

## GRACE CASTINGS LTD.: CONTEMPLATING BACKWARD INTEGRATION?

*Chitra Singla wrote this case solely to provide material for class discussion. The author does not intend to illustrate either effective or ineffective handling of a managerial situation. The author may have disguised certain names and other identifying information to protect confidentiality.*

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In August 2018, Mohit Mardia, the managing director of Grace Castings Ltd. (GCL), was preparing for an upcoming board meeting. At the meeting, which was expected to take place in GCL's head office in Ahmedabad, India, Mohit planned to present the strategic plan for GCL's future expansion and chart the future path for the company. GCL was a small mill that manufactured steel products, including structural bars, thermomechanically treated (TMT) bars, angles, and channels. In fiscal year 2017–18, the fully family-owned business had a financial turnover of US\$33.85 million.<sup>1</sup> With the recent growth in India's steel industry, Mohit was considering various options for GCL's expansion. The first option was backward integration, which meant increasing the capacity of billet manufacturing by adding a 30-metric-ton induction furnace. The second option was to expand the business by adding a new power plant. Mohit had to decide whether to recommend one or both of these options or simply maintain the status quo and grow the company at a slow pace. Preliminary estimates indicated that the capacity expansion of the induction furnace to produce castings and billets would cost \$6.5 million, whereas setting up a new power plant would cost \$7.7 million. The board meeting was the following week; by that time, Mohit would have to be sure which path to recommend in order to ensure GCL would be well prepared to compete in India's steel market over the next decade.

### THE INDIAN MARKET FOR STEEL

India was the third-largest steel producer in the world in 2018, after China and Japan, up from eighth-largest in 2003. In 2018–19, India was expected to produce 104.98 million metric tons (MMT) of finished steel.<sup>2</sup> India had seen an increasing trend in steel demand and production in recent years (see Exhibit 1). Part of this growth was due to the availability of raw materials (e.g., coke and iron ore) and cheap labour, as well as growth in the country's real estate, automotive, and infrastructure sectors. Crude steel consumption in India had grown at a compound annual growth rate of 5.49 per cent between 2011 and 2017 to reach a consumption level of 97.4 MMT, whereas finished steel production had grown at a rate of 8.39 per cent between 2011 and 2018.<sup>3</sup>

<sup>1</sup> All currency amounts are in US\$ unless otherwise specified.

<sup>2</sup> "Iron & Steel Industry in India," India Brand Equity Foundation, India Brand Equity Foundation, September 2018, accessed October 15, 2018, [www.ibef.org/industry/steel.aspx](http://www.ibef.org/industry/steel.aspx).

<sup>3</sup> Ibid.

The *National Steel Policy 2017* envisioned 300 MMT of steelmaking capacity for India by 2030.<sup>4</sup> To facilitate this goal, the Indian government had allowed up to 100 per cent foreign direct investment in the country's steel industry. The government had also allocated steel development funds to promote research and development in the country's steel sector. To boost domestic production, the Government of India had increased the minimum import price on many steel goods, which resulted in a lower rate of imports over the previous two years.<sup>5</sup> Specifically, imports from China, Japan, and Russia were down to 7.4 MMT in 2016–17 compared to 2015–16, for a drop of 36.6 per cent.<sup>6</sup> Over the same period, exports of finished steel increased from 4.1 MMT to 8.2 MMT.<sup>7</sup>

The steel industry comprised many products that had different shapes, specifications, and uses including sheets, ingots, structural bars, billets, rods, pipes, and angles. At a broader level, the products could be divided into two categories: (1) flat steel products, such as flat sheets and hot- and cold-rolled products, which were at the higher end of the quality scale, and (2) non-flat long steel products, such as structural bars, channels, angles, and TMT bars, which were at the lower end of the quality scale.<sup>8</sup> Customers came from a variety of industries including real estate (construction), automotive, appliances, and sugar production. Many customers were price sensitive; others gave more importance to delivery time and quality. Based on the production process and the product, the Indian steel industry could be roughly divided into two segments: (1) integrated steel plants (ISP), or primary steelmakers, and (2) mini-mills, or secondary steelmakers.<sup>9</sup>

### Integrated Steel Plants

ISPs were vertically integrated steel companies that added key activities across the value chain. They had large capacities and a minimum efficiency scale (approximately 1 million metric tons). These mills used a blast furnace to convert raw materials (e.g., coke and iron) into pig iron. They then used a basic oxygen furnace to convert pig or sponge iron and ferrous or steel scrap into molten steel. Most of these ISPs used modern technology such as continuous casting to convert molten steel into billets or other steel products. Older plants that had been upgraded for better efficiency levels across the steelmaking process had state-of-the-art technology (see Exhibit 2a).

Private companies such as Tata Steel Ltd., Jindal Steel & Power Ltd., and JSW Steel Ltd.,<sup>10</sup> as well as public sector units such as the Steel Authority of India Limited and Vizag Steel, fell under this category.<sup>11</sup> According to Mohit, many of these companies owned raw material (e.g., coke and iron ore) mines and had their own power plants. These companies provided a wide range of steel products to their customers, such as automotive companies, and produced mainly high-quality steel products, such as hot- and cold-rolled steel products; TMT rebars; wire rods; and bare and pre-painted galvanized, Galvalume, and special steel, which fell under the category of flat steel products. Their customers were spread across various sectors including agriculture, automotive, energy and power, construction, engineering, and government institutions. These customers placed orders in bulk and were particular about product quality, durability, and timely delivery. ISPs employed unionized workers with high labour costs. The sheer size of the ISPs

<sup>4</sup> Ibid.

<sup>5</sup> "Steel Sector Analysis Report," Equity Master, March 26, 2018, accessed July 25, 2018, [www.equitymaster.com/research-it/sector-info/steel/Steel-Sector-Analysis-Report.asp](http://www.equitymaster.com/research-it/sector-info/steel/Steel-Sector-Analysis-Report.asp).

<sup>6</sup> Ibid.

<sup>7</sup> Ibid.

<sup>8</sup> "JPC Report on the Steel Sector, 2017—Snapshot," Alpha Invesco, December 21, 2017, accessed March 8, 2019, [www.alphainvesco.com/blog/jpc-report-steel-sector-2016-17/](http://www.alphainvesco.com/blog/jpc-report-steel-sector-2016-17/).

<sup>9</sup> Joint Plant Committee, *Classification/Re-classification of Steel Industry*, accessed July 25, 2018, <http://jpcindiansteel.nic.in/writereaddata/files/LIST%20OF%20ISP.pdf>.

<sup>10</sup> Ibid.

<sup>11</sup> "Steel Manufacturing Companies in India," India Brand Equity Foundation, accessed July 25, 2018, [www.ibef.org/industry/steel/showcase](http://www.ibef.org/industry/steel/showcase).

allowed them to achieve scale as well as scope. According to a report by the Joint Plant Committee, the Steel Authority of India Limited produced 13.22 MMT of finished steel between April 2016 and February 2018. During that same period, Vizag Steel produced 3.581 MMT and Tata Steel Ltd. produced 10.548 MMT. JSW Steel Ltd. had an installed capacity of 18 MMT per year and 91 per cent capacity utilization, compared to 98 per cent at Tata Steel.<sup>12</sup> It had seven operational plants in India. In 2017, JSW Steel Ltd. was India's second-largest steel producer and the largest steel exporter. It planned to increase production capacity to 40 MMT by 2025. Other ISPs had similar aggressive expansion plans. The report by the Joint Plant Committee also noted that approximately 52 per cent of steel production in 2016–17 was contributed by six ISP companies: the Steel Authority of India Limited, Vizag Steel, Tata Steel Ltd., ESSAR Steel India Limited, JSW Steel Ltd., and Jindal Steel & Power Ltd.<sup>13</sup>

### Mini-Mills

Unlike ISPs, mini-mills (secondary steel producers) were small steel plants that operated on a smaller scale and were not fully vertically integrated. Mohit noted that these mills had a low minimum efficiency scale; some mini-mills had an installed capacity of just 0.1 MMT. They were active in certain parts of the value chain; for example, some mills produced only billets by using electric arc furnaces or induction furnaces; some mills were independent hot- and cold-rolling units; some were sponge and pig iron producers; and the remaining were re-rolling mills and galvanizing and tin-plating units. A few mini-mills had modernized their plants to include continuous casting, although most of them still followed traditional casting technologies (i.e., batch or non-continuous) because of their small scale of production.

These mini-mills were dependent upon suppliers for raw materials such as steel scrap or sponge iron and direct reduced iron or hot briquetted iron.<sup>14</sup> Use of steel scrap as a raw material affected product quality because impurities in the material were difficult to eliminate completely. Therefore, products from mini-mills included structural bars, angles, castings, and channels, generally categorized as low-end long (non-flat) steel products. Mini-mill customers were mainly traders or micro and small companies involved in industries including construction, sugar production, and valve or machine manufacturing. Because of the undifferentiated products, these customers were very price sensitive and required on-time delivery. Mini-mills were affected by the high cost of electricity, which increased their cost of production and led to low capacity utilization. There were 1,628 rolling mill units, 1,244 induction furnace units, and 39 electric furnace units.<sup>15</sup> The secondary steel producers segment produced 57 per cent of all steel in India during 2017–18.<sup>16</sup>

### GRACE CASTINGS LTD.

Rajeev Mardia had 25 years of experience running a steel mini-mill that was 100 per cent family owned. In 2002, Rajeev decided to leave the joint family business to pursue a new opportunity in Mehsana District, near Ahmedabad, Gujarat, India. The mini-mill GCL, which was established in 1992, was up for sale and in need of repairs. Rajeev decided to buy the unit and start his own business, moving away from the partnership with his brothers.

<sup>12</sup> Joint Plant Committee, Kolkata, *Secretary's DO Report: Flash Report*, February 2018, accessed July 25, 2018, [www.jpcindiansteel.nic.in/writereaddata/files/SECFEB17.pdf](http://www.jpcindiansteel.nic.in/writereaddata/files/SECFEB17.pdf).

<sup>13</sup> Ibid.

<sup>14</sup> Federation of Indian Chambers of Commerce and Industry, *Indian Secondary Steel Industry: Opportunities and Challenges*, 31, accessed July 25, 2018, <http://ficci.in/spdocument/20782/ficci-steel-report.pdf>, 31.

<sup>15</sup> Ibid.

<sup>16</sup> Ibid., 22.

Rajeev used his own funds to purchase GCL, a mini-mill that used an induction furnace to produce steel. Rajeev became chairman and chief financial officer of the company. He then appointed Mohit, his son, as managing director. GCL had manufactured mild steel<sup>17</sup> structural rolling products such as equal angles, channels, flat rolls, round rolls, square rolls, TMT bars, and mild steel ingots. In 2002, GCL had only one rolling mill, which produced about 1,000 metric tons per month. Over time, however, Rajeev and Mohit made minor technological changes to increase production to 3,700 metric tons per month. Mohit explained how the mini-mill's conversion took place:

To increase production, we took simple measures. For example, we decided to keep spares required to run the plant ready and also upgraded the mill with minor changes without hurting the production even for a day. Having the spares ready allowed us to reduce our downtime drastically and increased our production. We also improved on the quality from the time we took this unit and have always been working towards it.

In 2003, the new company installed two additional induction furnaces: one with a capacity of 3 metric tons, the other with a capacity of 3.5 metric tons. Each furnace had two crucibles. In 2006, GCL became a certified company with the International Organization for Standardization (ISO). In 2007, the promoters decided to diversify and set up a foundry division to manufacture quality castings of various sizes, with single piece weights ranging from 50 kilograms (kg) to 5,000 kg, as well as cast iron casts, spheroidal graphite, wrought carbon grade B and alloy steel, manufacturing valves, wing jaws, and crushers, catering to customers in various industries including valves, sugar, cement, rubber, and other infrastructure areas. GCL was then able to manufacture quality structural rolling products and castings under one roof. In 2009, with the growing Indian economy and the emerging needs of infrastructure development, GCL decided to expand its capacity and installed a fully automatic TMT bar mill producing best-quality TMT bars ranging from 8 millimetres (mm) to 32 mm. In 2013, GCL modified its TMT plant and upgraded its rolling capacity.

In 2014, GCL further expanded its melting capacity by replacing the existing induction furnaces with a new 8-metric-ton-capacity induction furnace with two crucibles, which was a departure from previous times, when only one crucible was used for heating, and each crucible could hold 8 metric tons of material. Given the growing demand for quality products, GCL installed a locally made continuous casting machine. The company thus changed the melting process to a much more refined form. It started making billets for its own use, which were used to manufacture higher-quality products. This change also helped GCL increase its product range of castings. As a result, the company gained an advantage over competitors by producing 5,500 kg single piece castings, which only a few industry competitors were able to do. In 2015, the company installed a 2.1-megawatt windmill in Porbandar (a coastal city in Gujarat, India). The new windmill helped the company save electricity costs by providing 50 million units of electricity per year.

### GCL in 2018

By 2018, GCL was a mini-mill that used an induction furnace to produce steel, and it had become an active member of various business organizations.<sup>18</sup> Raw materials such as **sponge iron and steel scrap** were melted in an induction furnace at a temperature of **1,500–1,600 degrees Celsius**, using a steelmaking process that created molten liquid steel (see Exhibit 2b). The molten steel was then cast in a high-speed modular caster to produce billets. It was then given the desired shape and size **using rolling mills**. GCL had an installed capacity

<sup>17</sup> Mild steel was also known as low-carbon steel because it contained 0.05–0.25 per cent carbon, which made it ductile and malleable. It was easy to produce and inexpensive because of its low tensile strength. It was used to manufacture structural steel. Peter Knowles, "Iron and Steel," in *Design of Structural Steelwork*, 2nd ed. (London, UK: Surrey University Press, 1987), 1.

<sup>18</sup> GLC was an active member of the following associations: Gujarat Re-Rolling Mills Association, Gujarat Steel Association, Gujarat Chamber of Commerce & Industry, Indian Foundry Men, and Gujarat Induction Furnace Association.

of 43,800 metric tons of billets per year<sup>19</sup> and an installed finished steel (structural steel and TMT bars) rolling capacity of 146,000 metric tons per year.<sup>20</sup> All the billets produced in GCL were used in-house for manufacturing finished goods. However, GCL had to purchase some billets from the marketplace because the billets it manufactured in-house were not adequate to meet the requirements of its production capacity. By this time, GCL had become a certified with ISO 9001-2015 and the Indian Standards Institute (ISI). The ISI certification mark was granted to Indian companies and products by the standardization authority of India. In 2017–18, GCL had a financial turnover of \$33.85 million (see Exhibits 3 and 4).

GCL had become an integrated company to some extent by setting up several major components: a captive wind farm in Porbandar to produce electricity, a steel-melting induction furnace for making billets, a foundry and casting division for producing single piece castings that ranged in weight from 50 kg to 5,500 kg, and two rolling mills for producing structural steel bars and TMT bars. The company drew its revenue from the sale of these products (see Exhibits 5a and 5b). With four different divisions under one roof, GCL was unmatched by any competitor in Gujarat and had considerably improved its client servicing ability with vertical integration. Customers could plan their requirement for a variety of products from one single source, which saved them valuable time, money, and inventory. Also, all products were manufactured in-house, which ensured good quality from one end of the value chain to the other. This factor had become GCL's manufacturing strength. The main customers of finished goods (e.g., bars, angles, or channels) were traders, who accounted for 90 per cent of GCL's sales; the remaining 10 per cent of finished goods were sold directly to end consumers. According to Mohit, "Traders prefer to do business with GCL because of the trust and relationship that GCL has built over time; traders know that GCL will never bypass them to reach the end customer directly. This trust is valued by traders who themselves are small and medium sized [businesses]."

According to Mohit, casting-related products were sold directly to machine manufacturers—the end customer. Most of these companies were micro and small manufacturers and were thus often sensitive to pricing. In 2018, GCL started producing high-margin product rolls that were used in rolling machines of different grades, such as stainless steel hot-rolling mills, adamite rolls, spheroidal graphite iron rolls, or EN 31-grade high-carbon rolls. It started selling these rolls to rolling mill manufacturers.

The company's growth was generally directed by Rajeev and Mohit, who made most decisions on the basis of five criteria: (1) opportunities for use of the product, (2) associated risks, (3) number of years required to break even, (4) profit margins, and (5) cost savings. According to Mohit, the company's growth was made possible by several key factors:

The biggest advantage we had over the years was that we always had space to expand. Also, our main strength in expansion was the turnaround time, which we have reduced by 50 per cent as compared to our competitors; all expansions were carried out without hurting our daily production; our plants were not closed even for a day. This helped us in saving costs and earning better profits. I would also like to mention that all the expansion was done without taking any external financial help; this too had helped us in reducing costs.

However, GCL's growth created various challenges. For example, the steel-melting induction furnace used for making billets and castings was operated at 33 per cent of its capacity because of the high cost of power

<sup>19</sup> Induction furnaces could be run continuously. GCL's induction furnace could complete 15 cycles in 24 hours. Each cycle could produce eight metric tons of molten steel, which meant that 120 metric tons of molten steel could be produced each day from GCL's induction furnace. Therefore, its installed capacity was 43,800 metric tons at furnace level. GCL's induction furnace was run for eight hours at night, allowing GCL to produce 14,600 metric tons of billets per year in-house.

<sup>20</sup> Two of GCL's rolling mills could produce 25 metric tons of steel per hour. Rolling mills could be run up to 16 hours per day and needed seven or eight hours of cool-down time. Therefore, the installed capacity of a rolling mill was 146,000 metric tons (calculated as  $25 \times 16 \times 365 = 146,000$ ).

(i.e., \$52.31 per metric ton), which accounted for about 5 per cent of GCL's production costs. GCL's induction furnace was operated for one shift of eight hours during the night, when India's government provided an energy subsidy to businesses. If GCL operated the plant continuously (i.e., three shifts per day), the cost of power would rise to \$80.00 per metric ton, accounting for 8 per cent of production costs. Other issues related to labour, finance, production, competition, sales, and marketing also contributed to hampering future growth plans.

### Labour Issues

GCL employed approximately 300 workers directly and 200 others indirectly. Most GCL employees were unskilled and semi-skilled. The portion of employees who had prior skills and education were either managers or sales people, as Mohit explained:

Steel production is a tough task as a person has to work in very high temperatures and the temperature of the metal is close to 900 degrees Celsius when re-heated, and also at times the liquid metal temperatures are as hot as 1,600 degrees Celsius. The persons willing to work in such temperatures are not easily available since it is tedious, hard, and requires a high level of endurance. In today's world, everyone wants a timed white-collar job where the working hours are fixed and [they] do not want themselves to be accountable. Also, employees want a good salary. Management is ready to give salary as per the market rate, but the management wants the employees to be responsible as well as accountable.

Since 2012, GCL had been giving incentives to its customers (i.e., traders) and to its sales representatives to promote the sale of company products. The incentives were based on the quantity of products sold and dispatched by the sales representatives and the quantity of products bought by traders. Traders and sales representatives were ranked under three categories for incentives, based on volume. Incentives included tour packages to Goa or Dubai, as well as trips to Singapore, which were awarded for the highest business volumes. Unskilled workers at the plant would receive a small bonus along with free food during the Diwali festivities every year.

### Finance-Related Issues

According to Mohit, the steel industry had various finance issues that needed to be considered when running a steel business:

The payment cycle in the steel industry is purely credit based and no one pays in advance. The business is considered to be a high-risk one, as the margins are very thin and credit varies from a 10-day period to a three-month period. The steel industry is again a very capital-intensive business—a volume game, purely. The higher the volume, the better is the chance of profitability. Bad debts are a common story in this business, and at times, capital gets blocked badly, resulting in losses.

Most of GCL's business (90 per cent) was with traders, rather than with end customers, such as infrastructure and real estate companies. End customers normally required long credit cycles that could extend 90–180 days, but traders used shorter credit cycles.

## Production-Related Issues

GCL also faced issues related to the company's production planning process, as Mohit explained:

GCL always tries its best to fulfill orders on time, but sometimes challenges related to production planning make it difficult to complete the order on time, leaving customers unsatisfied. Having over 100 different products (in terms of different specifications) under a single roof is the biggest benefit we have but with limitations, as it becomes very difficult to maintain a minimum inventory level of all products. At times, we do run out of stock in some sections (sizes or products) as a few of them are very slow-moving items. The principle that we use in production planning is completely based upon orders and market requirements. Our delivery in most of the cases is immediate and in some cases, it may also take a week's time for us to deliver the same. When the delivery schedule takes longer than usual, the challenge kicks in to have the customer satisfied.

## Other Challenges

The biggest challenge GCL faced, according to Mohit, was related to sales and marketing. The competition at the mini-mills level was regional because a mini-mill could not easily enter another region within the state that was already served by other manufacturers. High transport charges also made it difficult to supply products across the state. Manufacturers were also compelled by customers to give rewards such as discounts, incentive schemes such as tours, gift articles, and calendars, which added another \$77,000 in cost each year and made it difficult to calculate product prices accurately.

After the implementation of the goods and services tax (GST) in 2016–17, GCL was able to supply its products within Gujarat because check-posts and tolls had been removed. The shorter transportation time resulted in cost savings. However, GCL was still unable to supply products to neighbouring states because of high transportation costs, although material from other states could come to Gujarat very easily, which made it even more difficult for local manufacturers like GCL to survive. According to Mohit, GCL was forced to sell some products at prices below manufacturing cost, which resulted in losses for the company.

Power charges and raw material costs accounted for the bulk of costs in the steel industry. Power charges ranged from about 3 to 12 per cent of total manufacturing costs.<sup>21</sup> For plants that had their own power plant, power charges were near the low end of that range (approximately 3–5 per cent of manufacturing costs), whereas for plants that were dependent on the state electricity board, power charges were closer to the higher end of the range (approximately 8–12 per cent of manufacturing costs). Because electric power charges in Gujarat were very high, the cost of steel products was high, compared to states such as Maharashtra and Chhattisgarh, where the cost of steel products was lower, as were power charges.

## Competition

Despite rising demand for steel across India, mini-mills in Gujarat faced increasing competition, as Mohit explained:

The products we manufacture are very location centric as transportation plays a big role in expanding our footprint and presence. The pricing is also very volatile; it fluctuates on a day-to-day basis due to the variation in raw material prices. For mini-mills, the challenge is greater because prices are not stagnant for a fortnight or a month, like they are for main steel producers or ISPs.

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<sup>21</sup> Company documents.



Competition is also very high, not only from within the state but also from manufacturers in other states such as Maharashtra, Madhya Pradesh, Rajasthan, Chhattisgarh, etc. There are more than 100 mild steel manufacturers in India. Gujarat's steel production capacity is 10.712 MMT, which is 10 per cent of India's steel production capacity of 101 MMT.<sup>22</sup> Moreover, the average capacity utilization of mills in Gujarat is 48 per cent, which is very low compared to the average capacity utilization in the country of 81 per cent. The only advantage Gujarat state has is Alang—Asia's largest ship breaking yard—whereas other states are rich in materials like coal and ore.

Compared to competitors like Electrotherm India, GCL had an advantage in regard to location because most projects were in Ahmedabad, but most competitors were based in the regions of Kutch, Bhavnagar, Rajkot, and South Gujarat. However, some of these competitors had the advantage of proximity to ports for ease of export (see Exhibit 6).

Mohit made the following observations about GCL's competition: some competitors had a continuous-casting facility in addition to a direct or hot-rolling facility to manufacture bars, channels, and angles. The benefit of hot rolling was that it reduced the cost of production by approximately 30 per cent. Materials that were casted continuously were already hot, which avoided the need for reheating. The result was savings in power, fuel, and labour, to some extent. Another advantage of hot rolling was that the material could be given any length required by the customer, which GCL was unable to provide with either of its rolling mills using the direct or hot-rolling method.

GCL's competitors who were based in the Kutch region generated higher profit margins and lower production costs for the following reasons:

- They owned a power plant, which reduced their power-generation costs to \$0.05 per unit, compared to \$0.14 per unit for companies that relied on electricity boards.
- They had better-integrated plants, which provided them with several advantages: power generation; production of sponge iron from iron ore; use of an induction arc furnace for melting, with larger capacities (minimum of 15 metric tons each); and direct or hot rolling of end products such as bars, angles, and channels.
- They had better access to export thanks to their proximity to the port, which also made it easy to source raw materials, with lower import duties and incentives for export of 3.25 per cent of the invoice value.
- Their remote location for far off destinations and cities was very competitive, negating their geographical disadvantage of transporting goods within India.

Mohit was eager to expand operations at GCL. He believed that some issues were due to the company's limited operation size. In February 2018, to sustain growth, GCL had added a high-margin product to its portfolio—rolls, which were used in rolling mills. The production of the additional product had required an investment of only \$0.5 million because 60 per cent of the needed infrastructure to produce the rolls was already in place at GCL. The new product generated a 10–15 per cent margin, but it had only quarterly demand and limited growth potential. Mohit aspired to transition his small family business into a large company and eventually compete with ISPs. He felt that the time had come to begin the transition and was considering various options.

Option 1 was to add capacity in billet production through backward integration. This option would allow GCL to add melting capacity (i.e., an induction furnace) for 150,000 metric tons per year and start manufacturing castings and billets, which would help the company fulfill its rolling requirements for in-

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<sup>22</sup> Press Information Bureau Government of India Ministry of Steel, *Steel Plants*, April 20, 2015, accessed July 25, 2018, <http://pib.nic.in/newsite/PrintRelease.aspx?relid=118355>.



house production. Currently, approximately 70–75 per cent of the billets required by GCL were being purchased from the marketplace (see Exhibit 7). However, a new induction furnace with a 30-metric-ton capacity would cost \$3 million. As well, infrastructure such as cranes, shades, accessories, and water pipes would cost an additional \$3–3.5 million, for a total cost of \$6.5 million. In addition, the power required for this project would have to be purchased from private companies at a rate of \$0.10 per unit, compared to \$0.14 per unit from the state electricity board.

The main reason for GCL to consider increasing the capacity for billets was because the continuous casting process required the billets to go to rolling mills on a continuous basis. Increasing capacity would save the cost of reheating the billets, which was incurred for non-continuous or batch processes. The cost of reheating a billet for rolling was \$11 per metric ton. Currently, because most billets were purchased from the marketplace, GCL had to incur a reheating cost, which increased operation costs and reduced profit margins. However, an investment of \$6.5 million for a company with a net income of \$0.23–0.62 million seemed daunting (see Exhibits 4 and 5). To pursue this first option, GCL would have to take out a loan at an interest rate of 9–10 per cent. GCL also had to consider that it was not the only mini-mill interested in this option. Its competitors also had expansion plans, which increased the risk of the investment not yielding the required return for GCL. In addition, with increasing demand for steel, there was a possibility that prices of steel scrap would increase, further leading to reduced margins. If GCL wanted to reap the entire benefit of this project, it would have to set up its own power plant, which would lead to an additional cost of approximately \$7.70 million.

Option 2 was for GCL to integrate backward into casting and billets, as well as set up its own power plant. The total cost would be approximately \$14.2 million (calculated as \$6.5 million for the furnace plus \$7.70 million for the power plant). Although this option would eventually reduce power costs from \$0.10 per unit to \$0.05 per unit, the initial investment was significant (see Exhibit 8). Owning a power plant would also increase use of the existing steel-melting induction furnace, which was currently running at 33 per cent of capacity. This would certainly increase production in the induction furnace threefold.

Option 3 was to first set up only the power plant and then increase the use of the induction furnace from 33 per cent to 99 per cent of capacity. Backward integration could then be done a couple of years later.

As a fourth option, Mohit wondered if he should maintain the status quo and stabilize the production of the new product—the rolls—which had been added recently, as he rationalized:

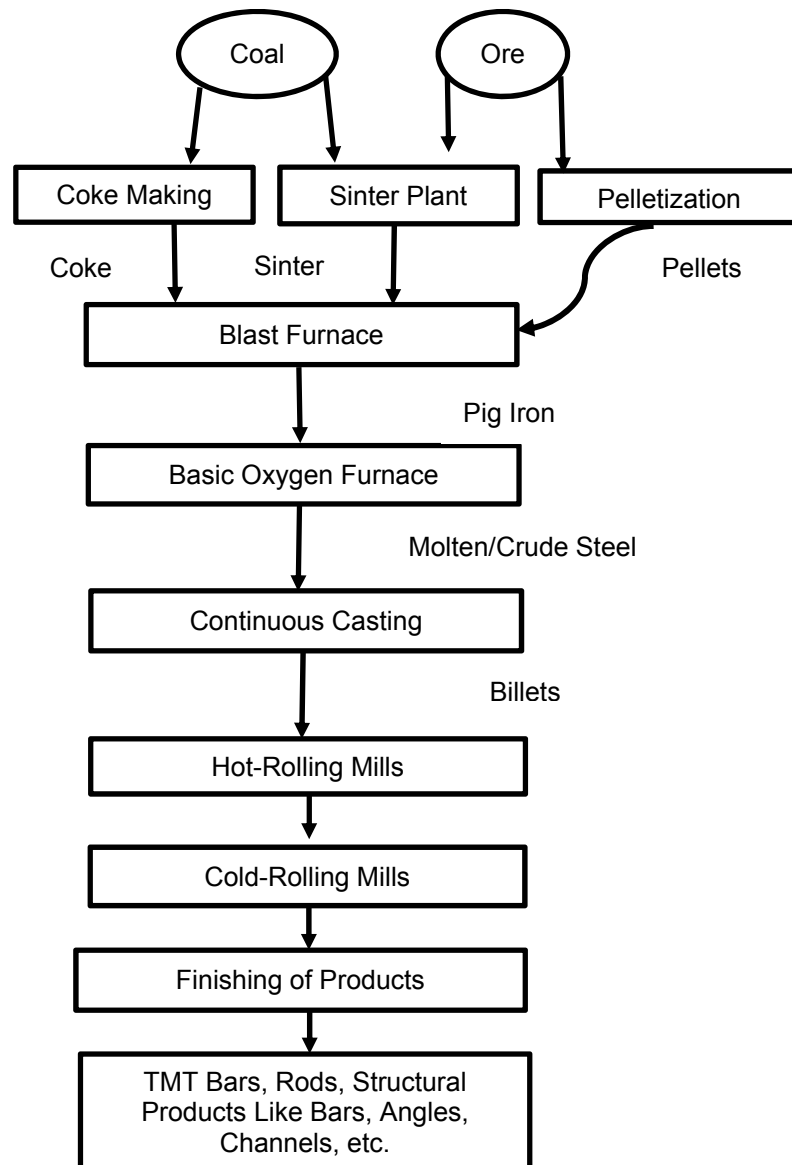
Rolls, as a product, seems promising because five out of the seven rolls producing mills in India are on the verge of bankruptcy, leaving room for other mini-mills to fulfill the unmet demand of rolls. Rolls are a high margin product, at 15–20 per cent margins, but involve a technical process. They have a limited growth potential, as they are used in rolling mills, which makes rolls a very slow-moving product. Given the bankruptcy of the five mills that produced rolls, there is room to grow in this product segment.

Mohit had only one week left to prepare for the board meeting. He wondered which option the company's resources should be directed toward in order to give GCL a competitive edge for the next decade.

**EXHIBIT 1: STEEL PRODUCTION IN INDIA**

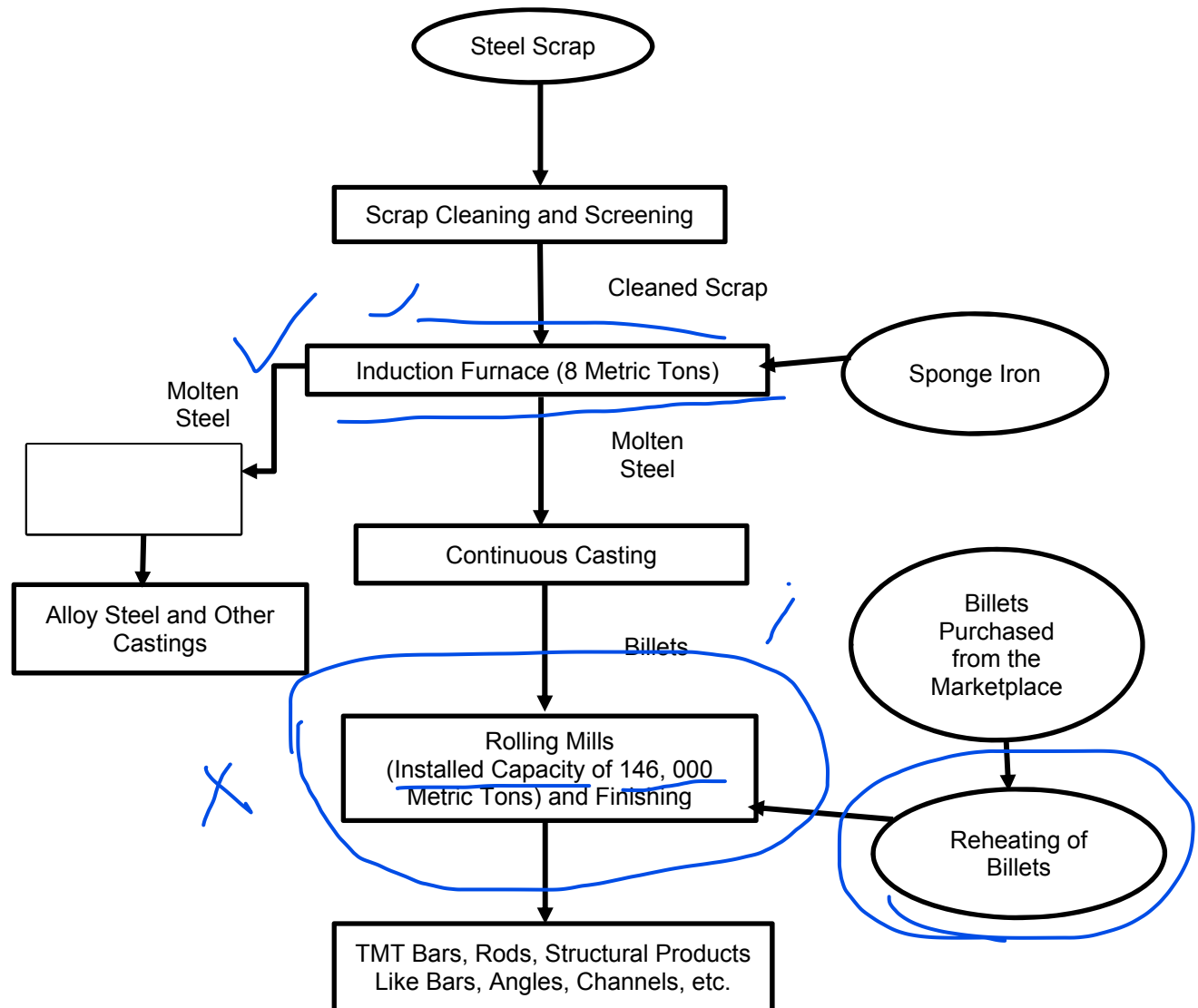
<b>Crude Steel Production in India</b>				<b>Finished Steel Production in India</b>			
<b>Year</b>	<b>Private Sector</b>	<b>Public Sector</b>	<b>Total</b>	<b>Year</b>	<b>Private Sector</b>	<b>Public Sector</b>	<b>Total</b>
2011	53.7	17.0	70.7	2011	55.4	13.3	68.7
2012	57.8	16.5	74.3	2012	63.2	12.5	75.7
2013	61.9	16.5	78.4	2013	68.9	12.8	81.7
2014	64.9	16.8	81.7	2014	74.2	13.4	87.6
2015	71.8	17.2	89.0	2015	79.3	12.8	92.1
2016	71.9	17.9	89.8	2016	78.0	13.0	91.0
2017	78.9	18.5	97.4	2017	96.4	14.9	111.3
April 2017 to February 2018	75.3	17.9	93.2	April 2017 to February 2018	92.5	14.6	107.1

Source: "Steel Manufacturing Companies in India," India Brand Equity Foundation, accessed October 18, 2018, [www.ibef.org/industry/steel/showcase](http://www.ibef.org/industry/steel/showcase).

**EXHIBIT 2A: STEEL MANUFACTURING PROCESS AT INTEGRATED STEEL PLANT**

Note: TMT = thermomechanically treated.  
Source: Company files.

## EXHIBIT 2B: STEEL MANUFACTURING PROCESS AT GRACE CASTINGS LTD.



Note: TMT = thermomechanically treated  
Source: Company files.

**EXHIBIT 3: BALANCE SHEET OF GRACE CASTINGS LTD. (YEAR ENDED MARCH 31)**

<b>Particulars</b>	<b>2017</b>	<b>2016</b>	<b>2015</b>	<b>2014</b>
<b>I. Equity and Liabilities</b>				
<b>(1) Shareholders' Funds</b>				
(a) Share Capital	237,116.9	237,116.9	237,116.9	169,830.8
(b) Reserves and Surplus	1,301,936.6	1,059,630.9	390,503.1	496,295.1
<b>Total Shareholders' Funds</b>	<b>1,539,053.5</b>	<b>1,296,747.8</b>	<b>627,620.0</b>	<b>666,125.9</b>
<b>(2) Non-current Liabilities</b>				
(a) Long-Term Borrowings	1,532,700.8	1,696,646.2	1,535,077.4	1,941,345.7
(b) Deferred Tax Liabilities (Net)	187,322.8	58,906.8	-	-
(c) Other Long-Term Liability	801,771.1	1,298,605.2	2,319,671.4	-
<b>Total Non-current Liabilities</b>	<b>2,521,794.7</b>	<b>3,054,158.2</b>	<b>3,854,748.8</b>	<b>1,941,345.7</b>
<b>(3) Current Liabilities</b>				
(a) Short-Term Borrowings	545,111.1	422,426.3	717,817.1	342,895.8
(b) Trade Payables	834,770.2	547,427.6	1,047,954.6	593,493.8
(c) Other Current Liabilities	190,481.8	177,053.4	128,389.8	30,834.3
(d) Short-Term Provisions	73,824.0	121,514.4	8,628.0	6,904.8
<b>Total Current Liabilities</b>	<b>1,644,187.1</b>	<b>1,268,421.7</b>	<b>1,902,789.4</b>	<b>974,128.8</b>
<b>Total Equity and Liabilities</b>	<b>5,705,035.3</b>	<b>5,619,327.8</b>	<b>6,385,158.2</b>	<b>3,581,600.4</b>
<b>II. Assets</b>				
<b>(1) Non-current Assets</b>				
(a) Fixed Assets				
Tangible Assets	3,207,311.8	3,429,664.6	3,879,197.0	1,482,994.2
Intangible Assets	19,411.7	29,220.1	39,028.4	307.5
Capital Work-in-Progress & Advances	-	92,410.2	2,993.5	23,632.1
(b) Non-current Investments	207.7	207.7	207.7	92.3
(c) Deferred Tax Assets (Net)	-	-	37,496.4	21,967.6
(d) Long-Term Loans and Advances	269,881.1	293,548.9	272,972.0	184,986.3
<b>Total Non-current Assets</b>	<b>3,496,812.3</b>	<b>3,845,051.5</b>	<b>4,231,895.0</b>	<b>1,713,980.0</b>
<b>(2) Current Assets</b>				
(a) Current Investments				
(b) Inventories	994,850.2	924,438.5	844,859.4	1,065,367.3
(c) Trade Receivables	877,400.8	612,262.9	1,145,924.1	669,226.3
(d) Cash and Cash Equivalents	17,957.9	8,556.6	18,049.3	34,888.5
(e) Short-Term Loans and Advances	306,138.6	213,211.7	108,407.2	95,135.5
(f) Other Current Assets	11,875.6	15,806.6	36,023.3	3,002.8
<b>Total Current Assets</b>	<b>2,208,223.0</b>	<b>1,774,276.3</b>	<b>2,153,263.2</b>	<b>1,867,620.4</b>
<b>Total Assets</b>	<b>5,705,035.3</b>	<b>5,619,327.8</b>	<b>6,385,158.2</b>	<b>3,581,600.4</b>

Note: All currency amounts are in US\$.

Source: Company files.

**EXHIBIT 4: PROFIT AND LOSS STATEMENT OF GRACE CASTINGS LTD. (YEAR ENDED MARCH 31)**

Particulars	2017	2016	2015	2014
<b>I. Income</b>				
Revenue from Operations	29,905,778.1	31,615,380.0	28,802,798.0	26,881,556.0
<b>II. Other Income</b>	778,506.5	1,413,350.0	118,524.5	25,417.4
<b>III. Total Revenue</b>	<b>30,684,284.6</b>	<b>33,028,730.0</b>	<b>28,921,322.0</b>	<b>26,906,973.0</b>
<b>IV. Expenses</b>				
(a) Cost of Materials Consumed	25,632,187.0	27,248,431.0	25,126,352.0	23,915,180.0
(b) Changes in Inventories of Finished Goods and WIP	-111,778.7	-131,020.0	234,217.8	-185,939.0
(c) Employee Benefits Expense	261,170.0	226,443.7	183,329.4	163,325.6
(d) Finance Costs	127,696.3	206,985.6	183,328.2	198,396.5
(e) Depreciation	587,394.7	669,283.7	388,824.6	220,938.4
(f) Other Expenses (Mainly Excise Duty)	3,816,893.6	4,043,075.0	3,215,916.0	2,953,910.0
<b>V. Total Expenses</b>	<b>30,313,563.1</b>	<b>32,263,199.0</b>	<b>29,331,968.2</b>	<b>27,265,812.0</b>
<b>VI. Profit before Exceptional and Extraordinary Items and Tax</b>	370,721.5	765,531.0	-410,646.0	-358,839.0
Add: Exceptional items				
<b>VII. Profit before Extraordinary Items and Tax</b>	370,721.5	765,531.0	-410,646.0	-358,839.0
<b>VIII. Extraordinary Items</b>				
<b>IX. Profit before Tax</b>	<b>370,721.5</b>	<b>765,531.0</b>	<b>-410,646.0</b>	<b>-358,839.0</b>
<b>X. Tax Expenses from Continuing Operations</b>	0	0	0	0
(a) Current Tax	75,585.9	123,517.6		
(b) Short (Excess) Provision of PY			138.7	
Less: MAT Credit Entitlement	75,585.9			
Net Current Tax		123,517.6	138.7	
(c) Deferred Tax	128,415.9	96,403.1	-15,772.8	-119,059.0
<b>XI. Profit (Loss) for the Period (Profit after Tax)</b>	<b>242,305.6</b>	<b>669,127.8</b>	<b>-395,012.0</b>	<b>-239,779.0</b>
<b>XII. Earnings per Equity Share</b>				
<b>(1) Basic and Diluted</b>	1.57	4.34	-2.56	-2.17

Note: All currency amounts are in US\$; WIP = work-in-progress; PY = previous year; MAT = minimum alternate tax.  
Source: Company files.

**EXHIBIT 5A: REVENUE FROM DIFFERENT PRODUCTS AS A PERCENTAGE OF TOTAL SALES  
(YEAR ENDED MARCH 31)**

	<b>2017</b>	<b>2016</b>
<b>Products and Services</b>	<b>%</b>	<b>%</b>
Steel Scrap	0.28	0.48
Sponge Iron	0.17	0.32
Alloys Steel Casting (Foundry)	1.42	0.98
Angle And Flat Bar (Structural Bar)	7.00	7.97
Channel (Structural Bar)	27.71	24.00
Round (Structural Bar)	12.21	8.50
Square Bar (Structural Bar)	0.85	0.50
Mild Steel Billet	0.00	0.00
Mild Steel TMT Bar	47.20	54.00
Mild Steel TMT Round Bar	1.02	1.25
Loading and Freight Charges	1.17	1.00
Revenue from Wind Power Generation	1.00	1.00
<b>Total Revenue or Sales from Income Statement</b>	<b>100.00</b>	<b>100.00</b>

Note: In August 2018, the maximum retail price of structural bar and thermomechanically-treated (TMT) products was US\$600 + 18% goods and services tax (GST) per metric ton.

Source: Company files.

**EXHIBIT 5B: AVERAGE RATE OF FINISHED PRODUCTS AND STEEL SCRAP  
(YEAR ENDED MARCH 31)**

	<b>2017</b>	<b>2016</b>	<b>2015</b>
Structure (Structural Bar-Related Products)	403.76	521.76	521.76
TMT	401.04	528.83	528.83
Foundry (Alloy Steel)	932.98	1,024.82	1,024.82
Steel Scrap	257.77	376.47	376.47

Note: All currency amounts are in US\$ per metric ton; TMT = thermomechanically treated.

Source: Company files.

**EXHIBIT 6: COMPETITORS IN THE GUJARAT REGION**

<b>Company Name</b>	<b>Installed Capacity (in Metric Tons) in Rolling Mill</b>
Electrotherm India	600,000
Gallantt Metal Ltd.	422,400
Mono Steel India Ltd.	200,000
ASR Multimetals Private Ltd.	150,000
Aashiana Rolling Mills Ltd.	220,000
Grace Castings Ltd.	146,000

Note: All competitors have billet-making capacity, but none of them have foundry-casting division; all use a continuous-casting machine, except Aashiana; and all are in the Kutch region, except Aashiana in Ahmedabad.

Source: "Steel Division: Manufacturing Facility," Electrotherm, accessed October 18, 2018, [www.electrotherm.com/steel-pipes.aspx](http://www.electrotherm.com/steel-pipes.aspx); "Company Overview," Gallantt Metal Limited, accessed October 18, 2018, [www.gallantt.com/HTML/gallantt-metal-limited.html](http://www.gallantt.com/HTML/gallantt-metal-limited.html); "Company Profile," ASR Multimetals Private Limited, accessed October 18, 2018, [www.asrmultimetals.com/coprofile.php](http://www.asrmultimetals.com/coprofile.php); "Company Description," Aashiana Rolling Mills Ltd., accessed October 18, 2018, [www.emis.com/php/company-profile/IN/Aashiana\\_Rolling\\_Mills\\_Ltd\\_en\\_3735773.html](http://www.emis.com/php/company-profile/IN/Aashiana_Rolling_Mills_Ltd_en_3735773.html).



**EXHIBIT 7: COST OF RAW MATERIALS AS A PERCENTAGE OF TOTAL COST OF RAW MATERIALS CONSUMED (YEAR ENDED MARCH 31)**

Raw Material	2017	2016
	%	%
Mild Steel Billets (Structure Mill)	37	30
Mild Steel Scrap and Ferrous Alloys (Furnace)	9	10
Mild Steel Scrap and Ferrous Alloys (Foundry)	1	0
Mild Steel Billets (TMT Mill)	53	60
<b>Total Cost of Raw Materials Consumed</b>	<b>100</b>	<b>100</b>

Note: In August 2018, the maximum retail price of billets was US\$554 + 18% goods and services tax (GST) per metric ton; the maximum retail price of steel scrap was US\$400 + 18% GST per metric ton; TMT = thermomechanically treated.  
Source: Company files.

**EXHIBIT 8: IMPORTANT EXPENSES AS A PERCENTAGE OF TOTAL EXPENSES (YEAR ENDED MARCH 31)**

Expenses (as a Percentage of Total Expenses in the Income Statement)	2017	2016
Employee Benefits Expenses	0.9	0.7
Power and Fuel Consumed	4.8	4.5
Labour Charges (i.e., Mainly Contract Labour)	2.1	1.8
Stores Consumed (e.g., Grease, Ball Bearings, Nuts, etc.)	3.7	3.6
<b>Total Expenses (as Shown in the Income Statement)</b>	<b>100</b>	<b>100</b>

Note: Employee benefits expenses include directors' remuneration, provident fund expenses, and wages and salaries of employees. They do not include contract labour charges; these labour charges are included under finance costs in the income statement.  
Source: Company files.