Executive Summary

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TITANIUM 2013 speakers examine aerospace trends, reflect on the reach and strength of global supply chain

TITANIUM 2013, the 29th annual conference and exhibition, which was held Oct. 6-9 at Caesar’s Palace Hotel, Las Vegas, assembled a cast of industry executives and observers who delivered insight into the forces driving the global titanium sector. The gathering, organized by the International Titanium Association (ITA), welcomed 1,182 attendees from more than 25 countries, a slightly higher headcount compared with the 1,107 delegates at TITANIUM 2012, which was held in Atlanta.

As usual, trends in commercial aerospace—the titanium industry’s largest market—garnered its share of the spotlight during the proceedings. Guest speakers and panel discussions weighed aerospace forecasts and unfolding market opportunities for players in the titanium business. However, along with the strong interest in aerospace projections, there also was a sense that a greater number of executives and entrepreneurs are becoming more attuned to the subtle, underlying dynamics of the titanium global business.

Henry Seiner, vice president of business strategy for Titanium Metals Corp. (TIMET), took note of this heightened awareness among conference delegates—especially those who represent the younger, “new generation” of industry leaders. Located at TIMET’s Toronto, OH, facility, Seiner is an industry veteran who oversees TIMET’s marketing, product management, purchasing and production planning operations and has responsibility for all aspects of TIMET’s supply chain. He was a member of the conference’s World Industry Demand Trends panel, and served as the moderator for the World Industry Supply Trends panel. TIMET, a major titanium producer, recently was acquired by Precision Castparts Corp., Portland, OR.

Based on his interaction with delegates, Seiner said he detected a greater appreciation for the links in the full breath of the titanium supply chain: feedstock, sponge, master alloys, mill products, part production and scrap. The global supply chain has been fortified and become
stronger in the last five years, due to significant investments by the titanium industry. But while there is overall business optimism, led by aerospace programs, industrial applications—heat exchangers, desalination plants, food and chemical processing—have been sluggish due in large part to the "doldrums in world GDP (gross domestic product) growth. We’re all waiting for the party to start," Seiner said.

Seiner’s observations on supply chain issues were echoed throughout the gathering, with speakers on various panels addressing the complexities of international logistics, consolidation trends, the closed-loop management of scrap, supplier consolidation, and cost issues.

**Demand Trends**

Dawne Hickton, vice chair, president and chief executive officer of RTI International Metals, Inc., Pittsburgh, in her presentation “Commercial Aerostructure Titanium Demand and the new supply chain,” examined “unprecedented potential opportunities”—a record backlog order levels for commercial jets—for the titanium industry. She explained that she viewed international commercial aerospace titanium demand through the lens of the industry’s global supply chain, “because today it is the supply chain and the function of the supply chain that’s impacting today’s titanium demand.” Overall, commercial jets represent a demand level of 40 million pounds of titanium between now and 2018, according to Hickton. Given that projection for business, she posed a question to those in the audience: “Can our supply chain, which is represented in this room, meet that demand?”

Hickton said that, as of 2013, there are over 10,000 large commercial jets in the backlog, with aerospace giants Airbus and Boeing accounting for nearly 94 percent of the total. (She noted that, in early October, Airbus announced its first-ever order to a Japanese airline: JAL). “And within that backlog, there is a lot of titanium.” She then ticked off specific titanium levels for major jet platforms (estimates that included fasteners): 180,000 pounds for each double decker
A380; 145,000 pounds for the A350; 170,000 pounds for the 787; 120,000 pounds for the new 777 Generation X; and 32,000 pounds for the regional, single-aisle C919. Hickton also provided a chart that illustrated projected numbers for individual jet build rates between 2013 and 2017: 2,400 for the 737; 530 for the 787; 2,460 for the A320; and 255 for the A350.

Titanium fits well with the new generation of commercial aerospace design strategies, given the operating efficiency mandates to reduce fuel consumption. Another factor propelling jet build rates is projected global passenger growth, with nearly half of the world’s air traffic coming from the Asia/Pacific region during the next 20 years. Replacement of older, less fuel-efficient aircraft is another factor boosting build rates for the near term. Hickton declared that, “overall, the picture (in commercial aerospace) is very bright for titanium demand.”

Much like Seiner, Hickton pondered that state of the titanium industry’s global supply chain, as mentioned above, with her question to conference delegates; in effect, a call for industry leaders to reflect upon current business conditions. Years ago, she said the focus for the titanium supply chain was on how many mill products, ingots, and billets that the industry was going to ship. “Today we are much more interested in the supply chain as we add value to that mill product, whether it is an extrusion, a forging, whether we are welding a part, finally machining a part and assembling it. Can the supply chain for the titanium industry meet the demands? There are lots of moving parts with plenty of opportunity for bottlenecks.”

Supplier consolidation represents one of the “seismic changes” in the new titanium supply chain. Hickton cited Allegheny Technologies Inc.’s (ATI) acquisition of forging house Ladish, and Precision Castparts’ acquisition of Timet and Wyman Gordon. In addition, during the last two years, RTI also has been active on the acquisition trail and expanded its downstream operations with its purchase of Osborn Steel Extrusions (in October 2013), Remmele Engineering (in January 2012) and Aeromet International (in December 2011).
She also identified scrap revert of aerospace original equipment manufacturers (OEMs) as another aspect of consolidation. “It used to be you could tell what was going on in the titanium industry just by watching the price of scrap,” she said. “Not so much anymore. So much of the scrap, as a result of the supplier consolidation, is maintained within a closed loop that the impact of what’s going on in the public purchasing of scrap has less of an impact on how we focus on the demand for the product.” Hickton also pondered the “far flung” logistics of managing a global supply chain as being a challenge for OEMs and the titanium industry. Offering one example, she said a mill product might start in Ohio; travel to Texas for an extrusion; go to Kentucky or Pennsylvania for further processing; land in Montreal for machining; and then end up in Japan or Europe for additional applications.

Oliver Dreier, metallic materials and castings procurement manager for Airbus, expanding on the presentation by Hickton, forecasted that there will be a demand for more than 29,200 new commercial aircraft during the next 20 years, representing a total market value of $4.4 trillion. Dreier broke down the estimated demand into three categories of aircraft: 20,240 single-aisle; 7,270 twin-aisle; and 1,710 “large.” Speaking from the Airbus perspective, he said that vertical integration will be a key differentiating factor for supplier selection. Firm prices are the baseline, along with “very demanding requirements” from the global aerospace supply chain.

Hunter R. Dalton, executive vice president, ATI Long Products, and president, ATI Allvac, Monroe, NC, discussed how titanium must adapt in order to meet the demands of next generation, fuel efficient commercial jet engines. According to Dalton, titanium will remain a material of choice for engine components even as engine temperatures continue to rise. He examined the current market specifications and forecasts for jet engine deliveries, underlining the rise of “green” engine designs that reduce noise, emissions and fuel consumption as well as higher operating temperatures as being critical factors for the future design of jet engines. Higher operating temperatures will spur a demand for more nickel-based and titanium alloys per
engine and a wider use of superalloys (generally defined as alloy combinations that contain iron, cobalt and nickel). Superalloys are likely to be specified for jet engine combustors, shafts, high-pressure compressors, and high-pressure turbine/low-pressure turbine. New generations of high-performance titanium alloys are expected to be the material of choice for engine fan and compressor cases, disks, impellers, forged compressor blades, vanes, and fasteners.

Regarding the demand for harder, higher performance titanium alloys, the industry must address the fabrication challenges from these materials, namely increased difficulty in machining, according to Robert Cohen, CEO, TECT Aerospace, Wichita, KA. This will require enhanced techniques such as the development of customized machine tools and software programs that measure and adapt to real-time machining conditions—"smart machining".

Michael G. Metz, president, VSMPO-Tirus U.S. Inc., Highlands Ranch, CO, provided insights on titanium demand in the Russian Federation. Much like North America, aerospace remains the primary market sector spurring titanium demand in Russia, along with power generation, shipbuilding, and general industrial applications. Russian aerospace demand, which includes the production of aircraft, engines, rockets and helicopters, will top 9,000 metric tons by 2018, compared with just under 8,000 metric tons in 2013. Russia’s projected demand for titanium, which includes aerospace and general industry, is expected to reach 14,000 metric tons by 2016, compared with 12,000 metric tons in 2013.

Kevin J. Cain, president, Uniti Titanium, Moon Township, PA, reviewed titanium demand from major industrial business sectors. A producer of titanium mill products, Uniti Titanium is a joint venture between ATI and VSMPO. Cain estimated that, during the next five years, heat transfer equipment will consume 3,500 to 5,000 metric tons of titanium, while demand for power generation (nuclear, standard thermal, combined cycle gas) will register up to 8,000 metric tons during the same time period. Near-term average annual consumption of titanium in the chemical process industry will range from 9,500 to 12,000 metric tons, while annual titanium demand for desalination projects will range from 750 to 2,000 metric tons over the next five years.
Distinguished Speakers

Keynote speaker Kevin Michaels, vice president, ICF International, Fairfax, VA, discussed how aircraft programs and global trends will affect near-term demand for titanium. Overall, Michaels projected the worldwide average for air travel will grow by nearly 4 percent through 2022, fueled by demand from travelers in Asia/Pacific, Africa, South America and the Middle East. By contrast, Michaels described North America and Europe as “mature” air travel markets, with slower annual growth rates.

He defined the aerospace industry’s current total material demand in “buy weight” at 1.44 billion pounds, dominated by aluminum alloys and steel alloys. Titanium alloys represent a 10-percent slice of that pie. Airframe production now accounts for 66 percent of total titanium demand (145 million pounds) followed by production of aerospace engines (27 percent) and maintenance, repair and overhaul (MRO) services. Michaels anticipated aircraft demand for titanium will grow 4.6 percent through 2023, reaching an estimated “buy weight” of 225 million pounds, led by the needs of airframe production.

Among the important developments in the global aerospace supply chain, Michaels underlined plans by Airbus to construct a new 116-acre, $600-million facility in Mobile, AL. According to information on the Airbus website, the facility, slated to come online in 2015, will focus on the final assembly of its A319, A320 and A321 planes. Groundbreaking ceremonies were held in April 2013 for the Brookley Aeroplex plant, which is expected to house 1,000 “high-skill” workers.

Michaels did point to additive manufacturing technology as a “long-term” area of interest for the aerospace industry, citing General Electric Co. as having committed to an
investment of $3.5 billion during the next five years, presumably to weigh its potential for
developing engine components.

John P. Byrne, vice president of aircraft materials and structures, supplier management,
for Boeing Commercial Airplanes, one of the distinguished speakers at the conference, said
that, through the year 2032, airlines will need more than 35,000 new airplanes (project
deliveries) valued at $4.8 trillion—a forecast that bodes well for the titanium industry. He
oversees the purchase of raw materials, standards, fabricated parts, assemblies and major
structures for all Boeing Commercial Airplane programs. As for the aerospace giant’s titanium
strategy, Byrne underlined that Boeing is focused on a closed-loop scrap solution, with in-house
scrap collection and revert considered critical for success. Boeing, he said, is “actively
protecting its input supply.” Ultimately, when it comes to sourcing titanium, he said Boeing is
looking to achieve a “system balance,” which takes into account demand, ordering inventory,
and revert.

Another Boeing executive and distinguished speaker, Michael Warner, director, market
analysis for Boeing Co., sought to identify underlying growth factors for the airline industry. This
year, global airlines will carry three billion passengers. He cited “low-cost” carriers as being a
major factor fueling growth in the airline business, with much of the demand coming from India,
China and emerging Asian markets. He’s responsible for Boeings annual publication, the
Current Market Outlook, which describes the long-term demand for air travel and the resulting
demand for new aircraft.

Warner displayed a chart that declared air travel today is “safer, greener and still a
bargain.” Using the year 1990 as a baseline, Warner’s chart indicated fatal accidents and air
fares have declined during the last 23 years, while the fuel efficiency of planes has soared. In
particular, he pointed to the advent of the Boeing 737 MAX platform, which he touted as having
an expanded flight range, along with reduced fuel consumption and noise. The build for the 737
MAX will begin in 2015. The new plane is scheduled to enter into service by 2017. He also cited the Boeing 777X as the next great airplane, underlining its larger, fourth-generation composite wing and advanced GE engine with laminar-flow nacelles.

The third distinguished speaker, James Glassman, managing director and head economist for commercial banking at Chase Bank, provided charts that illustrated an improving global economic picture since the deep downturn of 2009. According to Glassman, “the global pulse is quickening,” with household net worth, housing starts, vehicle sales and employment levels all moving in a positive direction. At the same time, inflation appears to be in check, he said.

Supply Trends

During his summary remarks as the moderator for the supply trends panel, Seiner focused on the economic interrelationship between titanium scrap and sponge. In recent years, he said sponge has become more expensive, driven by the pigment market, while scrap has been relatively cheap, due to the overhang of inventory in the aerospace business, along with sluggish capital investments in industrial markets. Understanding the interplay and delicate balance of scrap/sponge supply trends has “become more important to more people in the titanium business.” He identified this interplay as one of the “significant interdependencies” that affect the global titanium feedstock, sponge, master alloys and scrap markets. He proposed that leaders in the titanium industry need to better define and monitor these underlying connections “in order to estimate the future of these highly volatile elements of the titanium mill products supply chain.” However, Seiner pointed out that, due to the various consolidations that have taken place in recent years, “the amount of market information being released into the public domain by titanium producers and consumers is, in many cases, more limited than it has been in the recent past.”
Philip Dewhurst, associate consultant, Roskill Information Services Ltd., London, provided a detailed roadmap of titanium sponge production and trends. According to his forecast, global production of titanium will reach 310,000 metric tons by 2018; of that overall total, about a third or 100,000 metric tons will be sponge for aerospace-grade titanium. He said that, after falling to 123,500 metric tons in 2009, annual global supply of titanium sponge rose by an average of 26.5 percent per year, from 2010 to 2012, to reach 241,000 metric tons. As a result, by 2012 there was a global sponge surplus of 20,000 metric tons, which consisted mainly of industrial or standard material produced in China. Sponge output in 2013 is expected to fall to about 230,000 metric tons due to growing inventories and slowing demand.

Dewhurst outlined key factors driving the global supply of titanium sponge. He said there are more than 20 worldwide producers of sponge, including 14 in China, three in the United States, two in Japan and Russia, and one each in Kazakhstan and Ukraine. In addition, India, in recent years, has started ramping up sponge production. Most of China’s output is of industrial or standard grade sponge for its domestic market. Most sponge production in Japan, Russia and Kazakhstan is largely aerospace grade, which ultimately is earmarked for export.

In the United States, he said three companies produce sponge for the domestic North American market—an overall, estimated production capacity of 34,000 metric tons per year—but noted that most U.S. requirements for sponge are imported. Dewhurst said TIMET’s sponge capacity at its Henderson, NV, plant is 12,600 metric tons, with most of it dedicated for its own use to produce aerospace grades of titanium. ATI produces sponge at its Albany, OR, plant (10,000 metric tons per year) and its Rowley, UT, facility (11,000 metric tons per year), with most of that capacity for standard grades. Honeywell Electronic Materials, at its Salt Lake City installation, has a sponge capacity of 300 metric tons per year, which is used to create high-purity electronic grades of titanium.

Offering a profile of other major sponge producers, he said China has an overall capacity of 147,000 metric tons per year, with most of its sponge used domestically for industrial titanium.
applications. Dewhurst said exports of sponge from China are small, but beginning in 2012, a growing amount is being converted to mill products for export. Japan’s annual sponge production capacity is 68,000 metric tons for aerospace and industrial applications. About half of Japan’s sponge production goes to export sales. VSMPO Avisma is Russia’s largest sponge producer—an annual capacity of 44,000 metric tons—for aerospace and industrial use, much of which is exported. Ukraine’s annual capacity for standard sponge is 12,000 metric tons, produced mainly for export, with near-term plans for an additional 20,000 metric tons of sponge, some of which will be aerospace grade. Kazakhstan has an annual capacity of 30,000 metric tons, with domestic melting slated to reduce sponge exports. In India, fledgling sponge production by the Kerala State Industrial Development Corp. calls for an initial annual capacity of 10,000 metric tons.

Guido Löber, managing director, titanium alloys and coatings, GfE Metalle und Materialien GmbH, Nuremberg, Germany, presented a European perspective for titanium master alloys, regarding their production, application and the current supplier base. Löber defined a master alloy as containing two or more elements with a defined composition—a semi-finished product manufactured for use as a raw material by the titanium industry. He pointed out that a master alloy is not a commodity and without master alloys, which are engineered to provide enhanced material-performance properties (higher strength, heat and corrosion resistance) there are no titanium alloys. “The titanium industry requires a healthy master alloy supplier base,” he declared, adding that “commitments along the supply chain are essential. At the end of the day, the message that ‘prices must go down’ is much too simple.”

Regarding necessary commitments to the supply chain, Löber said suppliers to master alloy producers are expected to provide clear strategic commitments in order to support the titanium industry with a sustained supply of consistent quality materials. He encouraged suppliers to show more flexibility regarding pricing (fixed prices, formula prices, settlement basis) as well as demonstrate the willingness to share in commercial risks. "We, as master alloy
producers, must balance the expectations of our customers and the capabilities of our raw material suppliers while taking into consideration our own constraints provide our products to specification, on time and at a price level manageable for all participants of the supply chain,” he said. “We must be innovative in developing technical solutions for present and future master alloy requirements as well as leading cost reduction programs.”

According to Löber, master alloy producers also have expectations from their customers. These expectations include balancing purchasing orders within the approved and certified supplier base; understanding and accepting the influence of currency exchange rates with regard to master alloy pricing; intensifying cooperation with the master alloy producers in areas such as an early involvement in research and development activities and developing reliable mid-term and long-term forecasts. Löber said customers play an important role in helping master alloy producers adjust their capabilities and capacities at the right time, which ultimately will provide more sustainable economic benefits for all involved, “because we cannot simply turn (our master alloy development and production efforts) on and off.”

Dennis Plester, manager, minerals marketing, Mineral Sand Sales division of Tronox, Sandton, South Africa, discussed his company’s Fairbreeze Mine project. Depending on the timing of regulatory approval and subsequent construction, the Fairbreeze mine could be operational in the second half of 2014 and have a life expectancy of approximately 15 years,” Plester said.

Tronox, which has its corporate offices in Stamford, CT, is a global supplier of TiO₂ via chloride technology and titanium feedstock (synthetic rutile, natural rutile, slag, ilmenite). It operates five mineral sands mines and processing facilities—three in South Africa and two in Australia. During his presentation, Plester said that while the main application for titanium feedstock is titanium dioxide pigment production (86 percent), the remaining 14 percent is evenly divided between titanium sponge production and welding consumables. He pointed out that, historically, the three feedstock consumption sectors have had different purchasing
practices due to their production requirements and product specification. “Based on existing production and approved projects, there will be a slight oversupply until 2015/2016, but this can change quickly with only minor changes in production or demand.” Plester confirmed that Tronox is committed to bringing new feedstock supplies online, citing the Fairbreeze project.

David McCoy, managing consultant and director for TZ Minerals International, Perth, Australia, presented a paper, “Titanium Value Chain: Sand to Melted Products,” which reviewed how sponge producers have seen “an unprecedented surge in cost” for titanium minerals during the last two years. “First it was rutile; more recently, the price for other high-titanium content feedstocks used for sponge has become more expensive as legacy contracts expire.” According to McCoy, manufacturing costs to produce sponge have changed so much in recent years that sponge companies have started to explore alternative, lower cost feedstock sources. The challenge, he said, is that any alternative feedstock must meet industry requirements to produce high-quality sponge.

McCoy’s talk complemented the presentation by Dewhurst. Referencing overall 2012 global sponge production levels, McCoy identified China (36 percent), Japan (25 percent) and Russia (20 percent) as the top three producers of sponge. By way of comparison, the United States accounts for just 5 percent of total global sponge production. TZ Minerals International is a global consulting company with offices in the United States, Australia, Europe, Africa and China.

“Closing the Loop,” a paper by David Rose, general manager, Caledonian Alloys Inc., Monroe, NC, focused on the strategic management of industrial scrap and waste streams, to “collect, process, and return to the designated melt facility where it can be best used to support the customer and the supplier. The scope of ‘closing the loop’ includes all customer and supplier melt facilities, forge facilities, machining facilities, and finishing facilities. It can even be extended into the ‘end of life’ recycling process.”
Rose spelled out revert management “cradle to grave” solutions provided by Caledonian Alloys and PCC Revert Group, which encompasses cost and quality benefits. Caledonian Alloys provides management and consulting services for superalloy and titanium alloy recycling for the aerospace, land-based turbine, and chemical industries. His “bullet point” recommendations indicated long-term agreements for revert services are essential, along with the need to select a provider that functions as a full-service manager. When it comes to scrap management, “full service” is a concept that includes taking responsibility for onsite scrap collections, logistics, processing and certification, as well as competent inventory management, he said. Selecting a full-service provider is essential for realizing the benefits of a revert closed-loop system and controlling metal waste streams. Segregation of materials is critical to improving the value of the material. Full control of site activities means no “leakage” within a company’s supply chain.

**Overview of Asian Markets**

Several speakers in the Overview of Asian Markets Panel provided insights on market conditions and business trends in South Korea, China and India. Chris Lim, on behalf of Jae Hwa Ryu, director of South Korean steel producer Posco, said South Korean net imports of titanium products (scrap, powder, ferrotitanium and mill products) reached nearly 20,000 metric tons in 2012, down from about 23,000 metric tons in the previous year. The market size for South Korean titanium mill products is 8,000 metric tons. Titanium demand is forecasted to grow at an annual rate of 2 percent through 2015. Founded in 1968, Posco has diversified its product line to include titanium, magnesium and stainless steel.

Helen Cao, general manager of Shanghai Huaxia Industry Co. Ltd., Shanghai, China, said overall Chinese consumption of titanium in 2012 reached 50,000 metric tons, reflecting a rapid rate of growth compared with consumption of 23,000 metric tons in 2009. Cao estimated current titanium production levels in China at 57,000 metric tons for sponge and 50,000 metric tons for ingot. She said the market demand for titanium in China is likely to decline 5 percent
during the next five years, due in part to a greater focus on higher-quality, lower-volume titanium products.

Deependra Singh, marketing manager for Indian Rare Earths Ltd. (IREL), Mumbai, India, said the company operates three titanium feedstock mineral separation plants, with annual production levels of 536,000 metric tons for ilmenite and 23,100 metric tons for rutile. In addition to IREL, there are four other Indian producers of titanium feedstock: Beach Minerals; KMML; Trimax; and VV Minerals. Overall titanium feedstock production in India (all five producers) is estimated at 1.2 million metric tons for ilmenite and 39,100 metric tons for rutile. Singh also noted IREL recently launched a rare earths plant in India. According to online reports, IREL has a 10,000-metric-ton capacity monazite processing plant in the eastern Indian state of Odisha. Monazite is a phosphate mineral containing the rare earth metals cerium, lanthanum, and thorium. China is the major source of rare earths, which are acknowledged to be strategic industrial materials. Rare earth elements have applications in hybrid cars and electric vehicles, consumer electronic devices, lasers and fiber optic technologies, and defense applications.

**Medical Applications**

Speakers in the Medical Applications Panel identified strong business opportunities for titanium, especially in the fields of implants and joint replacements, all of which are expected to demonstrated continued near-term growth, especially in North America, to serve the medical needs of the aging Baby Boomer population. Panel moderator Jeff Wise, vice president of sales and marketing for Titanium Industries Inc., Rockaway, NJ, interviewed prior to the start of the conference, underlined the importance of the medical sector as a high-growth field for the titanium industry. Wise pointed out that while many business markets have suffered significant deterioration and employment cutbacks in the wake of the 2009 financial crisis, the medical industry continues to expand. However, while titanium’s near-term opportunities in the medical
field are lucrative, several speakers offered words of caution regarding downward cost pressures and challenges to the global supply chain for medical devices.

Robert J. Daigle, senior vice president, Structure Medical, LLC, Naples, FL, said the United States orthopedic market is valued at $15 billion. Structure Medical is a producer of medical implants used to treat injuries and disorders of the musculoskeletal system. Daigle outlined how medical device manufacturers are under mounting pressure to reduce costs—a trend that would impact the titanium industry. He said stakeholders in the healthcare industry “are communicating their plans to seek less expensive alternatives to brand-name medical devices that could provide similar clinical outcomes, potentially squeezing profits from manufacturers and the supply chain.

“Medical device manufacturers are reporting increasing pressure to lower prices, driven by stakeholders’ interest in lowering their cost,” he continued. “This pressure is being driven down through the supply chain. Hospital sustainability depends on their ability to reduce cost.” Daigle said that many hospitals and regional medical centers are acquiring physician offices, healthcare facilities and surgery centers. He urged titanium companies that do business in the medical field to concentrate on supply-chain issues. “Remove the waste from your operations. Make it easy and cost efficient to do business with your company. Work closely with your customers to identify waste, and then remove it. Provide your customers with solutions; if not, someone else will.”

Haden Janda, senior materials engineer, advanced surgical devices, Smith and Nephew, a global medical technology company in Memphis, TN, presented a paper titled “Titanium as a Metal of Choice for Medical Implants: Present and Future.” Janda, who has authored 20 scientific publications, reviewed the basic medical applications for titanium: orthopaedic reconstruction (joint replacement systems for knees, hips, and shoulders); trauma (products that help repair broken bones); sports medicine (minimally invasive surgery of joints); and advanced wound management (wound care treatment and prevention products used to
treat hard-to-heal wounds). Janda also provided an overview on a medical technology known as “osseointegration,” which utilizes porous titanium coatings. He said the technology involves the application of spherical or asymmetric commercially pure titanium beads. The beads are sintered onto the bone-contacting surface of implants, which then promote bone ingrowth (osteoconductive). Janda reported Smith and Nephew registered sales of more than $4 billion in 2012.

Stanley Abkowitz, chairman and chief executive officer of Dynamet Technology Inc., Burlington, MA, described how leading-edge powder metal manufacturing techniques can create “custom engineered titanium compositions and structures with useful combinations of properties, not producible by traditional melt processing. This approach provides the opportunity for new materials-based solutions for the medical device designer to overcome the limitations of current material options in the design and manufacture of higher performing medical device products.”

Carlos Toledo, global commodity manager, Stryker Implants Division, discussed that challenges in developing a comprehensive supply chain to meet quality deliverables for the medical market. He said key attributes for suppliers include logistical support and complying with quality assurance systems associated with medical products. He also cited the trend of reducing costs and supplier consolidation, noting that from 2010 to 2013 there was a 30-percent decline in the number of suppliers in the medical supply chain.

Stryker Corp., a designer and manufacturer of medical devices based in Kalamazoo, MI, has been active on the acquisition front to expand its reach and global supply chain capabilities. According to online news reports, last March Stryker completed its acquisition of Chinese-based Trauson Holdings Co. Ltd. Trauson, founded in 1986, is a leading manufacturer of instruments and implants for trauma and spine. In addition, The Wall Street Journal, in its Sept. 25, 2013 edition, reported that Stryker agreed to acquire Mako Surgical Corp. and its robotic-surgery platform, “a move aimed at distinguishing Stryker’s line of replacement knees and hips for its
increasingly cost-conscious hospital customers.” A Stryker spokeswoman, quoted in the article, said that the addition of Mako would help it cater to hospital and insurance executives who increasingly want new devices to help reduce overall costs.

**Mill Processing/Melting**

Henrik Franz, head of research and development for the Metallurgy Division of ALD Vacuum Technologies GmbH, reviewed recent advances in plasma technology for the remelting and processing of reactive metals and the production of titanium alloys and identified specific projects. For 2013, he cited the development and startup of 400 kW plasma torch for powder production at GKSS Research Center, Geesthacht, Germany; a 1200 kW, three-torch furnace at IMR Shenyang, China; and a 1.6 MW helium torch for ALD’s testing facility in Hanau, Germany. In describing these advanced plasma systems, he touted the technology for its improved control of alloy, a lower risk of contamination, higher yields and the enhanced capability to handle titanium aluminides. In the summary of his presentation, he said plasma torches are now available in a range of 35 to 1600 kW, representing a market-driven expansion of ALD’s product portfolio.

Hansjörg Rau, senior vice president, Outokumpu VDM GmbH, Essen, Germany, discussed “quality assured production of Ti-6Al-4V in an electron beam (EB) furnace.” His presentation focused on the high-volume utilization of titanium scrap, saying that Outokumpu’s EB cold hearth remelting furnace has a maximum capacity is 5,000 metric tons per year. The furnace’s recycled feedstream includes sponge, cobbles and compacted chips. The EB furnace features an automatic beam-power distribution control system and a melting rate of 1,600 kilograms per hour, with the capability to produce ingots and slab. However, Rau acknowledged that the melting of the Ti-6Al-4V alloy in an EB furnace is a challenge. He said the most important issue is to control the alloy’s aluminum content because of its “pronounced evaporation” rate during the melting process.
Guihong Qin of Baosteel Special Materials Co. Ltd. of China outlined results of her company’s research of hot tandem rolling of TC6 bars, which she described as a heat-resistant titanium alloy. The research work focused on the alloy’s microstructure. She provided snapshots of Baosteel’s tandem rolling and forging presses. Of three trial methods, she identified one production line, which includes open and radial forging presses and a tandem rolling station, as successfully meeting the specifications of microstructure and mechanical properties of TC6 bars.

Piet Kooman, sales and marketing director for Timesavers International BV, Goes, the Netherlands, presented information on coated abrasive media designed with a specific orientation, rather than a random orientation, which provides higher stock removal rates. The Timesavers system uses mineral oil, which improves the abrasive’s cutting action. He said a key feature for the system is a vacuum table that can accurately hold complex flat parts.

**Award Winners**

During the festivities of TITANIUM 2013, the ITA presented its annual awards to two distinguished members of the titanium industry. J. Landis Martin received the Lifetime Achievement Award, and Stanley Abkowitz was the recipient of the Applications Development Award.

In 2005, Martin stepped down after serving 16 years as chairman and chief executive officer of TIMET. He later formed Platte River Equity, a Denver-based firm that invests in companies involved in the metals, chemicals, manufacturing, infrastructure and energy services sectors. Martin maintains a positive outlook for the titanium industry and plans to remain as an active participant in its ongoing global growth. He anticipates the industry will continue to make strides to bolster its global infrastructure for production and supply-chain management. Recalling the early days of his career, Martin said he always had a “fascination” with titanium’s superior properties as an industrial material of
choice, especially for commercial and military aerospace applications. “Today there’s still nothing that can replace titanium in the aerospace market,” he said.

The founder, president and chief executive officer of Dynamet Technology Inc., Burlington MA, Stanley Abkowitz has pioneered the development and application of titanium powder metal technology for four decades. Dynamet recently garnered approval by aerospace giant Boeing Co. through Boeing Commercial Aircraft (BCA) after an extensive evaluation of Dynamet’s Ti-6Al-4V alloy product and development. This effort resulted in Dynamet becoming the sole qualified supplier for Ti-6Al-4V powder metal products, meeting the requirements of the Boeing Material Specification. Abkowitz said acceptance of powder metal titanium as a substitute for conventional Ti-6Al-4V mill products or forgings for use in aerospace is more than just a personal honor; he feels it marks a new era for the use of titanium powder metal technology in the aerospace industry.

Brett Paddock, president of the ITA, and the president and chief executive officer of Titanium Industries Inc., Rockaway, NJ, praised the two award winners and their achievements in the industry. “We were extremely pleased to recognize two long-time contributors to the titanium industry and supporters of the ITA: Lanny Martin and Stanley Abkowitz. In addition to the two award winners, Paddock also congratulated Susan M. Abkowitz of at Dynamet Technology Inc., Edward J. Newman of Keywell LLC, Chicago, and Henry Seiner of TIMET on being appointed to the ITA board of directors. Formal induction ceremonies were held during TITANIUM 2013.

“The 29th annual ITA Titanium conference attracted a record number of attendees this year in the historically popular spot of Las Vegas,” Paddock continued. “Delegates gathered to hear industry leading executives present their outlook on supply and demand trends as well as over 80 papers presented on other pertinent topics relating to the titanium industry. The conference had record turnout, the content of the speaker panels was extremely robust, the distinguished speakers were the leading experts in their respective fields and the networking
opportunities, once again, proved to be the best in the industry. Attendees clearly left the conference with a firm understanding of trends in the markets that affect their businesses.”

As outlined during conference presentations, Paddock concurred that the commercial aerospace market “continues to be the main demand driver in the titanium industry with a very positive outlook for a four to five year period of increased consumption. However, not all markets were positive, with fairly weak near-term demand in the industrial market, excess inventory in the airframe sector, and shipments into the aero engine spares market being negatively impacted by legacy parts. The military and defense market is forecasted to be a bit stronger than had been anticipated. All in all, the industry should see a strong growth period for the foreseeable future, with much of the potential coming in late 2014 and 2015.”

Based in Denver, CO, and led by Jennifer Simpson, executive director, the ITA will sponsor two conferences in 2014. The TITANIUM EUROPE 2014 conference and exhibition will be held May 19-21, 2014 at the Hilton Sorrento Palace Hotel in, Via S. Antonio 13, Sorrento, Italy. Separately, in North America, TITANIUM 2014 is slated to run Sept. 21-24, 2014 at the Hilton Chicago, 720 S. Michigan Ave., Chicago. The gathering in Chicago will mark the 30th TITANIUM forum in North America. Call the ITA at (303) 404-2221 or visit the organization’s Web site (www.titanium.org) for more information on submitting papers, reserving exhibition space and early-registration incentives.

This report was developed by an independent freelance writer on behalf of the International Titanium Association (ITA) and is intended to provide a broad overview of the TITANIUM 2013 conference. The summary provided is based on the presentations interpreted, but is not intended to be either exhaustive or inclusive of all presentations.