Mill Perspective and Challenges in the Medical Supply Chain
Douglas J. Harvey

With the consistent growth of the medical industry and its ever-expanding use of titanium and titanium alloys, a healthy, responsive and adaptive supply chain is critical.

The goal of my time with you this afternoon is to give the perspective of a titanium bar mill, one of the furthest points upstream in this chain. Please let me begin by stating the TSI Titanium has a rather unique position of being an independent mill with no melt capabilities or direct affiliations to the distributor or OEM levels. I will do my best to present this from the point of view of any mill that feeds titanium bar and other mill products into the medical industry, however some of the information I share with you may not apply to all mills.

Within my discussion, there will be three main points. The first point will be some insight into the most significant hurdle a mill faces when meeting the demands of the medical consumers: time. The second will be the impact of current changes within the medical industry relating to approvals and supplier control. Finally will be some suggestions, from a mill perspective, to help minimize the risk felt by the various levels of this chain.

An underlying theme of my talk will be planning. Planning is something we all strive to do better, and can only be affective with accurate information. Obviously this is required at all stations of the supply chain. And most importantly, that information must flow in both directions. As demand increases from the medical manufacturers, word must be sent up the chain so that the mills and melters can begin the process of ramping up production. Likewise, as other industries’ needs fluctuate and potentially consume more of the mills’ capacities, a lack of information from us, up to the medical consumers, sets the OEMs up for a very unpleasant surprise.

For TSI Titanium, the starting point is as-cast ingot, bloom or billet. That’s where our hands-on life cycle begins. To give you a point of reference, we begin with ingot, roughly 30-36” diameter, and our finished product is round or rectangular bar. The size range we produce for round bar is from .375” diameter up to in excess of 18” diameter. Rectangular product closely follows that range.

Depending on market conditions, procurement of our raw material can be as simple as a spot buy, which is a relatively rare occasion, or a lead time as long as 6 months. However, to get a feel for what is really involved in the supply change from the mill back, we have to look at the real genesis of the product... black sand. The steps involved just to get a usable form into our system are complex and time consuming.

I’m sure most of us are familiar with the long-standing process to get titanium from its mined, rutile for to an alloyed or commercially pure form of metal, but sometimes it warrants a recap just to keep in mind that the supply process does not begin with an ingot.

Rutile is converted into sponge by way of the Kroll process, a time consuming step that puts a usable form into the hands of the melter. From submission of purchase order for the sponge until delivery,
melters can face a 20 week lead time. From this point the melter adds the other ingredients and, ultimately, cast the ingot. Another process that takes time and care, balancing melt slots and raw materials to produce a product that meets all the requirements of the end users. All of this adds time to the planning process of ingot acquisition.

With proper information flowing up the supply chain, a mill like ours can negate some of the more extended lead times by having the appropriate material in the pipeline. This most likely will be done on a speculative basis, but that is nothing new in this industry.

Once the hurdle of acquiring metal is cleared, our clock really starts to tick.

Our initial step of ingot breakdown, whether by rolling or forging, can vary from 6 to 16 weeks. A series of conditioning, inspection and cutting processes prepare the billet for rolling. Rolling mill cycle times can be as long as 8 weeks, even for common, run-of-the-mill sizes and shapes, or sometimes many months if a custom shaped product is required. Heat treating, bar finishing, physical analysis and immersion ultrasonic inspection all must follow and all take many weeks to accomplish. To help put a number to the information I just threw at you, in processing time from ingot to a finished bar product, there could be a range of 18 to 24 weeks. And that’s excluding ingot procurement. This is just to get finished bar into the hands of the distribution level or to a machine or forge shop to process the material closer to its final form.

All steps must be done with diligence and care to optimize properties, ensure integrity and strive to result in a defect free product that meets the standard of the OEM and their consumers. Quite simply, it takes time to make good material.

Now that we have discussed what happens on our end of the chain, I’d like to turn my attention to the companies at the other end of the chain. In the recent past, quite a few of the major medical OEMs and their subsidiaries have gone through changes in vendor analysis, auditing and qualification processes. Some changes have been minor, but some have been rather considerable, including significant reductions in approved suppliers at all levels of the chain. Understanding that this ultimately results in a higher quality, safer product for critical applications, it is a commendable step. However, with this control comes higher risk for delays and hiccups in material feeding the industry.

Most decisions in any business come down to minimizing costs. The decisions for tighter control over manufacturers can be traced back to the cost that inferior or flawed products pose in the medical industry, ranging from the recall and resupply of potentially defective items, to the literal cost of pain and suffering of the ultimate end users, the medical patients.

Cost is taken into consideration when developing an approved supplier list. It takes time, manpower and money to qualify suppliers and then maintain their status within a system.

However, delays in production due to extended lead times by suppliers or material shortages also impact cost. It is this balancing act that presents itself to some of the medical OEMs. Do the cost
savings of maintaining a small supplier base outweigh the potential negative cost if that supplier base must extend lead times?

With an estimated 50% of titanium and titanium alloy consumed by the aircraft industry, it’s no secret what happens when that group of consumers gets their assembly lines moving. There is no doubt that the manufacturers of titanium mill products value the medical industry as a consumer, but when demand increases, lead times increase. In the current climate with the Boeing 737 ramping up and the certification of the 787, as well as announcements of increased build rates by Airbus, advanced planning by the medical OEMs with clear communication up the supply chain becomes absolutely critical.

With respect to that, the great advantage the medical industry has is that demand is generally much steadier relative to the other larger consumers of titanium. While there are ups and downs in material need and consumption, it’s safe to say that these tend to be isolated within 12 month cycles and not multiple year roller coaster rides. And while there has always been growth in the medical industry, it is of the gradual nature, permitting a thorough course of action. We believe that this gives the medical OEMs a decisive advantage when working towards minimizing their exposure to the effects of other consumer groups. Whether they prefer to work directly with manufacturers or through their relationships with distributors, an open line of communications throughout can only establish a foundation for consistent, reliable products and product flow.
MILL PERSPECTIVE AND CHALLENGES IN THE MEDICAL SUPPLY CHAIN

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TSI Titanium
• Biggest challenge to the mills: Time
• Changes to the Medical OEM’s supplier models
• Suggestions and solutions(?)
PLANNING

- Melters & Mills
- Medical OEMs
TSI TITANIUM’S PERSPECTIVE
From ingot to fully tested, finished bar:

**18-24 WEEKS**

Good Product =
OEM SUPPLIER CONTROLS

- Qualified suppliers
  + Melt sources
  + Mills
  + Service centers
  + Manufacturers

Increased exposure to supply chain issues.
SUGGESTIONS AND SOLUTIONS

- Planning
- Communication
- Creativity