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> The demand for steel in India is likely to be driven by the "House for all by 2022" mission to build 19.5 million homes over the next two years and $140 billion spending on railways, roads, and metros.

2020 a year mix of apprehensions and optimism for the steel industry

For Indian steel producers, 2019 was an unremarkable year. Like some of the previous years, the steel sector slumped throughout the year, save for the last two months. Globally and domestically, the steel industry witnessed a steep price fall not seen in the past three years. For example, prices of hot-rolled coil steel fell for 21 straight weeks; only toward the end of 2019 did some steel companies raise the price of steel products.

After 2019 saw the domestic market grapple with a surge in imports, increased dependence on imported coking coal from select countries, the steel ministry should be focusing on managing the availability of iron ore as leases of a clutch of mines are scheduled to expire in March this year.

The industry is hoping 2020 will see increased demand for steel, better prices, and the development of new products. India's spending on infrastructure is expected to drive the steel industry's growth in 2020. Activity is restarting in areas like pipelines, bridges, construction, and metros. The demand for steel in India is likely to be driven by the "House for all by 2022" mission to build 19.5 million homes over the next two years and $140 billion spending on railways, roads, and metros. The turbulence in two sectors, automobile and real estate, has dragged down the steel sector in the previous three quarters. The auto sector consumes about 15% of India's steel production, and in terms of sentiments, it acts as a barometer for steel. The only positive, though, is that steel prices rose during the last two months, albeit marginally.

The entire steel industry is waiting for car sales to pick up — including those factories that have no exposure to the auto sector. Auto sales have a pull factor. If the sector does well, steel prices will rise, and that benefits everyone. But the need for more spending on infrastructure cannot be downplayed. A continuation of investments in the infrastructure sector. Also, a stimulus for consumption in the rural sector will spur growth in steel,

Though the profitability of the steelmakers, measured by EBITDA per tonne, will decline a further 5% in 2020 following a sharp

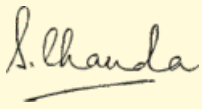
decline of around 25% in 2019 because of soft demand, according to Moody's Investors Service, which has negative outlook for the Asian steel sector in 2020.

So, what does the immediate future hold for steel in India?

A majority of steel producers and analysts are positive Q4 of the fiscal will show a rebound. What gives them hope is the Indian government's announcement to put fresh investment into the country's infrastructure.

- In India, the average production cost per tonne steel is about $450, whereas in China it is as low as $350 where players get the benefit of low tax and incentives. As far as iron ore is concerned, we have it in abundance. The only thing is the judicial allocation has to happen. Coking coal is not available in our country and the whole industry is dependent on import of coking coal, particularly integrated steel sector imports from Australia, Indonesia, the US etc. These issues need to be addressed for the benefit of the steel producers.
- The government unveiled the multimillion-dollar National Infrastructure Pipeline (NIP), with projects spread across 18 states over the next five years.
- From the fiscal year 2020 to the fiscal year 2025, sectors such as energy (24%), roads (19%), urban development (16%) and railways (13%) will take up around 70% of the projected CAPEX.
- To achieve a U.S. $5 trillion economy by the fiscal year 2025, India needs to spend about $1.4 trillion on infrastructure.
- Though the industry situation has improved, surplus steel capacity will also remain an alarming issue for the long term.

So we the steel industry fraternity start the year with optimism and look forward to government support. It is time the pertinent hurdles on a priority basis are addressed on an immediate basis. The Ministry of Steel along with each and every player of steel fraternity has a major constructive role to play in bringing the sector out of the long crisis looming over.



(Sakuntala Chatterjee Chanda)

Bangladesh Steel Industry:
A Comprehensive Review

By Mohammad Asrarul Haque & Arif Abdullah - Analysts, EBL Securities Limited

Bangladesh is one of Asia's buoyant emerging steel markets and has a growing need for raw materials and steelmaking technologies. The movement towards a progressive national economy strongly depends on how the construction materials especially steel related industries have evolved and such products are readily available. Steel is a basic raw material for infrastructural development and multiple other uses. Fortunately, the country has a proud heritage for the art of steel making and shaping for a long time.

Growing demand for steel products ensures promising industry prospect, however, high market competition, excessive investments and increased cost of doing business squeezing profitability of the industry players

The Government of Bangladesh has projected the economy to grow by 8.2% in Fy2020. Meanwhile, Asian Development Bank (ADB) has also forecasted the economy to grow by 8.0% in FY2020, which makes Bangladesh as the fastest growing economy in Asia-Pacific region. According to industry experts, there is a linkage between a country's economic growth and growth in steel consumption. If GDP is expected to grow by 8%, steel industry should grow by at least 16% per year.

The country's economic activities took a turnaround in recent period. Increase in VAT and other regulatory duties, implementation of new VAT law and strict field level enforcement along with higher market competition, high interest rates and slow private credit growth etc. has significantly affected industry demand and sales of various industries including steel as well. Meanwhile, global economic slow-down has also started to affect the economy of the country. However, our long term view remained positive as the demand for steel will inevitably grow in line with the country's economic and infrastructural development. Major buyers of mild steel and re-rolled products include government, individuals and institutional buyers in the real estate sector. Implementation of the government's huge infrastructural development plans have been driving the double digit growth rate in the country's steel industry and we expect that the industry will also be enjoying strong growth in the next decade amid ambitious development initiatives by the government. Besides, growing urbanization, industrialization, increased wage earners' remittance inflows and higher purchasing power of consumers are accelerating the growth in overall construction sector.

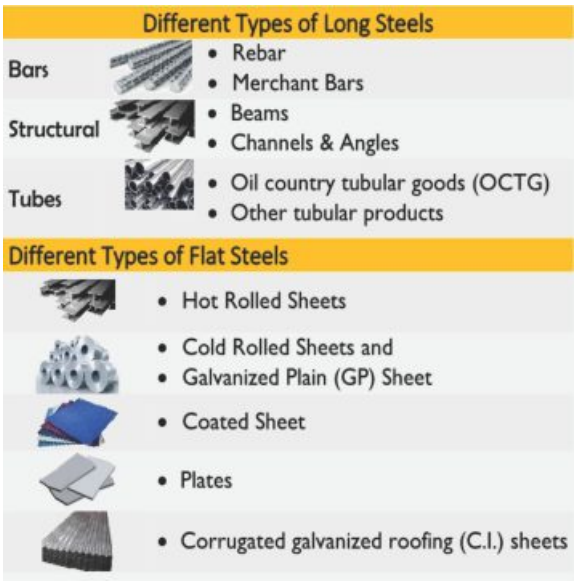
STEEL: MAJOR TYPES AND USES

Steel manufacturers produces steel in several types according to demand from end consumers. Based on shape, the steel industry can be categorized based on three types of products: long steel (MS rod/TMT bar), flat steel (mainly CI sheet and CR coil) and stainless steel.

In Bangladesh, most construction steel can be traced to local production of long products, most of it in reinforcing steel, commonly known as M.S. Rods. Long Steel products are used in all industrial sectors, particularly in the construction and engineering industries.

Different types of flat products includes Plates, Hot Rolled Sheets, Cold Rolled Sheets and Coated Sheet. Steel stock in the form of capital goods such as machineries and transportation vehicles are entirely imported. Corrugated galvanized roofing sheets commonly known as C.I. sheets are also produced in Bangladesh.

In Bangladesh, around 81% in the roofing and 42% in the fencing of total households in rural and urban areas are constructed with CI (Corrugated Iron) sheet and GP (Galvanized Plain) sheet, according to industry insiders. Besides, various Government projects, NGOs initiatives, Agro based firms, and industrial unit use a substantial volume of CI/GP sheet for fencing and roofing. As supportive material CI/GP sheets are also used in other civil constructions.



PRODUCTION TECHNOLOGY, KEY RAW-MATERIALS

There are mainly two types of technology for producing steels based on the raw materials consumption: the blast furnace-basic oxygen furnace (BF-BOF) technology (integrated) and electric furnace (EF) technology (recycled). However, variations and combinations of production technologies also exist. Electric Furnaces can again be divided into two categories, one is an electric arc furnace (EAF), which is used to generate heat by arc to melt scrap steel, and the other is an induction electric furnace (IEF), which generates heat by electromagnetic induction to melt scrap steel, especially in medium frequency induction.

Raw-material Components in Steel Production based on technology

Source: World Steel Association (WSA)

Predominantly iron ore, limestone, coal (or coke), and recycled steel (iron scrap/billet) are used in the BF-BOF technology while mainly recycled steel and electricity are required for the EAF technology. According to World Steel Association, about 75% of steel is produced using the blast furnace method and 25% of steel is produced via the electric furnace method. Another steelmaking technology, the open hearth furnace (OHF), makes up about 0.4% of global steel production. The OHF process is very energy intensive and is in decline owing to its environmental and economic disadvantages. However, all of these production methods can use recycled steel scrap as an input. Most new steel contains recycled steel.

In Bangladesh, there is no integrated mills (based on blast furnace-basic oxygen furnace method) for producing steel products. Steel millers here rely on electric arc and induction furnaces to process the scrap and adds value by transforming them into finished steels. Currently there are around 300 steel mills, among them there are 150 re-rolling mills and 30 auto steel mills in the country and rest of the millers produce steel through conventional process of re-rolling ship cutting plates, according to industry personnel.

LOCAL INDUSTRY TRANSFORMATION: JOURNEY FROM NON-GRADED TO GRADED STEELS

The last decade witnessed transformation of Bangladesh Steel Industry from nongraded to graded and specialized steels in at least 5 high quality grades. Leading manufacturers started to compete by introducing graded steels since 2008. Meanwhile, industries are also changing technology from traditional manual to auto-rolling and semi-auto rerolling mills.

With the local production of high quality graded steels, dependency on imported steels for large infrastructural projects has almost eliminated and the country became selfreliant in producing quality steel products.

SLOWDOWN IN GLOBAL STEEL INDUSTRY GROWTH IS EXPECTED DRIVEN BY SLOW GLOBAL ECONOMY

While main consumer segments of global steel products are construction, automobile and machinery sector, respective growth projection in 2019 and 2010 for these three segments remains slow or contractionary. According to World Steel Association, the global construction sector's growth is expected to slow to 1.5% in 2019 and 1.2% in 2020 after a moderate growth of 2.8% in 2018. However, uncertainty over the trade environment, mainly triggered by US-China trade war and volatility in the financial markets continue and could pose downside risks to this forecast. Construction sector growth in emerging market might remain strong mainly driven by infrastructural activities but the outlook is mixed for the developed markets. Meanwhile, global automotive production lost speed in 2018 and is anticipated to contract in 2019 with recession deepening and broadening across several major markets. After strong growth in 2017-18, global mechanical machinery is also expected to decelerate or remain flat in 2019-20 as the slowing down of the global economy and continuation of trade tensions hurt global investment activities.

BANGLADESH STEEL INDUSTRY IS SELF-RELIANT, HAVING SUFFICIENT CAPACITIES TO FEED THE DOMESTIC DEMAND

There is no exact year-to-year available data regarding the production and market share of the steel industry

Source: World Steel Association (WSA) and EBLSL Research.

of Bangladesh. However, In terms of production capacity for both finished and semi-finished (billet) steels Bangladesh is now self-sufficient. According to the industry players, Bangladesh's combined annual installed capacity of producing steel in 2018 was 8.5 million MT and the country has consumed 7.0 million MT steels which was only 1.6 mill MT a decade ago. Installed capacity of producing steel will cross 9 million MT by the end of 2019 and the production capacity to increase by another 3-4 million MT in the next few years after completion of various ongoing and planned capacity expansion projects by various industry players. It is expected that by 2030, steel consumption will reach 18 million Tons.

The country's annual installed capacity for various long steel products like Rod, Angle, Channel, Bar etc. is around 8.0 million MT and annual demand for long steel is 5.5 million MT. Besides, within the flat steel products, the country's present installed capacity is 1 million MT for cold rolled steel and 0.4 million MT for colour coated sheet.

Even though industry capacity is higher than the domestic demand, the industry is exposed to seasonality. Sales remains sluggish during the rainy season and higher in winter season. So, actual production remains lower in the dull season. On an

average 70-75% capacity utilization is termed as optimal by the industry players.

The market size of steel is around BDT 450 billion. The local steel market grew at a rate of 15%-20% in last two years from 8-10% per year previously. Growth was higher in last two years mainly due to faster ADP implementation initiatives taken by the government prior to Bangladesh National Election held in end of December 2018.

Currently, 45 steel mills are the members of Bangladesh Steel Manufacturers Association (BSMA) who manufacture over 80% of the steel products in the country.2 Moreover, major industry players are injecting fresh investment in this sector to enhance their production capacity to grab the potential of huge demand for the implementation of government's gigantic infrastructure development plans.

THOUGH INDUSTRY IS DOMINATED BY FEW LARGE PLAYERS, SMALL PLAYERS ARE REGAINING THE POSITION WITH FRESH INVESTMENT

The steel industry in Bangladesh is turning into perfect competitive market from previous oligopolistic one. Even though three big steelmakers BSRM, Abul Khair Steel (AKS) and KSRM had long been continuing their dominance in steel market and controlling more than 50% of the market, their dominance is shrinking since the last few years as small players growing aggressively. Currently there are 52 manufacturers who produces at least 10,000 MT Rod per year and these firms jointly account for almost 92% of the total production of long steel. To meet the burgeoning demand for the construction materials mostly driven by mega government projects, local firms went for boosting steel production capacities by investing heavily in steel manufacturing projects.

Abul Khair group is the largest steel producer in the country in terms of both revenue as well as capacity. Abul Khair Steel's re-rolling mill (AKS) is capable of producing 1.4 million metric tons high quality graded hot-rolled steel (TMT) rebar per annum. The company's capacity utilization is ratio is roughly 80%. AKS has a special reputation for price adjustment to avail larger market share and other companies do the same accordingly to maintain the competitiveness.

BSRM Group is the pioneer in the steel industry of Bangladesh and currently the second largest in the market with 1.24 million MT installed capacity of MS rod and bar annually.

The group has good track record for producing quality steel and strong market penetration.

To cater to the growing demand in coming days, KSRM has also increased its capacity from 0.45 million MT to 0.8 million MT recently. Another industry player, GPH Ispat has just its production capacity by more than 6 times. It has invested in a massive expansion project of its re-rolling mill to increase its capacity from 0.12 million MT to 0.76 million MT per year which has commenced its production from November 2019.

	Major Players in Steel Market	Present Capacity	Ongoing Expansion
		[Values in thousand MT]	
1	Abul Khair Steel (AKS)	1,400.0	-/-
2	BSRM Group	1,240.0	-/-
3	Kabir Steel Rolling Mills Ltd. (KSRM)	800.0	-/-
4	GPH Ispat Limited (GPH)	760.0	-/-
5	Mohsteel Limited **	500.0	-/-
6	Anwar Ispat Limited	360.0	-/-
7	Shahriar Steel Mills Ltd.	216.0	-/-
8	Baizid Steel Industries Ltd.	206.0	-/-
9	Salam Steel Concast Re-rolling Mils Ltd. (SCRM)	130.0	70.0
10	Ratanpur Steels Re-Rolling Mills Limited	187.2	-/-
11	Bashundhara Steel Complex Limited**	160.0	-/-
12	Bandar Steel Limited	120.0	-/-
13	S. S. Steel Limited	108.0	12.0
14	Magnum steel Industries Limited	100.0	-/-
15	Rahim Steel Mills Co. (Pvt.) Ltd	n/a*	-/-

*Information not available; **Updated data not available; *Source: EBLSL Research*

Currently, there are 9 CI sheet (flat steel) manufactures in Bangladesh. Among them AKS (Abul Khair Steel Mills), PHP Steels Mills, KY Steel Mills (KDS Group), S. Alam Cold Rolled Steels Ltd., Appollo Ispat, Galco Steels and TK Steel Mills are the top players in flat steels manufacturers. Most of the market players are Chittagong based. PHP Family is now envisioning to set up Country's first Integrated Steel Plant (blast furnacebasic oxygen furnace plant) to produce both Semi Finished and Finished Steel in the form of Flat and Long Products from Iron Ore.

	Major Players in Flat Steel Market	Capacity in mn MT
1	Abul Khair Steel (AKS)	760,000
2	PHP Steels	250,000
3	KDS group	120,000 (CR Coil), 50,000 (GS Coil), 25,000 (CR Closed Annealed), 60,000 (NOF-GS)
4	Appollo Ispat	120,000 (CRM), Galvanizing Line 200,000 MT
5	S.Alam Group	120,000 (CR Coil), 72,000 (NOF)
6	Karnafully Steel (T.K Group)	80,000 (CR Coil)

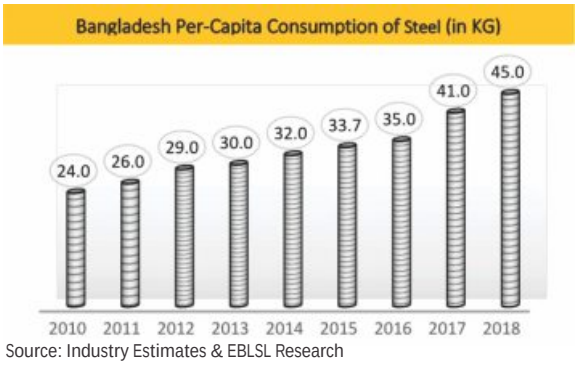
Source: Company annual reports, company websites and other available secondary sources.

Though earlier it was appeared that small players will lose their businesses due to business expansion by big players and high input cost, the situation has changed a bit. The present scenario in steel sector is kind of 'Grow or Die. A number of small millers including some Dhaka & Narayangonj based steel products traders are also setting up new plants to capitalize on the high growth potential of the industry and also to secure a market presence. Small millers are mostly targeting the retail segment of the market, individual homebuilders and real-estate segment while large players are eying towards mega government projects. This leads to a future danger for the large millers as once government projects will slow down, large millers are likely to loss major market share.

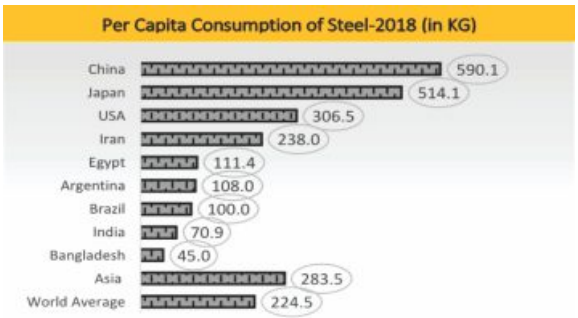
LOWER PER CAPITA CONSUMPTION COMPARED TO GLOBAL STANDARD INDICATES HUGE INDUSTRY PROSPECT:

While the country has been experiencing one of the fastest economic growth in the world, its per capita consumption of steel is significantly lower than the global standard.

Bangladesh is one of the lowest consumers of steel products in the world. According to the World Steel Association (WSA), average per capita steel consumption in the world was 224.5 kg in 2018 while that of Bangladesh was only 45 KG during the same year. Per capita consumption of finished steel in Bangladesh (41) was even lower than the regional peer Myanmar (40.5), India (75.3), Pakistan (45.7), Sri Lanka (53.5) etc. according to WSA data 2017 (latest data not available yet). Lower per capita consumption indicates that the industry has plenty of room to grow more. Bangladesh's per capita steel consumption witnessed 8.2% CAGR in last eight years and may reach to 65-70 kg by 2022 and around 70-75 kg by 2024.



Source: Industry Estimates & EBLSL Research



Source: Industry Estimates & EBLSL Research and EBLSL Research

The sector is expected to grow further driven by the increasing purchasing power and ongoing infrastructural developments by both public and private sector of the country.

According to real estate developers, usually 1.0-1.5 MT rods required to construct a 1000 sqft roof slab. So, along with mega government projects, increased demand from household and real-estate sector both in rural and urban areas will require huge volume of steel and will ultimately result in higher per capita consumption as well.

THRIVING STEEL DEMAND FOR THE GOVERNMENT INFRASTRUCTURAL PROJECTS DRIVING DOUBLE DIGIT GROWTH IN STEEL CONSUMPTION

The demand for steel industry is mainly driven by two factor; one is the implementation of the government's ADP plans and government's infrastructure building activities and the other is from the industrial and individual level demand especially from the real estate sector. However, in the last decade, Govt. projects has driven the majority of growth in the steel demand. Currently, the government projects account for nearly 35% to 40% of total steel consumption which was only 15% a decade ago.

The Government is investing tens of billions of dollars on mega projects notably including Padma Bridge, Ruppur Nuclear Power Plant, Metro Rail Projects and numerous infrastructural and transportation development projects etc. A lot of infrastructural works are running in the country and it would take another 5-7 years to finish them. Among them, Rooppur nuclear power plant and Padma Bridge are being constructed solely with steel manufactured locally. Due to the expectation of the undertaking of more mega projects in near future and overall healthy economic growth, there is ample opportunity for steel consumption to grow.

A CHALLENGING YEAR ONGOING FOR THE CONSTRUCTION SECTOR DUE TO SLOW IMPLEMENTATION OF GOVERNMENT PROJECTS AND BANKING SECTOR LIQUIDITY SHORTAGE

The government has slowed down releasing funds for the development projects after the national election, as the government itself has been suffering from fund shortage due massive expenditure projects and growing budget deficit. According to media reports and insiders, the government is not making due payments to the contractors which has reduced rod sales for the development projects during the running year. Government consumption of rod dropped in the 1st quarter of the current fiscal year (July-September period).

Meanwhile, persistent liquidity crisis in the banking sector may continue to pose challenges to the sector as liquidity crisis has lessened the loan ability of the banks. Both the real-estate sector as well as industrial sector has been suffering from banking sector liquidity crisis and high interest rate that ultimately causing de-growth in sales volume of steel products as well. The private sector consumption of rod was also down, owing to the slowdown of the real estate sector.

Rod millers sold 0.5 million MT of rod per month last year, but it declined to 0.4 million MT so far this year6. Sales of rod fell around 20% in the first quarter of the fiscal year, according to newspaper reports. However, sales usually declines a bit in the first quarter of a fiscal year compared to other quarters owing to lower demand. Hence, overall sales might improve in the second half of the fiscal year 2019-20. And even if the industry may perform poorly in the current year, attractive industry growth will prevail in coming years as planned infrastructural activities will be implemented and new projects will be undertaken. Meanwhile, the government is also looking for more FDI and foreign loans for various project implementation.

RIDING ON THE MAJOR INVESTMENT IN DEVELOPING BACK-WARD LINKAGE INDUSTRY BY LOCAL STEEL PRODUCERS, BANGLADESH IS NOW SELF-RELIANT FOR SOURCING OF PRIME RAW-MATERIAL, BILLET

Among the crude steel products, billet is considered as the prime raw-materials for producing steel products. Most of the re-rollers are now adopting backward integration process in order to produce quality and cost-effective products.

In Bangladesh, due to large investment by major steel manufacturing groups, the billet industry has itself become big along with the finished steel industry. Presently, the country's total installed capacity for producing crude steel (billet) stands roughly at million MT per year whereas in 2014, Bangladesh had only around 1.0 million MT of total billet producing capacity. Meanwhile, the country's billet manufacturing capacity will also increase further in near future as massive capacity expansion projects by large players undergoing. Currently, 35 mills are manufacturing billet and the local production of billet is considered enough to fulfill the requirement of local steel demand.

MARKET LEADERS IN BILLET:

A number of large players such as Abul Khair (AKS), BSRM and GPH Ispat, KSRM, Metrocem and Anwar Ispat have invested heavily on steel melting projects which increased local crude steel (billet) production capacity significantly, reduced import dependency has transformed Bangladesh into a self-sufficient country in the billet manufacturing.

	Manufacturers of Billet	Current Capacity	Ongoing Expansion
		[Values in thousand MT]	
1	BSRM Group	1,662.5	-/-
2	Abul Khair Steel Melting Ltd. (AKSML)	1,600.0	-/-
3	GPH Ispat Limited (GPH)	1,008.0	-/-
4	Kabir Steel Rolling Mills Ltd. (KSRM)	600.0	200.0
5	Shahriar Steel Mills Ltd.	270.0	-/-
6	Modern Steel Mills Limited	200.0	-/-
7	Baizid Steel Industries Ltd.	190.0	-/-
8	Sheema Automatic Re-Rolling Mills Ltd.	120.0	-/-
9	Salam Steel Concast Re-rolling Mills Ltd. (SCRM)	120.0	-/-
10	Bashundhara Steel Complex Limited	100.0	-/-
11	Magnum Steel Industries Limited	100.0	-/-

Source: EBLSL Research

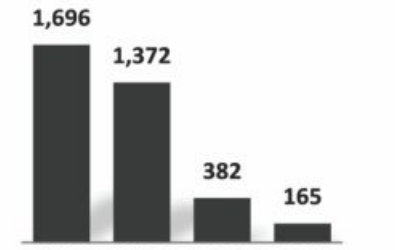
Only four big players in the industry Abul Khair (AKS), BSRM, GPH Ispat and Kabir Steel (KSRM) has almost 5 million MT capacity for the semi-finished steel melting (billet) production. GPH Ispat has recently expanded its billet producing capacity to feed its expanded steel manufacturing capacity. The company is increasing its billet making capacity from existing 0.17 million MT capacity to 1.008 million MT per year.

IMPORT OF BILLET HAS DECLINED SHARPLY OWING TO LOCAL PRODUCTION BUT HIGHER DOMESTIC BILLET PRODUCTION ACCELERATED IMPORT OF SCRAP MATERIALS IN RECENT YEARS

As local manufacturers are increasing their billet manufacturing capacity, import of billet has declined sharply in recent years. However, some steel makers still import billet as billet millers in Bangladesh mostly serve as the backward linkage for their own re-rolling mills. Bangladesh used to import billet mainly from China, US and India when local production of billet was below its annual requirement. Now the import demand for billet is insignificant.

volume of scrapped ships imports in Chattogram's ship-breaking market for recycling activities was recorded at 2.3 million MT during the same year. Based on these information, we can infer that estimated demand for scrap materials in Bangladesh is about 7.5 million MT for which we are dependent on imported scraps, scraps generated from ship-breaking yards and other domestically generated steel scraps. Every year 2.5-3.0 million MT scrap

Import of Billet (in thousand MT)



Source: Customs Data, extracted from the Daily Star report

Import of Iron Scarp (in thousand MT)

Source: World Steel Association and EBLSL Research

Meanwhile, higher billet producing facility is requiring higher volume of iron scrap, key raw-material for steel melting units based in Bangladesh. Only a small amount of required scrap materials are available from local sources (ship-breaking businesses). As local market is unable to supply adequate amount of iron scrap materials, amidst growing semi-finished steel manufacturing capacity, import of scrap materials has increased sharply in the last few years. Bangladesh was the 7th largest iron scrap importer in Asia in 2017 and in the next few years the position can improve to 3rd or 4th position. The country's import of billet came down to meagre 0.165 million MT in FY2017-18 from that of 1.696 million MT in 2014-15 and the declining trend is continuing.

Bangladesh imported around 2 million MT of finished steel products and 0.6 million MT of semi-finished steel products in 2017-18. Meanwhile, import of scrap has increased. According to World Steel Association data, Bangladesh imported 2.14 million MT raw materials for producing billets, including iron scraps, in 2017 against only 0.28 million MT scrap iron import in 2013. Data from Bangladesh Customs Department also reveals similar figures. According to customs department data, ferrous scrap imports was recorded at 2.6 million MT in FY2017-18 and the materials are procured from ship breaking industry in Sitakunda, supplying 35-40% of total demand. Around 300 ships are recycled in Sitakunda per year in 100+ shipyards. So, to meet the growing demand, it is expected that import amount of iron scrap will see a rising trend in the coming years.

On a recent development, the government of Bangladesh has envisaging to set up an environment friendly ship-breaking zone in Barguna with a view to turning the country self-reliant on iron-scrap material sourcing. Bangladesh Steel & Engineering Corporation is currently conducting the feasibility study of the project. Estimated budget for the proposed project is BDT 12.0-13.0 billion, 105 acres of land has been selected for the site, 3 km coastal area will be used for the project where 16 large ships can be recycled at a time using modern technology. If this project is implemented, import dependency will reduce significantly.

BEING SELF-RELIANT IS REDUCING THE DEPENDENCY ON IMPORT OF BOTH SEMI-FINISHED AND FINISHED STEEL

Even though local steel industry has the capability to feed entire demand of the steel products in Bangladesh, the country imported 2.67 million MT of

Source: World Steel Association and EBLSL Research

semi-finished (billet) and finished steel (both long and flat) products in 2017, according to WSA statistics. Major import products are, hot-rolled coils, steel structures, steel coils, special steel, pipes etc. According to customs department data, import of total steel products, comprising raw material (steel scrap), semi-finished, finished products and imported scrap vessel quantity (ship breaking) was around 7.7 million MT in FY2017-18, among which only 2.6 million MT were finished and semi-finished products (HBI, DRI and billets).

However, import is in downtrend since 2015-16 and going forward, import is expected to decline sharply as local millers have already expanded their capacity to produce both semi-finished and finished steel products significantly while the government has increased import duty for Billet.

Source: World Steel Association and EBLSL Research

Apart from occasional spike, import of long steel products such as MS rod and bar has stayed fairly low as the local production fulfills almost entire volume of the total demand. However, in recent times, some mega projects such as Rampal power plant, Kanchpur-Meghna-Gumti Bridge and Karnaphuli tunnel are being built by using imported steel, which may have caused a spike in the recent years in import of long products. Reason for using imported steels for these projects are requirement of specialized and customized sized products that the country doesn't have sufficient supply yet.

DUE TO HIGH DOMESTIC DEMAND AND PROTECTIVE IMPORT DUTY IN INDIA, EXPORT POTENTIAL IS LIMITED IN NEAR FUTURE

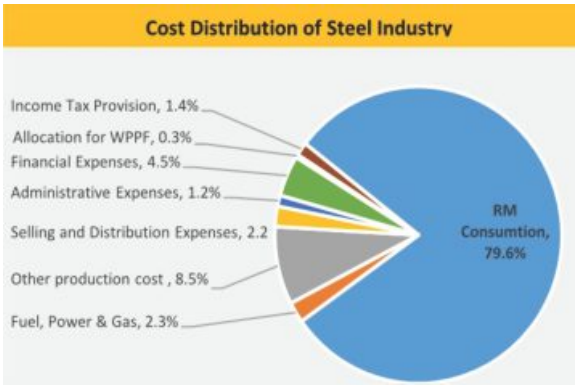
Bangladesh exports finished steel at small scale. Bangladesh has historically exported steel to Africa. Cold rolled and colour coated sheet are mainly exported after meeting the domestic demand. Government has already declared 10% cash incentive on Export of Galvanized Sheet/Coils (Coated with Zinc, Coated with Almunium, Zinc and Color Coated). However, due to massive domestic demand, most of the companies are focused on domestic sales and hence export sales have not achieved much growth in the last decade.

Although the country's steel sector remains mostly focused on domestic demand, owing to overcapacity and incessant investment by the market leaders, the country has the potential to export steel, especially to the northeastern states of India. However, the opportunity has been challenged as the state governments of India have imposed protective tax on imported rod. With the current capacity expansion programs of the existing steel companies, it can be expected that in the coming years, local steel companies will look for expanding their export business to increase their top line revenue.

Cost Structure and Profitability

PROFIT MARGINS ARE HIGHLY SUSCEPTIBLE TO INPUT PRICES, DUTY STRUCTURE, FINANCE EXPENSES AND FUEL & POWER COST AS HIGH MARKET COMPETITION ERODES THE ABILITY TO ADJUST RETAIL PRICES FULLY

An analysis by EBL Securities reveals that almost 80% of the cost of steel manufacturers are attributed to the raw-material consumption, on an average 4.5% of the cost are attributed to finance expenses and 2.3% of total cost is attributed to Fuel, Power and Gas cost. So, volatility on raw-material prices can have significant impact on the profitability of the steel manufacturing firms. Besides, hike on gas and electricity prices are on the card while prevailing interest rate is higher that is causing higher finance expenses for the steel manufacturing companies.



Source: Company disclosures and EBLSL Research

Volatility in raw-materials and utility cost along with frequent changes in regulatory duty structure results in high volatility in retail prices of steel products while increased market completion squeezing in profit margins of the companies. As the country needs to import significant volume of iron scrap materials from abroad, the price of iron scrap materials in the international market and currency exchange rate are very important. The raw material cost and subsequently retail price of the steels largely depend on input prices.

In the last 6-7 months price of scrap materials has been in falling trend. According to a recent report from a leading local daily, the price of scrap has fallen by USD 30 per MT since May 2019. The price of iron scrap materials in international market came down to USD 361 per MT from USD 389.

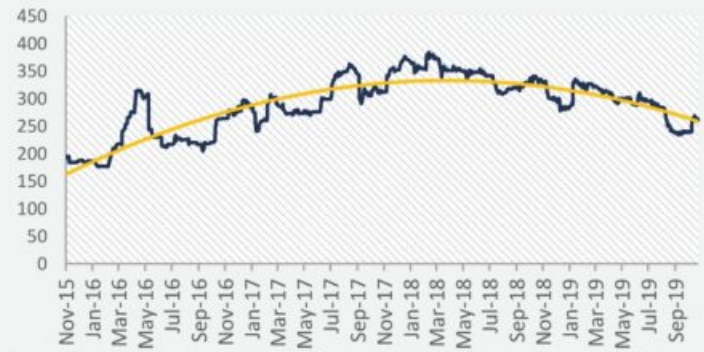
Recent fall in the raw-material prices in global market coupled with sluggish construction sector activities in current year as a result of slow implementation of government projects, in an environment of increased market competition triggered the retail prices of mild steel rod to fall after a short term spike. The prices of 60-grade rod was BDT 62,000- BDT 67,000 per ton in May, according to newspaper report, citing the state-run Trading Corporation of Bangladesh. The price of steel rod has declined by BDT 2,000 per MT on an average in September.

APOLOISPAT = Appollo Ispat Complex Limited
BSRM LTD = BSRM Limited
BSRMSTEEL = BSRM Steels Limited
GPHISPAT = GPH Ispat Ltd.
RSRMSTEEL = Ratanpur Steel Re-Rolling Mills Ltd.
SALAMCRST = S. Alam Cold Rolled Steels Ltd.
SSSTEEL = SS Steel Ltd.

Meanwhile, as the country had to import iron scrap and ships for breaking them into scrap materials in ship-breaking zones, depriciation of local currency against foreign currency increased overall import cost of the raw-materials that also affect production cost of the industry.

As steel is a low-margin product, any slight change in the raw-material cost significantly affects the profitability of the manufacturers. Manufactureres with high relainace on the quality raw-materials for graded steels are comparatively affcted more than the others. A 5% increase in the raw-materal cost would affect the gross profit margins of the steel manufactureres by 3-4%.

Steel Scrap Futures Historical Data (USD/MT)



Source:https://www.investing.com/commodities/steel-scrap-historical-data

BDT-USD Exchange Rate

Source: Bangladesh Bank & EBLSL research

	Erosion in GPM if Product Price Not Adjusted (Other things held constant)						
Increase in RM Price	Scenarios	APOLOISPAT	BSRM LTD*	BSRMSTEEL	GPHISPAT	RSRMSTEEL	SALAMCRST	SSSTEEL
	2%	1.36%	1.67%	1.38%	1.50%	1.56%	1.52%	1.20%
	3%	2.04%	2.51%	2.07%	2.26%	2.34%	2.28%	1.81%
	4%	2.72%	3.35%	2.76%	3.01%	3.12%	3.04%	2.41%
	5%	3.40%	4.18%	3.45%	3.76%	3.90%	3.80%	3.01%
	6%	4.08%	5.02%	4.14%	4.51%	4.68%	4.56%	3.61%
	7%	4.76%	5.86%	4.83%	5.26%	5.46%	5.32%	4.22%
	8%	5.44%	6.69%	5.52%	6.01%	6.24%	6.07%	4.82%
	9%	6.12%	7.53%	6.21%	6.77%	7.02%	6.83%	5.42%
	11%	7.48%	9.20%	7.59%	8.27%	8.58%	8.35%	6.63%
	12%	8.16%	10.04%	8.28%	9.02%	9.36%	9.11%	7.23%

Source: EBLSL Research based on the latest available audited financials of the respective steel manufactures (FY2018 for APOLOISPAT & SALAMCRST and others are based on FY2019 reports). *BSRMLTD is based on solo reporting

	Change in NPAT if product price not adjusted & other things remain constant						
Change in RM Price	Scenarios	RSRMSTEEL	SALAMCRST	APOLOISPAT	BSRMSTEEL	SSSTEEL	GPHISPAT	BSRM LTD*
	1.0%	-8.7%	-23.8%	-122.7%	-20.0%	-6.7%	-11.5%	-9.7%
	2.0%	-17.4%	-47.6%	-245.4%	-40.0%	-13.4%	-23.0%	-19.4%
	3.0%	-26.1%	-71.4%	-368.0%	-59.9%	-20.1%	-34.5%	-29.1%
	4.0%	-34.8%	-95.2%	-490.7%	-79.9%	-26.8%	-46.0%	-38.8%
	5.0%	-43.5%	-119.0%	-613.4%	-99.9%	-33.5%	-57.5%	-48.5%
	6.0%	-52.2%	-142.8%	-736.1%	-119.9%	-40.2%	-69.0%	-58.1%
	7.0%	-60.9%	-166.6%	-858.8%	-139.8%	-46.9%	-80.5%	-67.8%
	7.5%	-65.2%	-178.5%	-920.1%	-149.8%	-50.2%	-86.2%	-72.7%
	9.0%	-78.2%	-214.2%	-1104.1%	-179.8%	-60.3%	-103.4%	-87.2%

Source: EBLSL Research based on the audited financials of the respective steel manufactures for FY2018. *BSRMLTD is based on solo reporting

For a 1% change in raw-material cost, it has been revealed that APOLOISPAT will turn into a loss making concern while most of the other companies will experience double digit de-growth in the bottom-line. So, price of raw-materials is an important consideration for assessing profitability of the steel manufacturing companies.

Impact of fuel & power price change would be minimal for the steel manufacturers. Our research on listed steel manufactures reveals that a 5% increase in both gas and electricity price would lessen the gross profit of the manufactures by 0.08-0.30%.

FAVORABLE POLICY SUPPORT HAS BEEN WORKING AS A KEY CATALYST FOR MASSIVE INVESTMENT IN BILLET PRODUCING FACILITIES BY THE STEEL MANUFACTURERS

A number of factors acting as key motivators for big investment in billet manufacturing facilities by local entrepreneurs. Among them one of the key reason is to reduce the production cost of finished steel products. According to the industry insiders, domestic production of billet helped the steel manufacturers to reduce production cost by USD 158 per MT that ultimately helped to reduce retail prices of finished

	BSRMSTEEL											
	Change in Gas Price											
Change in Power Cost	0.0%	2.0%	3.0%	4.0%	5.0%	6.0%	7.0%	8.0%	9.0%	10.0%	11.0%	12.0%
0.0%	0.00%	0.01%	0.01%	0.01%	0.02%	0.02%	0.02%	0.02%	0.03%	0.03%	0.03%	0.04%
2.0%	0.07%	0.08%	0.08%	0.08%	0.09%	0.09%	0.09%	0.10%	0.10%	0.10%	0.10%	0.11%
4.0%	0.14%	0.15%	0.15%	0.15%	0.16%	0.16%	0.16%	0.17%	0.17%	0.17%	0.18%	0.18%
5.0%	0.18%	0.18%	0.19%	0.19%	0.19%	0.19%	0.20%	0.20%	0.20%	0.21%	0.21%	0.21%
6.0%	0.21%	0.22%	0.22%	0.22%	0.23%	0.23%	0.23%	0.24%	0.24%	0.24%	0.25%	0.25%
7.0%	0.25%	0.25%	0.26%	0.26%	0.26%	0.26%	0.27%	0.27%	0.27%	0.28%	0.28%	0.28%
8.0%	0.28%	0.29%	0.29%	0.29%	0.30%	0.30%	0.30%	0.31%	0.31%	0.31%	0.32%	0.32%
9.0%	0.32%	0.32%	0.33%	0.33%	0.33%	0.34%	0.34%	0.34%	0.34%	0.35%	0.35%	0.35%

Source: EBLSL Research based on audited statement of FY2018-19 of BSRM Steels Ltd.

steel by BDT 12,000 per MT.12 Government's policy support, including hike in the import duty on billet has mainly encouraged local millers in setting up backward linkage facilities as domestic production of billet turned out to be cost effective. In the past financial year, import of per MT billet was subject to BDT 800 AIT (advance income tax) along with 4% advance trade VAT, 15% VAT and 20% regulatory duty. However, in latest finance bill, source tax on import of raw materials for Steel industry was reduced from BDT 800 per MT to 500 per MT. Other notable changes were, VAT on scrap sales BDT 1,750 (previously 300), Fixed VAT on Billet sales BDT 2,000 (previously 450), Fixed VAT on rod sales BDT 2,000 however was later revised to BDT 1,200 for MS product produced from local/imported scrap for re-rolling (previously 450), VAT on retail sales 3,300 (previously 200) and Imposition of 5% advance tax on raw materials at the import stage.

Due to the increase in VAT, the price of mild steel rod were expected to go up to 10,350 per MT and cross BDT 70,000 per MT, according to Steel Millers. The industry insiders have opined that, the imposition of 5% advance Tax will increase the working capital requirement by 5% which will put liquidity pressure on banks and will create possibility of more bad loans if the steel makers fail to repay the bank loan in time due to increased production cost. However, as of September 2019, the rod price hasn't reached the forecasted level. As prices of scrap materials has dropped by 8%, while sales remained shaky in the 1st quarter of FY2019-20, retail prices dropped further.

However, on October 13, NBR has reduced VAT by up to 75% to keep steel prices in control. It has fixed specific VAT on MS products and MS products made from billet/ingot and meltable scrap on BDT 500 which was BDT 1,200 and BDT 2,000 previously. Also, it has imposed specific VAT of BDT 1,000 per MT on key raw materials of steelFerro-manganese, Ferro-silico-manganese alloy and BDT 1,200 MT on Ferrsilicon-alloy which was a 5% rate of VAT previously. Due to changing it to specific VAT, it will reduce the cost of importing these products.

Other factors are increase in the local demand of steel mostly driven by government projects, reducing exchange rate risk, reducing adverse effect on price fluctuation in international market etc. All these factors have worked as the catalysts in the growth of local billet production. Besides, improvement in country's power generation also encouraged them to invest more as steel melting facilities require huge uninterrupted power supply.

SUM-UP

Since steel demand is derived from other sectors like construction buildings, roads, consumer durables and infrastructure, its fortune is dependent on the growth of these industries as well. However, initiation of Padma Bridge construction, acceleration of Government's big infrastructure projects under Annual Development Program (ADP) and revival of the local real-estate industry will undoubtedly boost-up the steel consumption locally. However, uneven competition from new entrants, price fall in international steel market for finished goods, dependency on imported raw-materials (iron scrap), transportation, port facilities and tariff rationalization, high interest rates are the key challenges for the development of steel industry. Besides, a structural change is being noticed in the steel industry and manual & semi manual mills are gradually being phased out by modern automated mills.

STEEL INDUSTRY IN BANGLADESH CAPITAL MARKET

Steel Industry has a phenomenal presence in the capital market of Bangladesh. There are 7 steel manufacturing company, listed in Bangladesh capital market our of which, five are specialized in the making of MS Rod, MS Bar and MS billet while other two are specialized in Cold rolled and Galvanized steel sheets/coils. Here we have presented a comparative review on the listed steel industry manufacturing companies that are specialized in MS rod and bar.

COMPANY OVERVIEW

BSRM Steels Limited (BSRMSTEEL): BSRM Steels Limited is a high grade steel manufacturing company, mainly engaged in the production and supply of "Xtreme 500W" deformed bars of reinforced steel. The company was incorporated in 2002 and commenced commercial operation in 2008.

The product portfolio of BSRM Steels Limited comprises Xtreme-500W, ASTM 706 Grade 80 and

Comparative Snapshot							
	BSRMSTEEL	BSRMLTD	RSRMSTEEL	GPHISPAT	SSSTEEL	SALAMCRST	APOLOISPAT
Relative Position (As on 24th December 2019)							
Current Price	39.6	48.9	24.1	25.2	23.3	19.1	4.1
52 Week Range	39.0-66.1	48.8-87.0	23.5-56.9	24.5-39.9	20.4-55.0	19.0-36.5	3.8-11.0
No. of Shares (in Million)	376.0	236.1	101.2	360.2	245.0	98.4	401.3
Free-Float*	110.8	139.4	53.6	181.5	165.8	52.2	320.1
EPS (annualized)	1.5	4.1	2.2	1.8	3.2	1.2	-.2
Dividend (C/B)%	10/10	10/10	12/0	0/10	5/10	10/0	0/3
NAVPS	56.0	98.5	50.0	18.0	16.2	19.8	19.4
P/E (x)	26.1	11.9	11.0	13.7	7.3	15.9	n/a
P/B (x)	0.7	0.5	0.5	1.4	1.4	1.0	0.2
Market Share (Stand-alone)	12.2%	8.8%	1.7%	2.2%	0.8%	0.9%	0.9%

ASTM 706 Grade 60 etc. The Company's flagship product 'Xtreme-500W' has contributed 63.9% in the total volume sales in 2017-18. Present Installed Capacity is 700,000 MT and capacity utilization in FY2018-19 was 108.3%.

Bangladesh Steel Re-Rolling Mills Limited (BSRMLTD): Bangladesh Steel Re-Rolling Mills Limited is the first fully automatic re-rolling mills built in the country. BSRMLTD produces a low carbon weldable quality high strength and high ductility concrete reinforcing bar. The company was incorporated in 1960 and commenced commercial operation in 1961.

The company mainly produces MS products like 60 grade and 40 grade MS bars, Angles, Channels, I-beam, Great-beam, etc. and MS billet (Raw-materials for MS Products).

BSRMLTD is now operating with two different units: (i) Re-Rolling unit for M.S.Rod, Channel, Angle and (ii) Steel Melting Works unit for production of M.S. Billet. Currently, annual installed capacity of BSRMLTD is 540,000 MT for Re-Rolling Unit and 150,000 MT for Melting Unit.

The company has two subsidiaries- (1) BSRM Steel Mills Limited (44.97% ownership), (2) BSRM (Hong Kong) Limited. BSRMLTD also has an associate company namely BSRM Steels Limited (31.19% ownership). The company also has indirect control over few other companies, upon which its associate concern has controlling share. The company became listed with DSE and CSE on 27 April 2015.

Ratanpur Steel Re-Rolling Mills Limited (RSRM): Ratanpur Steel Re-Rolling Mills Limited was incorporated on 22 April 1986 & commenced its commercial production in 01 July 1986. The Company is engaged in manufacturing and selling of various graded of M.S Deformed Bar (500W /TMT, 400 W and 300W) from M.S. Billet.

GPH Ispat Limited: GPH Ispat Limited is an integrated steel manufacturing company in Bangladesh that engaged in manufacturing of M.S. Billet from Steel Scrap & M.S. Rod from M.S. Billet and marketing of the same. It was incorporated in Bangladesh as a Private Limited Company on May 17, 2006, commenced its commercial production on 21 August 2008 and got listed to DSE and CSE in 2012.

S. S. Steel Limited: S. S. Steel Limited (SSSTEEL) is engaged in manufacturing and selling of 500W MS-Deformed Rod, MS-Ingot, Billet, steel for the reinforcement of concrete (Ribbed Bar). They have two different plants namely steel & rolling plant. Billets & ingots are produced in steel plant and MS Bar Rods are produced in rolling plant.

SSSTEEL has three induction furnaces, one continuous custing machine (CCM) used for the production of MS-billets and one re-heating furnace & one auto re-rolling mill for producing MS-BAR rods. Corporate office of this company is located at Pragati Sarani, Dhaka and the factory is in Tongi Industrial Area, Gazipur.

Appollo Ispat Complex Ltd.: Appollo Ispat Complex Ltd is primarily engaged in the business of manufacturing & selling of Corrugated Iron (CI) Sheet of different thickness, ranging from 0.120 mm to 0.420 mm which is distributed mainly in rural & semi-urban areas of the country. The Brand of AICL is "Rani Marka".

Ownership structure: BSRMSTEEL has the highest sponsor holding while 17.06% of the shares of the BSRMLTD are hold by the foreign shareholders. It is mentionable that foreign holding of the company represents shares held by the foreign relatives of the

company's sponsors/ directors. Institutional holding is high for RSRMSTEEL followed by BSRMLTD and BSRMSTEEL.

➢ Except RSRM, all the other three companies have significant interest bearing debt in their capital structure.

Shareholding Structure

	Sponsor/ Director	Govt	Institute	Foreign	Public
BSRMSTEEL	70.53%	0.00%	18.24%	0.29%	10.94%
BSRMLTD	40.94%	0.00%	19.63%	17.06%	22.37%
RSRMSTEEL	47.03%	0.00%	22.50%	0.00%	30.47%
APOLOISPAT	20.24%	0.00%	22.32%	0.56%	56.88%
GPHISPAT	49.61%	0.00%	16.19%	0.00%	34.20%
SALAMCRST	53.07%	0.00%	26.51%	0.00%	20.42%
SSSTEEL	32.33%	0.00%	29.67%	0.00%	38.00%

Source: DSE Website (Latest available data)

*Free float shares exclude sponsor and government holding. + EPS of GPH Ispat has been restated based on post right issue number of shares outstanding.

Analysis on Listed Steel (MS Rod & Bar) Producing Companies

	RSRMSTEEL	SALAMCRST	APOLOISPAT	BSRMSTEEL	SSSTEEL	GPHISPAT	BSRM LTD (Consol)	BSRM LTD (Solo)
Financial Information (BDT mn):	**2019**	**2018**	**2018**	**2019**	**2019**	**2019**	**2019**	**2019**
Net Sales	6,808.7	3,806.6	3,863.8	61,060.2	4,150.6	13,268.70	83,115.3	44,408.9
Gross Profit	1,067.0	581.8	716.0	5,051.9	1,007.4	2,157.90	8,186.3	4,992.2
Operating Profit	987.9	522.4	535.0	3,369.1	796.5	1,735.00	6,655.7	3,637.9
Profit After Tax	564.4	121.5	21.4	1,728.1	519.2	806.2	2,504.4	1,860.6
Assets	7,400.0	13,837.2	12,992.4	65,808.2	7,678.3	31,493.00	91,067.2	52,553.6
Total Debt	1,673.3	1,284.1	706.1	31,819.4	2,153.3	24,012.90	43,162.5	15,277.5
Long Term Debt	849.7	1,284.1	706.1	9,067.9	325.5	16,676.40	5,009.6	3,871.5
Equity	5,006.8	2,037.7	7,867.3	20,897.2	4,489.7	6,335.40	30,508.5	23,007.4
Retained Earnings	2,301.0	491.6	1,629.5	9,196.8	1,323.6	1,597.00	7,953.1	7,953.1
Cash	47.9	30.7	123.9	914.8	518.3	281.8	784.7	761.6
Margin:								
Gross Profit	15.7%	15.3%	18.5%	8.3%	24.3%	16.3%	9.8%	11.2%
Operating Profit	14.5%	13.7%	13.8%	5.5%	19.2%	13.1%	8.0%	8.2%
Pre Tax Profit	0.6%	0.3%	0.0%	0.2%	0.7%	0.4%	0.2%	0.2%
Net Profit	8.3%	3.2%	0.6%	2.8%	12.5%	6.1%	3.0%	4.2%
Growth:								
Sales	-11.1%	55.3%	-32.4%	26.4%	15.7%	35.2%	20.6%	33.6%
Gross Profit	-16.4%	77.6%	-35.5%	3.5%	9.7%	34.7%	0.5%	3.4%
Operating Profit	-16.3%	95.3%	-42.5%	5.9%	13.3%	35.9%	-6.2%	-5.9%
Net Profit	-20.9%	15.3%	-95.5%	-4.0%	69.7%	20.4%	-24.0%	-33.0%
Profitability:								
ROAA	8.0%	0.9%	0.2%	3.1%	7.2%	3.0%	3.0%	4.0%
ROAE	11.8%	5.9%	0.3%	10.3%	12.6%	25.4%	10.5%	10.1%
Leverage:								
Debt Ratio	22.6%	9.3%	5.4%	48.4%	28.0%	76.2%	47.4%	29.1%
Debt-Equity	33.4%	63.0%	9.0%	152.3%	48.0%	379.0%	141.5%	66.4%

Source: Respective Company Last Audited Statements

➢ Among the listed steel manufacturers, BSRMSTEEL has the highest production capacity. The company's sister concern BSRMLTD holds the second largest position in terms of capacity. However, other two companies specially GPHISPAT are also undergoing major expansion project in increase their production capacity.

➢ As per the latest available financial results of all the four companies, Gross profit margin and Net profit margin was higher for SSSTEEL (24.3%, 12.5%), GPHISPAT (16.3%, 6.1%) and RSRMSTEEL (15.7%, 8.3%).

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710
PROCESS CONTROL SYSTEMS

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647
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386
ENVIRONMENTAL PLANTS

38
ENERGIRON DIRECT REDUCTION PLANTS

259
ELECTRIC ARC FURNACES

147
BLAST FURNACE AND CONVERTER PROJECTS

405
SECONDARY METALLURGY STATIONS

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138
TURNKEY PLANTS SUPPLIED WORLWIDE

2521
CASTING STRANDS FOR SLABS, BLOOMS, AND BILLETS

665
SLAB, BLOOM, AND BILLET GRINDING MACHINES

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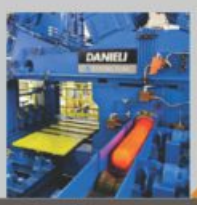

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Pre-Engineered Building (PEB) Sector of Bangladesh: Challenges & Opportunities'

By Md. Rashed Khan
Chairman Modern Structures Limited Directo, Bangladesh Indenting Agents'Association (BIAA)
Organizing Secretary Steel Building Manufacturers Association of Bangladesh (SBMA)
&
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B.Sc in Civil Engg. (BUET)

Introduction

A pre-engineered building (PEB) is designed by a PEB supplier or PEB manufacturer, to be fabricated using best suited inventory of raw materials available from all sources and manufacturing methods that can efficiently satisfy a wide range of structural and aesthetic design requirements. Within some geographic industry sectors these buildings are also called Pre-Engineered Metal Buildings (PEMB) or, as is becoming increasingly common due to the reduced amount of preengineering involved in custom computer-aided designs, simply Engineered Metal Buildings (EMB).

Being one of the fastest growing sectors of Bangladesh, the Pre-engineered building (PEB) industry could well be the next economy booster. The total PEB market size in Bangladesh is estimated to be approximately BDT 25,000 million per year.

PEB sector of Bangladesh is primarily an industrial oriented division. There are around 26 enlisted and 44 non-listed PEB enterprises. There are around 15 large and organized firms and rest are small & medium. Some large firms have already established themselves as strong regional player. Many firms are also trying to get a foothold in local market. So. recently expansion of existing production facilities has become a common and well expected reality. There are also some strong foreign players in our local market like Zamil Steel. Kirby Building Systems Ltd.. Buildtrade Engineering Ltd.. Modem Structures Ltd.. SteelMark Buildings Ltd.. Sarker Steel Ltd . NDE Steel Structures Ltd.. PEB Steel Alliance Ltd.. Mammut Building Systems FZC, and Tiger Steel Engineenng LLC. Actually foreign players introduced this system in our country first.

Background

Local steel-building makers are expecting a bnght future for the pre-fabricated building sector as an increasing number of conglomerates, including foreign companies, are setting up such structures for industnal use The demand for steel buildings is increasing in the country as it needs low investment and less time, and provides high safety. A pre-fabricated steel structure is now being used for different purposes such as setting up factories, multi-storied buildings, power plants and bridges. A higher resale value of the steel structure is another reason it has gained popularity Owners will be able to get four times the value if they sell the steel structure of the building as scrap even after 50 years, which is not possible for conventional buildings The country has immense potential in steel infrastructure as steel consumption per capita is still very low against global standards. Currently, steel consumption per person hovers around 12 kilograms in Bangladesh, while it is nearly 459 kg in Germany and 506 kg in Japan and 477 kg in China, according to World Steel Association 2013. Many companies are setting up factories with pre-fabricated steel structure as it gives the flexibility to relocate at any time and makes maximum use of floor space Setting up such steel-structure buildings began in Bangladesh in 1985. Initially, the structures and components were being imported In 2001. local entrepreneurs first took the initiative to set up steel buildings locally, according to industry insiders. More than 100 companies are now involved in such businesses; some 24 companies are members of the Steel Building Manufacturers Association of Bangladesh (SBMA). The sector has so far invested more than Tk 1.000 crore. employing around two lakh people directly and indirectly, including 3.000 engineers. Presently, the annual demand for prefabricated steel buildings in Bangladesh is around Tk 2.500 crore. growing at more than 35 percent for the last several years Local companies meet around 85-90 percent of the demand and the rest is imported Pre-Fabricated buildings consist of several factory-built components or units that are assembled onsite to complete the unit. The factories made of prefabricated buildings are now mainly located in Gazipur. Narayanganj. Comilla. Chittagong. Manikganj and Savar The construction cost of such a building is Tk 250-Tk 350 a square feet, which is 20-30 percent lower than a conventional building Generally, it requires a year to build a 60.000-70.000 square feet building, while a steel building can be made in only two months. Hot rolled MS plate. CR coil. Nuts-Bolts and color coil are the key raw materials of the steel buildings and these are mainly imported from Korea. Japan. India and China. In the last five years, the country exported pre-Fabricated building materials worth around $50 million, mainly to Sudan. Pakistan. India and the UAE.

Objective of the Report

The main objective of the report is to assess the challenges & opportunities in the Pre Engineered Building (PEB) sector of Bangladesh. A thorough understanding of the Bangladeshi PEB industry and the companies themselves is being required. The existing PEB market scenario, annual growth rate of the industry, industry and company turnover, demographics of workforce, export potential etc. should be analyzed to set the objectives. The specific objectives of this internship report will be:

1. To overview the PEB Sector of Bangladesh
2. To analyze the challenges & opportunities related raw materials in PEB Sector of Bangladesh
3. To analyze the manufacturing challenges & opportunities in PEB Sector of Bangladesh

Scope of the Report

This study will cover few local companies and one foreign company.

- Bangladesh Building Systems Ltd
- McDonald Steel Building Products Ltd.
- Modem Structures Ltd.
- PEB Steel Alliance Ltd.
- Sarker Steel Ltd.
- Buildtrade Engineering Ltd.
- PEB Steel Alliance Ltd.
- Quantam Builders & Engineering Ltd.
- SteelMarks Buildings Ltd.
- Composite Steel Structures Ltd.
- Zamil Steel, KSA

Rationale of the Report:

The growth of Bangladesh PEB sector is evident both in local and in international market. PEB industry is very highly correlated with macro-economic performance. When the disposable income increases, the demand for steel building grows as well. This has been manifested through the industrial sector booming in Bangladesh as well as the increasing number of new entrants in the PEB production.

The micro and small firms are less efficient and need to upgrade skills and production techniques and technology. The medium are quite efficient by industry standards. However, they have less diversified product range and have to sell at lower margins. The larger firms are clearly the trendsetters of industry production and production processes, they have the capacity to export and respond quickly to changes in taste of domestic customers. Further analysis of the drivers of profitability indicates that diversity in the product variant mix and the input-mix are key factors.

Therefore, a broader marketing strategy, import of new steel processing machinery, financial feasibility analysis and matching production strategy should be drafted for individual companies. These initiatives will ultimately be effective in driving sales, providing value-added services and profitability performances.

Methodology of the Report

Some systematic steps will be followed for the completion of this report. Proposed methodology if this report is given below:

Step 1 : Identification and definition of the problem

Step 2 : Literature review

Step 3 : Data collection

The paper will be written on the basis of information collected from primary and secondary sources.

(I) Primary Data:

Primary data will be collected by surveying of the companies and in depth interview with the organizations' officials and top management.

(ii)Secondary Data:

For the completion of the present study, secondary data will be collected The main sources of secondary data will be:

- Brochures, manuals and publications of the organization
- Websites and journal
- Data from published reports of various organizations
- Different Books, Journals. Periodicals. News Papers etc.

Step 4 : Data preparation and analysis

There will be both quantitative and qualitative data analysis. The quantitative data will be analyzed through Microsoft excel software and other statistical software if deemed to be necessary. The qualitative data analysis will be performed through thematic technique.

Step 5 : Draft report preparation

Step 6 : Final report and defense

Two reports will be submitted on this research work: Draft report and Final report. Draft report will contain all the necessary data analysis and finding on the research. After having feedback from the course instructor, the edited final report with conclusion will be submitted within few days of draft report.

Limitations of the Report

1. The companies are mainly private limited companies. The information provided by them cannot be verified by a third party.
2. Lack of Human Resource.
3. The forecasted growth pattern and turnovers may deviate significantly due to future domestic and global economic conditions.

Industry Overview:

Popularity of pre-engineered or prefabricated building is increasing in our country gradually. Different industrial organizations are involved in developing prefabricated building. Even the hospital authorities are using this type of steel building. Eventually steel building is becoming a new industrial sector commercially. The development of steel building has been started in our country since 1985. In the very beginning different structures and materials of such building were imported separately and assembled here in our country to make the buildings. However from 2001 local entrepreneurs have started making steel buildings in our country and in addition to that these buildings are exported these days. Nevertheless import or export of such building refers to the import or export of the structures and the materials of the building.

Per capita use of steel is a vital factor to understand the progress of a countries economy just the way per capita income is a significant indicator of a countries economic condition. In the developed countries for instance in'America, in Canada, in Japan, in Germany and in Korea, per capita steel use rate is 500-700 Kg whiie in the rapid development countries like in India it is 59 kg, in China it is 460 kg and 123 kg in Brazil. The per capita steel use in the world is 215 kg where it is 240 kg in Asia and 40 kg in Bangladesh. From the evidence it is noticeable that Bangladesh has a poor per capita use of steel in comparison to the developed, developing and even neighbor country India.

The ratio of steel use in different sectors in a country is usually like as given below:

- Construction industry 27%,
- Structural Steel work 11%,
- Mechanical engineering 14%.
- Automotive 16%,
- Domestic appliances 4%.
- Ship building 1%,
- Tubes product 12%,
- Metal product 12% and
- Others 3%.

Basically because of ship building construction and prefabricated steel building industry the use of steel in Bangladesh has risen to a limit in last 10 years. Both of the industries are new in Bangladesh which started to flourish since 2001. By nature both the industries require good labor and as a result Bangladesh is in an advantageous position in comparison to other countries. Both of the industries are raw materials dependent and 70% of the raw materials are produced by India. Korea. Japan and China. All of the mentioned countries are geographically in neighborhood to Bangladesh which provides some additional facilities.

In the industrialization infrastructure and communication sector of our country steel buildings has added a new dimension. In our country prefabricated steel structure is being used in different kind of structural establishment. For instance this structure or building is in use in 98% industrial organization, multi-storied garments building, commercial building, office building, residential building, power station, flyover, and bailey bridge.

Apart from rapid industrialization there is no other alternative of rapid progress in an overpopulated country like ours which has agriculture based economy. Rapid industrialization requires sustainable establishment within the shortest possible time. In the prefabricated steel structure construction, the pillars (columns), beam and steel plate and sheets are produced which later on is assembled in the site to establish a building. Use of prefabricated steel structure/ building can only help construct establishment with the use of least money and time maintaining the best quality. Moreover prefabricated steel structure/ building can be replaced and renovated easily, it has very good resell value and most importantly is has less probability of collapsing due to earthquake or other accident.

Nevertheless thousands of people lost life because of RCC made establishment like Rana Plaza. Spectrum Garments etc getting collapsed due to construction errors. There is hardly any chance of collapse in the case of prefabricated steel structure/ building. Buildings constructed with prefabricated steel structure can be damaged or bended because of the ductility of steel material, earthquake or any other accident and reason like construction errors but they never collapse suddenly like those RCC constructed ones. As a result there is a chance to rescue life and asset meanwhile and thus no life is at stake. Only the use of prefabricated steel structure to establish building can be a safe and permanent solution to the problem that rose in the field of RMG industry, the biggest export sector of our country, after Rana Plaza being collapsed back in 2013. There has been an image crisis in the national and international market which is the result of lackin safe and sustainable establishment in garments sector and prefabricated steel structure/ building is a good remedy to overcome the crisis. Again it takes only one fourth of the construction time of the regular RCC ones. There is no need to place columns that blockade the space, closely to support the load and thus there is enough space to situate the heavy machineries. The scrap that in the structure can be later on sold if not needed anymore.

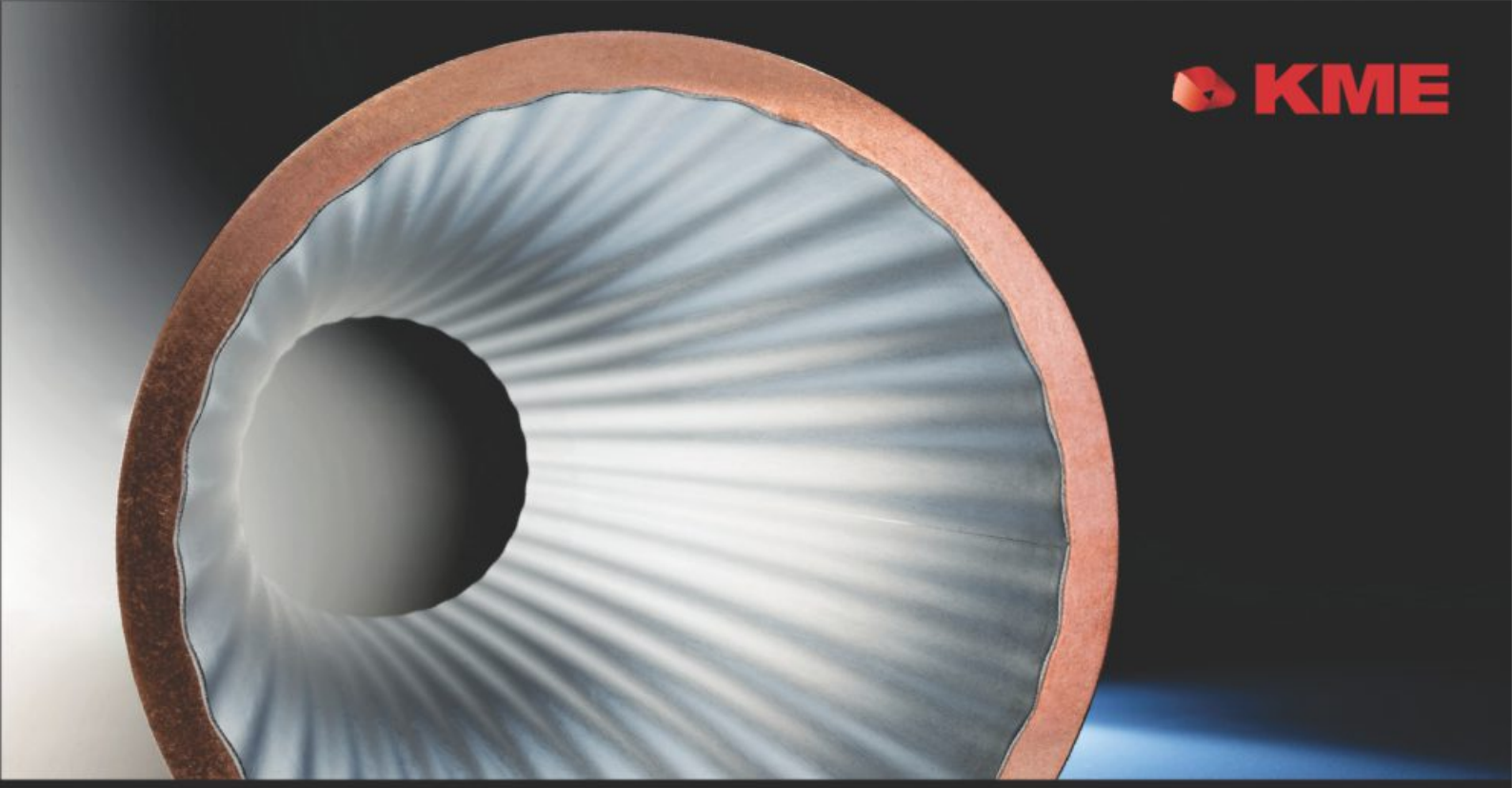
In our country prefabricated steel structure/ building used to be imported before 2003. For the first time in 2003 industries that can manufacture prefabricated steel structure/ building developed and eventually in last 12 years the number of such industry raised up to 70. Now 3.000 engineers. 100,000 direct laborer and 100.000 indirect laborer is engaged In this sector. Factories that manufacture prefabricated steel structure/ building are mostly situated in Gazipur. Narayanganj. Cumilla, Pabna, Kushtia, Bogura, Chattagram, Manikganj and Savar. A very

special aspect of this sector is that it has a high demand of skilled human resource like engineers, welder, fitter, fabricator and skilled and trained human resources from this sector can get high salary job facility in abroad The amount of investment in this sector has reached 1000 thousand crore Bangladeshi taka. Against the demand of Pre-Fabricated Steel Structure/ Building of a value of 2500 crore taka, the production rate is of a value of 3000 crore Bangladeshi taka which subsequently leading the | sector opening the door of Export after fulfilling the local demand. In last 5 years there has been successful export of Pre-Fabricated Steel Structure/Building of 5 million dollar to India. Pakistan. Myanmar. Abu Dhabi. Sudan. Rumania etc. Being a labor oriented industry the easy to get skilled human resources like engineers, welder, fitter, fabricator has established Bangladesh as a strong competitor in the export of pre-fabricated steel structure/ building. Internationally the value of the raw material of prefabricated steel structure/ building is 600-700 us dollar per ton whereas the manufactured product costs 2000-2500 us dollar per ton. So value addition of this sector is much higher than to those of the garments and ship manufacturing industries and thus this industry has a good future from the perspective of Bangladesh. Steel hot rolled coil, steel color coated coil, galvanized coil etc are the main ingredients of prefabricated steel structure/ building industry and the raw materials of this sector is mainly import dependent.

Pre-Fabricated Steel Structure/Building industry are facing a dual problem now. According to the import agendas of Bangladesh the raw material import of an Industrial organization should at minimum tax that is 5 %. However the raw materials of this sector is imported at 10% tax as semi finished product and 25% tax as finished goods. On the other hand even though there is extra production of Pre-Fabricated Steel Structure/Building against the local demand still finished Pre- Fabricated Steel Structure/Building are imported under HS code 9406 at a tax rate of 2% which is contradictory to the import regulation. As a result the country is being deprived of import revenue of hundred crores of taka and again the local industries are getting in competition despite of being equal.

Source: Steel Building Manufacturers Association of Bangladesh (SBMA)

BANGLADESH STEEL INDUSTRY (In 000 Metric Tonnes)	2016	2017	2018
Total production of crude steel	100 e	100e	100e
Production of continuously cast semis (Billets/Bloomes/Slabs)	100 e	100e	
Production of continuously cast steel	100 e	100 e	
Crude steel production by Electric Furnsce	100 e	100 e	100 e
Exports of semi-finished and finished steel products	4	6	6
Imports of semi-finished and finished steel products	4014	2673	3140
Imports of Ingots & semis	875	129	
Imports of Long Products	670	235	
Emports of Flat products	2394	2177	
Imports of Tubular products	70	124	
Apparent Steel Use Crude Steel Equivalent	4310	2929	3433
Apparent Steel Use per Capita	27	18	21
Apparent Steel Use (Finished Steel Products)	4052	2754	3227
Apparent Steel Use (Kg Finished Steel Products)	26	17	20
Imports of Scrap	2011	2142	



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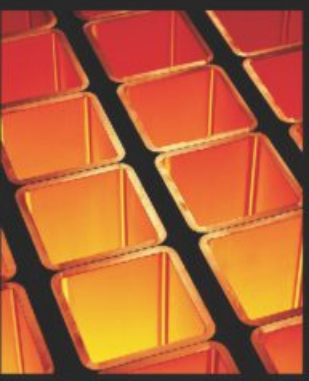

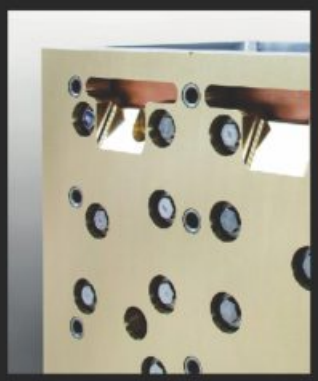

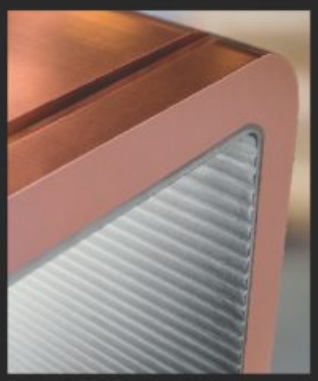

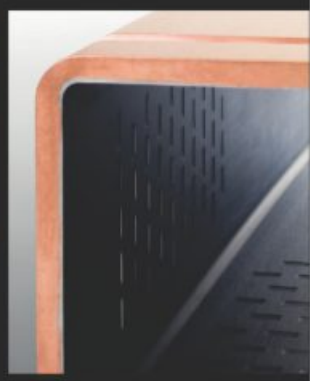

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"There is no alternative to industry-academia collaboration"

By Sakuntala, Editor, Steel Scenario

Dr. Fahmida-Gulshan - Head of the Department, Metallurgical Department, BUET

Dr. Fahmida-Gulshan obtained her Bachelors and Masters Degree in Metallurgical Engineering from Bangladesh University of Engineering and Technology (BUET), Dhaka in 2003 and 2006 respectively. She topped the list of the graduating students in her batch. Dr. Gulshan received her PhD degree from Tokyo Institute of Technology, Tokyo, Japan in 2009. During her doctoral study she enjoyed the Monbukagakusho Scholarship of Japanese Government. She has been a faculty of BUET since 2003 and currently working as a professor and head of Materials and Metallurgical Engineering department of BUET. She received INSA JRD TATA fellowship and conducted research at National Metallurgical Laboratory, Jamshedpur, India in 2014. She also participated in European Union funded Erasmus Mundus program and visited Wroclaw University of Technology, Poland in 2016 and University of Limerick, Ireland in 2018 and 2019 as a visiting academic staff. Her areas of interest include industrial waste recycling, waste water purification etc. She has published more than 80 papers in reviewed journals and conference proceedings. She has successfully completed several research projects as principal investigator financed by Department of Environment under Ministry of Environment of Forests, Ministry of Science and Technology, Government of the People's Republic of Bangladesh. She is working as the focal person of several academic link programs between BUET and prestigious foreign universities of Poland, Ireland and USA. She is also the coordinator of Materials Research Center of BUET. Besides her professional career she also graduated from the prestigious music school CHHAYANOT in 1994 and enjoys singing.

S.S: As Head of the Department (HOD) of the Metallurgy Department of BUET, do you think students are yet to understand the importance of steel usage in a sustainable developed economy?

FG: The truth is, Metallurgical Engineering was not a very popular subject in Bangladesh in the past. Students who got admitted into BUET or other engineering universities used to prefer Computer Science and Engineering, Electrical Engineering, Mechanical Engineering, Civil Engineering etc. Since 1962 BUET started offering a course in Metallurgical Engineering with 10-12 students in Honours Level. Hence the number of Metallurgists in Bangladesh was very low. Most of them used to go abroad after completion and few would join in the steel industries or other industries in Bangladesh, as the number of steel industries in Bangladesh was also low.

However, in the last 10-15 years things changed. Recently, Materials Science department has been opened in five other public universities. Even the number of seats

in BUET has been increased up to sixty. Every year, presumably 150 materials engineers graduate in the country. With the developments in the economic sector of Bangladesh, steel sectors have also emerged tremendously. At present, approximately 400 steel and re-rolling industries have been established in Bangladesh. The steel consumption has increased up to 45 kg per capita. The contribution of the steel sector in the megaprojects of Bangladesh is undeniable. Nowadays, graduates in this field get good jobs with decent salaries easily. So, engineers who are staying in the country are prioritizing the steel sector nowadays. There seems to be a great demand in this sector for graduates who have already entered into the job sector. Similarly, those who chose to stay in this sector gradually understand its uprising demand.

SS: Do you think Metallurgical pass out students are staying back in the country to work in the steel industry? What additional steps do you think institutions, as well as the government of Bangladesh should take in retaining young minds for working in domestic steel companies?

FG: Well, almost 50% students [BUET metallurgy graduates] are staying back in the country and a large number of them are working in the steel industry. Remaining 50% of students are going abroad to get higher studies.

At present, approximately 400 steel and re-rolling industries have been established in Bangladesh. The steel consumption has increased up to 45 kg per capita.

The government of Bangladesh can do a lot to retain more graduates. The first thing to do is to establish a governmental Ministry of Steel, which in fact, has already been established in our neighboring country India. This office will advise and give consultation on the issues related to the steel industry. Secondly, the production of quality steel, its use, importance and should be included as well as emphasized as curriculum in the university as well as in professional practice. Along with these, training courses can be designed and provided by the Government in such a way that metallurgical engineers can enrich themselves by going abroad or, by being directly trained under efficient trainers from other countries.

Another important issue is the government should focus on providing the female materials/ metallurgical engineers with sufficient job opportunities in the steel sector.

In most of our steel industries, there is no corporate culture. Unfortunately, it is evident that engineers who work in the mills and factories are maltreated, comparing to the engineers who work in big industries. Another problem of the small mills is that, in most cases, the managements want only one fresh engineer to operate the entire workstation, which most of the time, turns out to be a mammoth task for him. In most of the industries, there is no 'In House Training Facility' and no R&D; and the safety/security system is poor. Generally, the working environment is not up to the mark. Scraps, metals, and iron are either piled up unnecessarily or spread here and there. Heat, dust, overhead cranes etcetera also tend to create problems in swift working. If the government wishes to do so, they can concentrate on eradicating these situational obstacles by pressurizing the industries because the more these obstacles will be diminished, the more engineers will be motivated to contribute to the steel sector.

Another important issue is the government should focus on providing the female materials/metallurgical engineers with sufficient job opportunities in the steel sector. What is surprising is that even after having the same qualities as the male metallurgical engineers, only 1 or 2 steel mills recruit female metallurgical engineers in Bangladesh. Sometimes, the job criteria directly imply that female engineers should not apply. Every year in engineering universities, 30-40% of female materials engineers

complete graduation and many of them show enthusiasm towards working in steel industries. The government can take some steps to enforce the steel industries to recruit female engineers.

Last but not least, the government should establish a steel research center or laboratory where quality control of steel will be checked, diversified steel products will be produced, waste management of steel industries etc. will be researched and worked on. Our steel industries only produce deformed bars, one or two mills produce angles and channels. Other vast areas of steel production, such as- alloy steel, die steel, tool steel, electrical steel, naval steel are still left to be explored. The steel research center can produce diversified steel products and take proper measures to experiment and explore these areas, which will create bigger opportunities for us to develop in steel production. Steel products made in Bangladesh will thus reach in the across the globe, which can be led by our own metallurgical engineers.

SS: Institutions like yours play an important role in taking forward the domestic steel industry as a catalyst. What other forms of institutional support do you think will help the steel industry to move forward?

FG: For this to happen, there is no alternative to industry-academia collaboration. In Bangladesh, little is practiced on R&D in the steel industries. Academicians can contribute to many research fields, such as reduction of electricity consumption during steel production, decreasing heat time, accurate refractory selection, scrap selection and so on. Steel industries can provide funds in these projects where industry personnel and students of masters or PhD level can research under the observation of their respective universities. These researches will play an important role in producing quality guaranteed steel in the least possible time span.

To clarify it further, I can illustrate some points. There is no iron ore deposit system in Bangladesh, which is why steel is produced here through scrap melting and refining. Most of the industries use an induction furnace in order to do this. This induction furnace route of steel making is only used in Bangladesh till now. Academicians can play an important role in producing quality steel using the induction furnace routes.

Again, the waste that is produced in the Bangladeshi steel industries, such as- slag, mill scale, APC dust, etc is not properly utilized. The slags are basically landfilled, and the mill scales are exported. Slags have versatile uses, i.e, as concrete reinforcements, in cement industries or road surfacing, which is still unknown to the industries. These wastes can be recycled and used as resources, which academicians can focus on as well. Universities can arrange multiple seminars or workshops in order to theoretically enrich the industry personnel in steel production. At the same time, workers from the industries can share their practical experiences with the faculties and the students, which will create an interconnection between them as well as increasing the knowledge of the latter.

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Source: World Steel Association

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"We believe that the industry has plenty of room to grow more in Bangladesh"

By Sakuntala, Editor, Steel Scenario

Aameir Alihussain,
Managing Director, BSRM Group of Companies

Aameir Alihussain is a young leader & entrepreneur of the steel Industry of Bangladesh. Born into the family of visionary Industrialist Mr. Alihussain Akberali; he has always been a good initiator. He is a 3rd generation business leader in his family.

Aameir Alihussain, the Managing Director of BSRM Group of Companies, has more than 18 years of experience in steel industry. Under his marvelous leadership, BSRM reached the transitional milestone from a small scale re-rolling mill to the state-of-the-art largest steel producer in the country.

He aims to set high industry standards for the company by introducing modern management concepts and instilling team spirit. Ensuring quality and optimum customer satisfaction are his top priorities.

In business circles, he is considered as a model of enterprise for his honesty, integrity and hard work. Mr. Aameir Alihussain has been recognized as the Highest Individual Tax Payer under Chittagong Division in 2014-2015 and 2015-2016 consecutively by the National Board of Revenue, Bangladesh. He has been awarded by the Govt. of Bangladesh Commercially Important Person, CIP (Industry) and CIP (Export).

He graduated in Economics from Mc Gill University, Canada & completed MBA (Dean's List) from LUMS University during the year 1997 & 2000 respectively. He is also engaged in various social activities which includes being a co-founder of a School at Nasirabad, Chittagong which imparts free education to more than 500 underprivileged children. Additionally, the group conducts a number of CSR initiatives which has impacted lives of thousands of people across the country.

SS: What makes Bangladesh Steel Industry a vibrant and growing sector in today's era of economic crisis?

AA: Bangladesh has witnessed the massive development in its history for the last decade. The world's economy is indeed a bit sluggish in recent years, but we were very much constant in infrastructure development. The construction boom and the implementation of mega infrastructure projects are responsible for today's vibrant and growing steel industry. Around one million people are employed directly or indirectly in the sector. Thanks to the Bangladesh Government for initiating several mega projects and Rapid urbanization.

Steel Sector during 2019 –

- Production Capacity: Around 8.0 to 8.5 million tonnes
- Consumption: 7.5 million tonnes
- Industry Size: Around USD 5.9 Billion
- Active mills: 400+ Large and Small mills are operating, of which 45 mills are BSMA (Bangladesh Steel Manufacturers' Association) members.

SS: 1952 to 2020, how was the journey for BSRM so far?

AA: Sixty-six years ago, in 1952, Bangladesh Steel Re-rolling Mills (BSRM) began its journey as the first steel re-rolling mills in the then East Bengal. It strived to change the civil construction landscape of Bangladesh through constant innovation. To be trusted, reliable, and safe, it meticulously met international standards of steel, able to compete with the global market. BSRM introduced the first Grade 500W reinforcing steel branded as XTREME, steel for special moment resisting frames ULTIMA, the best cost-effective steel – MAXIMA and the only corrosion resistant Fusion Bonded Epoxy coated rebar CENTURA for sustainable constructions in saline areas, a service providing center for its valuable customers – The FastBuild service center that conforms the BNBC code, and, 500DWR with a higher tensile strength to yield strength ratio of 1.25 – conforming BDS ISO6935-2 ensuring highest elongation at maximum force and reducing the chance of sudden collapse of structures. The journey of these 66 years has seen many peaks and valleys, but the flame never dimmed, BSRM was diligent in its efforts to illuminate the future of Bangladesh.

SS: What are the challenges faced by Bangladesh Steel Producers? Why do they mostly stick to long products and not other varieties?

AA: Steel producers are facing many challenges for several factors, including rising import costs, port congestion, lack of gas supply, and restriction on transport of goods by 20-tonne vehicles on the highways, etc.

We have demands for long products. Other varieties of product demand have not yet created on a vast level. We have kept the possibilities of extending the need under close monitoring and over time, hoping to go for such production facilities based on consumption.

SS: What role does BSRM play in the present steel boom in Bangladesh?

AA: Today, Bangladesh's steel industry is almost 8 million ton industry. Being the market leader, BSRM Solely serves more than 20% of the demand. Almost all the country's mega projects are using BSRM. BSRM is producing 50 mm rebar for country's one of the largest developing projects, mighty Padma Bridge.

BSRM is not just producing rod, for the development of all kinds of sectors, BSRM manufactures Angle, Channel, Square Bar, Wire, etc.

SS: Where do you see BSRM and Bangladesh Steel industry by 2030?

AA: A decade ago consumption of steel, which includes mild steel rod, prefabricated steel, and corrugated iron sheet, was 1.6 million tonnes and last year it stood at about 8 million tonnes. As a developing country, Bangladesh is expecting massive growth in infrastructure development and urbanization in the next decades. In the last ten years, there has been a phenomenal growth in Bangladesh, mainly due to the pro-business and development policies of the government led by our Honorable Prime Minister Sheikh Hasina. Moreover, Bangladesh is achieving a constant GDP growth of more than 7%, which is higher than many other south Asian countries like India, Pakistan, and Myanmar. The steel industry of Bangladesh had and will surely have a significant contribution there.

Today, Bangladesh's steel industry is almost 8 million ton industry. Being the market leader, BSRM Solely serves more than 20% of the demand.

At present, Bangladesh's steel consumption is significantly lower than the global average, according to the World Steel Association, the international trade body for the iron and steel industry. Around 40% of the population is 25 years and below so there is still a lot of opportunity in future. Bangladesh has been doing better than other South Asian countries in various social indexes.

Currently, the per capita consumption in Bangladesh is 45kg, whereas the global average is 241kg. In India, the average is 82kg and in Pakistan 24kg. Per capita steel consumption is much higher in developed countries — 631kg in South Korea, 265kg in the USA, and 823kg in Japan.

We believe that the industry has plenty of room to grow more in Bangladesh. As the leading manufacturer of steel in the country, BSRM will continue to contribute in the industry.

"Per capita steel consumption may rise to 73 kg by 2022"

By Sakuntala, Editor, Steel Scenario

Md. Rashed Khan
Chairman & Managing Director, Modern Structures Limited
General Secretary , Steel Building Manufactures Association of Bangladesh (SBMA)
Director , Bangladesh Indenting Agent's Association (BIAA)

SS: How is the Pre Fab Market in Bangladesh? Is it a developed or growing market?

RK: Bangladesh Pre-fab market is a developing one, it is developing at 15-20% every year. In last few years we have seen major increase in usage of pre-fab in our country. The total PEB market size in Bangladesh is estimated to be approximately BDT 25,000 million per year. The growth of Bangladesh PEB sector is evident both in local and in international market. PEB industry is very highly correlated with macro-economic performance.

SS: Has steel consumption in Bangladesh increased in the last decade?

RK: Yes, Now steel consumption is Bangladesh is around 35 Kg per capita per year, before it was around 25 Kg per capita per year, so the increase has been substantial. Bangladesh, one of the emerging steel markets in Asia, has been witnessing a rapid increase in steel production capacities since the last couple of years. Rising steel-making capacities are driving raw material imports like steel scrap, pig iron and DRI further.

SS: Steel is the future metal globally. How supportive is the Government of Bangladesh in promoting steel usage in various infrastructural works under the government?

RK: All mega projects taken by Bangladesh government namely Padma bridge, Sea ports, Airports, metro rail, High tech parks are of steel structure. Buoyed by the increasing demand for steel amid the implementation of mega infrastructure projects, many of the larger mills have signed up for capacity expansion and other infrastructural activities for improving power generation. So it is clear that Government is very much supportive for promoting steel structure. As per estimates, per capita steel consumption may rise to 73 kg by 2022. A lot of infrastructural work, along with mega government projects, is running in the country and it would take another 5-7 years to finish them. So the demand for steel will be there in the future.

SS: As a General Secretary of SBMA, what initiatives are your association is taking in promoting the usage of steel in Bangladesh?

RK: SBMA is an important organisation for steel industry development in Bangladesh. As the GS of this association, we initate the following:-

1. Communicating different government agencies to promote steel structure.
2. Taking initiatives to educate and share knowledge and technical know how to increase technical skills of member companies.
3. Conducting periodical media campaign and seminars to create general public awareness about the benefits of steel structures.

SS: What is the future of the Bangladesh Steel Industry by 2030?

RK: by 2030, steel industry in Bangladesh will stand on a solid foundation to lead national development.At present, the current steel production capacity is estimated to be at 6.5 to 7 million metric tons and it can be said that at least another 3 to 4 million metric tons of steel-producing capacity will be added in the next few years on the back of aggressive expansion plans of leading steelmakers.

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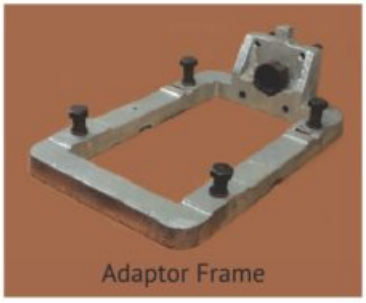
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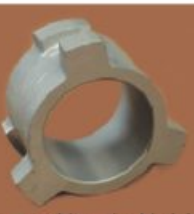
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'Purvodaya' - Accelerated Development of Eastern India through Integrated Steel Hub

By Joyanta Mani, Correspondent, Steel Scenario

Union Minister of Steel & Petroleum, Shri Dharmendra Pradhan launched 'Mission Purvodaya' to accelerate the development of eastern India through integrated steel hub. Departments of five states— Odisha, West Bengal, Andhra Pradesh, Chattisgarh and Jharkhand along with PSUs including SAIL, IOCL and Coal India will work together to accelerate steel production in these regions. The Steel Ministry is planning to invest USD 70 billion, which is likely to result in USD 35 billion addition to the GDP with creation of 2.5 million jobs.

"The eastern part has the potential to add more than 75% of the country's incremental steel capacity envisioned by the National Steel Policy 2017, he said adding it is expected that out of the 300Mt capacity by 2030-31, over 200 Mt can come from this region alone. This mission will certainly pave the way for India towards USD 5 trillion economy set by the Government", Shri Pradhan added.

He also emphasised that this region is rich with natural resources, however, it has lagged in socio-economic development as compared to other parts of the country. This mission will enhance capacity addition through easy setup of Greenfield steel plants, develop steel clusters near integrated steel plants as well as demand centres. Additionally, logistics and utilities infrastructure will see a surge resulting to a growing socio-economic landscape in Eastern India along with a healthy steel industry and employment opportunities across the entire value chain.

"Eastern India, is a focus area for the government and about half of aspirational districts are in this region which are becoming hotspots of socio-economic development. Eastern states of India (Odisha, Jharkhand, Chhattisgarh,

West Bengal) and Northern part of Andhra Pradesh collectively hold 80% of the country's iron ore, 100% of coking coal and significant portion of chromite, bauxite and dolomite reserves. Besides, major ports like Paradip, Haldia, Vizag and Kolkata which are present in this region have more than 30 % of India's major port capacity," opined Shri Pradhan.

Bihar would be included later within the cluster for driving growth in steel consumption along with the upliftment of 57 backward districts of the region. Since eastern India holds a special focus, the government has taken several measures including a Rs. 1.02 trillion worth of National Infrastructure Pipeline.

"Eastern region contributes 70% of the country's total steel production at the current stage which will further rise to 87% with the integrated steel hub in place by 2025. The oil and gas sector has been a major consumer of steel and the expansion would boost the steel industry increasing the share of manufacturing to services," stated Shri Sanjiv Singh, Chairman & Managing Director, IOCL.

Shri Anil Kumar Jha, Chairman, CIL stated that CIL has been focussing on minimising importing of coal by increasing its production of coal. Smt. Rasika Chaube, Additional Secretary, Ministry of Steel, Shri Rohit Yadav, Joint Secretary, Ministry of Steel, Smt. Vandana Yadav, Secretary - Industries, Govt. of West Bengal, Shri Hemant Sharma, Secretary - Industries and Shri S.K.Behera, MD, RSB were present on the occasion.

In this Seminar organized by CII, the stalwarts of steel industry spoke various ways and means to take the steel industry forward with Industry 4.0. Under the theme - Manufacturing Strengths and Future of Eastern India, a panel discussion was organised including panelists - Mr. Bishwaroop Halder, Vice President & Group IT Head (RSB Global), Mr. Amit Chatterjee, Chief Analytic Officer, Tata Steel Limited, Prof. Surya Pal, Prof-In-Charge, DHI Centre of Excellence on Advanced Manufacturing Technology, IIT Kharagpur, Mr. Manish Jha, Plant Head-Tata Cummins, Jamshedpur, Mr. Vijay Jhanwar, President, Chhattisgarh Sponge Iron Manufacturing Association and Member Apex Committee APC, Mr. Indranil Chakraborty, Regional Head, Siemens, Mr. Arup Mukherjee, General Manager & Plant Head, Tata Hitachi & Mr. Vivek Baheti, Director-Century Industrial Products Private Limited, discussing on Industry 4.0 and beyond along with its impact on manufacturing industry and digital enterprises.

Kolkata Metropolitan Development Authority (KMDA) shall construct Steel intensive buildings in the City

intensive residential complex. At present they have planned to build such houses at Patuli near E M Bypass. Once this project becomes successful, they will go in for more such multi-storeyed houses at the disaster prone areas in the State.

One executive of KMDA has informed that to resettle & rehabilitate the workers who are residing inside the Rabindra Sarovar they have already invited tenders. There total 32 number apartments will be constructed in four (4) storeyed buildings. But following the demand of the residents, the walls will be made of bricks or concrete.

KMDA has informed that in South India including Chennai similar Steel intensive

buildings and offices are already there. Few days back the executives of KMDA sat with Hon'ble Minister of Urban Affairs Mr. Firhad Hakim to discuss on this issue. Their authority is of the opinion that once such project becomes successful, this technology shall be followed to construct other buildings too to ensure the strength of construction.

From KMDA it has been known that for many years there are quarters within the Rabindra Sarovar for the workers who are keeping its maintenance. The Court dealing with Environment has alleged that due to these resident workers also the environment of Rabindra Sarovar is getting polluted. That is the reason the authority has decided to resettle them at some other location.

Environment worker Ms. Sumita Bandyopadhyay has said "Due to the residence of the workers within the campus of the Sarovar, the Environment is getting polluted naturally. Cars are also entering. For that the Environment is getting indirectly polluted. It was long demanded to relocate them for this reason." KMDA has informed that once the workers are relocated, a garden will be developed at that place.

Hon'ble Minister of Urban Affairs has said "Construction of Concrete building takes lot of time. So, they have opted for this alternative. To lessen the losses due to Storm and Earthquake, Steel intensive building is the most suitable alternative. For that reason, primarily at Patuli they will be constructing Steel intensive residence to resettle and rehabilitate the workers of their department." The Minister said they will survey to assess as to the occurrence and type of disasters at different parts of the state. Going through the outcome of the survey, decision will be finalised to go in for more such Steel intensive residential buildings.

"Calderys India has recently set up a state of the art Refractory Lance manufacturing facility at its Katni plant with a prime objective of bringing globally proven technology and world-class products to India"

By Sakuntala, Editor, Steel Scenario

Ish Mohan Garg, Chairman Imerys India & Vice President - South West Asia (HTS)

SS:. What are your views on the present status of the Indian Refractory Industry and what is the expectation in the coming years?

IMG: The Refractory industry has always provided undying support to the entire core industries in India; however, its efforts mostly go unacknowledged and unappreciated. The major pain-areas of the Refractory industry are fluctuating raw-material costs in the international market, over-dependence of China for raw-materials and low encouragement to mineral exploration quests in India. Along with 'Make in India,' it has become a need of an hour to 'Mine in India' in order to explore minerals, reducing imported raw materials and making us self-sufficient.

There is a thin line between Demand and Supply,which needs to be carefully balanced to do sustainable business. From a demand perspective, India's per capita consumption of steel, cement, aluminium, automobile and oil & gas products is between 1/4th to 1/6th of World average consumption, which itself ensures that our end markets would continue to grow at a healthy rate. From a Supply perspective, we continue to see exponential growth in the demand for premium products and high-quality services, which would result in faster growth of World-class refractory producers as compared to commodity players.

Keeping a positive and optimistic mind-set, the refractory industry would grow with a better rate as compared to the last decade in accordance with the growth in the core industries.

S.S: The Refractory sector plays an important role in the development of the steel industry in India. What role do you think refractory makers will play in achieving the 300 Mt target by 2030 in India?

I.MG: With the visionary dream of our Prime Minister for making India a 5 Trillion Economy by 2024, we expect that the core industries will continue to grow at a faster pace. India's steel production capacity is expected to reach 300 million tonnes by 2030. India has clear-cut prospects of an exponentially growing economy and so does the refractory industry.

We firmly believe that the refractory industry has a key role to play in providing solutions for superior quality steel production. Calderys India has recently set up a state of the art Refractory Lance manufacturing facility at its Katni plant with a prime objective of bringing globally proven technology and world-class products to India. The Refractory Lance Plant is designed to manufacture all kinds of monolithic lances with superior performance to withstand standard steel making operating conditions using European Technology. With this new manufacturing line, Calderys India aims to provide global expertise locally, share the dream vision of 'Make in India' along with the goal to achieve 300 MT steel by 2030.

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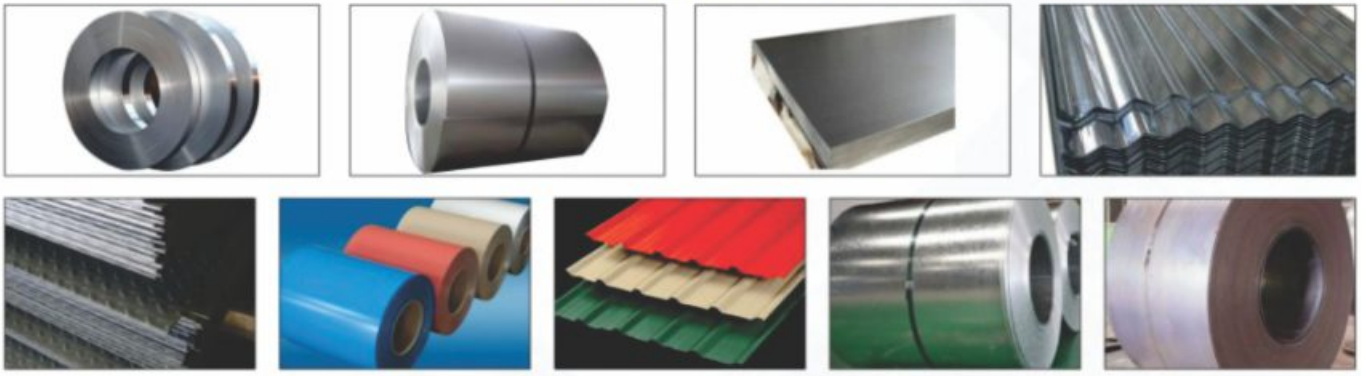

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"We have developed a telecommunication module, a cloud based solution, to get machine data"

By Sakuntala, Editor, Steel Scenario

Mr. Christian Wolf is presently the Managing Director of Velco GmbH since 2004. Priorly, he worked as Project Manager at Velco GmbH since 1995 and Project Engineer at MDS Mannesmann Demag Sack from 1991-1995.

Mr. Wolf was born in 1966 in Velbert/Germany and studied Mechanical Engineering from Ruhr-Universität Bochum/Germany. He was also an ERASMUS Exchange student at University of Sheffield/ UK.

Mr. Christian Wolf,
Managing Director, VELCO GmbH

SS: You are in the family run business for past 45 years. How has been your experience in taking forward this company ahead?

CW: It was founded by my father and I am the second generation. Now he is in his eighties, but still very much in the background, while I am steering it ahead. We started thinking of doing some production in 80's and 90's in India, but in last two years we have started doing some local production in India to take forward our business line ahead.

SS: Since when are you attached to the refractory industry?

CW: I have been exposed to refractory industry since my childhood as I used to make sand cakes out of refractory materials my father used to come home. So it was as early as when I was four or five years old I was exposed. But, professionally since 1991 I am working.

SS: How has been the development in the refractory sector since you have taken over in 1991?

CW: Steel will have its demand always as without steel no country's infrastructure can grow and steel has an immense contribution in a country economic growth. In Germany we engage in lot of recycling of steel, so scrap plays a very vital role in steel production, but in India the story is different. In India still infrastructure development is not very steel centric though there are number of integrated steel plants. If steel can be treated as an integral part of a country's infrastructure growth it can make avenues for high skilled job and it can give immense boost to a country's economic growth. Yes, right now it is going through some crisis as I feel some power struggle in political world in giving an impact to steel global business. With increase in raw material prices, changes in energy tariffs there has been some detrimental impact on steel industry, but I feel India though has immense potential to grow as a steel market but has a long way to go ahead in steel business as it is still 15 to 20 years behind any developed country using steel.

SS: How is the German steel industry performing in recent times?

CW: In Germany we have been always having fluctuation in the steel industry. Germany has may restrictions and regulations for energy consumption and CO2emissions and huge penalties are being imposed on the producers. So, this is a huge burden to the industry players. So lot of exisiting producers have closed down their mills and bringing in higher potential mills. Even the competition in

the market sometimes forces lot of steel companies to close down. As Germany has very highly developed exisiting infrastructure continiuous requirement for steel is low, but yes for engineering products steel demand remains high. Most of the steel demand is for making wind mills, cars, pipe lines and equipments which we build and export are biggest consumer of steel in Germany. So any of these sectors go down immediately there is a direct impact on steel industry. At this moment it looks like in next few years there might not be any growth rather a small decrease in steel production by 2-3%. But, I do not see this as a huge problem as Germany still will continue producing very high quality steel over next years.

What the producers need right now is support from the government, by reducing the tariffs on Co_2 emissions, so that they can create some profits. If the environmental regulations are too high then the producers will find it difficult to keep the plants running.

SS: Germany being one of the most developed country has very efficient steel or refractory industry with very stringent Carbon emission and other pollution rules. What has been the impact of this on German companies and do you think other countries need to follow these laws?

CW: In this city where our company VELCO is had a long histroy in founderies. We had furnaces like the mini blast furnaces, but it created lot of emissions like carbon dust and powders over 50 years nearly all these furnaces have shut down. The following generations who took over the business started understanding environmental aspects of running these high emission plants and closed down the operations or sold out the lands for constructing super markets of DIY factories. In one hand there has been major job looses, but in the other hand there is blue sky and clean air. So reduction of number of plants have brought down pollution substantially. Even in India, it is time that you have to put environment as a priority. Not only increase of production which should drive the industry forward in India, it is important to keep with the environment regulations. Even the Chinese have learned and they have closed old polluting plants and contructed new plants who pollute less.

SS: What makes VELCO unique in your refractory sector?

CW: Our USP (unique selling point) is we make tailor made equipments, we use the best technology and make it optimum utility product for final end users. We don't make 100 machines of same kind, but we prefer to make much less number but customise it for our clients, so that they get best performance and efficiency from the machines.

SS: So, VELCO sells customised products to its clients. How has been your market in India, other parts of Asia and Middle East?

CW: Business in Middle East is not as much as we expected, so that is little disappointing. It might be as we do not have enough sales partner in this region so we have lost the market. For India we are immensely positive and we have an excellent partner Arcum Engineering. So through them we extend support to our end users and with the starting of our new initiatives two years back we are doing a licensed production of gunning machines in the India. This is mainly with the target to offer service to smaller companies which do not have import facilities. The big companies like Tata or SAIL have all paper work ready for importing machines but for the small ones, it is the issue with the smaller. To reach these smaller companies and cost wise make it more competetive, we are doing part production in India. 50% core compotent from Germany and rest 50% produced in India. Customers now can avail high quality products at a lesser price.

SS: What is the growth of VELCO you are looking at in next few years?

CW: We are not looking a higher sales figure but looking at getting a stable market for our company. So for new machines we are looking for telecommunication module so that you can get machine data to send to the customer. In this process the customer will get to see what is the status of the machine, whether the machine is being used effectively by a plant. This service at this moment we are only offering to European market, but hopeful that soon this will be used by Indian customers also. So IT is being synced with machines, where the customers and our company as a provider the usage of the machine along with its optimum efficiency.

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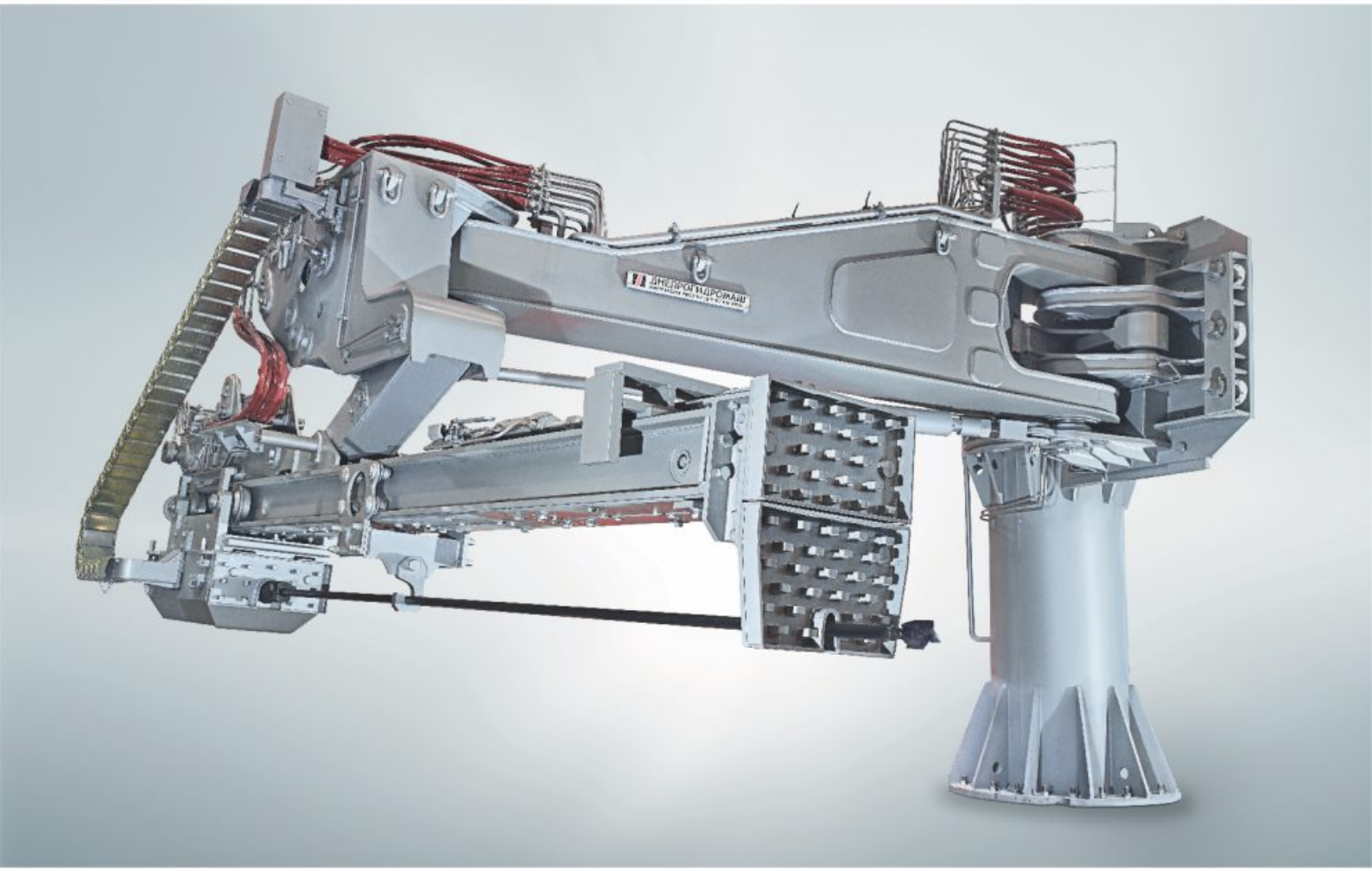

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A Study on 80% Alumina-containing Calcium Aluminate Cements

By Goutam Bhattacharya*, Christoph Wöhrmeyer & Chris Parr
*Imerys Refractory, Abrasives & Construction, Kolkata, India

Introduction:

Although 70% alumina-containing calcium aluminate cements (CAC) are the most popular in refractories applications, 80% alumina-containing CAC is also used by many manufacturers for long. In some countries, such as Japan and Korea, 80% aluminaCAC is quite popular and is used in both conventional (regular) as well as deflocculated castables. However, globally its use in conventional castable and gunning is more popular, particularly in applications where very high refractoriness is desired. In this article three 80% alumina CAC – Secar® Plenium, Secar® 80 and Secar® XT were compared in terms of their mineralogy, physical properties - flow, set time, strength, specific surface area (Blaine) and application performance in a model conventional castable composition.

80% alumina CAC:

Mineralogy:

All three 80% alumina CAC are composite cements with integrated additive system[1]. Secar® Plenium and Secar® 80 have similar mineral composition with high amount of CA, CA_2 and A phases with no $C_{12}A_7$ (Table 1), whereas Secar® XT has higher amount of CA, lower CA_2 and similar A together with some amount of $C_{12}A_7$.

Table 1: Mineralogy of 80% alumina CAC

	Secar® Plenium	Secar® 80	Secar® XT
CA	++	++	+++
CA_2	++	++	+
$C_{12}A_7$	-	-	+
A	++	++	++

CA = $CaO.Al_2O_3$, CA_2 = $CaO.2Al_2O_3$, $C_{12}A_7$ = $12CaO.7Al_2O_3$, A = Al_2O_3

Specific surface area (Blaine):

Specific surface area (Blaine) of all three 80% alumina CAC are significantly higher than 70% alumina CAC. Secar® XT has slightly higher surface than the other two (Figure 1) and the difference among the three cements is not large.

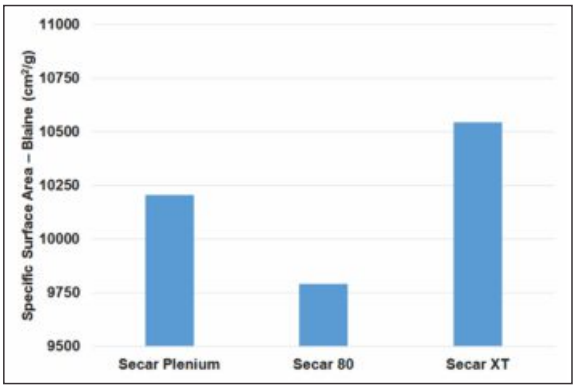

Figure 1: Typical specific surface area (Blaine) of the three 80% alumina CAC

Physical Properties:

The physical properties – flow, setting and strength of the cements were tested in specific mortar compositions (Table 2) in standard laboratory condition (20°C and >50% relative humidity). European standard sand (EN 196-1)was used to prepare the mortar. Flow was tested immediately after mixing as well as at specific interval using an ASTM shock table and an ASTM C230 flow cone after applying 25 shocks. The increase in diameter was expressed as % flow. Initial and final set times were tested using an automatic Vicat apparatus. Prisms (160 x 40 x 40mm) were cast and compressive strength was tested after curing at 20°C and >90% relative humidity, demoulding and breaking the prism in two halves from the middle.

	Sand (g)	Cement (g)	Water (g)	Water/ Cement (W/C)
Secar® Plenium	1350	500	160	0.32
Secar® 80	1350	500	180	0.36
Secar® XT	1350	500	200	0.4

Table 2: Mortar compositions for testing 80% alumina CAC

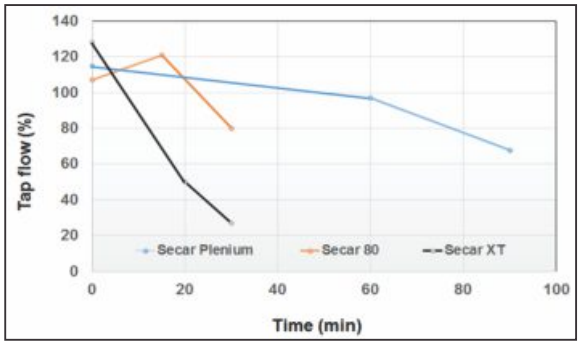

Figure 2: Typical flow (Tap) profile of the mortar using three different cements and different water addition as shown in table 2

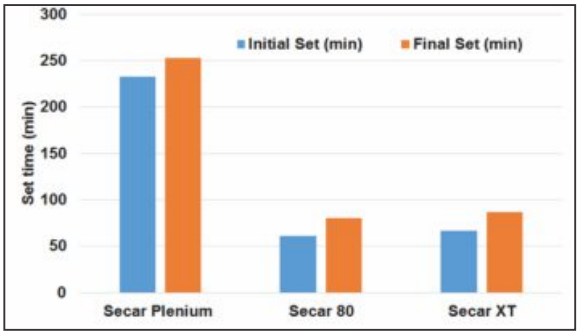

Figure 3: Typical set times of the mortar using three different cements

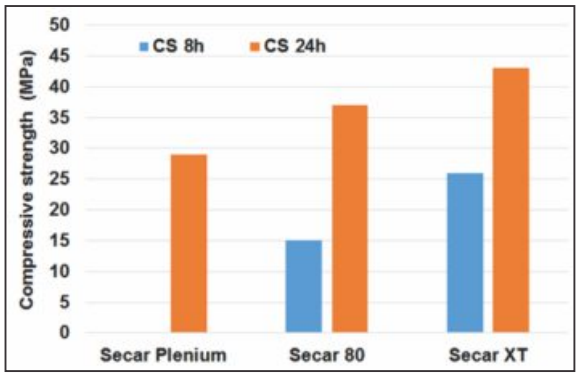

Figure 4: Typical compressive strengths of the mortar using three cements after curing 8h and 24h at 20°C

Results:

Secar® Plenium showed similar initial flow as other cements despite much lower water addition (Figure 2). Initial flow ofSecar® 80 was slightly lower than Secar® XT, which may be due to lower water/cement (w/c) ratio for Secar® 80. Despite higher w/c for Secar® XT, its flow decays the fastest with only 27% flow retained after 30min, whereas flow for Secar® Plenium was retained for very long (68% after 90 min).

Set times of Secar® XT and Secar® 80 were similar with initial set around 1h, whereas Secar® Plenium showed significantly longer set times (initial set ~4h) (Figure 3). Accounting for the w/c ratio differences, Secar® XT is the fastest and Secar® Plenium even more longer setting than the other two.

After 8h Secar® Plenium did not develop any compressive strength as expected from its long setting, whereas Secar® XT develops higher strength than Secar® 80 (Figure 4). After 24h, Secar® Plenium developed good strength, whereasSecar® XT still showed the highest strength, although its difference with other cements decreased compared to those after 8h.

Application testin a regular castable:

The performance of the cements in application was compared in a regular castable composition (Table 3). The castable after wet mixing was

placed in an ASTM C230 flow cone and vibration flow was measured immediately andat regular interval till the flow decays completely. 160 x 40 x 40mm prisms were cast, demoulded after curing 24h at 20°C, dried 24h at 110°C and then fired at several temperatures from 500°C to 1550°C. Cold Crushing Strength (CCS) was tested on the cured, dried and fired samples. Apparent porosity of some fired sample was tested using water boiling method. Hot Modulus of Rupture (HMOR) was tested on the dried sample after holding 30min at 1450°C. Refractoriness Under Load (RUL) was performed according to ISO 1893/5013.

Raw material	Fraction	Wt%
Tabular alumina	¼" - 8 mesh	32
Tabular alumina	8 - 14 mesh	15
Tabular alumina	14 - 28 mesh	10
Tabular alumina	28 - 48 mesh	13
Tabular alumina	-48 mesh	10
Tabular alumina	-325 mesh	5
80% alumina CAC		15
Total		100

Table 3: Model castable composition to compare 80% alumina CAC

Results and discussion:

Water addition of the castable was adjusted to generate similar initial flow (vibration) around 100%. Secar® Plenium consumed only 5.5% water, whereas Secar® 80 (6.7% water) and Secar® XT (7% water) took considerably larger amount water (Figure 5). To compare flow with other CAC for similar water addition, a Secar® Plenium composition was tested with 7% water addition, which, as expected, generated significantly higher flow. As observed in standard sand mortar, in castable composition also,Secar® Plenium retained flow for significantly longer time despite less water consumption, whereas Secar® XT showed very rapid flow decay, faster than even Secar® 80.Secar® Plenium with 7% water addition did not show flow decay even after 2h. Rapid flow decay of Secar® XT may be linked to its mineralogy with reactive $C_{12}A_7$, whereas low water demand and long working time for Secar® Plenium is probably due to its specific integrated additives. Secar® Plenium (7% water) showed the longest exothermic peak time, whereas Secar® 80 and Secar® XT developedthis at significantly shorter times (Figure 6).Other properties of Secar® Plenium were tested with 5.5% water.

After 24h, CCS for all CAC were similar, although water demand for Secar® Plenium was significantly less (Figure 7). This is possibly due to slow reactivity of Secar® Plenium thanks to its additives. In the mortar composition this slow reactivity of Secar® Plenium is even more evident with lower 24h strength than Secar® 80 and Secar® XT. In the model castable composition, Secar® Plenium perhaps gained some reactivity due to the accelerating effect of fine alumina[2]. CCS after drying 24h at 110°C, firing 6h at 800°C, 1100° and 1500°C showed significantly higher values for Secar® Plenium compared to the other CAC due to lower water demand, which generated much lesser porosity (Figure 8).Secar® 80 showed higher strength from 110°C to 800°C than Secar® XT, which may be due to higher amount CA_2 in Secar® 80. CA_2 hydrates at a higher temperature and results in higher strength at 110°C and perhaps contributes partly towards to higher strength till 800°C. Above 600°C, CCS drops possibly due to dehydration of calcium aluminate hydrates. Secar® 80 showed its lowest strength at 1100°C, whereas Secar® XT reached this early (at 800°C) probably due to its larger surface area and hence higher reactivity to form ceramic bond.Apparent porosity of all three CAC decreased from 800°C to 1100°C or 1350°C possibly due to sintering and then increased due to formation of CA_6 leading to expansion.

HMOR for Secar® Plenium and Secar® 80 showed similar results at 1450°C, whereas Secar® XT developed higher hot strength (Figure 9). This difference may not be explained by the content of the liquid phase formed at the test temperature as both Secar® 80 and Secar® Plenium developed higher HMOR at a higher temperature (1500°C) than their respective values at 1450°C. RUL (T0.5%) of a prefired sample after 6h at 1000°C for Secar® 80 was 1505°C, whereas Secar® XT showed >1600°C.

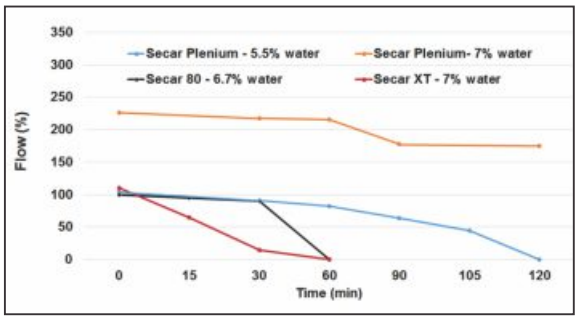

Figure 5: Vibration flow as a function of time for the three 80% alumina CAC in the model regular castable

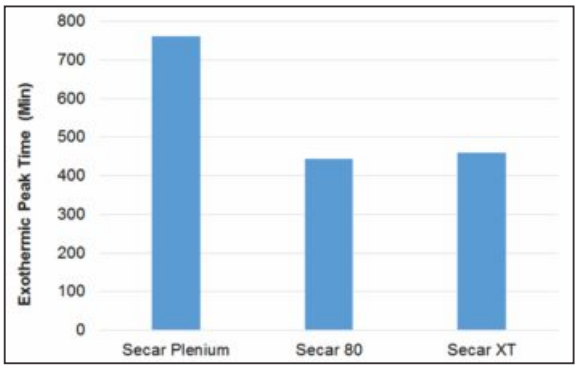

Figure 6: Exothermic Peak Time (min) of the model regular castable with the three 80% alumina CAC

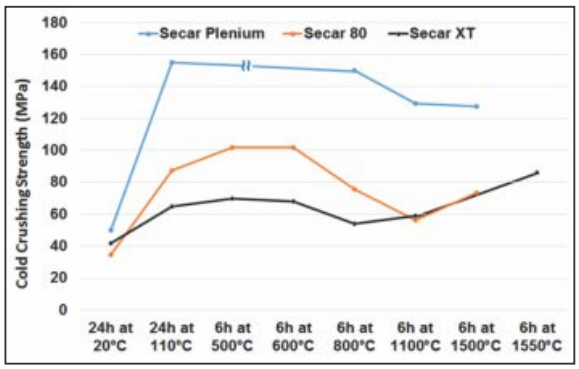

Figure 7: Cold Crushing Strength (CCS) of the model regular castable with the three 80% alumina CAC after curing, drying and firing at different temperatures

Source: Secar Gazette Volume: 32,October 2019

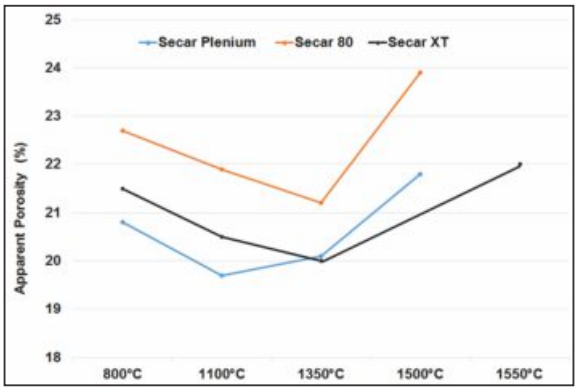

Figure 8: Apparent Porosity (%) of the model regular castable with the three 80% alumina CAC after firing at different temperatures

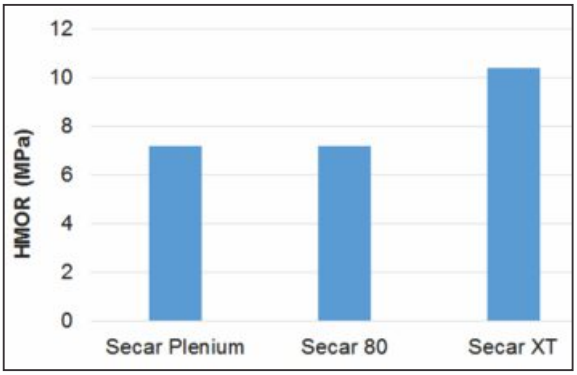

Figure 9: Hot Modulus of Rupture (HMOR) of the model regular castable with the three 80% alumina CAC after 30min at 1450°C

Conclusion:

80% alumina CAC (Secar® Plenium, Secar® 80 and Secar® XT) differs in mineralogy, specific surface area and integrated additives. Presence of $C_{12}A_7$ and higher surface area makes Secar® XT more reactive, which leads to faster flow decay and good early strength in standard mortar as well as in the model castable. Secar® Plenium showed the slowest flow decay, longest set times and consumed significantly less water thanks to its additive and led to higher strength (CCS) in a large temperature range (110°C, 800°C, 1100° & 1500°C). Secar® 80 developed higher strength from 110°C to 800°C than Secar® XT in the model castable composition due to its higher CA_2 content which led to hydration at higher temperature. Apparent porosity of the castables decreased from 800°C to 1100°C or 1350°C possibly due to sintering and thereafter started to increase probably due to expansive CA_6 formation.

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STEEL MARKET PRICE

(thousand tonnes)

Source: Steel Market Alert

LOCATION	ITEM	PRICE	PRICE	LOCATION	ITEM	PRICE	PRICE
	IRON SCRAP	12/23/2019	01/25/2020	FINISH GOODS		12/23/2019	01/25/2020
	CAST IRON				FLAT		
Ludhiana		24000	NA	Ahmedabad		36500	39000
Mandi Gobindgarh(Imported)		24400	26700				
Mandi Gobindgarh(Toka)		23400	25700	Durgapur	ANGLE	31000	
					CHANNEL	31500	35000
	MELTING SCRAP						
Ahmedabad		21600	23700	Ghaziabad	ANGLE	33500	
Alang		23100	24300				
Bhavnagar		22900	24300	Indore	ANGLE (35x5..40x5..50x5)	37000	40500
Bhiwari		18300	20000		FLATS (18x4..19x5..25x5..32x5..37x5)	35500	38500
Delhi		24000	25700		ROUND (12mm)	36500	39000
Durgapur		21500	24500		PATA (37X9..49X11..44X9..44X11)	37000	40000
Ghaziabad		24000	26000		SQUARE (8mm..10mm..12mm)	35500	38500
Hyderabad		21400	22600				
Indore		22700	24400	Kolkata	CHANNEL	31500	35000
Indore Old Scrap		21800	22700		CHANNEL 250	32500	36000
Jalna Melting		24200	26200		CHANNEL 300	33500	37000
Jaipur		21000	23400				
Jalna Super		23500	25700	Mandi Gobindgarh	ANGLE (40x5 to 75x8)	34200	36400
Jammu		21800	22700		CHANNEL (125mm to 20mm)	34400	38100
Kanpur		21500	22400		CHANNEL (75x40,100x50)	34700	36900
Ludhiana		25200	26800		ERW Pipe	34400	36400
Kolkata		22000	25000		FLAT (20X5 to 40X6)	34000	37100
Mandi Gobindgarh		20900	22900		FLAT (50x8 to 150x20)	34300	36100
Mandi . Melting Scrap		23900	25900		GIRDER (Joist 125x20mm)	34300	38600
Mujfernagar		24400	26500		LOCAL PLATE	38400	38600
Mumbai		20500	22400		ROUND (25mm to 53mm)	35200	35900
Nagpur		19600	20000		SHUTTER PATTI 21g	40100	40900
Raigarh		23000	24600		SQUARE 12mm	35200	37100
Raipur		23200	24700		T-Iron	36800	388000
Rourkela		22400	24500		TMT 12mm	34500	36700
					Z-Section	36300	38300
				Mumbai	ANGLE (20X3,25X3, TO 37X3)	36800	39700
	PELLET				ANGLE (35X4)	34800	37700
Jaipur		18600	20900		ANGLE (35X5)	34500	37400
Durgapur		17300	19700		ANGLE (40X5, 40X6,50X5,50X6,65X6)	34400	37300
Raigarh		15800	17900		FLAT (16X4.5, 12X5, 40X3)	37200	40000
Raipur		17500	19400		FLAT (18X4, 20X3, 25X3)	36100	39000
					FLAT (25X8)	36100	39000
	PIG IRON (FOUNDRY GRADE)				FLAT (30X3)	36400	39300
Batala		30500	31000		FLAT (40X6,100X12)	34400	37300
Jalandhar		30500	NA		Gate Channel	37900	40800
Ludhiana		30500	31500		ROUND (10,12MM)	36100	39000
Mandi Gobindgarh		30700	31700		ROUND(16mm, 20mm, 25mm)	35400	30900
					SQUARE (10,12,16,20mm)	35400	30300
	PIG IRON (STEEL GRADE)				SQUARE (9mm)	36100	39000
Batala		28200	30000		TMT		
Jalandhar		27000	NA	Raigarh	8mm		35500
Ludhiana		28000	30100	Raigarh	25 mm		34200
Mandi Gobindgarh		28200	30300	Kolkata	8mm		36400
	SPONGE IRON			Kolkata	25 mm		3500
Durgapur		18300	20700	Vizag	8mm		37000
Mandi Gobindgarh		20500	22800	Vizag	25mm		35500
Raigarh		17400	19600	Mandi Gobindgarh	8mm		38600
Raipur		18400	20400	Mandi Gobindgarh	25mm		37700
Rourkela		NA	NA	Mumbai	8mm		35500
Jaipur		20200	22500	Mumbai	25mm		34700

WORLDWIDE MONTHLY CRUDE STEEL PRODUCTION (thousand tonnes)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	23 Jan 20 Total
Austria	685	632	715	652	646	632	605	577	588	609	562	521	**7 423**
Belgium	635	624	745	661	707	634	676	640	601	705	628	650 e	**7 905**
Bulgaria	45	46	51	55	56	55	45	43	43	55 e	50 e	55 e	**595**
Croatia	16	12	12	8	0	2	4	0	5	2	0	3 e	**65**
Czechia	440	398	395	417	401	398	393 r	366 r	374 r	271 r	350 r	361	**4 563**
Finland	330	237	337	373	374	287	220	258	299	316	258 r	186	**3 473**
France	1 238	1 248	1 383	1 288	1 235	1 285	1 312	1 050	1 205	1 181	1 109 r	918	**14 451**
Germany	3 455	3 319	3 667	3 358	3 513	3 405	3 217	3 266	3 351	3 323	2 949	2 850 e	**39 675**
Greece	124	121	150	111	130	126	92	35	130	122	115 e	120 e	**1 376**
Hungary	156	156	176	172	154	122	136	121	109	141	163	164	**1 770**
Italy	1 971	2 044	2 285	1 956	2 225	2 088	1 987	854	2 210	2 226	1 986	1 413	**23 245**
Luxembourg	189	179	222	201	201	190	189	112	183	178	175 e	180 e	**2 200**
Netherlands	617	572	612	511	610	515	605	578	396	574	545	521	**6 657**
Poland	845	766	912	805	807	659	812	695	613	756	644	750 e	**9 065**
Slovenia	58	50	57	57	56	54	49	53	51	53	51	55 e	**645**
Spain	1 152	1 146	1 370	1 293	1 247	1 209	913	1 027	1 170	1 225	1 070	760	**13 581**
Sweden	462	410	440	432	452	362	389	362	398	330	309	376	**4 721**
United Kingdom	606	663	647	631	636	606	629	509	590	610	542 r	558	**7 225**
Other E.U. (28) (a)	941 e	873 e	934 e	929 e	951 e	919 e	897 e	838 e	779 e	933 e	884 e	915 e	**10 795**
European Union (28)	**13 964**	**13 494**	**15 109**	**13 908**	**14 399**	**13 548**	**13 170**	**11 384**	**13 095**	**13 610**	**12 387**	**11 357**	**159 430**
Bosnia-Herzegovina	72	71	76	76	73	53	64	73	49	55	68	70	**801**
Macedonia	18	18	29	22	22	25	19	0	22	21	21	24	**239**
Norway	60	49	52	52	57	58	20	60	58	63	53	40	**621**
Serbia	176	141	184	177	185	171	136	112	178	160	154	158	**1 929**
Turkey	2 569	2 635	2 986	3 044	3 063	2 689 r	2 925	2 634	2 733	2 687	2 886	2 893	**33 743**
Other Europe	**2 895**	**2 913**	**3 326**	**3 371**	**3 401**	**2 996**	**3 164**	**2 878**	**3 039**	**2 985**	**3 181**	**3 185**	**37 333**
Belarus	216	198	227	227	231	221	211	227	232	232	225 e	230 e	**2 680**
Kazakhstan	217	235	398	380	397	335	399	368	315	351	340 e	350 e	**4 085**
Moldova	12	22	42	40	30	34	35	37	39	25	25 e	20 e	**360**
Russia	6 256	5 746	6 105	5 846	6 338	6 084	6 110	5 819	5 842	5 806	5 620 e	6 000 e	**71 570**
Ukraine	1 850	1 689	1 968	1 938	1 827	1 659	1 784	1 938	1 745	1 561	1 325	1 561	**20 848**
Uzbekistan	46	42	50	54	56	61	54	63	57	47	45 e	50 e	**625**
C.I.S. (6)	**8 597**	**7 932**	**8 790**	**8 485**	**8 879**	**8 394**	**8 593**	**8 452**	**8 230**	**8 022**	**7 580**	**8 211**	**100 168**

(a) - Portugal, Romania, Slovakia (b) - HADEED only. (c) - partial data: 2017 approximately 90%. e - estimated r - revised

The 64 countries included in this table accounted for approximately 99% of total world crude steel production in 2018.

Important note:

Annual and year-to-date totals may include revised data not available on a monthly basis.

WORLDWIDE MONTHLY CRUDE STEEL PRODUCTION (thousand tonnes)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	23 Jan 20 Total
Canada	1 166	1 046	1 252	992	1 032	1 084	1 060	1 111	1 078	1 030 r	954 r	985 e	**12 790**
Cuba	19	18	17	18	18	17	19	21	21	20	23	25 e	**235**
El Salvador	8	8	8	8	8	7	10	8	10	8	10	10 e	**105**
Guatemala	26	25	23	25	24	24	26	26	27	26	27	30 e	**310**
Mexico	1 636	1 661	1 676	1 650	1 668	1 446	1 493	1 519	1 464	1 463	1 424	1 495 e	**18 595**
United States	7 518	6 956	7 686	7 357	7 553	7 244	7 419	7 396	7 004	7 250	7 088 r	7 457	**87 927**
North America	**10 373**	**9 714**	**10 661**	**10 049**	**10 302**	**9 822**	**10 027**	**10 081**	**9 603**	**9 797**	**9 525**	**10 002**	**119 962**
Argentina	371	318	391	421	407	412	418	436	406	382	358	326	**4 645**
Brazil	3 015	2 740	2 869	2 963	2 834	2 822	2 449	2 524	2 403	2 597	2 604	2 416	**32 236**
Chile	81	102	84	24	77	81	97	107	96	111	115	120 e	**1 095**
Colombia	83	96	62	80	95	101	117	123	113	130	104	100 e	**1 200**
Ecuador	51	52	50	49	51	50	53	53	52	47	51	50 e	**605**
Paraguay	2	1	1	1	1	2	2	3	3	3	4	3 e	**25**
Peru	101	91	107	97	108	109	104	118	102	101	103	100 e	**1 240**
Uruguay	6	3	4	5	4	5	5	5	5	5	7	6 e	**65**
Venezuela	4	7	11	5	3	5	9	4	0	1	0	1 e	**50**
South America	**3 715**	**3 410**	**3 579**	**3 646**	**3 579**	**3 585**	**3 254**	**3 373**	**3 181**	**3 378**	**3 345**	**3 122**	**41 161**
Egypt	722	686	706	728	651	603	526	408 r	496 r	552	604	574	**7 257**
Libya	29	48	46	57	46	54	52	31	46	68	66	63	**606**
South Africa	521 e	528 e	544 e	576 e	510 e	454 e	464 e	434 e	481 e	502 e	385 e	267 e	**5 666**
Africa	**1 272**	**1 263**	**1 296**	**1 361**	**1 207**	**1 112**	**1 042**	**873**	**1 022**	**1 122**	**1 055**	**904**	**13 530**
Iran	1 971	2 017	2 235 e	2 800 e	2 895 e	2 800 e	2 895 e	2 895 e	2 800 e	2 895 e	2 800 e	2 895 e	**31 900**
Qatar	221	175	235	192	235	231	230	229	222	228	174	186	**2 558**
Saudi Arabia (b)	469	448	397	405	439	464	456	463	412	331	399	410 e	**5 095**
United Arab Emirates	304	289	212	269	291	287	225	286	293	285	289	297	**3 327**
Middle East	**2 966**	**2 929**	**3 078**	**3 665**	**3 860**	**3 781**	**3 807**	**3 873**	**3 728**	**3 739**	**3 662**	**3 788**	**42 879**
China	78 594 e	70 988 e	80 326	85 032	89 091	87 533	85 223	87 251	82 773	81 521	80 287	84 265	**996 342**
India	9 591	9 421	10 042	9 021	9 468	9 388	9 485 r	8 868 r	8 772 r	8 980 r	8 928 r	9 281	**111 246**
Japan	8 142	7 745	9 084	8 648	8 674	8 794	8 387	8 120	8 040	8 150	7 716 r	7 784	**99 284**
South Korea	6 252 r	5 271 r	6 275 r	6 001 r	6 275 r	5 949 r	6 026 r	5 905 r	5 711 r	5 964 r	5 917 r	5 876	**71 421**
Pakistan	255	259	272	293	290	300	300	285	264	265	260	270 e	**3 313**
Taiwan, China	1 985	1 678	2 026	1 974	1 933	1 814	1 893	1 869	1 759	1 725	1 670 e	1 740 e	**22 065**
Thailand	340	282	358	327	428	400	369	380	308 r	361 r	333	300 e	**4 190**
Vietnam	1 746	1 431	1 784	1 867	1 750	1 695	1 793	1 741	1 598	1 594	1 537	1 531	**20 066**
Asia	**106 904**	**97 075**	**110 167**	**113 163**	**117 908**	**115 873**	**113 477**	**114 419**	**109 224**	**108 560**	**106 647**	**111 047**	**1 327 926**
Australia	468	385	424	472	494	476	429	501	459	488	448	449	**5 493**
New Zealand	56	53	50	61	57	58	55	60	49	51	59	57	**667**
Oceania	**523**	**439**	**474**	**533**	**550**	**534**	**484**	**561**	**508**	**540**	**508**	**506**	**6 160**
Total 64 countries	**151 209**	**139 169**	**156 480**	**158 181**	**164 085**	**159 645**	**157 018**	**155 894**	**151 629**	**151 752**	**147 890**	**152 121**	**1 848 548**

WORLDWIDE MONTHLY CRUDE STEEL PRODUCTION (thousand tonnes)

	December 2019	November 2019	December 2018	% change Dec-19/18	12 months 2019	12 months 2018	23 Jan 20 % change
Austria	521	562	633	-17.7	7 423	6 885	7.8
Belgium	650 e	628	580	12.1	7 905	7 980	-0.9
Bulgaria	55 e	50 e	55	0.2	595	666	-10.7
Croatia	3 e	0	14	-76.5	65	136	-52.1
Czechia	361	350 r	406	-11.0	4 563	4 938	-7.6
Finland	186	258 r	315	-41.0	3 473	4 146	-16.2
France	918	1 109 r	1 126	-18.4	14 451	15 387	-6.1
Germany	2 850 e	2 949	3 227	-11.7	39 675	42 435	-6.5
Greece	120 e	115 e	88	36.4	1 376	1 467	-6.2
Hungary	164	163	160	2.7	1 770	1 989	-11.0
Italy	1 413	1 986	1 708	-17.2	23 245	24 532	-5.2
Luxembourg	180 e	175 e	143	25.6	2 200	2 228	-1.3
Netherlands	521	545	567	-8.1	6 657	6 813	-2.3
Poland	750 e	644	878	-14.6	9 065	10 167	-10.8
Slovenia	55 e	51	41	32.6	645	654	-1.3
Spain	760	1 070	1 049	-27.6	13 581	14 320	-5.2
Sweden	376	309	402	-6.4	4 721	4 654	1.4
United Kingdom	558	542 r	535	4.2	7 225	7 268	-0.6
Other E.U. (28) (a)	915 e	884 e	919 e	-0.5	10 795	10 990	-1.8
European Union (28)	**11 357**	**12 387**	**12 847**	**-11.6**	**159 430**	**167 655**	**-4.9**
Bosnia-Herzegovina	70	68	79	-10.6	801	695	15.2
Macedonia	24	21	27	-11.5	239	266	-10.1
Norway	40	53	43	-8.1	621	575	8.0
Serbia	158	154	148	6.8	1 929	1 973	-2.2
Turkey	2 893	2 886	2 886	0.2	33 743	37 312	-9.6
Other Europe	**3 185**	**3 181**	**3 184**	**0.0**	**37 333**	**40 821**	**-8.5**
Belarus	230 e	225 e	229	0.4	2 680	2 470	8.5
Kazakhstan	350 e	340 e	56	525.0	4 085	3 964	3.1
Moldova	20 e	25 e	22	-9.1	360	497	-27.6
Russia	6 000 e	5 620 e	6 184	-3.0	71 570	72 122	-0.8
Ukraine	1 561	1 325	1 885	-17.2	20 848	21 100	-1.2
Uzbekistan	50 e	45 e	48	4.2	625	646	-3.3
C.I.S. (6)	**8 211**	**7 580**	**8 424**	**-2.5**	**100 168**	**100 799**	**-0.6**
Canada	985 e	954 r	981	0.4	12 790	13 444	-4.9
Cuba	25 e	23	21	16.7	235	225	4.2
El Salvador	10 e	10	8	21.4	105	99	5.9
Guatemala	30 e	27	26	17.6	310	300	3.4
Mexico	1 495 e	1 424	1 612	-7.3	18 595	20 204	-8.0
United States	7 457	7 088 r	7 478	-0.3	87 927	86 607	1.5
North America	**10 002**	**9 525**	**10 126**	**-1.2**	**119 962**	**120 880**	**-0.8**
Argentina	326	358	356	-8.4	4 645	5 162	-10.0
Brazil	2 416	2 604	2 709	-10.8	32 236	35 407	-9.0
Chile	120 e	115	94	28.0	1 095	1 145	-4.4
Colombia	100 e	104	101	-1.0	1 200	1 219	-1.6
Ecuador	50 e	51	48	4.5	605	583	3.7
Paraguay	3 e	4	3	-0.5	25	25	-1.1
Peru	100 e	103	101	-1.0	1 240	1 217	1.9
Uruguay	6 e	7	5	15.6	65	60	8.3
Venezuela	1 e	0	4	-87.5	50	129	-61.2
South America	**3 122**	**3 345**	**3 421**	**-8.7**	**41 161**	**44 947**	**-8.4**
Egypt	574	604	670	-14.3	7 257	7 807	-7.0
Libya	63	66	55	15.1	606	396	53.0
South Africa	267 e	385 e	423	-36.9	5 666	6 327	-10.4
Africa	**904**	**1 055**	**1 148**	**-21.2**	**13 530**	**14 530**	**-6.9**
Iran	2 895 e	2 800 e	2 068	40.0	31 900	24 520	30.1
Qatar	186	174	202	-8.0	2 558	2 575	-0.7
Saudi Arabia (b)	410 e	399	468	-12.3	5 095	5 240	-2.8
United Arab Emirates	297	289	292	1.5	3 327	3 247	2.4
Middle East	**3 788**	**3 662**	**3 030**	**25.0**	**42 879**	**35 582**	**20.5**
China	84 265	80 287	75 489	11.6	996 342	920 027	8.3
India	9 281	8 928 r	9 356	-0.8	111 246	109 272	1.8
Japan	7 784	7 716 r	8 463	-8.0	99 284	104 319	-4.8
South Korea	5 876	5 917 r	6 163	-4.7	71 421	72 464	-1.4
Pakistan	270 e	260	283	-4.6	3 313	4 719	-29.8
Taiwan, China	1 740 e	1 670 e	2 038	-14.6	22 065	23 240	-5.1
Thailand	300 e	333	437	-31.3	4 190	6 403	-34.6
Vietnam	1 531	1 537	1 292	18.4	20 066	14 008	43.2
Asia	**111 047**	**106 647**	**103 521**	**7.3**	**1 327 926**	**1 254 452**	**5.9**
Australia	449	448	449	-0.1	5 493	5 689	-3.4
New Zealand	57	59	58	-1.3	667	652	2.3
Oceania	**506**	**508**	**507**	**-0.2**	**6 160**	**6 341**	**-2.9**
Total 64 countries	**152 121**	**147 890**	**146 207**	**4.0**	**1 848 548**	**1 786 007**	**3.5**

(Source: worldsteel association)

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