

# ALL INDIA INDUCTION FURNACES ASSOCIATION



# AIIFA

## INDUCTION FURNACE NEWSLETTER

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## HANDBOOK ON INDIAN STEEL INDUSTRIES

(a directory of units producing steel through electrical route)

2018-19



Compiled by:



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# INTERVISTA

**Ranjan Bandyopadhyay**, a distinguished name in the steel fraternity, heads the **Joint Plant Committee (JPC)** as **Executive Secretary**. A Computer Engineer from the University of Calcutta, Shri Bandyopadhyay's relation with JPC's data, dates back to the late 90s. His profound knowledge on data and his intrinsic penchant for it, has steered JPC's databank to the cusp. Presently the organisation is considered as the only authentic, non-partisan databank on iron and steel recognised by the Ministry of Steel, Government of India.



*Ranjan Bandyopadhyay, while speaking to the Editorial team of All India Induction Furnaces Association reveals the present status of the steel industry, the areas of focus that may lead the steel industry to reach its targeted 300 mtpa, the services that the JPC offers the stakeholders of steel. Excerpts follow-*

## **1. What in your opinion is the present status of the Indian steel industry?**

Ans- A positive tone pervades the air surrounding the Indian steel industry as the country attains the rank of the world's second largest steel producer in 2018 overtaking Japan. It is good to reckon that the country's crude steel production has grown by 5 per cent in 2018 soaring to 106.46 million tonnes.

India's production graph has been steadily rising and will most likely do so in the ensuing years. Demand has soared by 7.9% during April-December, 2018 as had been envisaged by the Short Range outlook of World Steel Association. Consumption has grown considerably by 7.9% during April to December 2018. On the whole, the Indian steel sector looks good. The ace companies of this industry have kept themselves busy with capacity additions, starting greenfield and brownfield projects, bringing in newer product mix and taking over of weaker companies. Research and Development has got enough emphasis especially at the behest of the Hon'ble Steel Minister who is particularly keen on this aspect. Moreover, the continuous protection of the Ministry of Steel has given the steel industry the right fillip to move ahead.

## **2. What are the areas to be focused on in order to reach the target of 300 mtpa of steelmaking capacity by 2031?**

Ans- The National Steel Policy has laid down a broad roadmap of long term development for the steel industry in its pursuit towards the target of 300 mtpa of steelmaking capacity by 2030. In order to move ahead towards the target of 300 million tonnes, the Hon'ble Steel Minister has called upon everyone to accelerate the pace of work. The pursuit to the target will require innovative idea, revolutionary thinking, new investments, new synergies, capacity additions, newer products and thrust on research and development. This is the time when the companies are encouraged to come up with new technology and innovation for steel, so as to fulfil the aspirations of the government for Make in India. Moreover, with the roll out of the National Steel Policy 2017 it is expected that the industry will be guided with appropriate policy support in creating the right milieu for promoting domestic steel, thereby ensuring a proper dovetailing of the pace of production with that of consumption. Moreover, the policy on preference to Domestically Manufactured Iron & Steel Products is aimed at facilitating consumption of value added steel which seeks to accomplish the Hon'ble Prime Minister's favourite vision of 'Make in India' which has an aim to encourage the domestic manufacturers.

Interestingly, the domestic steel industry presently operates in a globalised set-up and markets have become more open to developments courtesy to the social media savvy era. The policy machinery will always provide

relevant support and the Government will continue to monitor the market situation as a facilitator. The steel producers should seek this situation to explore ways to boost their efficiency, raise demand or pep up the market for their products, thereby generating revenues and fortifying their own positions.

### **3. What is the role of the Joint Plant Committee and how does it facilitate the steel industry?**

Ans. Post deregulation, the Joint Plant Committee has metamorphosed into a broad based non partisan databank on the iron and steel industry and is considered as the destination of knowledge in the area of iron and steel.

It is the only institution of the country, officially empowered to collect, collate and analyse data on the iron and steel industry. The authenticity, profundity and timeliness of JPC data gives the technocrats, analysts and economists an added confidence to refer to it while studying the steel sector. Dissemination of knowledge is a strong forte of JPC's service and this gets implemented through a wide range of publications both monthly and annual. *JPC Monthly Bulletin on Iron & Steel*, monthly statistical reports like the *MIS Report* and annual publications like *Annual Statistics*, *Performance Review* have occupied a niche for themselves being coveted in the steel industry. Moreover, JPC prepares answers to Parliament Queries, offers analytical support to the Ministry of Steel, Government of India on varied issues and responds to queries arising from various ends of the steel industry.

JPC is also the official source agency for formulation of key macroeconomic parameters like IIP, GDP, WPI, Infrastructure index by concerned arms of the government and also serves as the official source of data on the Indian iron and steel industry for the World Steel Association (WSA). JPC's Studies & Surveys help the steel industry considerably. Innumerable of such work has already been completed and claimed by the stakeholders of the steel industry and more of such are in the pipeline. JPC's Study on rural steel demand has brought in enough accolades. Presently JPC is working on *End – Use Demand Survey*. Various segment surveys of particular use for the steel industry are also being pursued.

There is a plethora of work coming up. JPC will soon switch over to online data collection from the steel units. Keeping the needs of the stakeholders of the steel industry, JPC will, in the times to come, publish a steel directory, print a 'book on statistics' for the last ten years and will build up techno economical database together with a raw material database.

### **4. What according to you is the prospect of the Indian steel industry?**

Ans. Moody's Report has confirmed that India will be the brightest spot for the steel sector over the next 12-18 months. According to their statement, India's steel consumption is rising at least 5.5 per cent to 6 per cent every year, tracking strong GDP growth of 7.3 per cent to 7.5 per cent. Most of the steel experts have echoed similar idea. Moreover, the National Steel Policy 2017 has laid down a clear pathway for the future growth of the iron and steel industry. Steel producers, in line with the National Steel Policy, are moving ahead with capacity expansions, acquisitions and mergers, giving thrust on research and development and innovating newer product mixes. The government has harmonised this situation by offering various protection measures to mitigate the industry's struggle. A handsome budget has been allocated for infrastructure growth especially that of rural infrastructure thereby spelling out an imminent escalation of steel demand. The Hon'ble Prime Minister's vision of 'Make in India' encourages domestically manufactured iron and steel products and is expected to lead to a rise in domestic steel demand.

On the whole, the country's steel industry awaits affable time; and this is confirmed by World Steel Association which in their recent Short Range Outlook has projected a 6.4% growth in steel demand in 2019 and 6.6% growth in 2020.



# Priorities and Preparedness for Leadership in Production of Reinforcing Bars by Indian IFs & Re-Rolling Units

*Srikumar Chakraborty  
Metallurgical, Member of Consulting*

*Continue from last issue*

The China Iron and Steel Association (CISA) announced at its meeting in January that the government aimed to completely eradicate low quality steel by the end of June 2017 primarily targeting towards induction furnaces (IFs). The targeted closures are considered as a political priority and have been given a specific deadline, indicating the government's seriousness to support the operations of qualified mills. Many induction furnace units are located in remote areas and the market is quite fragmented across the country, with a majority producing billet and rebar. Since they are typically small operations that charge only scrap to produce steel without secondary steelmaking where quality is too poor (Richard Lu Senior Analyst, CRU).

China's new high-strength rebar standard is designed to limit the use of inferior steels in construction. The standard eliminates low strength Grade 2 rebar and sets out specifications for three different high strength standards: Grade 3 (400MPa), Grade 4 (500MPa), and Grade 5 (600MPa). These will require 0.03% V, 0.06% V, and more than 0.1% V respectively.

Key changes to rebar policy in China were made in response to the 2008 after Sichuan earthquake, which killed an estimated 68,000 people. Many victims were fatally injured by disintegrating and falling fabricated floor systems in brick and concrete structures, as buildings were not reinforced suitably. New design codes were issued in December 2010 and took effect in August 2011. These new codes aimed to restrict and gradually eliminate the use of lower strength bars (Grade II). Generally speaking, such changes to domestic construction regulations have led to increased ferrovanadium consumption but the uptake in production and consumption of higher-grade rebar has been gradual, as the government permitted companies to wind down their inventories. From 2013 onwards, laws and regulations have been more strictly enforced, however, reports in China have suggested that "fake" rebar of Grade III and above are sometimes sold, which are, in reality, lower-grade alternatives.

Another thing going for vanadium is China's reluctance to manufacture low-quality rebar used in building construction. Recent earthquakes in China and Japan have shown the Chinese that using cheap rebar is penny wise and pound foolish. They're increasing the amount of vanadium in the rebar by about 100 percent so that they can end up with structural specifications that are necessary to keep buildings standing for long periods of time. The rebar alone, that's estimated to bring another 10,000 tonnes a year of vanadium demand.

Indian Standard : The rebar standard covers the requirements of deformed steel bars and wires for use as reinforcement in concrete in the construction sectors, in the following strength grades as: Fe415, Fe 415D, Fe 500, Fe 500D, Fe 550, Fe 550D and Fe600. The figures with Fe indicate the specified minimum 0.2 percent proof stress or yield stress in N/mm<sup>2</sup> (MPa) and the letter D following the strength grade indicates the category with same specified minimum 0.2 percent proof stress/yield stress but with enhanced specified minimum percentage elongation applying to hot rolled steel without subsequent treatment or to hot rolled steel with controlled cooling and tempering and to cold worked steel.

Composition & Mech Properties.	Fe415	Fe500	Fe500D	Fe 550	Fe 550D	Fe 600
Carbon	0.3 max	0.3 max	0.25 max	0.03 max	0.25 max	0.30 max
Sulphur	0.06 max	0.055 max	0.04 max	0.55 max	0.04 max	0.040 max
Sulphur +Phosphorous	0.110 max	0.105 max	0.075 max	0.100 max	0.075 max	0.075 max
Carbon Equiv C.E	0.42 max	0.42 max	0.42 max	0.42 max	0.42 max	0.42 max
Yield Strength N/mm2	415 min	500 min	500 min	550 min	550 min	600min
UTS N/mm2	485	545	565	585	600 min	660
UTS/Yield	1.16	1.09	1.13	≥ 1.06	≥ 1.08	≥ 1.06
Elongation %	14.5	12	16	10	14.5	10

Commonly ductility of rebar is defined quantitatively by % elongation to fracture or the ratio of tensile to yield strength, and qualitatively by a bendability test. For example, the US rebar standard, ASTM A 615, requires a minimum percent elongation in an eight inch tensile test sample which varies according to bar diameter and strength level. Similarly, bend tests which specify varying sizes of mandrels and degrees of bend, require that cracks do not form on the bent surface of the bar.

This standard allows the chemical composition and carbon equivalent to be limited so that the material can be readily welded by conventional welding procedures. However, material not conforming to these limits is generally difficult to weld for which special care and precautions will have to be taken.

Steel making and processing is at the discretion of the producers/manufacturers. This standard also applies to reinforcing bars and wires supplied in coil form. This standard also applies to reinforcing bars and wires which may be subsequently coated. However, the deformed bars produced by re-rolling finished products such as plates and rails (virgin or used or scrap), or by rolling material for which the metallurgical history is not fully documented or not known, are not acceptable as per this Indian Standard. Indian Standard for rebar briefly states as:

**Rebar Classification and properties :** Primarily, rebar is classified or graded by its yield strength. Different countries normally follow rebar standard as:

1. India- Fe 400, 500, 500D, 550, 550D, 600 etc as IS 1786: 2008,
2. Canada- CSA-G30.18 normally defining two minimum yield strength level 400 & 500 MPa,
3. Japanese - JIS G3112 minimum tensile strength level,
4. Australia/ New Zealand – AS/NZS 4671 defining tensile strength indirectly by specifying a minimum strain hardening ratio in reference to yield strength i.e. ratio of tensile strength to yield strength,
5. Russia- GOST 5781-82/ GOST 10884-94/ GOST R52544-2006/ GOST TU 14-170-5254-2006 etc.

Mechanical Requirements (Comparative) of World Rebar Standards shown below in the Table below:

Country	TS N/mm2	YS N/mm2	Av. TS/YS Ratio	% Elong.	C.E
India	550	500 min	1.1	12	0.42
US	550	420 min	1.25	12	0.52
Canada	625	500 min	1.15	12	0.52
Aus/NZ	575	550 min	1.15	10	0.52
Japan	620	490 min	1.15	10	0.52
Germany	550	500min	1.05	10	0.52

BS4449: Chemical Composition:

Element Grade	Carbon	Sulphur	Phosphorous	Nitrogen
250	0.25	0.060	0.060	0.012
460	0.25	0.050	0.050	0.012

**Area of Applications :** Rebar has long been used by construction companies for reinforcing steel bars to keep concrete structures intact in residential and commercial buildings, bridges etc. also in various design art form due to its flexibility and unique limit less design appeal, decorative railings both inside and outside of houses. By using an assortment of rebar tools (<http://www.bnproducts.com/>), virtually anything can be created with both safety and creativity in mind.

Rebar resists tension, compression, temperature variation, and shear stresses in reinforced concrete because the surface protrusions on a deformed bar inhibit longitudinal movement relative to the surrounding concrete. During construction projects, rebar is placed in a form and concrete from a mixer is poured over it. Once the concrete has set, deformation is resisted and stresses are transferred from the concrete to the Rebar. International standard specifies each bar size should have the nominal unit weight, nominal dimensions, and deformation requirements (dimension and spacing deformations), as well as chemical composition, tensile strength, yield strength (grade), and elongation tolerances.

Carbon and alloy steel rebar will corrode over time if left exposed to water or in a humid environment. Minor corrosion to carbon and alloy rebar is not an issue and may assist the rebar in supporting liquid concrete due to surface deformation. Carbon and alloy steel rebar can remain exposed in inventory up to several years. Rebar may be coated by an epoxy (a powder-coated paint) after the manufacturing process to enhance corrosion resistance. Coated rebar is used in applications where the rebar is exposed to a high degree of salt, such as in roads, bridges and parking garages. Epoxy coated rebar can remain in inventories indefinitely due to its corrosion resistance.

**Cost Comparison of Rebar & Structural Bar between India, China,US, EU. (MEPs Report)**

Avg. Price	India		China		US		EU	
	Rupees/Metric Ton		RMB inclusive of VAT		\$/Metric Ton		Euro/Metric Ton	
	Rebar	Merchant Bar	Rebar	Merchant Bar	Rebar	Merchant Bar	Rebar	Merchant Bar
<b>Sep'17</b>	30500	31400	4290	4370	587	716	510	537
<b>Oct'17</b>	29200	30300	4180	4280	596	638	517	557
<b>Nov'17</b>	29900	30900	4980	4500	589	637	512	554
<b>Dec'17</b>	32900	33700	4050	4200	614	637	503	558
<b>Jan'18</b>	37000	37100	4170	4300	642	671	523	582
<b>Feb'18</b>	38400	38300	4130	4280	684	703	524	587
<b>Mar'18</b>	38200	38700	3930	4210	681	723	523	577
<b>Apr'18</b>	38800	38900	4180	4190	724	745	509	573
<b>May'18</b>	40400	41000	4240	4190	744	777	495	587

### The calculation used in this RMB to INR, 1 RMB = 10.3862896599 INR

The revised standards in china spell out stricter requirements for alloy content, weight and dimensions as well as the tolerance levels of the various grades of rebar. The revision also discontinues the low-quality grade HRB335 for rebar and introduces HRB600, the highest grade of the long steel product produced in China. Market observers expect rebar prices to rise once these revised standards come into force. "Production costs will increase by 100-150 yuan (\$16-24) per tonne, "Inspectors have found local implementation of a production ban on ditiaogang worrisome," Xu Lejiang, vice minister of industry and information technology, said at the meeting. Xu said producers still saw a total phasing out the inefficient induction furnaces unlikely because it caused unintended "collateral damage" to certain plants.

Wang Guoqing, research director at Lgmi.com, a steel industry website, said correcting the problem would encourage high-quality production and help upgrade the rebar industry. Production of ditiaogang rose last year amid a steel price recovery, which "jumped 70.1 percent," she said. Ditiaogang output totaled 120 million tons last year, estimated Mysteel, a real-time news portal for the nation's steel market.

While ditiaogang sells for 1,500 yuan (US\$216) a ton, speculators resell it in the quality steel market where the rebar price was around 3,000 yuan per ton recently. This means "both illegal producers and speculators earn large profits," Wang said.

### Standard maximum Yield Strength in different countries (Memorie Country Ref.)-

1. RUSSIA GOST 10884-94, 1200 MPa High yield strength with addition of silicon up to 2.3%
2. UKRAINE DSTU 3760-06, 1000 MPa
3. JAPAN "New RC Project 1993", 980 MPa & Also includes grades @ 1275 MPa but only for transverse reinforcement applications
4. USA ASTM A1035-14, 830 MPa. High yield strength by controlling microstructure.
5. KOREA KS D3504-11, 700 MPa, Ceq increase allowed up to 0.63
6. ENGLAND BS 6744-01+A2:09, 650 MPa Stainless steel rebar
7. INDIA IS 1786-08, 600 MPa - Microalloyed steel with maximum Ceq of 0.53
8. CHINA GB1499.2-07 500 MPa Ceq max 0.55

Carbon Equivalent (CE) value is used to understand how the residuals and different alloying elements affect the strength of steel. Table below presents the contribution made by Carbon Equivalent value to the weldability of TMT bars.

Level of CE	Weldability Performance
Upto 0.35	Excellent
0.36 - 0.40	Very Good
0.41 – 0.45	Good
0.46 – 0.50	Fair
Over 0.50	Poor

Source: Technical Report 1967, IIW Doc. IX-535-67 3. Experimental Procedure - It has been observed (Ref; ENGINEER - Vol. LI, No. 02, pp. [7-14], 2018 © The Institution of Engineers, <http://doi.org/10.4038/engineer.v51i2.7290>) from Study of Yield Strength and Elongation Variations of Reinforcement Steel TMT Bars, by K.P.A.S. Perera and S.P. Guluwita) that alloying element Si and Mn, and the CE values are found to influence the yield strength and elongation of TMT bars causing high variations of these properties among the bars of a set.

Therefore, precise controlling of alloy addition during de-oxidation and de-sulphurization treatment of liquid steel in the ladle is necessary to obtain a low variation in yield strength and elongation of TMT bars. Based on the results of the experimental study, the following conclusions can be drawn to ensure consistent quality in

**TMT bars as:** 1. Ferro-silicon (Si) and ferro-silicomanganese (Mn) have to be added to the melt or liquid solution so that the ratio of Si : Mn is 1 : 4 approximately. 2. Carbon Equivalent value in the melt or liquid solution has to be controlled to be in the range  $0.37 < CE < 0.4$  % by mass. Overview of international standards for high-tensile rebar where.  $C_{eq}$  as per IIW standard: for micro-alloyed Rebar-  $(C+Mn/6+(Cu+Ni)/15+(Cr+Mo+V)/5)$ . And without micro-alloy –  $C+Mn/6$

Largo Resources Ltd. ("**Largo**" or the "**Company**") announces its support for the new rebar standard announced on February 9, 2018 by the Standardization Administration for the People's Republic of China. This announcement also includes a special action to cut down on the use of all substandard steels in China. The new rebar standard and related action is expected to be implemented by November 2018.

Mr. Mark Smith, Chief Executive Officer of Largo stated: "The revised rebar standard will enhance the quality of rebar being used in China, which will in-turn allow China to build earthquake resistant homes and industrial capacity in the most efficient manner in terms of energy and raw material consumption and pollution generation. High strength low alloy vanadium steels are the most efficient material available for the development of the infrastructure necessary in order to create economic opportunity for the approximately two thirds of the earth's population living in developing economies."

### Indian Specification for Rebar (IS 1786 :2008)

Mech.Prop : Tps →	Fe415	Fe415D	Fe500	Fe500 D	Fe550	Fe550 D	Fe600
TS N/mm <sup>2</sup>	485	500	545	565	585	600	660
Yld N/mm <sup>2</sup>	415	415	500	500	550	550	600
EI %	14.5	18.0	12.0	16.0	10.0	14.5	10.0

Composition:

Carbon	0.30	0.25	0.30	0.25	0.30	0.25	0.30
Sulphur	0.060	0.045	0.055	0.040	0.055	0.040	0.040
Phosphorous	0.060	0.045	0.055	0.040	0.050	0.040	0.040
S & P	0.110	0.085	0.105	0.075	0.100	0.075	0.075

### Comparison of composition and mechanical properties of Fe 500 & Fe 500D Rebar

	Chemical Composition		Mechanical Properties		
	Fe 500	Fe 500D	Parameters	Fe500	Fe500D
Max % Element	Fe 500	Fe 500D	Yield N/mm <sup>2</sup>	500	500
Carbon	0.30	0.25	UTS N/mm <sup>2</sup>	545	565
Sulphur	0.55	0.40	UTS/YS Ratio	1.08	1.1
Phosphorous	0.55	0.40	%Elongation	12	16
Sulphur+Phosphorous	0.105	0.075			

To be continued ...

# STEEL SECTOR NEWS

## **Renaming of Department of Industrial Policy and Promotion (DIPP)...**

The Department of Industrial Policy and Promotion (DIPP) has been renamed as the Department for Promotion of Industry and Internal Trade Mandate for the Newly Named Department...

The newly named department will work under the Union Ministry of Commerce. The order issued by the President states that the department would deal with matters related to start-ups, facilitating ease of doing business among others.

The subject matter of internal trade which was under the ambit of the Ministry of Consumer Affairs has been transferred to the newly named department.

With this new mandate, both internal and external trade has been brought under a single Ministry (Ministry of commerce and industry). This will ensure better coordination and help in promoting the growth of both segments of the trade.

Why the new mandate? For a long time Confederation of All India Traders Association (CAIT) was demanding for a separate Ministry of Internal Trade. CAIT sees the creation of a separate department by merging Internal and external trade is a step forward in the creation of a separate Ministry.

## **Proposal of extending tax sops for affordable housing to boost steel demand: AIIFA**

New Delhi, Feb 1 () The government's proposal to extend tax sops given to real estate firms for developing affordable housing until next fiscal will boost demand of long steel products, Secondary steel industry body AIIFA said Friday.

Presenting the Interim Budget for 2019-20 in the Lok Sabha, Finance Minister Piyush Goyal said benefits under Section 80-IBA of the Income Tax Act are being extended for one more year to housing projects approved till March next year. This proposal would boost supply of affordable housing.

"The announcements related to developing affordable housing until next fiscal will boost the demand of long steel products like TMT bars etc in the country," All India Induction Furnaces Association (AIIFA) Secretary General, Kamal Agarwal said.

The government also announced that capital gains of up to Rs . 2 crore could be rolled over for investment in two housing units from the current one unit only. It also exempted tax on notional rent on a second self-occupied house.

The AIIFA represents electric induction melting furnace industry which produces products like mild steels, low alloy steels and stainless steels, among others. Sponge Iron Manufacturers Association said it sees the Budget as positive step for the welfare of middle income group. "We welcome the Budget. It is a good Budget it will result in an inclusive growth of all industries including sponge iron," its Executive Director Deependra Kashiva said.

Material Recycling Association of India (MRAI), which represents over 900 members of the country's ferrous and non-ferrous metals recycling industry, said the government has gone extra mile for the farmers and middle class.

"The budget is no doubt a very good one for small scale businesses. Recycling industry is a growing industry in India and players' don't have a big set ups. The wages are also not that high but with the tax relief given, more units will come up," MRAI President Sanjay Mehta said.

*Source: TOI, 01/02/2019*



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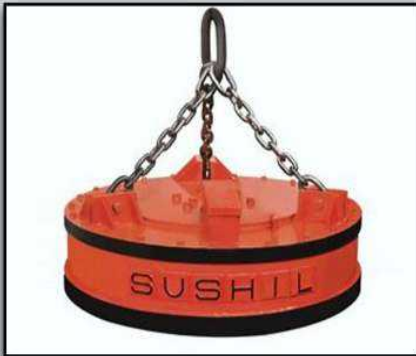
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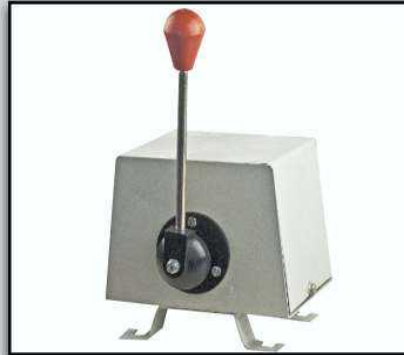
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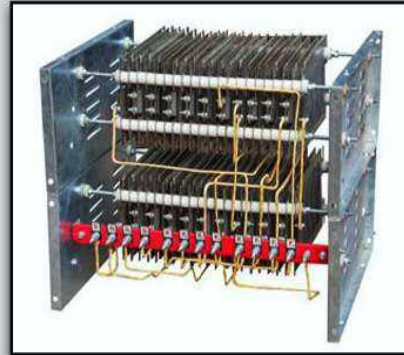
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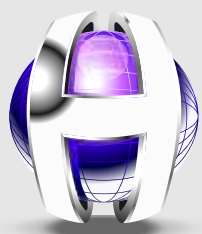
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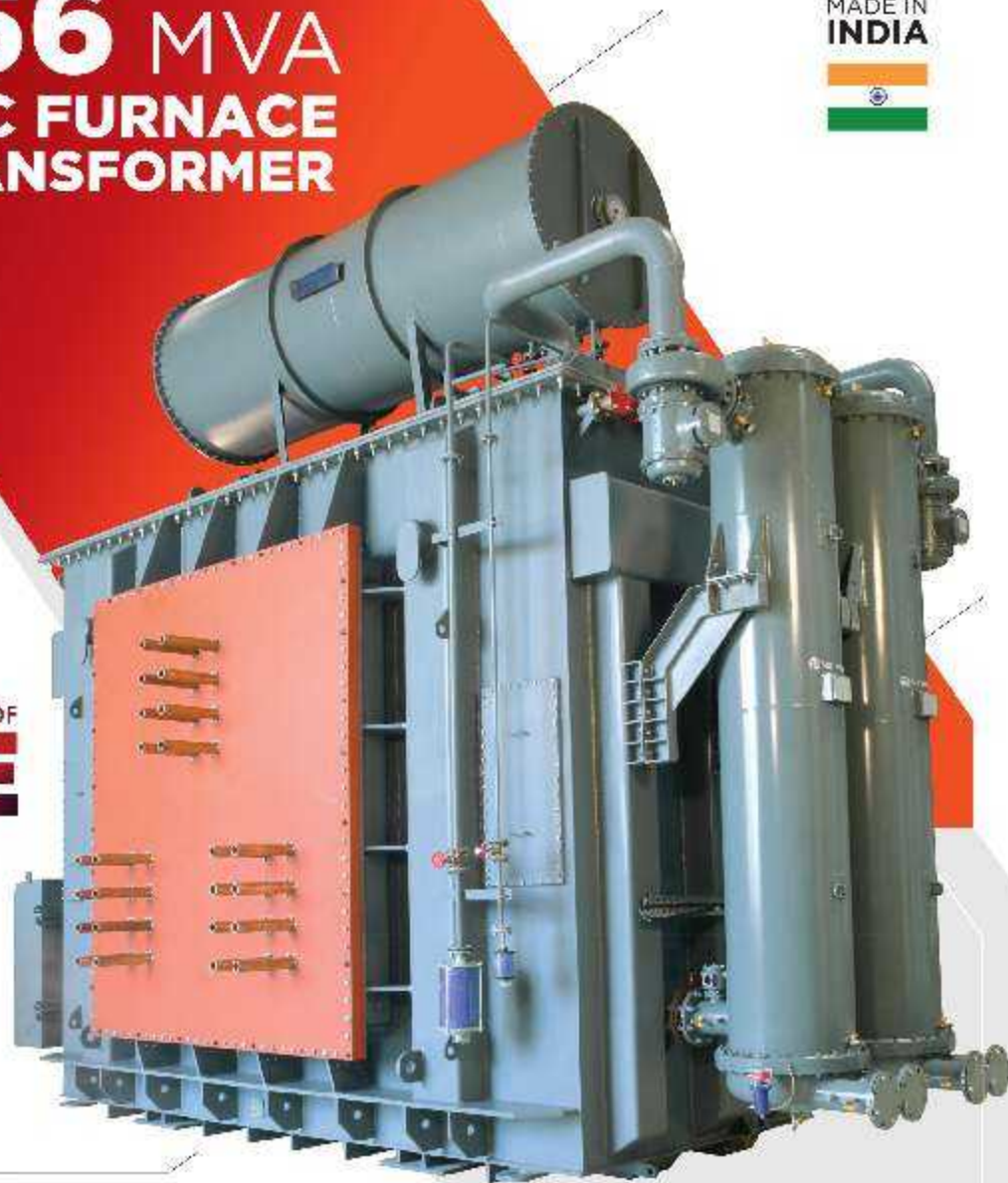


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