

Choosing the right aluminium rolling slab saw: Productivity and cost comparison of band and circular saws

In many aluminium smelters, remelt facilities and rolling mill cast houses producing rolling slabs, a sawing system is essential for removing the two ends of a slab before it is sent to preheating and hot rolling. This article by Sibnath Mitra, Product Manager, LOMA™ Machine Division, Magnum Integrated Technologies attempts to make an impartial comparison of the two types of saws to assist rolling slab cast house managers to make an informed decision.

In the past, cast house managers, project managers and consultants almost unequivocally chose circular saws. Over the last few years, however, key decision-making has revolved around choosing either a band or a circular saw – each having its unique set of advantages – some real, some proclaimed to be real, and most importantly, some perceived to be real without hard practical facts supporting them.

The author has worked for many years in the aluminium industry and has seen the operation in various cast houses in India, Italy, USA, Canada, Russia, South Africa and China. For this reason the author speaks without any bias. The facts presented here are real, and the conclusions drawn and the observations recorded are from experienced cast house personnel from all over the world. In addition, having worked with an OEM, all the data, including the maintenance requirements, are provided from the knowledge of design of equipment for proven mill-duty applications, feedback from old and new customers, information on parts supplied to old and new installations and service calls to customers' plants.

PRODUCTIVITY AND OPERATIONAL COST

Cutting Speed: The maximum cutting speed for slabs would be around 40dm²/min for a band saw, or at least that is what the manufacturers claim. For a slab of 600mm thickness, this translates to a calculated feed rate of 11mm/sec. In actual application, however, band saws never achieve a feed rate anywhere near that. The author has never seen a feed rate even half of that for band saws cutting slabs say 600 X 1500mm. Or even T-bars. Compared to that, LOMA™ circular saws can easily demonstrate a feed rate of 25mm/sec for slabs and 25 - 30mm/sec for T-bars. Feed Rate of 50mm/sec is very common while cutting aluminum billets,

Scrap Volume: Band saw manufacturers claim that the volume of scrap from their 1.6mm-thick blade is much smaller than that generated from a 15 mm-thick circular saw. This reduction will not translate into higher productivity in slab sawing since the volume of scrap in cut-thickness will be added to the head and butt scrap pieces and will be remelted anyway. Unless the number of cuts is large enough to generate an additional piece from the savings from cut-

thickness, there is no saving at all. This assumes, however, that the system is equipped with good chip collection and compaction systems. The saw chips generated by circular saws can, in addition, be reclaimed to a high degree especially if they are briquetted. Band Saw chips are not as compactable.

Blade Life: LOMA circular saws normally include 4 to 6 blades with HSS teeth segments or carbide-tipped inserts. These blades can be reground and retrofitted with new segments or inserts, giving them a very long life. This, however, assumes that the mist-lubrication and anti-pinch system are used and maintained in working order to avoid any damage to the blade disc. Circular saw blades are assets, whereas band saw blades are consumables. For a typical slab saw application, at least one band change per day is not uncommon, and each bimetallic blade costs between US\$700 to 1000. This in itself may add up to an annual cost of at least US\$200,000.

HSS Segment/Carbide Insert Price/Life: Each HSS Segment costs around US\$125 and each insert costs around US\$9.25. A

blade in the diameter range of 1830 - 2020mm will have approximately 60 to 80 teeth (2.5 to 3 teeth per segment) and hence a complete set of segments or inserts would cost about US\$550 to \$4000. These segment of comparable quality are, however, available at a cheaper rate in many Asian countries.

The life between re-sharpening of segmented teeth or inserts depends on several factors, including but not limited to accuracy of resharping, feed rate, coolant spray quality and quantity, design and condition of the saw, alloys being cut, slab temperature, and so on.

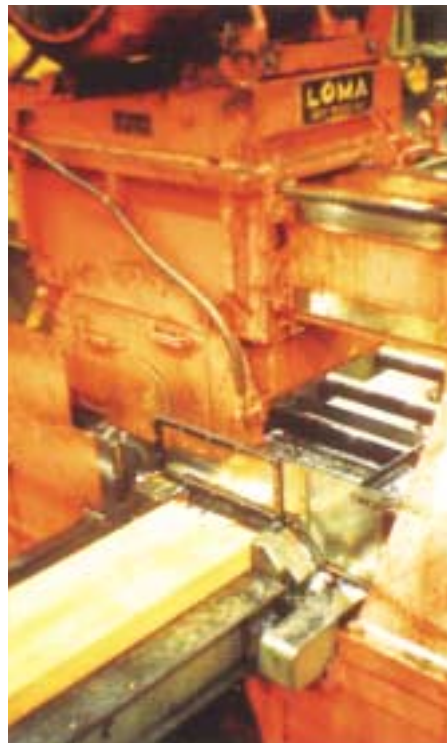
A conservative estimate for carbide inserts would be about 1,100m² or 1,705,000in² (can vary between 1 - 3 million in² or 645 - 1935m²) between resharping when sawing mainly soft and medium aluminium alloy slabs at room temperature. A blade with a new set of inserts, depending on the application, can be re-sharpened 10 to 12 times.

A conservative estimate for HSS Segmented Teeth would be between 1 to 1.5 million in² (645 - 968m²) for each sharpening when sawing mainly soft and medium aluminium alloy slabs at room temperature. A blade with new segments, depending on the application, can be re-sharpened 25 to 30 times. Sharpening cost varies widely from region to region. US\$200 per sharpening is a reasonable estimate in the western world.

Anti-pinch System: The anti-pinch system that normally comes with a band saw is nowhere nearly as robust as the one offered with LOMA circular saws. Moreover, the basic design is not likely to be as effective in a vertical band saw as it is in a horizontal band saw.

Saw Motor Size: A band saw motor will be typically smaller than a circular saw motor. However, this reduction and the corresponding saving in power will be insignificant given the size and KW requirement of a large cast house. Moreover, the higher productivity often results in a two-shift operation for a circular saw. The labour cost savings of the third shift more than compensate for the additional power use.

Sound Level: Band saws are typically quieter than circular saws. However, a circular saw with a properly designed sound enclosure could meet or exceed the allowed dB level. ▶00



Input from Bill Curtis, Manager, US Operations of Magnum Integrated Technologies, Steve Spencer, Manager Engineering of Magnum Integrated Technologies, Don Haas of Haas Saw Supply Co. and Earnest Jesacher of Wagner Carbide Saw Div, in writing this article is gratefully acknowledged.

MATERIAL HANDLING

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Maintenance Requirements: Circular slab saws and material handling systems designed by LOMA have been running practically without any need for major changes in parts or components for the last 30 to 40 years in several installations. Generally speaking, if the lubrication schedule is followed, lubricating and hydraulic oil hygiene is maintained, compressed air is clean and dry, and operating parameters are kept within specifications, the saw and the associated handling equipment will perform for years without need to change any major part or component. The system is designed to avoid any major parts replacement for preventive or predictive maintenance.

On the contrary, Band Saws need frequent parts replacement. The cutting speed for the band saw for sawing aluminum is high which means the band saw blade is twisted very often resulting in blade fatigue, wear and tear on the drive, idler wheel and blade guides. The guide wheel assemblies (the ones that twist the blade by 90 degrees before and after the cut) need to be changed, probably once a year depending on their usages, as part of preventive maintenance that would cost about US\$5000 in material alone each time. Another example would

be the synthetic layer (elastomer ring or band on the drive wheel) on the band saw wheels that makes the band ride smoothly and quietly on the wheels without slippage. The need for periodic re-coating of these drive wheels in a band saw is yet another maintenance cost. These are in addition to the carrying cost of extra spare wheels to keep the saw running when one set of wheels is sent for re-build. LOMA circular saw systems do not have such built-in maintenance costs associated with their regular and proper use.

LIFE-CYCLE COSTING: INITIAL INVESTMENT

The price of LOMA circular saws varies widely, depending on application. It is true that the initial investment in a circular saw appears to be much higher than the initial investment in a corresponding band saw. However, if one tries to compare life cycle costing of a band and a circular saw, one has to remember that LOMA circular slab saws have been running well in several installations for 35 to 40 years, whereas the expected economic life of a band saw would probably be, on average, less than a third of that. Taking the above-mentioned facts into consideration regarding the ongoing cost of

bands, maintenance cost, replacement cost and time saving, one will come to a clear conclusion that circular saws are by far the best choice for companies which have as their objective to maximize productivity and reliability and to minimize maintenance and long term costs.

Industry Trend: According to feedback from our extensive list of customers, band saws are gaining limited access to billet saws producing multiple billets per cut, where the small blade thickness might result in additional pieces of billets from the same log. However, in slabs and T-bar sawing, circular saws are being chosen more often than not for their unmatched productivity. In some cases, where a band saw was chosen for some perceived advantages other than productivity, the decision was later reconsidered when productivity increase resulted in a bottleneck at the saw. ■

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