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# AIIFA

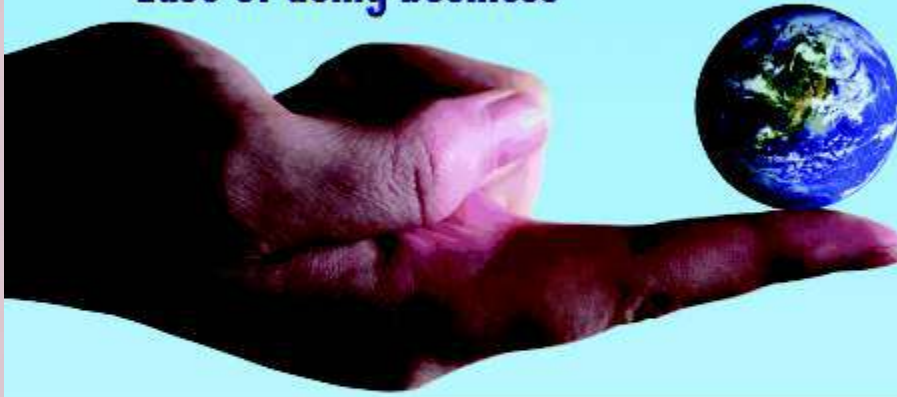
INDUCTION FURNACE NEWSLETTER

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## What's Inside



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AIIFA'S 33rd Annual Conference

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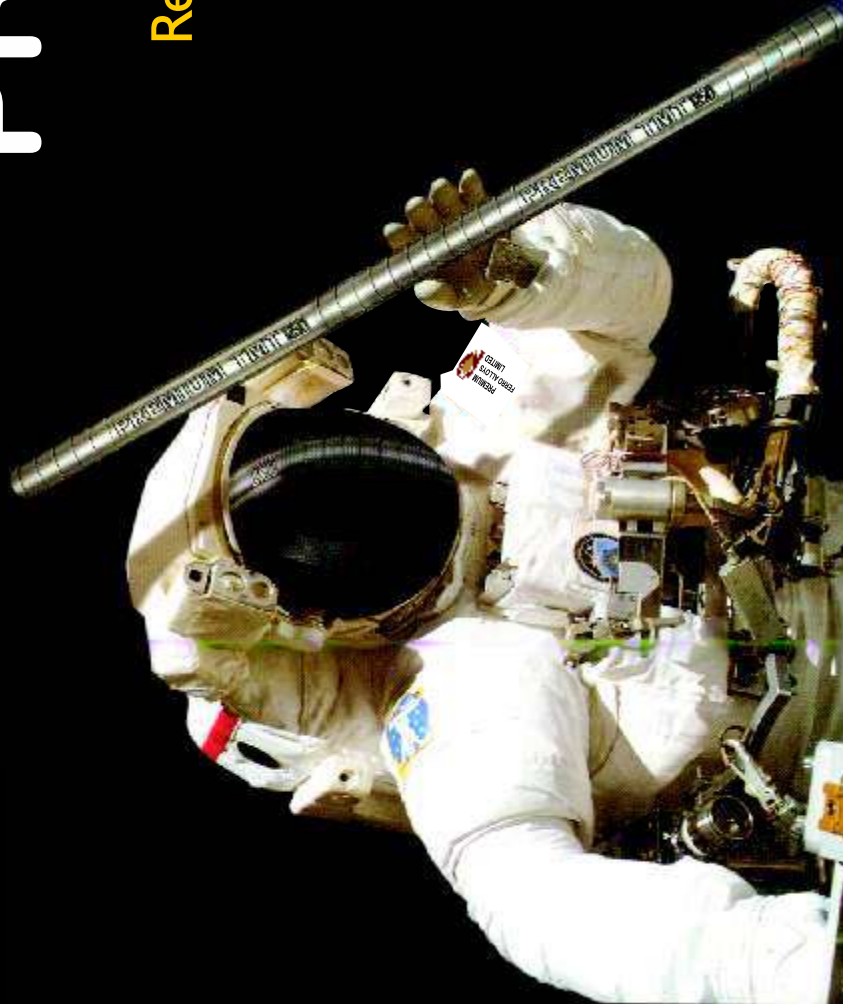
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## HANDBOOK ON INDIAN STEEL INDUSTRIES

(a directory of units producing steel through electrical route)

2018-19



Compiled by:



All India Induction Furnaces Association

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# Write-Up on Brief Project for Steel Re-Rolling Mill

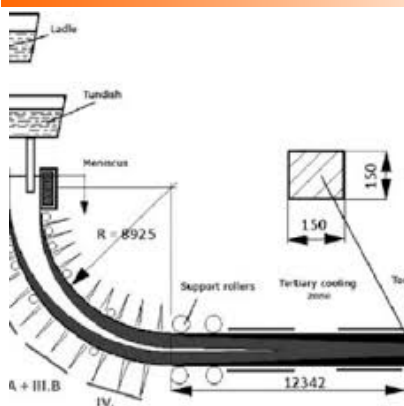
P. Mishra

*Sr. Executive Director, AIIFA, Delhi*

**Introduction:** Apart from demand for steel re rolled products in housing sector, substantial requirements as exponential growth is seen from other major end use applications like industrial buildings and civil works, commercial buildings and complexes, dams and bridges, infrastructure projects excluding roads and bridges and many other industrial uses. Infrastructure development has been given top priority by Govt. of India in coming 10-12 years and as such huge investment proposals are coming to set up environment friendly steel re rolling mills in the country. Establishment of new industrial undertakings in larger sizes will be required to maintain substantially high industrial production, as there are remote chances of many of presently closed industrial units. Booming consumer market has triggered construction of commercial buildings and related civil works such as amusement parks, sports grounds etc. However, on a reasonable basis, the total demand from all above sectors may be assumed to be at 100 to 150% of demand from housing sector all India basis and for individual state. As transportation cost will be major factor, long products sales will be generally within a radius of 200-250 km from rolling mills. The demand for long products is estimated based on various estimates for finished steel. The estimated total demand for finished steel including exports is about 76 million MT signifying an annual growth of 7.5% - 8.5%.

The Rebar industry has been a main steel production units among the Finished Steel product categories consisting about 35 -38 percent of the total steel production in the country. The construction and infrastructure boom in the country in the past decade contributed to the rapid growth in the industry. The rebar industry is characterized by both primary and secondary players operating in the market. Integrated Steel Producers (ISPs) in the category of Major & Main Steel Producers like SAIL, Vizag Steel, Tata Steel, JSW, that produce from the pure iron ore account for about 30 percent of the total rebar market. The remaining 70 percent is catered by about 300-400 producers and the lead role is played by secondary producers like VISA, Essar, Bhushan, Jindal Steel & Power, Tulsyan, SRMB, Shyam Steel, B.K.Steel, Jai Balaji, Sujana, Kalika, Adhunik Industries, Kannappan Iron & Steel Co (KISCOL), GBR TMT, Prime Gold Group, Huge rebar industries scattered in Chattisgarh and Odissa, etc. Medium and small players have regional presence catering to the demand in a particular region.

**Manufacturing Process of Steel Rebars :** Tested billets mostly in cross-section of 75 X75, 80 X 80, 90 X 90



mm, 95 X 95 mm, 100 X 100mm, 115 X 115 mm, 125 X 125, 140 X 140 mm are ideally suited in the rolling mills and are fed in mills after re-heating the stock in re-heating furnace operated with the help of burning liquid or liquid and gaseous fuels for producing round bar of small sections.

The liquid steel produced from conventional steel making routes like BOF, EOF, EAF and IF followed by secondary refining & continuous casting or ingot casting, satisfying quality are sourced by re-rolling units from mini steel plants, major and main steel plants in the country. The billet casting units (shown in picture) in mini steel plants attached in line with induction

furnace, LRF or AOD are providing greater flexibility in production of changing market demands extremely quickly ranging steel grades from simple construction steel (rebar) to state-of-the-art Special Bar Qualities (SBQ) for the automotive industry and other engineering applications, as well as high-grade wire products. Billet sections cover rectangular, square and round sections in different sizes. Direct charging of hot billets to the rolling mill, reduce the cost of reheating equipment and energy and slow cooling to allow for sufficient hydrogen diffusion optimizing caster throughput for maximum productivity with reduced billet-handling operations ensuring quality.

**Brief Guidelines from Govt. for Setting up of TMT Unit :** The New Industrial policy, Govt of India has opened up for private investment for iron and steel sector by removing it from the list of industries reserved for public sector. The policy exempts it from compulsory licensing. Imports of foreign technology, as well as foreign direct investments, are freely permitted up to certain limits under an automatic route. This type of manufacturing operation attracts many different types of registration and licenses from the different Govt. agency. Sometimes it differs according to the form of organization and investment raised by the manufacturing company. However, state laws and rules of statutory authorities need to be consulted to start up for necessary compliances.

#### **The criteria for selecting location of IF /Rebar factory are:**

Registration of the willing firm with ROC. According to the management pattern and investment ratio, choosing the right form of business organization.

1. Trade License from the local authority has to be collected.
2. Project has to be registered under the ceiling of MSME.
3. For BIS certification of Rebar products, application is to be made
4. Apply for NOC from Pollution Control Board stating the process and fulfilling mandatory requirements
5. Obtain ISO Certification
6. Apply for Registration of VAT or any other related Financial Issues.

The tested steel billets as input materials for rebar production are the only suitable material for producing consistently good quality steel. The main and major producers provide BIS test certificates with Rebar containing the detailed chemical and mechanical properties on purchase of billets by re-rollers. The cost of steel billet manufactured using the electric arc furnace is comparatively higher than BOF or IF route. Most people are familiar with reinforcing steel, commonly called "rebar". It is used in bridges, buildings, skyscrapers, homes, warehouses, and foundations to increase the strength of a concrete structure. Rebar (in picture above) is used in concrete to provide additional strength, as concrete is weak in tension, while steel is strong in both tension and compression.

Since the rolling operation in rebar production is often the last process step, any rejection for any reason at rolling stage is very costly and hence the quality control of rolling process is very important. Severe competition in Indian steel industry urges quality improvements in rolling processes. Among all the quality concerns, the surface integrity is an extremely important quality characteristic of the rolled products. Products with severe surface defects in rolled or concast billets for final rolling as rebar have to be scrapped. Therefore, it is highly desired to detect, reduce, and eventually eliminate the defect at liquid steel or concast stage if possible. Unfortunately, the surface defects remain as the most troubling problems in the hot rolling process. In re-rolling industry, direct rolling of concast billet is a technical evolution of hot charging, where continuous cast billet is directly pushed to the rolling mill, without the need for an intermediate process of re-



heating. Different solidification zones during casting of continuous cast M.S. billets for rolling Rebar is shown below.

In this process, the need for a re-heating furnace is eliminated, resulting in a complete heat saving due to this redundancy. The direct rolling process can be adopted in composite units by controlling the secondary cooling of the continuous casting machine by means of Programmable Logic Control (PLC), hydraulic cutting of billets, high-speed transfers of hot billets, and a canopy covering over the conveyer belt.

➔ **Shaping Process by Re-Rolling:** Pencil ingots from mini steel plants or billets from different sources to the desired finished section in the hot condition by way of passing the material between a pair of grooved rolls and providing suitable drafts at various stages.



The whole operation is conducted at a particular temperature range between 1150-1200°C and within a limited time span. The stages of rolling operation are comprised of heating of feed stock to rollable temperature, rolling the feeding stock in different mill stands, cropping the hot bar during the process of rolling between mill stands as applicable and subsequently finishing in form of hot rolled deformed bar in straight length. The hot bar coming out of the last pass is then conveyed through TMT line and collecting in a cooling bed after shearing.

The bars at almost ambient temperature are sheared to commercial length stored and kept ready for dispatch. Steel re-rolling as it exists today, however, was developed in England in the 16th century. Today, depending on the kind of technology used, re rolling mills can be classified into 'bar mills' or 'structural rolling mills'. While bar mills exclusively produce HSD (high strength deformed) bars, structural rolling mills are equipped to produce flats, angles, and other structural steel products. The production process in a typical re rolling unit begins with hot charging of raw billets, pencil ingots or blooms in an oil, coal or gas-fired re-heating furnace. Once the raw material achieves the desired temperature, it is manually or automatically pushed out into the rolling floor, where rollers are used to squeeze and stretch them into finished steel products.

➔ **Reheating Furnace for heating Inputs:** In the entire process, the re-heating furnace is central to efficient production in the conversion process. The amount of energy required to fire and keep it heated has a direct bearing not only on production efficiency, but also on bottom lines and more crucially on greenhouse gas (GHG) emissions. Since re-heating of raw material incur much cost as such efforts are on for cost control in reheating of stock switching over from heating by oil to producer gas..

Technology for the use of coal-based producer gas as fuel has been well accepted by re-rolling units in view of cost saving project. The use of lump coal widely prevalent in near by areas may result in the inability to

control furnace temperature as well as causing environment pollution, which means incomplete combustion and subsequently higher SFC. This technology package of producer gas modifies the re-heating furnace to replace lump coal with coal-based producer gas as the firing agent.



**Billet Re-Heating Fce. in Re-Rolling Mill**



**Billet Re-Heating Fce. in Re-Rolling Mill**

Producer gas allows for a greater degree of control over combustion, and is made available in two forms: (1) hot raw gas and (2) cleaned cold gas. The package also includes an improved furnace design that is able to make optimum use of the producer gas. This technology package leads to higher thermal efficiency, lower burning loss, and low pressure and temperature during operation. By replacing lump coal with a cleaner fuel, the emissions load of the mill is also reduced. Such small investment of about 8-10 million rupees, hopefully, will reduce in fuel consumption (per tonne of furnace throughput) at the level of 25%–30%. Simple payback period as 6–8 months. In virtually every re-rolling mill where billets and pencil ingots are cold charged in re-heating furnaces. This means heating billets from room temperature to 1200 ° C, leading to significant wastage of sensible heat. However hot charging process offers a solution that enables re-heating of hot billets as they emerge from the continuous caster at temperatures of 600–800 ° C, resulting in reduced fuel consumption for re-heating. The package also has the provision of a buffer furnace to compensate for mill delays.

**Rolling Process:** Direct rolling is a technical evolution of hot charging, where continuous cast billet is directly pushed to the rolling mill, without the need for an intermediate process of re-heating. In this process, the need for a re-heating furnace is eliminated, resulting in a complete heat saving due to this redundancy. The direct rolling process can be adopted in composite units by controlling the secondary cooling of the continuous casting machine by means of Programmable Logic Control (PLC), hydraulic cutting of billets, high-speed transfers of hot billets, and a canopy covering over the conveyer belt. However, this process may need higher investment installing at least 2X 10/15T Induction Furnace, 1X 12/ 18T LRF i.e. holding heats for sequence casting which may result improving productivity, quality reducing cost to a great extent.

Re-rolling mills, also called 'reduction mills', are widely distributed in India. Unlike the millions of tonnes produced in a large integrated steel plant every year, the re rolling mill is typically a small or medium enterprise, with steel production capacity at 10–30 tonnes per hour and an annual production varying from 10,000 to 400,000 tonnes per year depending on one or two or three shift operation basis. Steel re-rollers can procure raw materials as locally manufactured billets melting by induction furnace melting units using scrap, sponge iron, steel from automobiles, ships, and by-products. The re-rolling mills tend to be less dependent on direct access to crude steel. Today, there are an estimated about 2000 re-rolling mills in India, scattered across the country producing about 19.5 million tonnes of steel products in which about 80% are exported.



The M.S. Billets/ pencil ingots is fed into the re-heating furnace that uses Producer gas, Coal Pulverizer or Furnace Oil as a fuel. In the furnace these charged M.S. Billets will be heated to a desired temperature. After heating, the red hot iron will be drawn into Re-rolled Steel product of desired dimensions and will be dispatched to the market after proper bundling and inspection. Water is being used as a coolant during the drawing process and the same will be recycled back from the underground sump with the help of re-cycling pump provided. The Mill-scale generated during the process will be given out for Landfill and road making process. For re-heating furnace any one of the following fuels will be used such as furnace Oil, Producer Gas and Pulverized Coal depends on the availability of fuels in the market.

The newer rebar steel grades being introduced are Fe-500, Fe-550, and Fe-500D. Similarly, in terms of application, a newer range of steel rebar that is corrosion resistant, epoxy coated, and earthquake resistant is being used increasingly in applications than the conventional rebar. Based on application at the site of work, the steel rebar market can be segmented into mild steel bars and deformed steel bars. Mild steel bars are used to support the tensile stress of slab beams. Deformed steel bars come with deformity or lugs or ribs on the bar surface. It has higher tensile strength as compared to the mild steel rebar and avoids slippage, limits cracks in concrete, and also binds two materials strongly.

Based on its finish, the steel rebar market can be divided into black rebar, epoxy coated rebar, and fabricated rebar. The use of these finishes depends on the environmental conditions that the bars are subjected to face.

- \* Conventional uncoated rebar is black rebar used at sites with minimum exposure to moisture, with minimum chances of catching rust or corrosion.
- \* Epoxy rebar is usually found in marine applications where there is a high chance of corrosion due to salinity of water. Black rebar is the preferred rebar is widely used owing to its cost effectiveness.

TMT, stands for thermo-mechanical-treatment rebar, the newer variety of steel in construction industry, has been accepted worldwide as new-generation-high-strength steel product having superior properties compared to ordinary rebar with respect better weldability, strength, ductility and bendability meeting highest quality standards at international level. Under thermo mechanical treatment, bars are made to pass through a specially designed water cooling system where outer surface cooled but inner core remains as hot creating a temperature gradient in the bars. When the bar comes out from the cooling system, heat flows from core to surface causing tempering effect and achieve high yield, toughness, malleability etc best suiting for construction sectors. Govt of India, in its New Industrial Policy opened up iron and steel sector for private investment by removing it from the list of industries reserved for public sector exempting it from compulsory licensing. Some of the general criteria, checking the state law, are to be complied.

- \* Registration with ROC according to management pattern and investment ratio.
- \* Obtain Trade License.
- \* Apply for Udyog Adhar MSME on line registration if project comes within ceiling .
- \* Apply for BIS Certification.
- \* Apply for NOC from Pollution Control Board.
- \* Obtain ISO Certificate.
- \* Apply for VAT Registration.

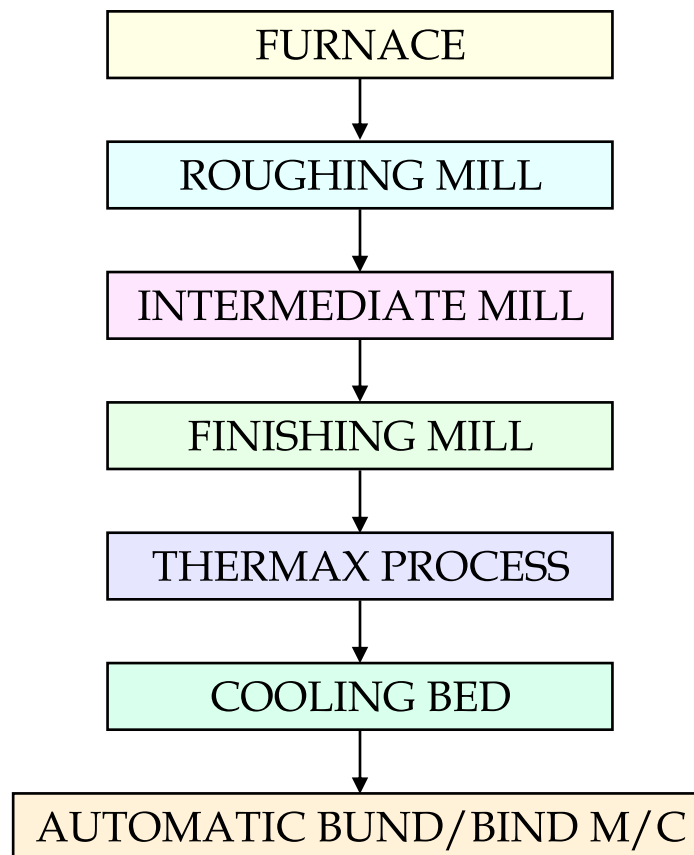
Popular TMT bar sizes 6,10,12,16,20,25,32 & 40 mm have maximum demand in specification IS 1786-2008 in grades Fe 415, 415D, 500, 500D,550. The re-rolling mill have sequence mix of Roughing, Intermediate and Continuous Mill for quality measurement in the progressive reduction process.

### Few Technical Information as Guidanc:

- \* Billet Rolling Temperature 1150-1200 °C
- \* Reheating Fce Temp 1250 – 1300°C ( Temp loss from exit to mill entry about 40-50 °C)
- \* Yield 89-93% ( Considering bad end discard)
- \* Scale Loss in Fce 2.5-3.5%
- \* Nominal Stand in Roughing Mill 2, 1000HP; Intermediate Mill 7 stand, 800HP;Finishin Mill 2 stand,400HP
- \* Nominal Capacity in Mill considered as 8-10T/hr.
- \* Reheating Fce Fuel Con. 1. By Oil – 40litre/T, 2. By gas 48NM3/hr, By Coal 70-80Kg/T

All above information are illustrative only not exhaustive (Thanks)

### Process Flow as Input-Output for TMT Bar Process Followed as Thermax / Tempcore



## Importance of Factory Shed in Re-Rolling Mill



Metal sheds are made for factories having melt shop, rolling, forging, casting and other related production or direct service units like maintenance and repair shops from thin sheet metal sheathing preferably by galvanized steel or corrugated iron attached to a metal base frame. In the re-rolling unit sheds protect equipments from rain, storm, lightening. It has long-term strength and resistance to fire, rust and damage. Life of shed covering Reheating Fce, Producer gas plant, main Mill and dispatch area may last for more than 60 years. On the top of main shed transparent water/ fire proof sheet

fitting may allow natural light to enter inside the factory which, hopfully, reduce power consumption to some extent. However, metal sheds may rust over time, particularly if they are constructed from steel that is not galvanized and in those areas rust proof paint may help to overcome problem. For a land area of 50,505 Sq M re-rolling complex, actual works ( includes billet stock bay, reheating fce, coal storage are, producer gas unit, main mill, maintenance & service activities , ware house for inspection and dispatch of products) comprises as 16540 Sq M (around 33% of total area) is to be covered by shed. There are reputed suppliers in the country who supply pre-fabricated sheds and fix structure on site.

## STEEL SECTOR NEWS

### Real problem for steel industry is demand for long products, Irepas says

14 Nov 2019

Low demand for long steel products such as rebar was at the root of the problems facing the steel industry, according to the International Rebar Producers & Exporters Association (Irepas). The raw material for blast furnaces was becoming cheaper but the ferrous scrap used in electric-arc furnaces was getting more expensive, while the prices for both rebar and hot-rolled coil were increasing. This was the cause of the current confusion in the global long steel products market, Irepas said in its latest short-range outlook published this week. "Customers are making inquiries for longer than they normally would, and mills are incurring greater losses than they can afford, so they are halting production and have stopped offering," Irepas said. "However, the current price increase should not hold for long because the real problem is demand." Fastmarkets' daily index for steel scrap, HMS 1&2 (80:20 mix), US-origin, cfr Turkey, rose to \$261.47 per tonne cfr on Tuesday November 12, up from \$254.80 per tonne cfr on November 1 and \$225.88 per tonne on October 1. The daily index for iron ore 62% Fe...

Source <https://www.metalbulletin.com>



## Green shoots? Steel companies increase prices first time in nearly six months

12 Nov 2019

India's two largest steel companies - Tata Steel and JSW Steel - have increased prices of hot rolled coil, the basic steel product, for the first time in nearly six months. These are the earliest signs that the slump in demand and the price may have bottomed out.

Both the steel majors have increased prices in the range of Rs 500 to Rs 750 per ton in early November. A ton of hot-rolled coil now sells for around Rs 35,000, up from about Rs 34,250 in October. In October, the prices were almost at three-year lows.

"We see that the de-stocking process has ended. People are now buying what they need," said TV Narendran, Global CEO and Managing Director, Tata Steel. "Market has taken the price increase. We will wait till the end of the month," added Narendran, giving indications of taking similar steps in the coming weeks. "There was a marginal price increase in May. But effectively, this is the first increase in steel prices this financial year," said Jayant Acharya, Director, Commercial & Marketing, JSW Steel.

The price increase is significant as it comes after a prolonged slump in the steel industry as clients in infrastructure and auto sectors - the two biggest clients - have struggled. While big infrastructure projects dried up, car and two-wheeler makers were forced to cut production and lay off employees as customers kept away.

This forced steel companies to shut plants for maintenance even as inventories piled up. Both Tata Steel and JSW Steel saw sales dropping in the first half of 2019, and revenue and profit numbers suffered. If not for a tax write-back, both companies would have suffered steep fall in profits in the second quarter.

Now, the price hike comes along with a drop in inventory levels. "Both at the mill and market levels, inventories have gone down. In Mumbai itself, the inventory is one-third of what it usually is. Auto companies are showing signs that sales have improved," added Acharya.

Internationally, too, steel prices have picked up a bit also to balance out the relatively high rates of raw materials, such as iron ore and coal that are used in steel making. Increase in steel prices may bring some relief after India's industrial output contracted 4.3 percent month-on-month (MoM) in September, according to the Index of Industrial Production (IIP) data released by the government on November 11.

The manufacturing output, which accounts for more than three-fourths of the entire index, contracted 3.9 percent in September. And, mining fell 8.5 percent.

However, companies now are riding on hopes that the slump could have bottomed out after a push from festival buying from October on wards.

Domestic passenger vehicle sales witnessed a marginal increase of 0.28 percent to 2,85,027 units in October from 2,84,223 units in the year-ago period.

This is significant for steel companies, most of whom are now in talks with auto clients for firming up contracts for the next six months. The price of the contracts are decided upon looking at the trends of the past six months.

"We are in talks with our clients. The pricing for the next six months will reflect the recent softness in steel rates. But as we go into the future contracts, the pricing will get better," said Acharya.

Narendran also pointed out that Tata Steel had finalised auto contracts, rates of which were lower than the last one. But, the next contract will start reflecting the increase in steel prices.

**Source :** <https://www.moneycontrol.com>

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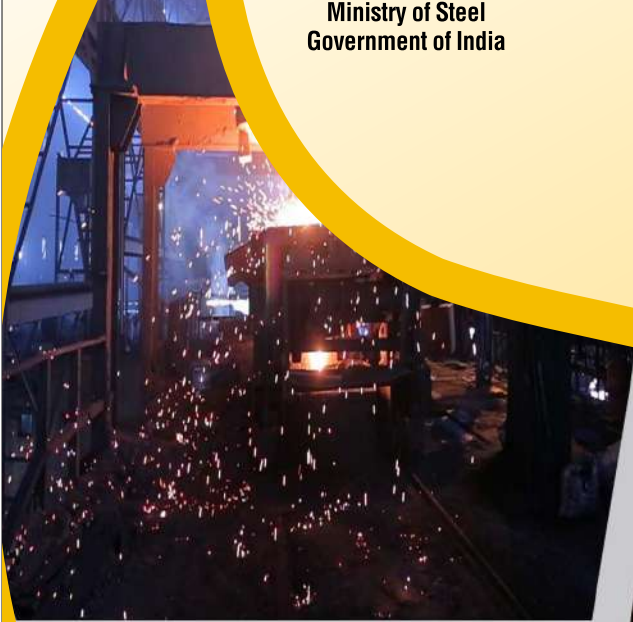


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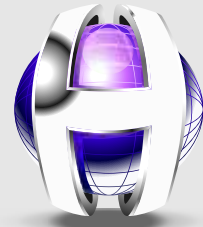
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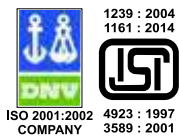
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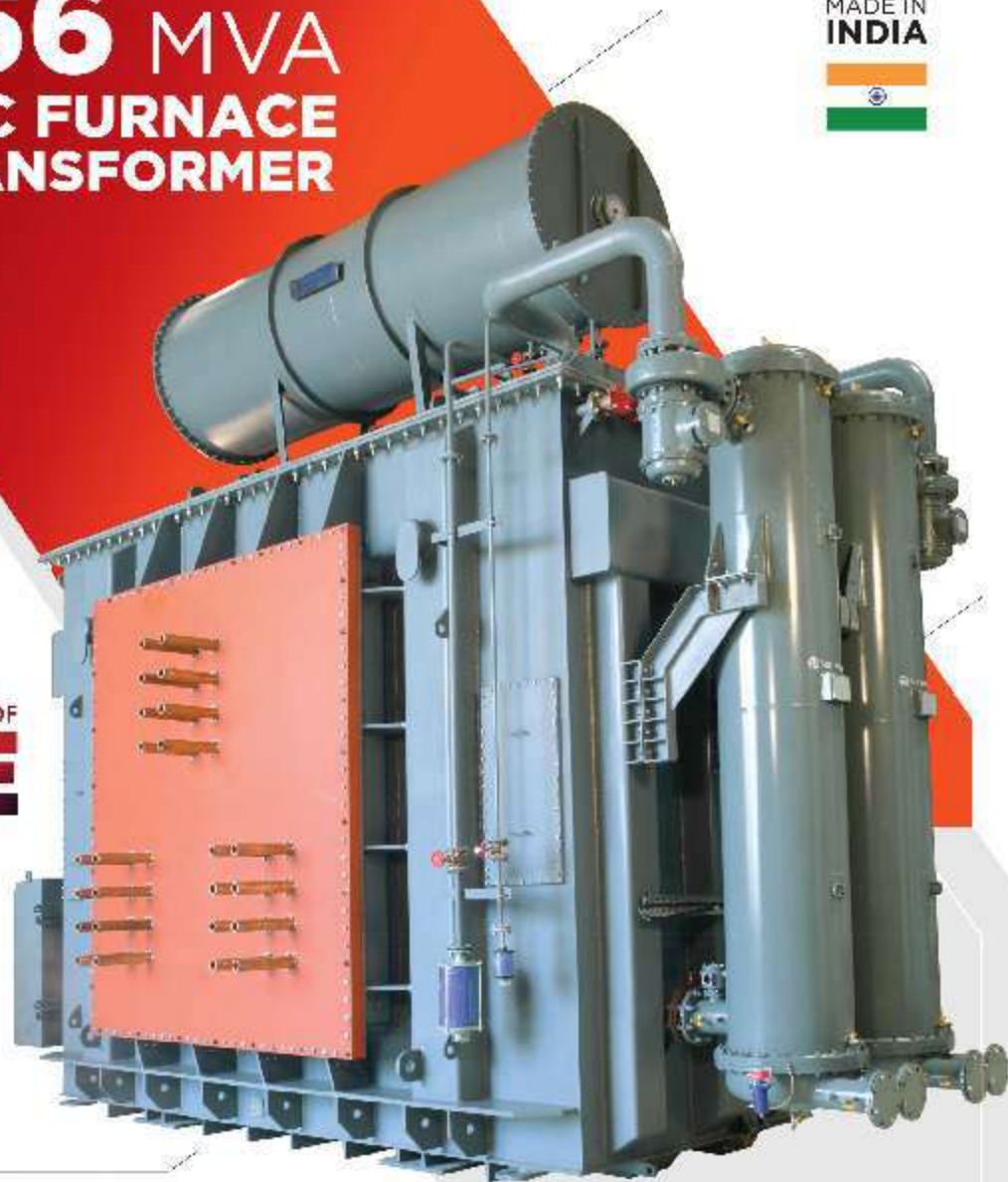


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