Aluminum Alloys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virtually all metals</td>
<td>Automatic &amp; manual application; TFC processes comply with a variety of mil specs; combines with other coatings</td>
<td>Provides excellent lubricity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Improves corrosion resistance</td>
</tr>
</tbody>
</table>
Architectural Titanium, Quite Literally, Glistens As a High-End Application on the Global Stage (continued)

Project: La Maison Simons, Alberta BC
Architect: LeMay Michaud, Quebec
Material: Uniti - CP Grade 2 - G1 finish - 0.060” thick
Volume: 14,000 pounds

The architects designed “blades,” ranging in length from 16’ to 41’, that were locked in place with giant steel bolts to a steel frame at the top. Then each blade was torqued to a specific point and locked into place into the bottom of the frame. Moving along the building, the blades seem to move. Photos show how the titanium seems to completely change color depending on the light — sunrise reflection makes it appear golden. The blades cover all three sides of the department store, located at the end of a shopping mall. (Note: The owner, Mr. Simons, visited the Guggenheim Museum during the grand opening in Bilbao. He so loved the titanium that he used it on his next store. Then the next, and the next — we did a total of five Simon’s stores.)
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When it comes to pondering the use of titanium for the global production of bicycles, one might say that the wheels are always turning when it comes to the latest designs and technology, and that industry trends and consumer preferences go in cycles.

Andrea Carolina Clark, titanium product manager, Continental Steel & Tube Co., Fort Lauderdale, FL, will share her perspective on “The Future of the Global Bicycle Industry” during the TITANIUM EUROPE 2018 Conference and Exhibition, sponsored and organized by the International Titanium Association (ITA), which will be held May 14-16 in Seville, Spain.

According to an abstract of her presentation, Clark will deliver an in-depth assessment of the future of the global bicycle industry. She will examine the current drivers of the bicycle industry in different world regions and it emphasizes on the growing demand for titanium bicycles and the expected global sales market in 2025.

Clark, in her presentation, indicates that the global bicycle industry is expected to continue growing as various organizations continue to advocate for cleaner environment, cheaper energy and a healthier lifestyle. High demand for low-cost transportation in developing countries as well as the subjective category of consumer market for bicycles typi-cally takes it cues from advances in the highly competitive, international sport of cycling, with demanding, aerospace-like specifications for bike frames and related components.

Bicycle manufacturing, especially for professional racing, is a complex balancing act that involves speed, safety, lightweight aerodynamic designs as well as the subjective category of rider “feel and comfort.”

Still, titanium has maintained its share of fans in the bicycle business. And based on Clark’s observations, the international bicycle industry, as a whole, continues to show signs of growth and it’s expected that titanium will benefit from this trend. Cycling historian Jeff Groman, who sold, built and repaired bikes for 35 years and was the proprietor of Classic Cycle on Bainbridge Island, WA, said “bike riders and bike builders still love titanium.” Groman, interviewed three years ago, said many bike builders have learned how to properly weld and machine titanium, he said. And for riders who live in Groman’s neck of the woods—the habitually rainy Pacific Northwest—titanium bikes never rust.

(Continued on pg 31)
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“There’s no downside to titanium when it comes to bikes,” Groman declared. “For riders, titanium bikes have a great ‘feel,’” meaning that the bikes provide a solid, comfortable, smooth ride. “The feel is similar to steel for bike riders, but titanium is stronger and lighter. And when you get off the seat and pedal up hill, a titanium bike really moves.”

Clark, interviewed just prior to departing for the TITANIUM EUROPE 2018 gathering, said that Continental Steel & Tube, supplies titanium tubing to bicycle manufacturers. According to Clark, Continental Steel & Tube's experience within the industry "allows us to approach other manufacturers with confidence. We make regular personal visits to bicycle manufacturers to promote our raw materials. We are strictly a material supplier and distributor of raw materials (from select mills) including titanium tubing, which is the main product we supply to the titanium bicycle industry."

Bicycle production, based on steady consumer demand and the growth of cycling as a popular international sport, remains strong in North America, Europe, Asia and Australia. "In terms of production of titanium bicycle, China dominated the global market with a share of 41.6 percent in 2017 and is projected to grow up to 43.5 percent by 2025," she said, providing a preview of her conference talk. Clark said that major factors driving the growth of this market in this region include: the skills required by new production workers or engineer in the industry are relatively basic and can be acquired over short periods of time, which attracts thousands of low-income workers; population growth and the desire for alternative modes of transportation; and increasing affluence and the benefits of maintaining healthy, active lifestyles. Clark said Grade 9 (Ti3Al-2.5V), Grade 2 and Grade 5 (Ti6Al-4V) remain the most popular titanium alloys for bicycle production, echoing the observations made by the Bicycle Times article for bicycle production in the 1980s.

Continental Steel & Tube (https://continentalsteel.com), an ISO 9001:2008 registered company, is a distributor of titanium, stainless steel, nickel, steel, aluminum, brass and bronze, with distribution centers in Miami, Houston, Chicago, Detroit, Los Angeles, and the New York City metropolitan area. Clark was born in Colombia and moved to South Florida when she was 12 years old. After attending school at Florida International University she worked in the aerospace industry supporting the C-130 and F-16 programs for four years. Since 2008 she has held the position of titanium product manager at Continental Steel & Tube. Being bilingual in English and Spanish has been a very valuable asset in her career development, allowing her to fully interact in the international market.
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EXECUTIVE SUMMARY
The International Titanium Association (ITA) hosted and organized the first TITANIUM ASIA 2018 conference and exhibition, which was held Feb. 4-5 at the Grand Hyatt Singapore, located on the Asian island city/state. The gathering in Singapore featured an array of guest speakers, with each bringing their own assessment of the global titanium industry, and an emphasis on the all-important global aerospace industry.

Prior to the Singapore gathering, there were developments in the aerospace industry. Several news outlets reported Boeing is pursuing an alliance with Brazil’s Embraer, with a focus on the market for 70- to 130-seat jets. Fortune and Flight Global had online stories on talks between the two companies last December. The New York Times, in its Feb. 4 edition, wrote that the partnership discussion had hit a “headwind” due to scrutiny by the Brazilian government. A number of stories suggested the Boeing/Embraer talks were spurred by a recent alliance between Airbus and Bombardier.

Separately, European aerospace giant Airbus recently announced plans to ramp up production of its A320 jets at an existing assembly facility near Beijing. A Jan. 9 report by BBC News, along with a similar Airbus press statement, said the company expects to produce six A320 jets a month by the year 2020. Aerospace remains a high-profile global business market for the titanium industry and much of the projected growth will be generated by the greater Asian region.

In addition, The New York Times, The Guardian, and Reuters, recently posted online articles speculating on the fate of the superjumbo Airbus A380. Some wondered whether Airbus had plans to phase out this aircraft, but CNN/Money and Forbes reported the United Arab Emirates-based carrier Emirates Airlines, in mid-January had placed an order of 20 A380 jets, with an option to purchase 16 more, a deal worth an estimated $16 billion.

Nicole Lecca, the Airbus senior vice president of materials and parts procurement and the chair of the Airbus material board, referred to the recent UAE transaction, noting that “2018 is already starting well for the giant European aerospace company. Lecca served as the distinguished guest speaker for the Singapore conference. She recapped Airbus’ 2017 performance, noting that there were 718 deliveries of jets, with a backlog of 7,265 planes. She said 35 percent of Airbus’ 2017 deliveries went to the Asian market, compared with 16 percent for North America and 13 percent for Europe.

Nicole Lecca, Senior VP, Material & Part Procurement – Airbus

According to Lecca, aerospace industry titanium demand for the foreseeable future will be driven by the growing adoption of carbon fiber reinforced polymer (CFRP) manufacturing for airframes and novel designs for pylons—structural components used to hold jet engines in place. Each day the Airbus supply chain consumes 50 metric tons of titanium, she said.

Henry Seiner, Vice President, Business Strategy – TIMET, Titanium Metals Corporation

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Henry Seiner, vice president of business strategy for Titanium Metals Corp. (Timet), and the chair of the ITA’s board of directors, addressed the topic of “Non-Aerospace Demand: Trends and Forecasting.” Seiner has extensive experience in the titanium industry, is responsible for Timet’s international supply chain, and oversees the company’s marketing, product management, purchasing and production planning.

Seiner said that, from Timet’s perspective, the 2016 global market, estimated at 150,000 metric tons, was broken out as 45 percent for commercial aerospace and 55 percent for other business sectors, which include military, industrial, consumer, and emerging markets.
such as mining, automotive and architecture. Mill product shipments by market in 2016, just over 80,000 metric tons (excluding commercial aerospace), shows the general industrial sector capturing the largest share of “volume,” followed by military and emerging markets.

Examining individual industrial markets, Seiner said titanium’s main volume in power generation typically has been driven by nuclear power plants. “The shift to investments in renewable energy sources in the future could impact titanium demand.” Titanium’s well-documented corrosion resistance properties have been the key advantage in the chemical processing industry (CPI). He said titanium has been “an integral part of CPI since the early 1960s and is viewed as a strong source of growth in the future.”

In recent years desalination infrastructure has been an attractive if somewhat uneven market for titanium, with critical demand coming from projects in Saudi Arabia. However, major new desalination projects have been pushed out to 2020, Seiner said. Titanium applications in oil and gas exploration have been limited due to cost, although titanium does have a niche in deep-floating platforms.

Offering a forecast for mill product shipments (excluding commercial aerospace), based on internal Timet estimates, Seiner said shipments are expected to see a steady climb and reach 120,000 metric tons by the year 2030, with most of the shipments going to industrial and consumer markets.

Dr. MP Sukumaran Nair, chairman of Kerala Minerals and Metals Ltd. (KMML), discussed India’s growth plans for the titanium sector. He said India’s overall economy is slated to reach $5 trillion by the year 2025, with an annual growth rate of 7 to 8 percent. With a population of 1.3 billion people, Sukumaran Nair said India “can achieve its full manufacturing potential as it looks to benefit from its demographic dividend (with 65 percent of its population in the 15-64 age group) and a large workforce over the next two to three decades.”

The value of India’s manufacturing sector in 2017 was estimated at $311 billion, with a compound annual growth rate of over 7 percent. “By 2030, the Indian middle class is expected to have the second largest share in global consumption at 17 percent,” he said. “Investments in the Indian manufacturing sector have been on the rise, both domestic and foreign. Initiatives like ‘Made in India’ and sector specific incentives to various manufacturing companies, are aiming to make India a global manufacturing hub. ‘Skill India’, a multi-skill development program, has been started to equip the workforce with the necessary skills required by the (manufacturing) sector.”

Regarding near-term plans, Sukumaran Nair said there will be a two-phase expansion of TiO2 production capacity to 100,000 metric tons per year from 40,000 metric tons. In addition, India is making investments in its “titanium downstream industrial complex” for producing value-added products from zircon, natural rutile, and titanium sponge. Efforts also are underway to boost the manufacturing of titanium mill products.

Heming Hao, market analyst, Argus Media, delivered a review of the Chinese titanium sponge market. Hao said annual titanium sponge output peaked at 80,000 metric tons in 2012 and 2013, but fell to just over 60,000 metric tons in 2017, with a capacity utilization of 74 percent. As for individual producers, Panzhihua Steel Titanium had the highest output at 13,000 metric tons, followed by Baotai Huashen and Zunyi Titanium (each with 9,000 metric tons), Luoyang Sunrui Wanjiti Titanium and Chaoyang Jinda (each with 8,000 metric tons), and four other companies.

China’s titanium sponge exports totaled 1,900 metric tons in 2017, compared with imports of 3,843 metric tons, according to Argus estimates. “Prices reached a five-year high at the end of May, supported by tight supply and higher production costs caused by environmental checks,” Hao said.

Günter Busch, an executive from the Southeast Asian Operations of ALD Vacuum Technologies GmbH, Hanau, Germany, shared his thoughts on “Titanium Powder – the Raw material of Future Production.” He began by identifying additive manufacturing/3D printing as one of the key technologies of the
future. Metal powder (titanium, along with high grade and stainless steel, nickel-based and nickel/cobalt-based alloys and precious metals), with spherical particles in a range of 15-100 \( \mu m \) diameter, will be in demand for electronics, industrial, energy, aircraft and aerospace applications. Specific applications include medical implants, aircraft engine turbine blades and disks, and automotive valves, impellers and pistons.

Busch provided an overview of an ALD powder production system, using an illustration that showed the charging feeding device, the melting section, melting coil, the atomization nozzle, spray cone, powder tower, exhaust of inert gas and cyclone, pneumatic powder transport tube, and the powder collection vessel. The system features melting in a high-frequency open coil induction process with an argon gas atmosphere. He said the best way to produce high purity titanium alloy powder is to use an open high frequency induction coil for the melting. “The morphology of the powder produced with inert gas atomization is spherical.”

He summarized his presentation by saying new 3D printing technologies will increase productivity and significantly reduce the costs to produce parts for a variety of applications. Spherical powder will fulfill the demanding requirements of additive manufacturing processes. The electrode inert gas atomization (EIGA) technology can achieve contamination free and spherical titanium or titanium alloy powder.

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Stephen R. Smith, the president of Edge International, gave a talk on “The Role of the Distributor for Medical Grade Raw Materials.”

As for the customers for medical grade raw materials, Smith said there are five major original equipment manufacturers (OEMs), representing 61 percent of the worldwide market (as of 2015), with their own in-house manufacturing, supplemented by contract manufacturers. By comparison, he said there are fewer than 100 smaller OEMs with limited in-house production capabilities, which also use contract manufacturers.

“Distributors play a key role in the medical grade raw material supply chain,” Smith declared. He noted that distributors provide value-added services such as just-in-time delivery to manage inventory costs, precision grinding and sawing, prototyping, and supplying non-standard grades of material.

Defining the role of the distributor, Smith urged OEMs to “work with a distributor on blanket orders whenever possible. This commitment enables the distributor to negotiate long-term price agreements and raw material hedge contracts with the mills, thereby enabling the distributor to offer firm pricing, with material always available on the shelf, for delivery as you need it to meet your production schedule.”

According to information posted on its website (http://www.edgeintl.com), Edge International, based in Dayton, OH, is a division of Titan Metal Fabricators, Inc. Edge is a stocking distributor of medical grade raw materials for the manufacture of implants and instruments used in the orthopaedic, spine and trauma sectors of the medical device industry. Titan Metal Fabricators, headquartered in Camarillo, CA, a reactive metal design, fabrication and metals distribution organization, acquired the assets of the metals division of Edge International in April 2017.

Smith gave a second presentation on “Titanium Technology in Medical Applications.” He estimated that medical devices in 2017 used 1,500 metric tons of titanium, for “head to toe” biomedical implants such as internal fixation (bone plates, screws and pins), prosthetics, extremity and joint replacements, dental implants, inner body devices, as well as surgical instruments.

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“Distributors play a key role in the medical grade raw material supply chain,” Smith declared. He noted that distributors provide value-added services such as just-in-time delivery to manage inventory costs, precision grinding and sawing, prototyping, and supplying non-standard grades of material.

Stephen Smith, President – Edge Intl/Supra Alloys

“The future for medical grade titanium looks bright,” Smith said. “The aging baby boomer demographic wants to continue to stay active. The health industry is pushing all ages to lead more active lives. Growth for medical grade raw materials is projected to be three to five percent per annum over next five years. Medical industry will continue researching new

(Continued on pg 40)
Our specialty is metal conditioning, utilizing customized systems that are built to the individual needs of steel mills, forge shops, and titanium producers. The capability to grind any size or shape within the limits of the horizontal and vertical travel of the grinding head, combined with our cantilevered boom arrangement, provide the flexibility required for job shop operations without sacrificing the productivity necessary for high-tonnage applications. Please visit our website for more information on all Mid-West Machine™ equipment, or contact us today and get more specifications on how the 6840T could benefit your operation.
and innovative uses for titanium. Distributors play a key role in the medical grade titanium supply chain.”

A presentation by Gary Lantzke, chief executive officer of Callidus Welding Solutions, detailed “The Evolution of Titanium in HPAL” (high-pressure acid leaching). HPAL began in 1998 as a method to extract nickel, copper and cobalt from laterite ore. Lantzke provided an illustration of an extraction process that showed titanium grade 12 (Ti0.3Mo0.8Ni) is used in autoclave nozzles and pipes, pre-heaters, steam piping, flow-control valves, blast tubes and process-slurry pipeline. Titanium nitriding is a standard solution for the erosion control of parts in the process.

Edward Jones, chief operating officer of Hangsterfer’s Laboratories Inc., provided a review of advanced cutting fluids and lubricants. He raised several points for consideration, such as confirming the use of metal cutting fluids that are compliant with REACH (registration evaluation authorization and restriction of chemicals) specifications in Europe and Asia. Jones pointed out that most commercially available cutting fluids are based on outdated formulations from the 1970s, containing boric acid, formaldehyde and secondary amine—“substances of very high concern.”

Optimum tool and machine performance is another factor to consider. “Lubricants are often the last part of the process to be considered,” he pointed out. “Often the process is engineered to the limitations of the lubricant not the limitations of the tools and machine.”

Founded in 1937, Hangsterfer’s Laboratories specializes in the research, development and custom formulation of a full-line of REACH-compliant metalworking lubricants, including emulsifiable oils, semi-synthetics, synthetics, straight cutting oils, drawing and forming compounds.

Jeremy Halford, president of Arconic Engineered Structures, discussed “Driving Growth Through Innovation; Commercial and Military Titanium Demand.” According to Halford, the aerospace industry currently has transitioned from the “era of design to the era of delivery.” He explained that the previous era of design “focused on development and introduction of new designs and technology, resulting in an unprecedented number of recently or soon-to-be introduced models,” such as the A320neo, and the 787 Dreamliner. The focus for the present era of delivery is on “transitioning to new airframe and engine platforms.” This means materials and process innovations are critical, such as Arconic’s 3D printing capabilities, according to Halford.

The aerospace industry forecasts it will need more than 41,000 new aircraft during the next 20 years, with a dollar value of $6.1 trillion, according to Halford. As for the demand for aerospace materials, titanium is expected to grow at a compound annual growth rate of 4 percent through the year 2020, equivalent to a titanium market worth of $4 billion. He explained that titanium is growing in conjunction with the expanded use of with composites, due to titanium/composite compatibility.

Halford also noted that the trend for global defense spending is rebounding, as this category reached an overall level of $1.8 billion in 2017, led by the Americas at $710 billion. He said continuing global conflicts, the need to replace aging aircraft and systems, and a strengthening of the global industrial base all will fuel the growth in defense spending. He said titanium will maintain strong growth in U.S. military aerospace platforms such as the F-35.

Nicholas D. Corby III, the titanium product manager for ELG Utica Alloys Group, shared his insights on “Titanium Scrap Trends; Impacts of a Dynamic Market.” ELG Utica Alloys is involved in the processing of titanium and superalloys turnings and solids, with global revert management programs in 12 locations in six countries, along with another 34 facilities.

Corby compared the advantages of scrap versus sponge (for the production of 1 metric ton of titanium), saying scrap offers a 95 percent reduction in both energy consumption and carbon dioxide emissions. Because of the value of titanium scrap, many OEMs, especially those in the aerospace sector, are controlling their revert supply.

U.S. titanium scrap consumption in 2017 reached nearly 40,000 metric tons, compared with about 25,000 metric tons in 2013, according to a bar chart displayed by Corby. Titanium scrap consumption peaked at just above 50,000
TITANIUM ASIA 2018 | Executive Summary (continued)

metric tons in 2011, according to Corby. He provided an overview of revert business activities in Europe, Russia and Japan. In France, a joint venture between Aubert & Duval, UKAD, ADEME (Energy), CACF (Finance) began qualification of revert operations in 2017, with industrial production slated to begin in 2018. However, the VDM melting facility in Essen, Germany, has closed. In Japan, a joint venture between Nippon Steel and Sumitomo Metal Corp. (NSSMC) has an agreement to supply aerospace system supplier SAFRAN, while Kobe Steel began supplying GE with Ti64 forgings in 2017. Russia has seen increasing scrap generation due to partnerships with OEMs delivering finished and semi-finished parts. And the utilization of skull furnaces will enable VSMPO to recycle domestic scrap that was previously available in Europe and the United States. “Technical expertise and new players in aerospace will increase competition and opportunities for new entrants,” in the global scrap market, he said.

Shuanshao Jia, general manager of Baoji Titanium Industry Co. Ltd., provided an “Outlook of the Titanium Industry in China.” Regarding the situation for titanium sponge producers in China, Jia said there currently is “massive overcapacity but a shortage on aerospace-level titanium sponge supply. In 2016, the overall output of titanium sponge in China was around 67,000 metric tons, but the capacity utilization reached only 76 percent. Currently, the top 10 companies share the market, but only four can produce the aerospace-qualified titanium sponge.”

Jia described the situation for the titanium material manufacturers in China as having excess capacity in low end and lack of high-end product supply. Jai said titanium material supply in China is highly dispersed, with more than 400 titanium companies located in Chinese titanium valley, known as BAOJI city. As for titanium price levels, Jia said prices for plate and tube have risen since 2016, but prices are expected to hold steady in 2018.

Titanium demand is rising from China’s commercial and military aerospace sectors, along with industrial markets such as nuclear power, desalination and chemical processing. “Aircraft orders will push titanium demand.” Jia said some new applications like construction and the marine industry will be growth markets for titanium.

Graham Walker, the vice president of sales and marketing for AMETEK Reading Alloys, and a member of the ITA’s board of directors, offered insights on titanium master alloys: “Critical Raw Materials for Critical Applications.” Vanadium and molybdenum dominate the titanium master alloy market, with niobium weighing in at about 5 percent of the market. Vanadium represents about 80 percent, by weight, of all master alloys, with applications found in aerospace, industrial, consumer and medical markets.

Walker said vanadium supply remains tight with demand continuing to be strong, noting that vanadium pricing is primarily driven by steel demand. “Vanadium prices in China continue to drive the price in Europe and North America. Little additional vanadium capacity expected to be brought on line in the short term. Chinese rebar mandates and vanadium redox batteries will create significant additional demand on top of an already tight supply environment.”

Supply remains tight in the global molybdenum market as some supply sources recently have been eliminated, while demand is rising for oil and gas exploration and infrastructure applications. China currently accounts for 36 percent of world molybdenum consumption, up from 12 percent in 2016.

Walker’s said a list of key issues for master alloy producers features the following points: quality is non-negotiable; certification and approval of raw material suppliers; documentation of procedures; supplier understanding and acknowledgement of the risk of HDI’s (high-density inclusions); risk prevention strategies; inspection; record retention; and audit schedules. He added that master alloy producers “must be continually on the lookout for new high-quality suppliers,” while the narrow supply chain is increasingly risky.

He stressed that master alloy producers are more than just suppliers, “they are partners. There is a tremendous amount of collaboration necessary to ensure material is available for anticipated increases in master alloy demand. Master alloy producers have the same stakes in the current environment as the rest of the aerospace supply chain, and producers are operating under the same financial constraints as the rest of the supply chain. With limited capacity for aerospace-quality material, it’s important that titanium melts continually strengthen their strategic partnerships with master alloy suppliers in order to maintain the health of this critical part of the supply chain.”

This year the ITA (www.titanium.org) will sponsor the sixth annual TITANIUM EUROPE conference and exhibition May 14-16 in Seville, Spain. The gathering will include a field tour to tour the Airbus facility in Seville—the production site for the A400M Atlas, a four-engine turboprop military transport aircraft. To register for this event, contact the ITA by phone (303-404-2221) or email (ita@titanium.org). The TITANIUM EUROPE 2018 forum will provide a full spectrum of information on the latest business, technology and market trends and developments in the global titanium industry.

The ITA is an international trade association dedicated to the titanium metal industry. Established in 1984, the ITA’s mission is to connect the public interested in using titanium with specialists from across the globe who may offer sales and technical assistance. The ITA educates engineers, designers and business executives on titanium’s superior properties and explains how those properties can be exploited to enhance products and services. The ITA also strives to advance ideas in research, design, metallurgy and engineering, and serve as the leading forum to cultivate the exchange of ideas and support a diverse, dynamic, global industry.
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SOLAR ATMOSPHERES OF WESTERN PA ADDS MILLING CENTER

April 16, 2018 – Solar Atmospheres of Western PA recently installed a second machining center to support its newest service for customers – tensile testing.

By adding a brand new fully programmable 8100 RPM Haas VF2 milling center, Solar is now able to support the machining of flat tensile specimens. This machining ability fully complements the function of the 10,000 PSI hydraulic jaw that is an integral component of the Tinius Olsen 300SL tensile machine. These massive hydraulic jaws can grip either threaded round or flat specimens.

Feedback from a recent customer satisfaction survey revealed how important this new mechanical testing service is to Solar’s customer base. Service Steel Aerospace states, “The ‘in-house’ tensile testing has improved our delivery performance and we couldn’t be happier.”

If mechanical testing is part of your heat treating or brazing scope of work, be assured Solar Atmospheres of Western PA can support this need within hours after thermal processing is complete. Solar is Nadcap and Boeing approved for all room temperature tensile testing.

Please contact Mike Johnson at 724-982-0660 x2223 or mike@solarwpa.com. He will be glad to discuss your requirements with you. For additional information about Solar Atmospheres, visit us at www.solaratm.com.

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IN MEMORIAM

James E. Leopold
Founder of Vulcanium Corporation/RIGHTech Fabrications

Vulcanium Corporation/RIGHTech Fabrications founder Jim Leopold, entrepreneur, family man, unapologetic Cubs' fan and military hero, passed away on December 28, 2017, at 99 years old.

A lifelong salesman, Jim purchased a Chicago area manufacturing firm in 1967, specializing in titanium products for the metal finishing industry. The consummate salesman with an approachable pragmatism to engineering and design, Jim grew his little company into a leader in corrosion resistant equipment. He was among the first to champion the widespread use of titanium grid coils in nickel baths, the replacing of hanging slab anodes with titanium anode baskets, and the introduction of zirconium to galvanizers. Through his leadership, Vulcanium Corporation was one of the earliest members of the Titanium Development Association, now the globally recognized International Titanium Association. To his many, many friends and colleagues inside and outside the industry, he was universally well-known and respected for his integrity and negotiating skills.

Jim was also a pioneer in the titanium distribution business. In 1972, he opened Industrial Titanium Corporation, later known as Vulcanium Metals International and now part of the United Performance Metals division of O’Neal Industries.

A true war hero, Jim was drafted into the Army’s 47th Infantry in 1941. Captain Leopold’s military leadership and bravery won him four Purple Hearts, a Bronze Star, a Silver Star and a battlefield commission during World War II’s North Africa and European campaigns. He remained active in many veteran organizations. Jim is survived by his sons Richard (president of RIGHTech Fabrications) and Jay, and by his daughter Susie and their families.

Please contact ossipeemedia@gmail.com for any further information.
Coogee Titanium Pty., Ltd  

Coogee Titanium is a division of Coogee Chemical, a long-established privately held chemical business headquartered near Perth, Australia. Titanium R&D is based in the Melbourne, Australia area. Coogee has leveraged their chemical engineering expertise to advance a Kroll-like process for the continuous production of titanium and titanium alloy powder to production. A production facility with Gen 4 equipment is being built in Kwinana, Western Australia, Coogee Chemicals' headquarters and a major operations facility. The production plant will focus on the production of Ti 6-4 low oxygen powder for additive manufacturing, MIM, and other advanced manufacturing applications. Alloy development will remain in Melbourne.

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Cosen Saws  
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Founded in 1976, Cosen is one of the world's leading band saw manufacturers with a broad product line and a global sales network including Cosen USA and Cosen Europe. Cosen's North American office and warehouse is located in Charlotte, NC. From there, the company provides an extensive selection of service replacement parts and local machine technicians. Our warehouse inventory contains over 100 new machines in stock and ready to ship at all times.

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The Flowserve Corporation is an American multinational corporation and one of the largest suppliers of industrial and environmental machinery such as pumps, valves, end face mechanical seals, automation, and services to the power, oil, gas, chemical and other industries. Headquartered in Irving, Texas, which is a suburb of Dallas, Texas, Flowserve has over 19,000 employees in more than 60 countries. Flowserve sells products and offers aftermarket services to engineering and construction firms, original equipment manufacturers, distributors and end users. The Flowserve brand name originated in 1997 with a merger of BW/IP and Durco International.
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Kocks Pittsburgh Company
http://www.kocks.de/en/company/locations/pittsburgh/
For KOCKS innovation is a part of tradition. Innovation was at the beginning of the company’s history with the idea of applying the 3-roll technology to forming tube as well as wire rod and bar. To date it determines the development of the company. To follow new avenues and to continuously optimize what seems to be perfect – this tradition keeps the company young and thrills our customers.

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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.

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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.

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+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 corporate 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.

Tel: +1 704-289-8531 • www.aries-manufacturing.com

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ATI
+1-412-394-2800
www.ATImetals.com
inquiries@ATImetals.com

ATI is a global manufacturer of technically advanced specialty materials and complex components. ATI is a market leader in manufacturing differentiated products that require our unique manufacturing and precision machining capabilities as well as our innovative new product development competence. Our capabilities range from alloy development to final production of highly engineered finished components, as well as producing powders for use in next-generation jet engine forgings and 3D-printed aerospace products. ATI offers our customers a unique supply chain solution that Creates Long-Term Value Thru Relentless Innovation®.

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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 690/6H4 solids & turnings, Titanium sponge, Strontium Metal, Electrolytic Manganese Flake, Silicon Metal, Aluminothermic Chromium Metal, Primary Magnesium, Hafnium Crystal Bar and ingot, Zirconium/Zirconilloy, SHG Zinc, Pure Tin Ingot, Pure Lead Shot, Rhenium Pellets, Tantalum and Niobium.

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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.

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

Banner Medical specializes in providing complete single-source cold finished bar, plate, sheet 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 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/Blanking
- Precision saw cutting
- Waterjet cutting

Quality Throughout
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

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Baoji JHY Titanium Industry Co., Ltd
+86 917 337 2996
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
Titanium Buyers Guide (continued)

Japan, United States, United Kingdom, Germany, Netherlands and other European countries.

Baoji Titanium Industry Co., Ltd.
+86 917 3382 075
www.baoti.com
ieddept@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 automobile 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 is a subsidiary company of Baosteel Group. 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.

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

BHN special Materials Ltd. is a leading high quality master alloy producer in Dalian, P.R. China. BHN is certified according to EN9100:2009 and ISO 9001:2016. BHN provides the full range of Vanadium, Molybdenum, and Niobium containing binary alloys for the Titanium Industry for aviation, military, and medical application in China and abroad. The expertise of BHN is to supply tailor-made multinary master alloys well designed to simplify the customers' manufacturing process to improve their competitiveness. To learn more about BHN, please visit our website at http://www.bhn-materials.com/.

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

BIBUS METALS Group is 100% Swiss owned, and since 1979 a 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 others:

Sheets/Plates, Wire/Bars, Tubes/Pipes, Strip/Foil, Weldingwire, 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.
+41 34 460 01 01
www.blaser.com
m.hensel@blaser.com

Blaser Swisslube AG is an independent and family-owned Swiss company founded in 1936. Blaser Swisslube is represented in more than 60 countries on all continents. The company develops and produces high-performance cutting fluids for customers who manufacture the tiniest to largest titanium components as well as critical and structure components, particularly for aerospace and medical. Blaser Swisslube's goal is to optimize manufacturing processes and to improve their economic efficiency, productivity and machining quality. In close cooperation with the customers Blaser Swisslube presents new solutions 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.

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.
Titanium Buyers Guide (continued)

Calvi Holding S.p.A.
+39 039 331071
www.calviholding.it
www.calvinetwork.com
contact@calvinetwork.com

Born from the aggregation of multinational entities with over 700 years of combined experience in the engineering and manufacturing of special steel profiles and the diversified mechanical division, which specialises in manufacturing special steel & titanium profiles based on customers’ specifications with hot and cold forming technologies, and consists of the 9 companies in the Calvi Network Special Steel Profiles and the diversified mechanical division, made up of 3 companies that manufacture lifting units for forklifts.

The group’s operations are organised into two divisions: the metallurgical division, which specialises in manufacturing special steel & titanium profiles based on customers’ specifications with hot and cold forming technologies, and consists of the 9 companies in the Calvi Network Special Steel Profiles and the diversified mechanical division, made up of 3 companies that manufacture lifting units for forklifts.

The Network, which boasts a long history of manufacturing steel and a world-class know-how, presents itself as a partner for the manufacturing of special sections for countless applications in a wide range of industrial segments, including energy, aerospace, medical, automation, and machine tools, and addresses the growing needs of the market for forming solutions.

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 buy 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 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.

China Steel Corporation
+866-7-802-1111

China Steel Corporation provides high quality titanium products, including ingot, plate, sheet, bar, wire coil and tube, for a wide range of applications in architecture, chemical industry, heat exchangers, copper foil facilities, fasteners, desalination, electronics, sports industry, leisure and moving forward to biomedical and aerospace application.

The stable and reliable quality of CSC’s titanium products have gained the acceptance of Asia industries widely, and CSC has also been selected as the first priority provider to purchase their needed titanium materials owing to CSC’s quick and efficient technical services. CSC will continue to improve customer services and the technical technologies both for customers and CSC itself to promote Titanium Alloy products’ international competitiveness.
Consarc Corporation
+1-609-267-8000
www.consarc.com
sales@consarc.com

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

Continental Steel and Tube Company
+1-954-332-2290
www.continentalsteel.com/Titanium/default.asp

Continental Steel and Tube Company is one of the world’s leading value added volume suppliers of quality metals. With an outstanding global reputation, our team of expert sales associates can supply 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 CP4 Gr1, CP3, Gr2, CP2Gr3, CP1 Gr4, Gr7, Gr5 Ti 6Al-4V, Gr6, Gr9, Gr 12, , Gr 19 (Beta C) & Gr 11. 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.

Cosen Saws
888-720-5371
www.cosensaws.com

Founded in 1976, Cosen is one of the world’s leading band saw manufacturers with a broad product line and a global sales network including Cosen USA and Cosen Europe. Cosen’s North American office and warehouse is located in Charlotte, NC. From there, the company provides an extensive selection of service replacement parts and local machine technicians. Our warehouse inventory contains over 100 new machines in stock and ready to ship at all times.

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 research across the metal value chain, specialising in novel metal production techniques, interfaces/corrosion, energy systems, metal forming, and additive manufacturing / 3D printing, particularly for Titanium and its alloys. Strong Multiphysics modelling techniques are combined with practical experimentation to understand and develop advanced solutions for global industry. HPMI partners with industry and other research providers around the world, in applied research or to develop new technologies. HPMI also provides consulting services, use of specialized facilities, additive manufacturing training, and aims to be a global leader in the knowledge and application of fundamental metals technologies. It runs CSIRO’s ‘Lab22 Innovation Centre’ – the largest metallic additive facility in the Southern Hemisphere. 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.

Cumberland Highstreet Partners
www.cumberlandhighstreet.com

Formed in 2016, Cumberland Highstreet Partners was created in response to the need for executive leaders to have access to a team of proven, experienced professionals who possess a deep domain knowledge of manufacturing. We bring accomplished and creative industry experts to the table who have personally led significant organizations. We are executives with proven track records of successfully navigating the ever-changing needs and requirements of industry.

Danobat S. Coop
+34 943 748 177
www.danobatcuttingsolutions.com
www.danobatgroup.com
salesaws@danobat.com

DANOBAT focuses on the design, development and manufacture of machine tools, high value-added production systems and fully flexible solutions, adapted to our customer’s needs.

Internationalization has been an ongoing process. Therefore DANOBAT has production plants and service centers in Spain, Germany, UK, USA and Italy, as well as an important sales and service network which covers 40 countries.

Innovation is one of DANOBAT’s hallmarks since it started its activity 65 years ago. Among its wide range of innovative solutions, DANOBAT offers its latest developments of customized solutions for the most stringent cutting processes. The latest technologies are utilized to achieve the highest rigidity and precision.

DANOBAT machines provide an ergonomic and high-end solution with a user-friendly and powerful software, and provides cutting edge sawing solutions.

DANOBAT supplies sawing solutions to customers demanding the highest technological requirements, in aerospace, oil & gas, forging
Titanium Buyers Guide (continued)

industry, energy, mold and die, automotive, steel manufacturers.

DANOBAT is part of the DANOBATGROUP, the machine tool division of the Mondragon Corporation. With a turnover of 260 million euros and 1300 people, it is one of the main Machine Tool and production system manufactures in Europe.

More info, please visit us at: www.danobatcuttingsolutions.com

Design Group
+1-253-926-0884
www.bwdesigngroup.com

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.

Dufereco SA
+41 91 822 56 00
www.dith.com

Dufereco Group is the ultimate shareholder of Vanchem Vanadium Products. (Pty) Ltd “Vanchem” and acts as its only distributor.

In 2016 Dufereco SA has also taken up a long-term distributorship agreement for vanadium products from Chengde Steel HBIS “Chengde”.

Chengde is an integrated steel and vanadium producer. Chengde vanadium products range include FeV50%, FeV80%, as well as standard and high-purity vanadium oxides and vanadium carbide nitride (VCN).

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.

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@conuрафae.com

FAE is an Argentinean 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
metals@edgeintl.com

UK manufacturer of tailor-made and high grade ferro titanium.
Titanium Buyers Guide (continued)

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

Fine Tubes, part of AMETEK Specialty Metal Products, 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 critical aerospace applications for the civil aircraft, defence and space sectors.

TITANIUM TUBE 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, Fusion Welding and Chemical Processing.

WORLD CLASS FACILITY
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 and Conditioning & Degreasing

AEROSPACE APPLICATIONS
Critical hydraulic, mechanical and structural applications include:
- Hydraulic and pneumatic control systems
- Aerospace Engine tubes
- Instrumentation and transmission tubing
- Mechanical tubes
- Actuation

Fine Tubes, Superior Tube, Hamilton Precision Metals, AMETEK Wallingford, AMETEK Eighty Four and Reading Alloys – all leading manufacturers of high precision metal products – form the AMETEK Specialty Metal Products division.

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 the medical device industry. In fact, most of the materials we produce ultimately end up in the human body.

As a result, we understand the critical importance of quality. After all, our employees have experience producing materials for applications designed to improve or even 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 AZLA - 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" (2.00mm) 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
+49-2103-7900
www.kocks.de
fk@kocks.de

Since 1946, the KOCKS brand has been a synonym for technological innovations that define the performance standards in the steel industry. KOCKS was the pioneer of 3-roll technology for tube and bar, and has continued to innovate for more than 70 years. The latest generation of 3-roll technology for specialty alloys and SBQ rod and bar rolling is the RSB® 5.0. The highlight and the core function of the new RSB® is the Size Control System (SCS®). The KOCKS SCS® controls and adjusts the rolling process in real time, supported by the KOCKS 4D EAGLE profile measurement system.

These features of the RSB® remarkably improve the rolled tolerances while at the same time simplifying the operation by means of automated optimization of the process parameters. A utilization factor of almost 100 percent in operating references worldwide confirms the reliability of these features that result in the best reproducible product quality. The Kocks RSB® is used by more than 80 customers worldwide, every day. Additionally KOCKS offers a surface inspection system, called 4D PANTHER, with the capability of a 100% inline detection of surface defects. Extremely high scan rates of the optical system in combination with smart and fast software algorithms make the difference. The system is fully operational with completion of commissioning and without time-consuming training.

The Stretch Reducing Block SRB® with 3 individually driven rolls (Star Drive) is the latest development for the production of high quality seamless and welded tubes with the lowest conversion costs. The combination of high-strength and high-precision roll stands with the latest in automation technology enables our customers to efficiently produce seamless tubes of the very best quality.

The whole service range includes consulting, planning, development, design, supply, assembly and commissioning of rolling mills and automation solutions as well as modification and modernization of existing plants.

Bars that are KOCKS rolled® are defined as an extraordinary quality finished product made with consistency day in and day out: “We make your product gold.”

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
Titanium Buyers Guide (continued)

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.

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

Built for Conversion on a quick turnaround.

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

Group N.V., is a leading manufacturer and global supplier of high performance metals and materials.

We offer a wide range of high-quality master alloys that meet the highest technical requirements for different specialized sectors, mainly aerospace, super alloy industry and ship-building.

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.

Our product spectrum is completed by inter-metallic Titanium Aluminum light weight alloys, known as gamma Titanium Aluminide alloys. Its present applications include low pressure turbine blades (LPT) for civil aircraft engines as well as turbocharger wheels for the automotive industry.

GfE is certificated in accordance to ISO 9001, EN 9100, ISO 14001, ISO 50001 as well as BS OHSAS 18001 and operates an accredited laboratory according to DIN EN ISO/IEC 17025

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.

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.

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

GRANDIS TITANUM is an ISO 9001:2008 certified 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 USA sales offices in California, Ohio and Oregon. We also have sales offices in South Korea, China, Russia, Belgium and Italy.

Haynes International Inc.
+1-765-456-6000
www.haynesintl.com
rburke@haynesintl.com gspalding@haynesintl.com

Haynes International, Inc. is one of the world’s premiere manufacturers of titanium tubing. HAYNES® Ti-3Al-2.5V alloy is used for aircraft hydraulic systems. Our seamless Grade 9 titanium tubing is produced to many industry specifications, including AMS 4943, AMS 4944, AMS 4945, AMS 4946, AS5620, SB 338/B 338Gr9 and UNS R56320. Additionally, Haynes is a leading developer, manufacturer and marketer of high-performance nickel- and cobalt-based alloys used in corrosion and high-temperature applications.

Hempel Special Metals GmbH
+41 44 823 88 24
www.hempel-metals.com

Hempel Special Metals AG is one of the largest stockists for Titanium, Nickel Alloy and Zirconium in Europe. Our companies are located in Switzerland, Germany, UK, Poland and we do have various sales representatives all over the world. 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.
Titanium Buyers Guide (continued)

Hi Tech Alloys
+1-925-937-3836
Incorporated in 1982.

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

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.

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

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

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

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, VD/VO, 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. STRATIX-ONE a Decision Support & Management Dashboard provides executives and managers with real time sales, operations and financial information.

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.
Titanium Buyers Guide (continued)

Jiangsu Tianpong Technology Company Ltd.
0511-86319358
www.tsqi.cn
rongjun_jiang@tiangong-tools.com

Jiangsu Tianpong Technology Co., Ltd was established in 2010, is a wholly owned subsidiary of Tianpong International. The company is located in JuRong City, JiangSu Province. Our company is a production, sales, strategy based on titanium and titanium alloy new materials, Tianpong has smelting, forging, hot rolling, cold rolling, finishing a series of production process of finished materials, the main products are titanium ingot, titanium bar, titanium tube, titanium plate, titanium coil, hot rolled tape. Titanium wire etc..

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 Saws methods. These include Band Saws, Plate & Block Saws, Cold Circular Saws & Hacksaws. Customers benefit from unbiased recommendations about which Metal Cutting Equipment is best for their application. We also offer complete Storage and Retrieval Systems!

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

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

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

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

KMI processing includes:
• Flat / Tapered / Contoured precision thickness machining
• Tolerances to +/-0.001”. (.0005” upon request)
• Sizes up to 110” x 360: larger sizes upon request
• Weight control for Aerospace applications
• Thin sheet grinding to .010”
• Surface Finishes from 250 RMS to 12 RMS and finer
• Polishing of sheet and plate to #3,#4 or #8 mirror. Non-directional also available

Benefits:
• State of the art measurement instrumentations
• Experience with all types of metals
• Plate / Sheets arrive clean, damage free and ready for fabrication

Industries we serve:
• Aerospace / Defense / Energy / Commercial Aircraft / Architecture

L.C.M.A.
+352 26 55 43-1
www.lcma.lu
Mr Otis Claey – CEO - claey@lcma.lu
Mr Thomas Mitidieri – Production Manager - Thomas@lcma.lu

Founded in 1996, L.C.M.A 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. L.C.M.A is ISO 9001:2015 and AS9100D aerospace approved and is PED97/23EC certified.

Being part of a vertical integrated structure L.C.M.A 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.

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 Material Testing, Nondestructive Testing and Calibration Services offered by Laboratory Testing Inc. (LTI) help businesses deliver the highest quality and most dependable products. The independent testing lab provides test results necessary for product development, material verification, production control and other important business decisions. LTI is fully qualified:
• NADCAP, A2LA and ISO/IEC 17025 accredited
• In compliance with ISO 9001 and ISO 13485
• Metal testing specialists since 1984
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Technical experts and a service-focused support team help customers get reliable test results quickly and economically. With a 104,000 sq. ft. facility, near Philadelphia, PA, Laboratory Testing Inc. is one of the largest full-service 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 EB/PVD processing industries. This experience, along with our
Titanium Buyers Guide (continued)

precise 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

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

LOTERIOS is a leading fabricator of titanium pipe, fittings, shell and tube heat exchangers and vessels as required.

Luoyang 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, salt. 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.

Luoyang Titanium Group (LTiG)

Luoyang Titanium Group, Inc. (LTiG) is the exclusive North American Representative of Luoyang Sunrui Wanji Titanium Industry Company Limited (Sunrui Wanj). Sunrui Wanj 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 Wanj’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 tubes and bars by supplying turnkey solutions to customers in over 45 nations.

Recently, fully integrated, automatic lines have been produced by Mair Research for the most demanding customers worldwide. Thanks to the reliability of our equipment we reach important targets on the field of special alloys and titanium alloys. The modern controls and a dedicated softwares developed for the finishing field allows fully automatic processing on the lines and consequent reduction of production cast with high repeatability standards. Mair Research can be your one-step supplier for all your finishing lines. For additional info do not hesitate to contact us via our website: www.mair-research.com

Makino
+1-800-552-3288
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.

ATS-MER
+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,
Titanium Buyers Guide (continued)

take up systems, plane straighteners and engineered material handling equipment. Purpose built processing equipment for the titanium industry.

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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.

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Metalalysis Ltd.
+44 (0) 1709 872 111 www.metalalysis.com kartik.rao@metalalysis.com

Metalalysis 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.

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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.

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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.

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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.

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

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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@monicoalloys.com

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

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

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

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

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Titanium Buyers Guide (continued)

Multi-Etch LLC
(928) 634-5307
www.multetch.com
info@multetch.com

Multi-Etch is a low-acid (pH 6.8), far safer etchant for titanium and other metals, with a less toxic waste stream, when compared with hydrofluoric and nitric acids. Preparing titanium with Multi-Etch enables anodizers to produce brilliant colors and welders to achieve welds that can withstand the rigors of deep space and deep ocean uses. Multi-Etch is also used to brighten titanium mill products and tumbled titanium parts, and to erase anodizing mistakes. Industries regularly using Multi-Etch include aerospace, medical, dental, jewelry and other arts, marine, architectural, and industrial.

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, pickling and inspection. NF&M’s Nadcap approved laboratory performs room temperature tensile, hardness, hydrogen analysis and micro/macrostructure evaluation.

NobelClad
+1 303.665.5700
www.nobelclad.com
sales@nobelclad.com

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.

Nooter Construction Company
314.421.7211
www.nooterconstruction.com
kekitchen@nooter.com

Nooter Construction Company is a national full-service industrial construction contractor. Nooter Construction Company has a long history of providing innovative solutions to complex problems with field service of reactive alloys. We have the capability to perform large capital projects and smaller maintenance work that requires specialty welding with materials such as titanium. Please give Nooter Construction Company a call to discuss your projects where reactive alloys will be processed and welded in the field.

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

Norsk Titanium AS is the world’s pioneering supplier of FAA certified, industrial scale, aerospace-grade, additively manufactured, structural titanium components. The company is distinguished in the aviation industry by its patented Rapid Plasma Deposition™ (RPD™) process that deposits standard Ti64-4 wire into complex components suitable for structural and safety-critical applications. The Norsk Titanium Merke IV RPD™ machine displaces legacy forging methods with a controlled, repeatable, high deposition rate process. Norsk Titanium’s proven in-production processes deliver substantial savings for aerospace, defense, and commercial applications.

North American Alloys
+1-800-985-2250
www.northamericanalloys.com
Michael Shulimson, President
michael@northamericanalloys.com
Steve Meredith, Director of Sales
steve@northamericanalloys.com
Peter Mason, Outside Sales
petermason@northamericanalloys.com
Peter Rockefeller, Warehouse Manager
peter@northamericanalloys.com


Contacts: Michael Shulimson – President, Steve Meredith, Director of Sales and Peter Rockefeller, Warehouse Manager
Titanium Buyers Guide (continued)

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

Nu-Tech Precision Metals manufactures by hot extrusion seamless pipe, tube, fittings, bar, 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.

Oerlikon
https://www.oerlikon.com

Oerlikon Metco is a global leader in surface engineering solutions that bring benefits to customers through a uniquely broad range of surface technologies, equipment, materials, services, specialized machining services and components. The surface technologies such as Thermal Spray and Laser Cladding improve the performance and increase efficiency and reliability. Oerlikon Metco provides a comprehensive manufacturing, distribution and service network, catering to aviation, medical, power generation, automotive and other strategic growth industries such as additive manufacturing and operates a dynamically growing network of more than 50 sites in EMEA, Americas and Asia Pacific.

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.

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

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. Our Quality Management System meets the IAQG’s series requirements.

With our experience and rigor acquired during the last few decades, the company consists of 90 staff members that have enabled them to increase their turnover 10 times over in 10 years.

PCC Metals Group
www.pre cast.com

The PCC Metals Group brings together 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 R&D leader in their respective industries. The PCC Metals Group unites the unique capabilities of each company, leverages their strong metallurgical expertise, and is able to better serve customers in the specialty metals market.

PCC Revert Group
http://www.pccforgedproducts.com/brands/caledonian_alloys/

The PCC Revert Group combines the assets of Caledonian Alloys and SOS Metals, and 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 into material ready for remelting to produce new nickel, cobalt, or titanium alloys. The Revert Group 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 and SOS Metals supply fully processed nickel and titanium revert material to the melting industry. Both SOS Metals and Caledonian Alloys also purchase revert material from a wide range of industrial customers throughout the world.

Perryman Company
+1-724-746-9390
www.perr ymanco.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. Perryman supplies and services customers in the aerospace, medical, consumer, recreation, infrastructure and 3D printing/additive manufacturing markets worldwide. Approvals include ISO9001:2015, AS9100D, and NADCAP. Perryman Company is headquartered in Houston, Pennsylvania. Our melting facility is located in Coal Center, PA and our hot rolling and finishing operations are in Houston, PA. Additional intermediate processing is located in Frackville, PA. Company sales offices are located in Houston, PA, Philadelphia, Los Angeles, London, Zurich, Tokyo, and Xi’an.

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

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

PM International Suppliers
(863) 644-6300
www.PM first.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.
TITANIUM TODAY

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 is on the trading of high quality titanium with diverse stocks. Besides, our product includes titanium slabs, sheets, bars, wires, pipes, fasteners, castings, etc. We committing to supply the most satisfying high quality titanium materials for users with quick lead time and favorable after sales service. Currently, our sales network is well deployed all over China, Taiwan and South-East Asia countries.

President Titanium Co., Inc.
+1-800-225-0304
www.presidenttitanium.com
sales@presidenttitanium.com

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

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

Product Evaluation Systems (PES) an independent testing laboratory, located in Latrobe, PA. PES is a proven partner in materials testing and offers exceptional services specializing in chemical, metallurgical, and nondestructive testing and analysis. Since 1979, PES has been proud to offer exceptional personalized response to customer needs and our Rapid Response, Dependable Delivery continues to help our clients streamline the process of outsourcing their materials testing. PES is both NADCAP and ISO 17025 accredited and holds multiple customer accreditations such as GE Aviation, Pratt & Whitney, MCL 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.cmqrtr.qc.ca

The Quebec Metallurgy Center is a technology transfer center located in Trois-Rivieres, Quebec, Canada. Our activities focus on supporting the technological development of manufacturing companies in the metallurgical sector. CMQ has developed a broad expertise on the transformation and development of advanced alloys such as titanium, zirconium, aluminum and nickel. Our semi-industrial metalworking facility is equipped for short series production with controlled atmosphere 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
Titanium Buyers Guide (continued)

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 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.

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

Rex Heat Treat is a family owned and operated business that was founded in 1938. We take pride in our ability to partner with our customers to gain insight regarding their future needs. We are a leader in customer service and quality for the heat treating industry. Our unique furnace design allows us to water quench titanium raw material and formed parts up to 16’ long to meet aerospace and medical specifications. We have furnaces capable of annealing up to 30,000 lbs. in one batch and we are approved by almost all major Aerospace companies. We have 3 locations in Eastern United States, Anniston AL, Bedford PA., and Lansdale, PA. Rex Heat Treat has experienced metallurgists on site and we offer testing services. We look forward to exceeding your expectations with timely communication and time performance.

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

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.

Rolled Alloys holds many quality approvals and certifications in the aerospace and medical industries. We are a preferred supplier to companies that are respected around the world for their exceptional quality standards.

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
+49-211-230999-11
www.s-d-group.com
o.frankenheim@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 jet cutting. Our just in time service provides our customers with cost savings and security of supply. S+D is aerospace approved according to EN 9120 issued by DNV GL.

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

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

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

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

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

Scanacon, Inc.
330-877-7600
www.scanacon.com

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.

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

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

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

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

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

Service Steel Aerospace is a customer oriented stocking distributor of high performance stainless steel, titanium, alloy steel, nickel based super alloy, and 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 PRV Metals
Companies
+1-626-969-6711
www.prvmetals.com

Manufacture 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.

Simonds Saws
www.simondsinternational.com

Manufacturer of industrial saw blades. The oldest cutting tool manufacturer in North America, Simonds offers one of the broadest and most trusted names found anywhere in the world of cutting tools. Many industries have grown to depend on the quality and innovation of Simonds products and services. We have a continuing tradition of quality, design, and innovation. Simonds has innumerable patents, a global leader in high-performance and high-production sawing. The first bandsaw manufacturer in the world to be ISO certified and we remain certified so today. We set our goals high and our customers have grown to expect it. Since 1832... The Professionals’ Edge.

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

Spectore Corporation
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.

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

Engineering precisely what you value

Starrag Group is a global technology leader in manufacturing high-precision machine tools for milling, turning, boring and grinding workpieces of metallic, composite and ceramic materials. Principle customers are internationally active companies in the Aerospace, Energy, Transportation and Industrial sectors. In addition to its portfolio of machine tools, Starrag Group provides integrated technology and maintenance services that significantly enhance customer productivity.

**Aero Structures**
Five and six axes high torque machining centers, 50 cubic inches per minute of Ti metal removal with the highest degree of accuracy. That’s STARRAG.

**Aero Engines**
Blades, Blisk, IBRs, Impellors and Casings – Processing requirements drive our machine design providing the highest accuracies and throughput.

**Avionics**
Complex machining for extremely precise parts for fuel injection, combustion chambers, flight controls and gyroscopes.

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

Supra Alloys is a Titanium Mill Products-stocked Titanium Service Center with the convenience of extensive in-house processing capabilities, and the ability to machine, custom mill, and fabricate high-quality titanium products that meet the highest quality standards. Supra routinely provides Titanium for applications from household, sporting, technology, apparel, corporate gifting and jewelry. 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.

Supra Alloys is a Titanium Mill Products-stocked Titanium Service Center with the convenience of extensive in-house processing capabilities, and the ability to machine, custom mill, and fabricate high-quality titanium products that meet the highest quality standards. Supra routinely provides Titanium for applications from household, sporting, technology, apparel, corporate gifting and jewelry. 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.

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 tools 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 America’s (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.

**T-M Vacuum Products, Inc**
856-829-2000
www.tmvacuum.com
eurbanski@tmvacuum.com

T-M Vacuum Products has more than 50 years’ experience designing and manufacturing various standard and custom size vacuum furnaces and vacuum ovens in both rough and high vacuum configurations with temperatures up to 2,000°C. We specialize in all metal hot zones and strive to create the best vacuum furnaces and vacuum ovens possible. Our team of experienced engineers and highly skilled technicians build the best systems in the industry. Our systems typically exceed 20 years of life in a full-time 24/7 production environment. This means that each vacuum furnace and vacuum oven, you purchase from us is the most advanced and cost effective on the market. As an ITA member company, T-M Vacuum is more than happy to assist customers in choosing the right vacuum furnace to meet their needs. Contact us or visit our web site for more information.

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

The Pennsylvania State University

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

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

TiFast is a European leader in the production of titanium bars, ingots, billets and wires for the aerospace, medical, defense, racing and industrial markets worldwide.

TiFast, located in Italy, has built a new titanium plant with best technologies. TiFast has a fully integrated production, including a melting plant, a rolling mill for bars and wires, a precision finishing shop, laboratories and R&D facilities.

TiFast can supply titanium bars with very close tolerances, special heat treatments including stress relieving and with a full range of finishing. TiFast also uses the best technologies for checking and controls.

TiFast also started to offer Titanium triple melted quality for critical applications.

TiFast is certified NADCAP for Aerospace and ISO 13485 for Medical Device. TiFast is also ISO 14001 certified for Environmental, German TUV ADWO, AS 9100, ISO 9001 and PED for Pressure Equipment.

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

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

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

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

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

- Titanium Anodize
- Aluminum Anodize
Titanium Buyers Guide (continued)

- Dry film Lubricants
- Corrosion Coatings
- Paints & Primers
- Teflon Coatings
- Manufacturers of Composite Parts (Carbon & Glass)

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

Certified UNI EN ISO9001:2008 and UNI EN 9120:2010. With 20 years of experience, Titanium Consulting and Trading, based in Florence, Italy, with a distribution center in Milan and affiliated offices and distribution centers in both Germany and England, is a privately owned stockist/distributor of titanium mill products. Being a major supplier in the European market for titanium mill products and its alloys, we can guarantee a prompt delivery for products including ingots, slabs, round bars, hexagonal bars, profiles, welding wire, plates, sheets, coils, tubes and pipes, as well as fasteners, forgings, flanges and fittings. Most ex-stock materials are shipped the next working day with full traceability for all items supplied. Products supplied are employed in a wide range of applications, including aerospace, medical devices, industrial, chemical. In 1996, Titanium Consulting & Trading further expanded its operations by setting up dedicated facilities to manufacture finished products on request. Processes available include cutting, welding, forming, turning, heat treatment and finishing.

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

TITANUM 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
bbrownlee@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/ejection service capability in the world. Mill products available from stock. For more information email bbrownlee@tifab.com.

Titanium Finishing Company
+1-215-679-4181
www.titaniumfinishing.com
melinda@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 Industries, Inc. (T.I.)
1-888-482-6486
www.titanium.com
sales@titanium.com

T.I. is the global leader in specialty metals supply for the aerospace, medical, industrial and oil & gas markets. Holding the world’s most complete inventory of specialty metals across a global service center network, T.I. delivers supply solutions at all levels of sophistication and complexity. With a globally experienced and technically driven team, T.I. has been providing dependable, quality driven service to our 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.

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

Trepunning & 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 quickship 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, 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.

TSI | ChemLogix
800-874-2811
www.tsi.com/metal-analyzers/
answers@tsi.com

TSI | ChemLogix manufactures handheld and online laser based metals analyzers. The TSI Chemlite™ Laser Metals Analyzer is a handheld instrument that will measure Al, Mg, and Ti in as little as one second. Ergonomically designed, industrially-hardened and inherently safe, the Chemlite is the only regulation free handheld for measuring Titanium. Verify or sort your Titanium on the spot with ease and confidence. The Chemline process sensor can be utilized in an online scrap sorting system. TSI can provide sensors or turnkey solutions to fit your specific application.

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-
Titanium Buyers Guide (continued)

date, high quality and comprehensive data, analysis and information is provided. TZMI annually hosts the largest titanium and zircon industry conference. Email: marketing@tzmi.com

Ulbrich Stainless Steels & Special Metals, Inc.
+1-203-239-4481
www.ulbrich.com
information@ulbrich.com

Ulbrich Stainless Steels & Special Metals, Inc., is a leading processor of a variety of different alloys including, but not limited to: stainless steels, PH grades, nickel and nickel alloys, cobalt alloys, niobium, zirconium, titanium and titanium alloys. Commercially Pure Titanium: Grade 1, Grade 2, Grade 3, Grade 4, and Titanium Alloys: Grade 9 (Ti 3-2.5), Ti 15.3.3.3 and 21s (Ti Beta21s), as well as the aforementioned metals are available in strip, foil, flat, round and shaped wire. Nitinol, Grade 5 (Ti 6-4) and Ti 6.2.4.2. are available in limited widths at Ulbrich. Please inquire for more detail on all of our product offerings.

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

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

United Performance Metals
888.282.3292
www.upmet.com
sales@upmet.uk  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, Nickel Alloys, Cobalt Alloys, Cobalt Chrome Moly, Titanium, Duplex Stainless Steel, PRODEC®, Aluminum, and Alloy Steel in coil, sheet, strip, plate, bar and near net shapes.

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

Our certifications include AS9100D, AS9100C Belfast, ISO 9001:2015, ISO 9001 Belfast, ISO 13485, GE Aviation S1 (S1000), Pratt & Whitney LCS and laser cutting approvals NADCAP AC7116, GE S422, and Pratt & Whitney PWA119.

United Performance Metals is headquartered in Cincinnati, OH and maintains nine service centers worldwide including Oakland, CA, Los Angeles, CA, Hartford, CT, Chicago, IL, Greenville, SC, Belfast, Northern Ireland, Budapest, Hungary, and Singapore.

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

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

UTC Aerospace Systems
+1-216-429-4227
www.utcaerospacesystems.com

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

Verder Scientific, Inc.
+1-267-757-0351
www.Verder-Scientific.com
info-us@Verder-Scientific.com

Verder Scientific Inc., comprised of the Retsch, Carbolite Gero, and ELTRA brands sets the standard in high-tech scientific equipment serving research institutions, analytical laboratories as well as manufacturing companies for decades. The company manufactures and supplies instruments for sample preparation, elemental analysis as well as heat treatment of solid materials.

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

Verichek Technical Services, Inc. is an ISO/IEC 17025:2017 Accredited Laboratory for PMI Testing, Hardness Testing, and OES Calibration. We provide a value-added service to our customers in the form of Training, Preventative Maintenance, Spare Parts, Service, Repair, and Calibration of OES Instrumentation. As a third party service and calibration provider to businesses in the metals industry, we also offer the best and highest quality OES, XRD, and Retained Austenite Measurement Instrumentation from GNR. Additional offerings include rental and refurbished instrumentation for cost-effective solutions to our customers. Visit our site or call us to learn more!

Vested Metals International LLC
904-495-7278
www.vestedmetals.net
info@vestedmetals.net

Vested Metals International is an ISO 9001 and AS9100 certified raw material specialty metals distributor with decades of experience specializing in hard to find alloys, grades, and sizes. We offer various grades of stainless steel, titanium, tool and alloy steels, aluminum, and high temperature nickel and cobalt based alloys. We pride ourselves on helping customers meet and exceed niche requirements.
**Titanium Buyers Guide (continued)**

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

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

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

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

**VSMPO - Tirus China Ltd.**
+86 10 8455 4688

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 3-314 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  
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.

**Weber Metals, Inc.**
+1-562-602-0260  
www.webermetals.com

Weber Metals, Inc. specializes in Aluminum and Titanium open and closed die forgings 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  
www.wellmetusa.com

Wellmet is located in California USA and we have been supplying and distributing Titanium Sponge and Titanium Powder for more than 20 years. We can also supply other non-ferrous metals with approved quality. Our Titanium Sponge producer is ISO9001:2008 certified and sponge quality is approved by world main consumers.
Wyman Gordon is a worldwide supplier to the aerospace and industrial gas turbine markets. We hold quality accreditations for all of the major airframe and engine manufacturers for both civil and military applications. Wyman Gordon creates rotating closed-die forgings which are critical for aerospace and land-based gas turbines. Wyman Gordon also manufactures structural forgings for airframe, nuclear, petrochemical, power generation, and space applications.

Xi'an Metals & Minerals Import & Export Co., Ltd.
+86-29-65659719   +86-29-65659718
www.fiwmo.com
info@tiwmo.com wxd@tiwmo.com hj@tiwmo.com

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

ZIROM S.A.
+40 246 216666
www.zirom.ro
zirom@zirom.ro

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

The products manufactured, ingots and forged semi-finished products, are intended both for cutting edge fields (aviation and nuclear areas) and various fields (metallurgy, chemical industry, medical technique and devices).

The ZIROM's integrated management system (quality, environmental, health & safety) and the ZIROM's products are certified by LRQA in accordance with the following standards: ISO:9001:2008, EN 9100:2009, ISO:14001:2005, OHSAS:18001:2008, NORSOK M-650. 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.

West Penn Testing Group
+1-724-334-1900
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

Western Superconducting Technologies Co. Ltd.
+86-29-8651-4505
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, Ti6AI7Nb, NbTi in the forms of ingot, billet, forging, slab, bar, rod, wire and profile in the domestic & overseas 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.

Westmoreland Mechanic~'
Testing &Research Inc.
+1-724-537-3131
www.wmtr.com
us.sales@wmtr.com

Westmoreland Mechanical Testing & Research is a world leader in materials testing. Celebrating our 50th year in business, WMT&R serves a broad range of industries including aerospace, automotive, medical, and power generation. We support our customers with our highly-skilled staff and advanced facilities. Our turnaround time is unrivaled, and with over 300,000 square feet of accredited production and testing space, we have the capacity and equipment to handle any materials testing project.

WMT&R’s testing expertise includes: Mechanical Testing, Composites, Fatigue, Stress/Creep Rupture, Fracture Mechanics, Metallography, Chemical, Heat Treat, Thermal Analysis, and Physical Properties Testing. For more information, please visit www.wmtr.com or email us.sales@wmtr.com.

Xi’an Metals & Minerals Import & Export Co., Ltd.
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www.fiwmo.com
info@tiwmo.com wxd@tiwmo.com hj@tiwmo.com

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

ZIROM S.A.
+40 246 216666
www.zirom.ro
zirom@zirom.ro

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

The products manufactured, ingots and forged semi-finished products, are intended both for cutting edge fields (aviation and nuclear areas) and various fields (metallurgy, chemical industry, medical technique and devices).

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West Penn Testing Group
+1-724-334-1900
www.westpenntesting.com

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Western Superconducting Technologies Co. Ltd.
+86-29-8651-4505
www.wstitanium.com
dxh@c-wst.com

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Westmoreland Mechanic~'
Testing &Research Inc.
+1-724-537-3131
www.wmtr.com
us.sales@wmtr.com

Westmoreland Mechanical Testing & Research is a world leader in materials testing. Celebrating our 50th year in business, WMT&R serves a broad range of industries including aerospace, automotive, medical, and power generation. We support our customers with our highly-skilled staff and advanced facilities. Our turnaround time is unrivaled, and with over 300,000 square feet of accredited production and testing space, we have the capacity and equipment to handle any materials testing project.

WMT&R’s testing expertise includes: Mechanical Testing, Composites, Fatigue, Stress/Creep Rupture, Fracture Mechanics, Metallography, Chemical, Heat Treat, Thermal Analysis, and Physical Properties Testing. For more information, please visit www.wmtr.com or email us.sales@wmtr.com.

Xi’an Metals & Minerals Import & Export Co., Ltd.
+86-29-65659719   +86-29-65659718
www.fiwmo.com
info@tiwmo.com wxd@tiwmo.com hj@tiwmo.com

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

ZIROM S.A.
+40 246 216666
www.zirom.ro
zirom@zirom.ro

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

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