Stainless steel - a metal par excellence

Metal corrosion is causing a loss of over 2500 bn USD to the global economy every year. In India, this loss amount to about INR 2,00,000 crore. Increased usage of stainless steel can play a significant role in reducing this enormous loss. Stainless steel by virtue of its composition has a much higher corrosion resistance than any other variety of steel and other common metals. Low alloyed grades have excellent corrosion resistance in general atmospheric conditions whereas higher alloyed grades (containing Ni, Mo, Ti, and lesser carbon) can resist corrosion in even hostile environments such as acidic and alkaline solutions, chloride bearing environments, and even at elevated temperatures and pressure which makes this metal an ideal choice for almost every industry.

The beauty of stainless steel lies in its amazing ability to form a transparent, self-healing protective layer of chromium oxide on its surface which is very thin but firm and continuous. This results in the ever shining rust-free surface the metal "Stainless Steel" is attributed with.

Stainless steel is the preferred material of choice for food contact application because of its resistance to corrosion, its inertness in the general atmosphere, and its ability to be easily cleaned and sterilized without loss of properties.

Having no pores or cracks to harbour dirt, grime or bacteria,

R. Ganesh

stainless steel lets soap and water do all but the toughest cleaning jobs. Cleanability is also important in relation to taste, color and contamination of edible products such as milk, processed foods and alcoholic beverages. The ability of stainless steel to be cleaned thoroughly with minimal effort not only results in a much cleaner and hygienic surface but also reduces the possibility of any odor or taste emanating from storage of food items for prolonged periods of time; thus making use of stainless steel as a preferred alternative as compared to other containers. This is of particular hygienic importance in food handling as developed countries such as the US and countries in the European Union command strict compliance with regards to usability of food processing equipment that is easy to clean, offers a sterile environment and is corrosion resistant. Stainless steel offers all these features making it a champion amongst its counterparts.

Stainless steel is not only a preferred metal in the Food Processing industry but is also an ideal option in the medical industry. In functional terms, medical devices must possess appropriate mechanical and physical properties such as durability, toughness, low magnetic permeability to meet their design criteria. In addition, they must exhibit adequate corrosion resistance when exposed to body fluids, cleaning agents and disinfectants as well as the ability to withstand a variety of sterilizing techniques. Stainless steel has all these features and has thus been employed as surgical implant material for many years. Moreover, stainless steel is also used in the pharmaceuticals industry because of its resistance to corrosion, inert surfaces and ease of fabrication. Over and above this, stainless steel finds its way into our day to day lives in a variety of other ways thus constantly growing its contribution to our well-being. Its physical properties also allow it to be fabricated by a variety of techniques into robust structures and also drawn into various shapes, which further increase its application in several areas.

However, it is interesting to note that the global per capita consumption of stainless steel is around 4-5 kgs, whereas in India

this is around just 2 kgs. In order to combat corrosion effectively, a more sustained and increased use of stainless steel is required in the country. Jindal Stainless have taken note of this scenario and have extended arms such as the Jindal Stainless Steelway Ltd, JSL Architecture Ltd, JSL's Lifestyle Division, Stainless Gallery that create an awareness and promote the usage of stainless steel in various areas of our day to day lives.

On the occasion of MMR's special issue on stainless steel industry, ***Mr. R. Ganesh***, Director-Operations and Sourcing, Jindal Stainless Ltd shared his vision towards domestic and export market by 2016 and metal corrosion impacts on global GDP in this exclusive interview with ***Pramod Shinde***. He also explains how Jindal Stainless anti-corrosion SS grades are more important to tackle the inherent problem from food, energy and marine etc.

Excerpts :

What is corrosion and what are its economic impact on global GDP?

Corrosion is a natural process and hence cannot be avoided. Every natural process tends to move toward its lowest possible energy state. Thus, iron and steel react with oxygen and water to turn into rust which is just 'hydrated iron oxides', similar in chemical composition to original iron ore. Corrosion / rust are the nemesis that have always accompanied iron and steel and shall continue to do so.

In our homes we notice their impact when the railings in our balcony's get rusted or the metal tools in the toolkit get eaten away by rust. A principal reason to replace automobile radiator coolant every 12 to 18 months is to replenish the corrosion inhibitor that controls corrosion of the cooling system.

But, far more serious consequence is how corrosion affects public infrastructure. The corrosion of steel reinforcing bars in concrete happens out of sight and can suddenly result in failure of a section of highway, collapse of electrical towers, and damage to buildings, parking structures, and bridges, etc., resulting in significant repair costs and endangering public safety. For example, the sudden collapse because of corrosion fatigue of the Silver Bridge over the Ohio River at Point Pleasant, in 1967 resulted in the loss of 46 lives and cost millions of dollars. More recent disaster was that of the collapse of a section of the Interstate 5 Bridge over the Skagit River in Washington on May 23, 2013, hurling cars into the river.

Today if we look at the economic impact of corrosion the Global Economy is on an average losing at 3-4% of its GDP to rust and corrosion. That's almost around USD 3000 billion, out of this today US alone accounts for around 1 trillion USD; in India this loss is over Rs. 2,00,000 crores.

Could you please elaborate on Jindal Stainless' recent order from the world's most ambitious nuclear power project - ITER - in France?

JSL has been selected by the International Thermonuclear Experimental Reactor (ITER) for supplying Stainless Steel for the Cryostat Project. ITER Cryostat is a large-scale scientific experiment that strives to produce commercial energy from fusion. Seven countries namely EU, India, Russia, China, South Korea, Japan and the United States have collaborated to make this project a success. This ITER Reactor is being constructed at Cadarache, France. ITER Cryostat, would be 29.5 meters in height and 29.5 meters in diameter and is being built up in 54 pieces by Larsen & Turbo India, which will then

assemble and erect this project in France. This would be the largest fusion equipment ever made in the world.

Approximately 3650 metric tonne of stainless steel would be used in this project and only 2 plate mills have been approved for this project - one being of Jindal Stainless, India and the other of Indu Steel of France. The overriding consideration in design and construction of nuclear power plant is safety. Strict rules such as those defined by various applicable codes of ASTM & ASME have been put in place to ensure that materials used in critical components are fully qualified for the intended applications.

Based on JSL's credentials along with the company's standard QAP, an audit was conducted of systems/ processing systems /heat treatment at its Jajpur stainless steel plant and its was found that JSL's Jajpur plant has the capability to meet the stringent technical requirement for the nuclear industry. Due to its continuous endeavours, the company has received vendor agreement to supply stainless steel plates/sheets for the renowned International Thermonuclear Experiment Reactor (ITER) project.

What would be your vision towards attaining business excellence target by 2016?

JSL has initiated strategic growth plans in both domestic and international markets and has made investments towards capacity expansions through forward and backward integration.

Domestic Market : On account of the global meltdown and severe recessionary conditions existing internationally, it has become important to have more thrust in the Domestic Market. We are therefore, focusing on improving our domestic market share and have accordingly allocated 75% of our production for the domestic market and the remaining 25% is being exported to strategic markets.

Export Market : Considering the large capacities that exist overseas, selling in the international market has become strategic in nature. The main focus is on long-term relationships with the key customer base.

a) Identification of focus countries is being driven on the basis of economic/growth parameters, SS consumption patterns/segments, profitability analysis. Accordingly, a greater penetration in European, Russian, Asian and Middle East markets is being focused. Continuous supply with increased focus on customer service is being driven strongly
b) Focus on increasing sales to OEMs has been increased through the local-to-global initiative wherein international OEMs with bases in India are targeted with a view to forging long-term relationships.

Product and application Development - Increasing Per Capita Consumption

Special drive has been organized in hitherto untapped segments like elevators, pumps, sugar, rice and petrochemical industries etc.

a) Development of new grades like 444, 445, 446 and/or special finishes by increasing capacities; improving upon technical know-how and/or adding necessary equipments is the firm's growth plan.
b) Approvals and registration for the newly developed products/ grades in domestic and international organizations is key focus area.
c) Parallel developmental activities for applications of stainless steels for products currently in other material / grades are being carried out.

Stainless steel – a corrosion resistant, the most preferable material for a sustainable growth of global economy, please elaborate….

Due to its resistance to corrosion and staining, as well as needing little maintenance, most stainless steel products have long useful lives. The average life of stainless steel products is in the range of 15-25 years and, for some applications, much longer. For example, the Chrysler Building is over 80 years old! Stainless steel products contribute towards renewable energy generation, energy efficiency, reduction in environmental impact, and safe food and beverage production. There are many types of stainless steel to suit a wide range of applications. Chosen and used correctly, they can make a major contribution to sustainability.

Stainless steel also improves our lives by making technical advances possible. Without stainless steel, the installations that provide us with clean drinking water, food and medication would not be nearly as hygienic and efficient as they are. Taking into account its entire lifecycle, stainless steel has one of the lightest impacts on the Earth of all known engineering materials. Stainless steel is 100 % recyclable. When products reach the end of their useful lives, over 80 % of the stainless steel is collected and recycled. The recycling of stainless steel is a large and profitable industry.

Stainless steel has been adding value to the communities in which it operates since the production process was first industrialized.

- 300,000 people are directly or indirectly employed in the stainless steel industry worldwide.
- 6% average increase in production each year since 1970.
- 30 million tonne stainless steel fabricated in 2010.

- 100% recyclable forever
- US$130 billion turnover of the global stainless industry, 2010

Could you please explain Jindal Stainless anti-corrosion grades to tackle the inherent problem from various industries like food, energy, marine etc?

Food: Stainless steel makes kitchen essentials extremely strong, durable and easy to clean. It has also proven in clinical tests to be more hygienic than other food-contact surfaces. The infrastructure providing clean water may be hidden, but is nonetheless very important. From the well to the tap, drinking water is extracted, treated, stored and conveyed in stainless steel equipment. Health awareness and the quest for durable building solutions make more and more owners choose stainless steel for domestic plumbing. Grades like 304, JSL U SD, JSL U DD, J4, 204Cu have been proved to be food-compatible.

Energy: Grades like 304/L and 316/L are being extensively used in the energy sector for their anti-corrosion and anti-wear properties. Increased use is seen in renewable energy sources like solar and biomass energies.

Marine: Grades like 316L with high contents of Ni & Mo are highly resistant to sea-water corrosion and are widely used in marine environments.

Have Jindal Stainless recently introduced better corrosion resistance product for house ware?

Yes, we have introduced grade 204Cu which is a low-cost solution for house-wares as compared to the conventional grades like 304 with no compromise on corrosion resistance. 204Cu is now extensively used in various applications like sinks, washing machine drums, microwave oven interiors, etc.

JSL's compliance with ASTM, JIS and DIN standards? Please elaborate

Yes, all our products are complaint to the various international standards like ASTM, JIS, DIN etc. apart from the Indian standards viz. ISO. Strictest quality compliances are being followed to produce world-class products. We have supplied material for nuclear applications to BARC. Also, we have bagged order for supplies to IGCAR recently. We have been consistently supplying material for various metro and railroad projects. These are just a few examples of our adherence to quality standards.

The author is Director - Operations & Sourcing, Jindal Stainless Ltd.