

PRE FEASIBILITY PROJECT REPORT

for

360 TPD Secondary Metallurgical Processing (Induction Furnace for the production of MS Billet)



SUBMITTED BY

Fortune Metals Limited

Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib
(Punjab)

SUMMARY

- 1.0 Fortune Metals Ltd. is a company registered under Indian Companies Act, 1956 having its factory premises at Talwara Road, Village Talwara, Mandi Gobindgarh, Tehsil Amloh, District Fatehgarh Sahib, Punjab.
- 2.0 The company is planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab.
- 3.0 The capital investment on the project would be around 54.30 Crores. The project would be implemented within 2 years after the receipt of the EC from MoEF. Around 50 persons per shift would work in the project. The project would operate for 330 days in a year.
- 4.0 Fatehgarh Sahib District is in the northwestern region of India and is a part of the Indo-Gangetic alluvial plains. The district lies between 30.644374° to 30.645334° north latitude and 76.389029° to 76.392687° east longitude. It has an average elevation of 270 meters (885 ft). Fatehgarh Sahib's climate corresponds to semi-arid with high variation between summer and winter temperatures. Average annual rainfall is in a range of 680 mm. The weather is generally dry but is very humid from mid May to the end of August. Rainfall is primarily from the southwest due to monsoon weather and is concentrated in the period July to mid September. The surrounding districts are Ludhiana and Roopnagar in north direction, Mohali District in the east and Patiala in the south. Fatehgarh Sahib is approx. 30 km away from Chandigarh (Union territory). Total Geographical area of the district is 114779 hectares. Out of this, the net cultivated area is 102028 hectares. Forest occupies 2022 hectares of the total geographical area of the district. Area not available for cultivation (Barren Land) of the District is 241 hectares. There are 454 villages in the district.
- 5.0 The promoters of the project are already having 4.7 acres of land at Talwara Road, Village Talwara, Mandi Gobindgarh, Tehsil Amloh, District Fatehgarh Sahib, Punjab. The benefits of the location are as below;
 - Required raw material is abundantly available in the area.
 - Well connected by road/rail network
 - Manpower available for industrial purposes

- Huge market for the product
 - Easy availability of power
 - Saving in the energy for the production of TMT bars by using hot billet directly for rolling
- 6.0 The induction furnace process will have process steps namely - Furnace loading, Heating, Slag removal, Alloying, Moulding, Cooling.
- 7.0 The industry would install 66 KVA sub station for the power required for the project. Power requirements would be around 25 MW. Power would be made available from PSPCL.
8. The industry would install 400 m³/day cooling towers, one D G set of 500 KVA capacity as a part of the utilities.
9. The industry will use scrap iron @ 375 MT/day as basic raw material. Besides this, alloying metals @ 5 MT/day would be used for the production of MS Billets @ 360 MT/day.
10. Fresh water requirements for the industry would be around 75 m³/day This includes water requirements for cooling towers, APCD and domestic requirements. Only domestic effluent @ 4.5 m³/day would be generated which after treatment in septic tank would be used on land for irrigation purposes.
11. The industry would install wet scrubbers as APCD for the control of emissions from the induction furnaces.

CHAPTER – 1

INTRODUCTION

Fortune Metals Limited was incorporated in November, 2004 by Mr. B.D. Bansal and his family. The Company set-up its maiden steel plant at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib (Punjab) manufacturing Thermo Mechanically Treated (TMT) Bars using state of the art technology. The plant is located on land area measuring 4.7 acres wherein TMT Bars of various thicknesses ranging from 8 mm to 40 mm are manufactured. The TMT bars are primarily used in real estate construction, industrial complexes and infrastructure development.

Within no time, the Company was successful in establishing its own brand "FORTUNE" for widest range of use as construction steel. With the only motive of achieving highest standards of quality, FML got ISI, ISO 9001:2008, ISO 14001:2004, ISO 18001:2007 and Evcon Turbo Technology Certification for its plant and product. FML's commitment towards quality can be judged from the fact that it's the only Steel Rolling Mill in this part of the Country to be accredited from National Accreditation Board for Testing and Calibration Laboratories (NABL).

The Company manufacture High Strength 'Quenched & Self Tempered' rebars (QST, called TMT in India). The technology it employ for the TMT (quenching box) is certified by EVCON TECHNOLOGIES and its range of sizes vary from 8mm to 40mm (8, 10, 12, 16, 20, 25, 28, 32, 36, and 40) in grades of Fe 415, 500 and 500D.

FORTUNE is the only producer in the Punjab manufacturing TMT bars of size 36 & 40 in Fe 500 and 500D grade which makes it an exception in the TMT bar Industry in Punjab. Fortune TMT BARS Fe 500 is a special grade of TMT bars produced under specific process conditions resulting in increased tensile strength as compared to Fe 415 grade TMT bars. Fe 500 bars are ideal for applications in heavy load RCC structures like flyovers, dams, bridges and other critical structures where high yield load (design load) is required without compromising on the ductility.

In view of state of the art plant, experience of promoters and established dealing with various Infrastructure and Construction companies through group company (M/s Fortune Metals Ltd), the company's plant has already been approved from renowned infrastructure and Corporates implementing various big projects including DLF, C&C Constructions, Hindustan Constructions Limited, Patel Engineers Ltd., Parsvnath Developers, ATS Builders, CHD Developers among others alongwith starting regular supplies to these players.

FML has an established network of more than 250 dealers across the State of Punjab, covering all cities and major villages of the State and has a full-fledged market team catering to corporate customers from adjoining states of Himachal, J&K, Haryana, U.P. and Uttrakhand.

The Company has commissioned its 2nd Plant at Raipur manufacturing Steel pipes of various sizes and commercial production of GI Pipes is likely to be started in April, this year.

THE PROMOTERS AND DIRECTORS

The promoters are well experienced in iron & steel industry for more than 3 decades along with successful track record of growth and profitability. They are having well established marketing network across seven states along with existing annual sales of more than Rs. 500 crore in iron & steel (Mainly TMT Steel). The affairs of the Company are being Managed by the Board of Directors as under:

NAME	AGE	QUALIFICATION	EXPERIENCE
Sh. Bhagwan Dass Bansal	58 Years	Graduate	38 Years
Sh. Deep Bansal	34 Years	B.Com	14 Years
Sh. Ashwani Kumar	40 Years	B.Com	19 Years
Sh. Kuldeep Bansal	39 Years	Chartered Accountant	17 Years

Brief Background and details of promoters are placed below:-

Sh. B.D. Bansal, is in the business of Iron and Steel for more than three decades. Sh. B.D. Bansal belongs to a family engaged in the business of Iron, Steel, Hardware & Machinery Parts since 1925. After completing his graduation in 1976, Sh. Bansal promoted M/s Ganesh Trading Company (GTC) with financial assistance from State Bank of Patiala. Till 2009, GTC was engaged in the trading of automobile Spare Parts as a distributor for the State of Punjab for around 7 reputed spare parts manufacturers (such as FAG Bearings, Kirloskar Engine, Amar Raja Batteries etc). GTC is having established sales network of sub dealers across Punjab in almost all the main cities of Punjab besides various towns/mandis. With the increasing involvement of promoters in Fortune Metals Ltd and thereafter in Fortune Metaliks Ltd, operations of GTC have been scaled down and now it is only maintain current account.

Sh. Deep Bansal s/o Sh. B.D. Bansal, after completing graduation, joined business in 2000 by promoting Ganesh Mercantile Company (GMC), a consignment agent/ bulk trader of pig iron and scrap.

Mr. Deep Bansal has remained instrumental in establishing the first TMT plant of Fortune Metals Ltd at Mandi Gobindgarh and is looking after its production and corporate sales along with that of new pipe plant of the Company at Raipur Chhattisgarh. TMT plant of Fortune Metaliks Ltd at Raipur had also been established by him alongwith Mr. Ashwani Kumar. Mr. Deep Bansal is looking after corporate sales and general administration of the Group.

Sh. Ashwani Kumar is a Commerce graduate with around 17 years of industrial experience. He is a close relative of Sh. B.D. Bansal. He has been shifted to Raipur in 2008 to initiate process of all approvals for establishing another TMT plant at Raipur in a group company Fortune Metaliks Limited. He is looking after the production and operations of that Plant at Raipur.

Sh. Kuldeep Bansal is a practicing Chartered Accountant having specialization in banking and financial matters and has wide knowledge of different types of Industries.

Based on the past experience of the directors of the company, the company is now planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab.

The proposed MS billet project shall be catering to the in-house requirements of the company for the production of TMT bars. The company is already producing TMT bars @ 280 MT/day by purchasing MS billets from the market. Indigenous production of MS billet would nullify the requirements of purchase requirements of MS billet from the market. Further, the project would be save lot of energy as the heating requirements for the rolling of TMT Bars would not be required. The hot MS billet from the induction furnace would be directly rolled for the production of TMT Bars. The implementation of the project shall be within 1 year from the date of receipt of Environmental Clearance from MoEF.

Project Description	Existing Capacity	Proposed Capacity	Additional
Expansion of existing rolling mills by adding 360 TPD Induction furnaces for the production of MS Billet	280 TPD of Rolled steel (TMT Bars)	360 TPD of Induction furnaces for the production of MS Billet	

CHAPTER – 2

PROJECT LOCATION

Fortune Metals Ltd. are planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab. The output of the induction furnaces will satisfy the input requirements of the rerolling mill. The company already has adequate land at the said location for the proposed expansion project.

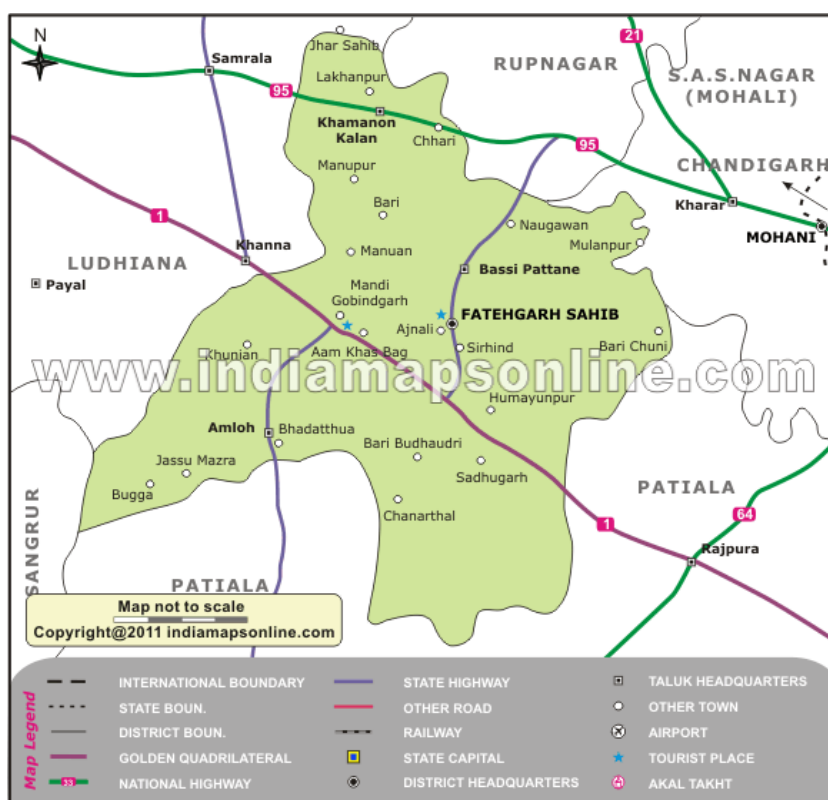
2.1 About the State : Punjab is a state in the northwest of the Republic of India, forming part of the larger Punjab region. The state is bordered by the Indian states of Himachal Pradesh to the east, Haryana to the south and southeast, Rajasthan to the southwest, and the Pakistani province of Punjab to the west. To the north it is bounded by the Indian state of Jammu and Kashmir. The state capital is located in Chandigarh, a Union Territory and also the capital of the neighbouring state of Haryana.

Agriculture is the largest industry in Punjab. It is the largest single producer of wheat in India. Other major industries include the manufacturing of scientific instruments, agricultural goods, electrical goods, financial services, textiles, machine tools, sewing machines, sports goods, starch, tourism, fertilisers, bicycles, garments, and the processing of pine oil and sugar. Punjab also has the largest number of steel rolling mill plants in India, which are located in Steel Town Mandi Gobindgarh, District Fatehgarh Sahib.



2.2 ABOUT THE DISTRICT

Fatehgarh Sahib District is in the northwestern region of India and is a part of the Indo-Gangetic alluvial plains. The district lies between 30.644374° to 30.645334° north latitude and 76.389029° to 76.392687° east longitude. It has an average elevation of 270 meters (885 ft). Fatehgarh Sahib's climate corresponds to semi-arid with high variation between summer and winter temperatures. Average annual rainfall is in a range of 680 mm. The weather is generally dry but is very humid from mid May to the end of August. Rainfall is primarily from the south-west due to monsoon weather and is concentrated in the period July to mid September. The surrounding districts are Ludhiana and Roopnagar in north direction, Mohali District in the east and Patiala in the south. Fatehgarh Sahib is approx. 30 km away from Chandigarh (Union territory). Total Geographical area of the district is 114779 hectares. Out of this, the net cultivated area is 102028 hectares. Forest occupies 2022 hectares of the total geographical area of the district. Area not available for cultivation (Barren Land) of the District is 241 hectares. There are 454 villages in the district.



- 2.2.1 Topography :** The topography of the district is even. It is mostly a plain of alluvial type. It also has loam to heavy loam and sand to sandy loam soils in certain parts of the district. Soil is rich in nutrients and suitable for crops like wheat, Paddy, Oil seeds, Sugar Cane, Potato and vegetables etc. The district lies in the South-eastern region of the State and falls under Patiala Division.
- 2.2.2 Physiographics:** The district has 4 sub-divisions, 5 Blocks, 5 Panchayat Samitis, 431 Gram Panchayats and 444 inhabited villages.
- 2.2.3 Rainfall and Climate :** The climate of the district is of extreme type. It is dry except during monsoon. There are large varieties of day and night temperature. The average annual rainfall of the district is 680 mm. The variation in the rainfall from year to year is not large. The monsoon starts late in June and generally lasts up to September. 90% of the rainfall is received from July to September. August is the month with more number of rainy days.
- 2.2.4 Temperature and Humidity :** There is no meteorological observatory in the district. Therefore records of the Patiala observatory in the neighboring Patiala District may be taken as representative of the climatic conditions in the district in general. The summer is intensely hot and on individual days the maximum temperature goes upto 47 °C. The scorching dust laden winds which often blow during the summer make the weather very trying. With the onset of the monsoon by about the beginning of July, there is an appreciable drop in the day temperatures.. The nights during the monsoon season are as warm as during the latter part of the summer. After the withdrawal of the monsoon by about the mid-September, there is a drop in the temperatures, the drop in night temperatures being more rapid. In winter cold waves affect the district in the wake of passing western disturbances and the minimum temperature drops occasionally to about the freezing point. Mornings are comparatively more humid than the afternoons. The humidity is high during the monsoon season. Humidity decrease thereafter and by summer which is the driest part of the year, the relative humidity in the afternoons becomes less than 40%.
- 2.2.5 Soil and Land Classification:** Fatehgarh Sahib District forms part of the Indo-Gangetic Alluvial plain consisting of Quaternary sediments. These sediments can be broadly classified into three sub divisions viz. Older Alluvium, formed by the depositional processes of older streams, Newer Alluvium, formed by the present day streams and Aeolian Deposits in the form of sand dunes and sand sheets representing the depositional feature of the wind action.

The Older Alluvium is extensive whereas the Newer Alluvium and the Aeolian Deposits have limited distribution. Although a number of remnants of sand dunes are present throughout the area, these are more conspicuous towards the western and southern parts of the district. The Older Alluvium comprises, polycyclic, interbanded clay, sandy clay, silt and sand with admixture of *kankar*. On the surface, it is chiefly represented by massive, pale reddish brown clayey silt to fine sandy silt with disseminated *kankar*.

2.2.6 Industries : Fatehgarh Sahib district has been a great contributor to the industrial scenario of the country with Mandi Gobindgarh also known as Steel Town of India in it. As of now 204 acre of land has been acquired in Mandi Gobindgarh for Industrial Focal Point in which a total no. of 389 plots have been developed out of which 350 has already been allotted. The district has four large scale units as on 31.03.2011. Four Mega Projects, having investment of more than 100 crore, have been sanctioned pertaining to sugar, concast billets, rolling mills, steel plant and rail-coach etc. The major investment in large sector is in agro & food sector for which bulk purchases are made from local suppliers. The more investment in large sector shall provide more opportunities for vendorisation in Medium Scale Enterprise sector. As per District Industries Centre (DIC), the district has 12 large and medium units and 3125 micro & small scale and artisan units registered with DIC as on 31.03.2011.

FATEHGARH SAHIB DISTRICT AT A GLANCE

S. No.	Parameter	
1.	Total Geographical Area of the district	114479 Hectare.
2.	Area under Forests	2022 Hectare (1.76 %)
3.	Area under agriculture	102028 Hectare
4.	Total population of the district	6,00,163
5.	Sex ratio (female : male)	871 : 1000
6.	Literacy Ratio	79.35 %
7.	Population Density	509/sq. km.
8.	Administrative setup	
	Number of Sub-Division	4
	Number of Municipality	4
	Number of Blocks	5
	Number of Police Station	9
	Number of Gram Panchayat	431
	Total Number of villages	454
	No. of Inhabited Villages	444
9.	Crops production (MMT/annum)	
	Paddy	361
	Wheat	369
	Sugarcane	14
	Rapeseed/Mustard	1.0

2.3 SELECTION OF SITE

The basic criteria for the selection of site for the induction furnace project are as below;

- Raw material availability
- Raw material cost
- Transportation cost
- Accessibility to markets within and nearby states
- Availability of land
- Connectivity of road/rail network.
- Market for final Product

Advantages of the location at Talwara Road, Mandi Gobindgarh, Dist. Fatehgarh Sahib (Punjab) for the expansion of existing 280 TPD rolling mills project by adding 360 TPD induction furnace project are as below.

The promoters of the project are already having 4.7 acres of land at Talwara Road, Mandi Gobindgarh, Dist. Fatehgarh Sahib (Punjab). The land area is sufficient for the existing as well as proposed expansion project. The promoters of the project are complying all the conditions of Consent to Operate issued by Punjab Pollution Control Board. Besides this, the other benefits of the location are as below;

- Required raw material is abundantly available in the area.
- Well connected by road/rail network
- Manpower available for industrial purposes
- Huge market for the product
- Easy availability of power
- Saving in the energy for the production of TMT bars by using hot billet directly for rolling

CHAPTER – 3

PROCESS DESCRIPTION

3.0 Fortune Metals Ltd. are planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab. The output of the induction furnaces will satisfy the input requirements of the rerolling mill.

The complete power requirements for the Induction Furnaces have been estimated to be about 25000 kW (25 MW). Land measuring about 4.7 acres already exists with the industrial unit.

The industry will operate perennially throughout the year, with 330 working days in a year. Overall, the industry plans to setup 3 set of Induction Furnaces of 15 Tones per heat capacity.

1.1 INDUCTION FURNACE PROCESS

A coreless induction furnace operates on a similar principle to a transformer, i.e., the induction coil acts as primary coil, having many turns, and the charge acts as a secondary coil, with only as single turn. When an alternating current is applied to the induction (primary) coil of a furnace, a significantly larger current is induced in the metallic charge materials. The resistance to the passage of induced current within the furnace charge causes the charge to heat up until it eventually melts. Once the metal is molten, the magnetic field generated creates a stirring action in the bath, producing both homogenization of the chemical composition and assimilation of any bath additions. Electrical energy at 11 kV (3-phase) is converted to 1250 V, through a transformer. It is further subjected to a 3-phase rectifier and inverter system which converts the power to single phase, high voltage – high frequency. The frequency converter amplifies the frequency from 50 Hz to 500 Hz. This power is applied to furnace coil to generate heat.

The electrical circuit and equipment of the induction furnace needs to be cooled with water. The cooling water is continuously recirculated from the storage tank. Any water lost due to evaporation, etc., is made up by adding fresh water.

The inputs, for the overall manufacturing process, will be;

- a) MS scrap, sponge iron
- b) Water (for cooling)
- c) Ferro-alloys – manganese, carbon, silica (as additives for alloying)
- d) Electrical power (only source of energy).

The specific equipment requirement comprises of;

- a) Induction furnaces of 15 MT loading capacity – three sets (6 in number – including furnace crucible, power pack, capacitors, hydraulic power pack, and other accessories)
- b) Electrical equipment/accessories – transformer, vacuum circuit breaker, etc.
- c) EOT cranes
- d) Cooling tower
- e) Cast iron moulds

Figure 1 shows the schematic flow diagram of the process involving induction furnace.

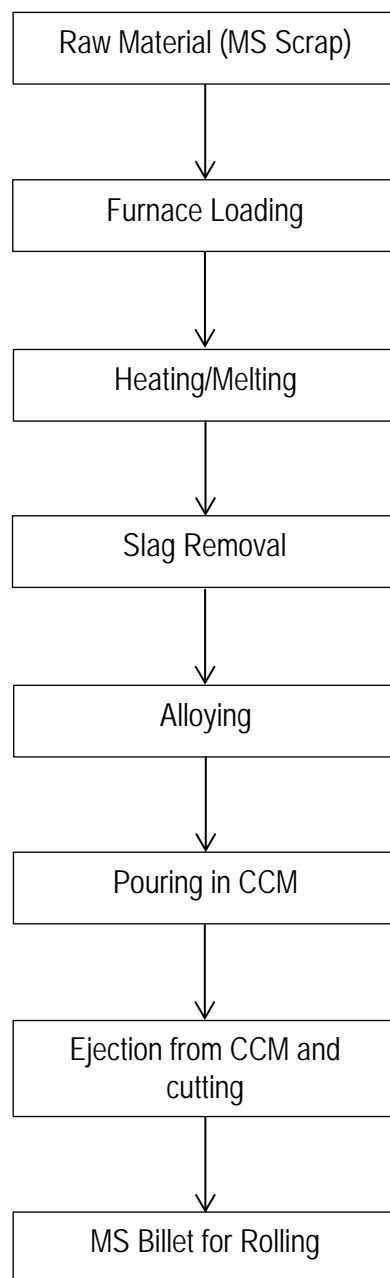


Figure 1 : Process flow-diagram for induction furnace

Furnace loading – The raw material (steel scrap crushed into suitable sizes which can be accommodated in the furnace) is loaded into the furnace crucible, to the brim, with the furnace set on.

Heating – The loaded pieces are heated to melting (temperature of about 1600°C) and steel scrap is loaded incrementally till the furnace crucible is completely filled (up to its rated capacity) with molten volume. The initial melting (melting of first stage loading) may take about 30 – 35 minutes, whereas, the time taken to complete the melting process may range from 50-70 minutes.

Slag removal – The impurities present in the molten content, being light, gets collected as slag at the top and requires regular removal from the top of the molten volume.

Alloying – Calculated quantities of carbon, manganese, silica, etc., are added to the molten metal, for alloying, to obtain the steel of desired grade/characteristics.

Moulding – The contents of the furnace are emptied by tilting it (by raising bottom of the furnace crucible against the outer edge of the furnace platform) and molten metal is poured into interconnected continuous casting moulds.

Cooling – The filled mould are allowed to cool at a particular temperature and after desired cooling the billet from the mould is cut to the size and sent for rolling.

3.4 Utilities

3.4.1 Electrical system

The induction plant power requirement will be about 25.0 MW. The power would be supplied by the PSPCL to the industry through their grid.

3.4.2 Standby electrical generator

The industry is having an existing generator of 125 KVA capacity. During the expansion process, an additional generator of 500 KVA capacity would be installed.

3.4.3 Cooling water – 400 m³/hour

The maximum induction furnace cooling water recirculation requirement will be about 400 m³/hour. Evaporation loss will be about 0.50 %. There will be no cooling tower blowdown from the process. Whole of the quantity lost will be made-up by adding fresh water/treated condensate from the process.

CHAPTER – 4

RAW MATERIALS

4.0 Fortune Metals Ltd. are planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab. The plant would be operational for 330 days in a year.

4.1 Raw Materials Requirements

The induction furnace will use scrap iron as basic raw material. Besides this, alloys such as Silicon, Silicon Manganese and Aluminum would be used for the production of Billets. Consumption of raw materials for the induction furnace plant is given below;

S. No.	Item	Unit	Total
1.	MS Scrap	MT	375
2.	Alloys such as Silicon, Silicon Manganese and Aluminum	MT	5

CHAPTER – 5

PRODUCTION

5.0 Fortune Metals Ltd. are planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab. The plant would be operational for 330 days in a year.

5.1 Production

Daily production of Billets from the induction furnace plant is given below;

S. No.	Item	Unit	Total
1.	MS Billets	MT	360
2.	By-products		
	Iron Slag	MT	10

CHAPTER – 6

ENVIRONMENTAL MANAGEMENT AND POLLUTION CONTROL

6.0 Fortune Metals Ltd. are planning to expand its existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab. The output of the induction furnaces will satisfy the input requirements of the rolling mill.

During the operation of the induction furnace unit, environmental pollution would be generated from different sources. The industry would adopt the latest technologies for the abatement of pollution generated by the production process.

6.1 WATER POLLUTION

6.1.1 Fresh water consumption

The industrial unit will use fresh water for the following purposes;

- Cooling of induction furnace electrical equipment
- Domestic consumption

The industry would install cooling towers @ 400 m³/day. Water would be required for the makeup of the evaporation losses in the cooling towers. On an average evaporation losses would be around 0.5 % of total water recirculation. The industry would require around 48 m³/day of water for cooling tower makeup. There will not be any cooling tower blowdown.

To support drinking water and sanitary requirements of the workers, industry will need a maximum of 5 m³/day of fresh water, which will contribute to less than 4.5 m³/day of domestic sewage. The industry will construct septic tank for the treatment of domestic sewage before its use for plantation purposes.

The industry will require around 20 m³/day of water for scrubbing. There will not be any effluent generation from the scrubbers.

6.2 Air pollution

6.2.1 Induction furnace

There is no combustion related polluted gaseous emissions as no fuel is being used in the process. The air pollution will be the result of the heating and melting process in the induction furnace. The gaseous emissions coming out of the mouth of the furnace crucible will be polluted and need cleaning before discharging it into the atmosphere.

The gaseous emissions will comprise of vapours/fumes, suspended particles, and some gases. The vapours are, primarily, of metals (chiefly iron) and metal oxides, oil/grease (in very low quantities). Dust and metal particles also contribute to the suspended particulates. Gaseous pollutants are, mainly, carbon di-oxide, carbon mono-oxide, and nitrogen oxides, though in very low amounts. The vapours, on condensation, add to the strength of suspended particulates.

The characteristics of the gaseous emissions do not remain constant because of regularly changing conditions of the contents of the furnace crucible throughout the process and batch nature of operations. Typically, on the initiation of melting of a loaded bunch of scrap (bunches are fed regularly into the furnace), there is a surge of polluted emissions which slowly dies down. Thus, the emissions are produced in surges at regular interval.

The critical suspended particulate matter (SPM) concentration, in the condition that the gaseous emissions are completely removed and there is no further dilution effect (from the surrounding air), can be estimated to be about 1200-1500 mg/Nm³. Most of the particulates (about 75%) are expected to have size in the range of 1-5 microns. The emissions (after dilution) will have temperature of about 150-200°C.

In case of an induction furnace, the criticality of the pollution problem is borne out of the very nature of the operational practices which make the capture of the emissions (coming out of the furnace) difficult. It requires an unconventional emission collection system that goes well with the operations.

As per the applicable statutory norms, the SPM level in the gas emission, at discharge point, shall not exceed 150 mg/Nm³. Additionally, the stack height requirements for discharge of process emissions is also to be complied with.

6.2.2 Air Pollution Control System

The contaminated emissions, from the mouth of the furnace crucible, will be collected through a hood and will be made to flow into the air pollution control device (APCD), which will clean it, of the pollution load, to desired levels. The cleaned gas will flow into the stack through a blower. The blower is meant to provide the gas flow with necessary pressure and velocity requirements. The stack will discharge the cleaned gas at desirable elevation.

The collection hood is meant to convey the emissions into the hood opening, from where it is carried to the APCD. The emissions capture mechanism, for an induction furnace has to lay special emphasis on the following;

- a) Emissions, from the furnace crucible, are released in puffs
- b) The emissions are blown horizontally by high power axial fans in an attempt to ward of the flare, coming out of the furnace crucible, away from the work area
- c) Once out of the furnace, the emissions cool down very quickly
- d) The vertical natural lift, quick cooling, horizontal blowing, etc., results in emission acquiring shape of an inverted bell (flaring as it goes up), obliquely inclined towards the pit (where the moulds are kept) area
- e) The emissions are likely to contain some incompletely oxidised volatile matter which need excess air for complete oxidation (before temperature of the emissions drop significantly) to reduce pollution levels
- f) The emission capture system should not interfere with the normal production operations

The hood, to be provided, will be a specially designed oblique hood. It will allow for undisturbed capture of emissions without interfering in the regular operations. The proposed hood tries to address the above mentioned factors to a large extent, due to the following;

- a) The hood profile and placement complements the emission geometry and trajectory, conveniently leading into the duct
- b) The placement of the hood is in such a way that regular production operations are not interfered with and the emission capture is effective all the time
- c) Maintenance of high induced flow and high capture time takes care of puff release of pollutants and blowing of the emissions by axial fans
- d) Adequate opportunity is available for complete oxidation of volatile organics

The scrubber

The proposed APCD will be centrifugal spray scrubber with modified irrigated inlet. In the centrifugal scrubber the performance of a cyclonic separator will be catalysed by irrigated inlet (through rod venturi) and wet scrubbing. Rod venturi comprises of a series of parallel bleeding pipes (water oozing from the pipes) provided vertically across the gas flow near the inlet of the scrubber. High gas velocity at the inlet coupled with irrigated inlet creates pseudo venturi effect with much lower pressure drop (because of lesser degree of turbulence). Wetting increases the size of the particulates. Particulate collection efficiency is improved by increasing the relative velocity between particulates and the gas stream. This is achieved by the centrifugal force of the spinning gas. The higher particle-to-liquid relative velocity also increases particle collection efficiency. The wetted walls prevent re-entrainment of the separated particulates. The water spray also aid in imparting centrifugal motion to the gas stream.

The flue gas will enter tangentially at the bottom of the cyclone cylinder. The water drops, at the rod venturi, will get atomised, partially, by the high velocity gas stream. This helps in transfer of fine particulates into relatively larger droplets.

Inside the scrubber, water will be sprayed by trains of jets (through a vertical spray manifold) spraying water directed outward from the centre. Additionally, the inner periphery of wall of the scrubber will remain wet with a falling water film to affect washout of the particulates (and water droplets) coming in contact with the wall. Some unsprayed portion, at the top, will be provided so that the liquid droplets, containing the collected particles, will have time to reach the walls of the chamber before coming into contact with the gas stream.

The top section of the cylinder will be provided with a gas flow straightening cum mist-eliminating section, across the flow, to limit the water content of the cleaned gaseous emissions. The cleaned gas will flow out from the top. The scrubbed water stream, loaded with removed particulates, will be ejected from the bottom.

The mist eliminator

The mist eliminator will be an impingement type separator, designed for horizontal gas flow. It is composed of sine curve shaped flow counters (with small baffles attached to the surfaces) assembled with phase separating chambers. They are mounted in a frame with a sump and form a separation module.

The profiles split the gas flow into single stream, but liquid drops can not make short radius turn as easily as the gas molecules. Therefore, inertia forces the liquid drops against the wall (of flow counters) where the drops agglomerate and flow by gravity in areas of low gas velocity. As drops contact the profile surface, they are transformed into liquid film, which is pushed along and drained as a film. Drop formation is prevented. The liquid film drains at 90° relative to the gas flow (cross-flow). Since the drops do not have to flow back against the gas flow (counter flow), the liquid draining capacity is greater, the allowable velocities are greater, and the limit drop size is smaller. Because the drag co-efficient is low, higher velocities are permissible without excessive pressure drop. At higher velocity, smaller drops are removed due to the increased inertial force, resulting in greater overall efficiency.

The scrubbing water tank

The scrubbed water removed from the bottom of the scrubber will have high suspended solids which will be allowed to settle in a sedimentation tank. The clean water will be stored in a tank to be recycled back. To maintain the quality of the scrubbing water, a part of it will be regularly drained (wasted). The water quantity lost will be made up by adding fresh water to it. The water will be pumped inside the APCD, for scrubbing, at desired pressure.

The ID fan

The blower (ID fan) –centrifugal flow (axial inlet and tangential outlet) type – generates necessary static gas pressure to compensate for suction pressure requirements; kinetic losses suffered by the gas flow; and inlet and outlet losses.

The stack

The stack will be provided with adequate provisions, such as, a sampling port, ladder, elevated platform, etc., for sampling and monitoring of stack emissions.

2.2.3 DG set

As per the applicable norms, the DG sets will be housed in an acoustic chamber. The combustion emission outlets will be provided with a muffler along with a minimum stack height of 3 m above the height of nearest building.

2.3 Solid waste

Solid waste will include;

- a) Induction furnace slag – 10 MT/day

The above waste has commercial worth and will be sold.

2.4 Hazardous waste

Hazardous waste will include;

- a) used/spent lubricant and transformer oil (Category 5.1 of Schedule – I) – 1000 litre/year

The used oils will be sold to the authorized recyclers.

CHAPTER – 7
PROJECT ESTIMATES

ESTIMATED OVERALL PROJECT INVESTMENT

The estimated cost of project for the expansion of existing 280 TPD TMT bars rolling mills by setting up 360 TPD Induction Furnaces for the production of MS Billet within the existing premises located at Talwara Road, Mandi Gobindgarh, District Fatehgarh Sahib, Punjab would be as below;

S. No.	Particulars	Cost (Rs. In Lakhs)
1.	Civil Works (Sheds & Building)	1000.00
2.	DRI, Scrap & Billet Handling Equipment	300.00
3.	Melting & Casting Equipment	1778.00
4.	Water System	60.00
5.	Fire Fighting	25.00
6.	Electrical Work	200.00
7.	Cost of 66 KVA Substation	250.00
8.	Security Deposit	300.00
9.	Line Expenses	200.00
9.	Misc. Fixed Assets	125.00
10.	Freight, Cost of Foundation, erection and Commissioning @ 10% of (1 to 8)	422.00
	Total	4660.00

TOTAL PROJECT COST : 360 TPD INDUCTION FURNACE FOR MS BILLET

S. No.	Description	Amount
1.	Total Fixed Assets	4660.00
2.	Pre-Operative Expenses	150.00
3.	Interest During Construction	450.00
4.	Contingencies @ 5% on Total Fixed assets	170.00
	TOTAL PROJECT COST	5430.00