Gearing up the Indian Copper and Brass Extrusion Industry

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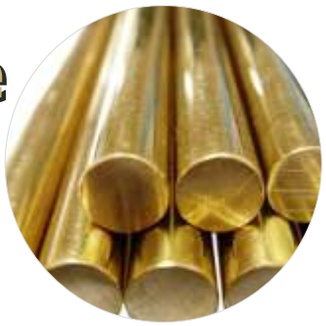
Out of this, he has spent about 14 years in aluminium casting and extrusion. Well-versed with almost all the aspects of the business, from customer consultancy, casting, manufacturing, dies and tooling, press, downstream operations. Raju Hirve has also interacted with a large customer base in applications such as architectural, electrical, transportation, automotive and general engineering.



Indian economy is all poised for a new thrust in the area of manufacturing, with the recent initiative by the present Government, after a stagnation of about a decade. To meet the requirements of enhanced output and quality demands both from the local as well as global markets, this is an overview on what measures the Indian copper industry can take, to meet the challenges.

Typical Features

The Indian copper industry, mainly on the downstream end, has some typical features, based on the historic developments, towing the economics and demographics of the country such as:

These units are rather small, with limited installed capacity. Most of these units predominantly use 100 % recycled scrap. They use the age-old book mould method for casting billets. The overall technological inputs, and deployment of quality systems is rather low.

As a result, no wonder that they face a myriad of problems in production, as given in Table – 1 enclosed. To cite an example, there are large variations in the mechanical properties, to the tune of up to 50% in some batches.

Table 1 : Problems Faced at Production

- Poor Surface quality of the billet
- Very large grain size
- High degree of segregation
- Overall inconsistency
- Gas entrapment, Blisters
- Poor extrudability and flow properties
- Large band of variations in the properties
- Central crack development
- High end-cutting losses
- High percentage of rejection
- Poor Electrical conductivity
- Wide variation in grain size, mechanical properties
- Variation in surface color
- High residue at the inner surface of tubes
- Poor life of dies and tooling
- Poor consistency in quality
- High rejection
- Poor margins

Opportunities for Improvements

It is high time that the industry wakes up to meet the demands of the future, and here are some initiatives that can be taken at various stages for radial improvements.

Raw Material

To begin with, a proper ratio of virgin metal to scrap may be introduced to curtail all sorts of impurities, thereby controlling the composition and reducing the need for burning out these impurities by oxidation. This would also lead to fuel efficiency and time saving.

Melting and Casting

Rapid melting by Induction route is highly recommended , though power shortages in some regions is an issue for some units. However, most units have shifted to this method by now.

On the melt treatment, improved de-oxidation and de-gassing (for Hydrogen) removal can be achieved with introduction of Lithium Tubes that take care of both the problems. With reduction in Oxygen content, the conductivity of pure Copper is controlled very well, and in Cupro-Nickel and other alloys, the formation of blisters, especially at the extreme downstream end such as tube drawing of thin tube , rolling of foil etc. can be controlled with reduction in Hydrogen.

Spectrometric analysis is fine for overall analysis control, but oxygen may be measured with the Zirconia based Oxygen probe . While this is a common practice in steel making, it is yet to be adopted by the copper industry.

Semi-continuous Casting of billets is one major step towards producing billets with consistent properties, in bulk. Today, such machines can be installed with reasonable investments.The overall benefits of these measures at Melting stage are given in the Table – 2

Table – 2 : Benefits of Improvements at Melting and Casting Stage

- Consistency in composition, appearance, and workability
- Lower rejections, cut-ends
- Improved Electrical conductivity
- Improved workability
- Improved surface of the billet
- Lower operating cost
- Fine grain size
- Improved extrudability
- Higher output
- Saving in energy
- Improved margins

Extrusion

Simple measures such as improved layouts, handling with higher degree of automation, use of pullers on run-out tables, level winding coilers etc. can lead to a number of benefits in the extrusion shop. It is a matter of targeting these improvements, and implementing them over a period right at the shop level itself, as given in Table -3

Table – 3 : Improvement Targets at Extrusion Stage

- Reduced damage to the surface in handling
- Reduced rejects
- Reduced accidents
- Higher output
- Higher output
- Consistency
- Cleaner inner surface

- Uniform, homogeneous deformation
- Control of cold working

Dies, Tooling and Spares for Extrusion and Draw Operations

Particularly with introduction of inexpensive conform extrusion machines, there is quite some concern on the quality and life of the dies and tooling such as Die Chamber, Abutment, Wheel, Spline etc. Instead of depending upon the inexpensive supplies that are wanting on performance, it is perfectly feasible to develop these consumables locally.

Tube Drawing

The draw shops are quite small in size, and mostly depend upon manual operations of the draw benches. It would be necessary to introduce Spool to spool drawing equipment (with capstan and caterpillar), for enhanced output with high degree of consistency and automation.

The Draw schedule design also calls for introduction of technological inputs, which is rather a random process based on inventory / availability of dies at hand.

Control of annealing, and through the metallurgical structure of the metal is the key to overall metalworking operation. There is a vast scope for improvement in this area, with deployment of qualified metallurgical engineers, and establish the processes with taking a cue from what is happening to the metal from the inside. Obviously, the laboratory facilities will have to be improved with microscopes and allied equipment, but that is not such a difficult issue any more.

Apart from this, there is a need to establish well-defined die design parameters, rather than depending on the die manufacturer alone. Also, the methodology for inspection of draw dies is also wanting. Both these factors are treated as black box.

Overall Improvements :

Just as in any other mass production units, the copper and brass industry also needs to adopt essential management techniques, with Q systems inclusive of Statistical Process control, CPK monitoring. Scheduling and Logistics is another area that calls for joint efforts of engineers and management, particularly when these can lead to substantial financial gains.

Other Strategic Issues:

Increased focus on the global market is a sure way to initiate and implement this kind of up-gradation program. Further value addition is also imminent when finished products in form of machined components and assemblies are offered instead of supply of the raw materials alone.