Annexure - 1
CTE & CTO

FILE NO. PCB/PL/KDICE/04/2003

CONSENT TO ESTABLISH

(As per Section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and Section 21 of the Air (Prevention & Control of Pollution) Act, 1981)

Dated: 9/8/2004

Consent No. PB/ICE/1768/2004

Ref. 1) Application for consent dated 9/10/2003,

Condition No. 1. This consent is granted subject to the power of the Board to review and make variation on all or any of the conditions.

Condition No. 2. This consent, unless withdrawn earlier and subject to Condition No. 1 shall be valid for two years from the date of issue. At the end of this validity period if the construction is in progress the same shall be renewed. If the construction is not yet to be started, the applicant shall apply afresh for consent to establish.

Condition No. 3. The applicant shall comply with the instructions that the Board may issue from time to time regarding prevention and control of air, water, land and sound pollution.

Condition No. 4. Air pollution control devices proposed viz. dust collector to raw material preparation system, primary & secondary, cooler discharge system, product separation system and dust settling chamber, water spray, water scrubber, gas conditioning tower, electrostatic precipitator etc. for waste gas cleaning section to limit the concentration of particulate matter 150 mg/Nm³ in the emission shall be installed before commissioning the industry with additional facilities required if any for controlling air pollution. The ambient air should not contain any other pollutant. Minimum stack/chimney heights shall be as detailed below:

1. 32 m above ground level for the rotary kiln.
2. 30m above ground level for ore circuit.
3. 30m above ground level for coal circuit.
4. 30m above ground level for product house.
5. 30m above ground level for cooler discharge circuit.

Condition No. 5. Enclosed stock bunkers/yard for collecting ash and coal dust shall be provided before commissioning the industry. Necessary water sprinkler facilities to suppress dust shall be provided near the loading and unloading area. The ash/coal dust generated shall be disposed off through factories and firm agreement shall be drawn up before commissioning the industry. The fly ash or char generated shall not be stored in open.

Condition No. 5(a)

1. The sound level (Leq) measured at a distance of 1m from the boundary of the site shall not exceed 60dB(A) during day time (8am - 6pm) and 45dB(A) during night time (8am - 6am).
The total sound power level of the DG set shall be less than $95 + 10 \log(KVA) \, \text{dB}(A)$, where KVA is the nominal power rating of the DG set.

The DG set shall be provided with acoustic enclosure (acoustic treatment with an insertion loss of minimum $25 \, \text{dB}(A)$).

The DG set shall be provided with proper exhaust muffler with an insertion loss of minimum $25 \, \text{dB}(A)$.

A proper routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer, which would help to prevent noise levels of the DG set from deteriorating with use.

Condition No: 6 The solid wastes containing iron ore and coal filters shall be reused as raw material.

Condition No: 7 Continuous monitoring and recording facilities to monitor the particulate matter in the emission through the stack shall be provided before commissioning the industry.

Condition No: 8 No bore well shall be provided for industrial purpose without permission from the Ground Water Department.

Condition No: 9 The effluent treatment facilities proposed namely cooling water recirculation arrangements, septic tank and soak pit shall be provided before commissioning the industry. There shall not be any discharge of trade effluent.

Condition No: 10 The applicant shall obtain the consent to operate from the Board under the Air (Prevention and Control of Pollution) Act, 1981 before commissioning the industry.

Condition No: 11 Suitable species of trees shall be planted and maintained within and along the periphery of the factory premises, forming a green belt to improve the environment.

Condition No: 12 The date of commissioning of the industry shall be intimated to the Head Office and District Office at Palakkad.

Condition No: 13 There shall not be any fugitive emission from the plant premises.

Condition No: 14 The location of the industry shall be as shown in the drawing which will be forwarded separately. No change or alteration to the above shall be made.

Condition No: 15 The applicant shall put up two signboards of size 6x4 ft near the main entrance of the plant. One board shall display the name of the industry and important details. The other shall display the latest air, water and noise monitoring data against standards specified.

Condition No: 16 All pollution control measures proposed by the unit suggested by the Board with above conditions and that obtained from the Central Pollution Control Board regarding the clean technology shall be provided before commissioning the unit and in case of any non-compliance, the Consent to Establish granted will be withdrawn.

Condition No: 17 No foundries shall be installed.

For and on behalf of the
KERALA STATE POLLUTION CONTROL BOARD

To
Sri M. Parameswaran,
Director,
M P S Steel & Castings (P) Ltd.,
NO. 17/102, Avarapallyam Road,
Ganapathy, Coimbatore-641 060

Copy to:
1. The Environmental Engineer,
   District Office, Palakkad.
2. Block IIE.
CONSENT TO ESTABLISH

[As per Section 25 of the Water (Prevention & Control of Pollution) Act, 1974 and Section 21 of the Air (Prevention & Control of Pollution) Act, 1981]

Consent No. PCB/HO/CE/PLKD/1/06/2005

Valid up to: 13.06.2007

Consent application dated 3/5/2005
Applicant’s letter dated 4/5/2005 and 7/6/2005

Consent under section 25 of the Water (Prevention and Control of Pollution) Act, 1974 and section 21 of the Air (Prevention and Control of Pollution) Act, 1981 is hereby granted to M/s. M.P.S. Steel Castings (P) Ltd. 476, Wise Park, Kanjikkode, Palakkad to expand the industry being constructed in sy no. 476/2 pl 3 4 5 6pl 7pl 8 9 10 11 12 13 14 pl 5 6 pl 478/1 2 3 4 5 6 pl. 482/4 5 550/2pl of Pudussery Gram Panchayat, Manthano, Palakkad district for production of 500 tonnes of sponge iron, 50 tonnes of char (by product) and 10 MW electricity per day based on the particulars furnished in the reference and subject to the following conditions.

Condition No: 1. This consent is granted subject to the power of the Board to review and make variation on any of the following conditions.
Condition No: 2. This consent, unless withdrawn earlier, and subject to Condition No 1, shall be valid for two years from the date of issuance. At the end of the validity period, if construction is in progress the same shall be got renewed. If the construction is yet to be started, the applicant shall apply afresh for consent to establish.
Condition No: 3. The applicant shall comply with the instructions that the Board may issue from time to time regarding prevention and control of air, water, land and sound pollution.
Condition No: 4. Air pollution control devices proposed viz. dust collector for raw material preparation system (primary & secondary) cooler discharge system, product separation system and dust settling chamber, water spray, gas scrubber, electrostatic precipitator etc. for waste gas cleaning section to limit the concentration of particulate matter to 150 mg/Nm3 in the emission shall be installed before commissioning the industry with additional facilities required if any, for controlling air pollution. The emission should not contain any other pollutant. Minimum stack/chimney heights shall be as follows:

1. 45 m above ground level for rotary kilns no. 1 & 2
2. 45 m above ground level for rotary kilns no. 3
3. 30 m above ground level for iron ore circuit
4. 30 m above ground level for coal circuit
5. 30 m above ground level for product house
6. 30 m above ground level for cooler discharge circuit

Condition No: 5. Enclosed stock bunkers yard for collecting ash and coal dust shall be provided before commissioning the industry. Necessary water sprinkler facilities to suppress dust shall be provided near the loading and unloading area. The ash or coal dust generated shall be disposed off through factories and firm agreement shall be drawn up before commissioning the industry. The fly ash/char generated shall not be stored in open.
Condition No: 5(a).

i. The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 56 dB(A) during day time (6 am – 6 pm) and 45 dB(A) during night time (6 pm – 6 am).
ii. The total sound power level of the DG set shall be less than 96+10log_{10}(kVA) dB(A).
The DG set shall be provided with acoustic enclosure / acoustic treatment with an insertion loss of minimum 25 dB(A).

iv The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB(A).

v A proper routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer, which would help to prevent noise levels of the DG set from deteriorating with use.

Condition No: 6. The solid wastes containing iron ore and coal filters shall be reused as raw material.

Condition No: 7. Continuous monitoring and recording facilities to monitor the particulate matter in the emission through the stacks shall be provided before commissioning the industry.

Condition No: 8. No bore well shall be provided for industrial purpose without clearance from the Ground Water Department.

Condition No: 9. The effluent treatment facilities proposed namely cooling water recirculation arrangements, septic tank and soak pit of sufficient capacity shall be provided before commissioning the industry. There shall not be any discharge of trade effluent.

Condition No: 10. The applicant shall obtain the consent to operate from the Board under the Water (Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act, 1981 before commissioning the industry.

Condition No: 11. Suitable species of trees shall be planted and maintained within and along the periphery of the factory premises, forming a green belt to improve the environment.

Condition No: 12. The date of commissioning of the industry shall be intimated to the Head Office and District Office at Palakkad of the Board.

Condition No: 13. There shall not be any fugitive emission from the plant premises.

Condition No: 14. The location of the industry shall be as shown in the drawing attached. No change or alteration to the above shall be made.

Condition No: 15. The applicant shall put up two signboards of size 6x4 ft. near the main entrance of the plant. One board shall display important consent conditions and the other shall display the latest air, water, noise, hazardous wastes and chemicals monitoring data against the standards specified.

Condition No: 16. All pollution control measures proposed by the unit suggested by the Board vide above conditions and those suggested by the Central Pollution Control Board regarding clean technology shall be provided before commissioning the unit and in case of any non-compliance, the Consent to Establish shall be withdrawn.

Condition No: 17. No foundries shall be installed.

Condition No: 18. Facilities for rain water harvesting shall be provided.

Condition No: 19. Trees and plants should be planted inside and along the boundary of the plot to form a green belt.

For and on behalf of the
KERALA STATE POLLUTION CONTROL BOARD

MEMBER SECRETARY

To:

Mr. M. Paramasivam,
Director,
M.P.S. Steel Castings (P) Ltd.
476, Wise Park, Kanjikode,
Palakkad - 678621

Copy to:
1. The Environmental Engineer,
District Office, Palakkad.
CONSENT TO OPERATE INDUSTRIAL PLANT
Under Section 21 of the Air (Prevention & Control of Pollution) Act, 1981

Consent No. PCB/HO/PLKD/A/F/ 303/2006


Ref:
1. Consent application dated 13/12/2005
2. Enquiry on 15/12/2005 & 2/2/2006
4. Applicant's undertaking received on 4/3/06

Consent under section 21 of the Air (Prevention & Control of Pollution) Act, 1981 is hereby granted to M/S M.P.S. Steel Castings (P) Ltd, 476, Wise Park, Kanjikode, Palakkad to operate the industrial plant for production of 300 tonne of sponge iron and 60 tonne of char (byproduct) in survey no. 476/2 pt, 3, 4, 5, 6pt, 7pt, 8, 9, 10, 11, 477/3, 4pt, 5, 6pt, 478/1, 2, 3, 4, 5, 6pt, 482/4, 5, 550/2pt of Pudusseriy Central village, Palakkad taluk, Palakkad district based on the particulars furnished in the reference cited and subject to the following conditions.

Condition No. 1 This consent is granted subject to the power of the Board to review and make variation in all or any of the conditions as per section 21(6) of the Act.

Condition No. 2 This consent, unless withdrawn earlier and subject to Condition No. 1 shall be valid up to 31/12/2008. In case the operation of the industrial plant/s is to be continued thereafter application for the renewal of the consent is to be made in the prescribed form between 3 and 4 months in advance before the date of expiry of the consent.

Condition No. 3 No change or alteration of industrial plant/s is to be made without the prior permission of the Board. Any change in the particulars furnished in the references and/or in the identity of the occupier/authorised agent is to be intimated to the Board forthwith.

Condition No. 4 The quantity of emissions through the following chimney/s shall not exceed the figures as mentioned below:

<table>
<thead>
<tr>
<th>Sl No.</th>
<th>Chimney No.</th>
<th>Description of chimney</th>
<th>Rate of emission</th>
<th>To be specified later</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Chimney of 45 m height and diameter 2.5m at top and 3.5m at bottom, above the ground level making emission from rotary kiln no. 1 &amp; 2.</td>
<td>To be specified later</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Chimney of 45 m height and diameter 2.5m at top and 3.5m at bottom, above the ground level making emission from rotary kiln no. 3.</td>
<td>To be specified later</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>Chimney of 15 m height and diameter 0.54m above the ground level making emission from iron ore circuit.</td>
<td>To be specified later</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>Chimney of 15 m height and diameter 0.54m above the ground level making emission from coal circuit</td>
<td>To be specified later</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>Chimney of 15 m height and diameter</td>
<td>To be specified later</td>
<td></td>
</tr>
</tbody>
</table>
Annexure - 1

CTE & CTO

6 6
0.6m at top and 0.64m at bottom, above the ground level making emission from product house.

7 7
Chimney of 15 m height and diameter 0.40m above the ground level making emission from cooler discharge circuit.
Chimney of 15 m height and diameter 0.38m above the ground level making emission from intermediate bunker.

8 8
Chimney of 15 m height and diameter 0.5m above the ground level making emission from stock house.

**Condition No.5** The emission characteristics shall not exceed the following.

<table>
<thead>
<tr>
<th>Chimney No.</th>
<th>Sl.No.</th>
<th>Parameter</th>
<th>Limiting standard (mg/Nm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Particulate matter</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Sulphur dioxide</td>
<td>1200</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Particulate matter</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>Sulphur dioxide</td>
<td>1200</td>
</tr>
<tr>
<td>3,4,5,6,7,8</td>
<td>1</td>
<td>Particulate matter</td>
<td>150</td>
</tr>
</tbody>
</table>

Emission should not contain any other pollutant.

**Condition No. 5a** The sound level (Leq) measured at a distance of 1m from the boundary of the site shall not exceed 75dB (A) during day time (6am - 6pm) and 70dB (A) during night time (6pm - 8am).

**Condition No.6** The occupier shall install or modify equipments, as necessary, so as to make the sound/emission quality conform to the standards specified in Condition No.5 & 5a immediately.

**Condition No.7** Enclosed stock bunkers/ yard for collecting ash and coal dust shall be provided before commissioning the industry. Necessary water sprinkler facilities to suppress dust shall be provided near the loading and unloading area. The ash or coal dust generated shall be disposed off through factories and firm agreement shall be drawn up before commissioning the industry. The fly ash/ char generated shall not be stored in open.

**Condition No.8** The occupier shall provide suitable sound/emission monitoring arrangements for monitoring all the parameters under condition no. 5 & 5a.

**Condition No.9** The occupier shall at his own cost get the ambient sound level monitored and the samples of emissions collected from all the chimney's and analysed for the parameters under condition no.5 & 5a at least once in three months.

**Condition No.10** Records of ambient sound level monitoring, emission monitoring and emission analysis should be maintained and shall be made available to the inspecting officers of the Board whenever called for. Ambient sound level monitoring reports and emission monitoring report consisting of emission analyses and flow measurement data are to be submitted in such form as shall be specified by the Board from time to time to the Regional Office at Kozhikode and to the District Office at Palakkad before the 10th of every month.

**Condition No.11** There shall not be any fugitive emission and/or effluent discharge from the plant/premises.

**Condition No.12** If the emission of any air pollutant in the atmosphere in excess of the standards laid down by the Board occurs or is apprehended to occur due to accident or other unforeseen act or event, the occupier shall forthwith intimate the fact of such occurrence, or apprehension of such occurrence to the Board. Also in case of such occurrence the occupier shall take immediate action to bring down the emission below the limit prescribed under condition no.5 & 5a of the consent.

**Condition No.13** Online continuous emission monitoring system shall be provided in the chimneys to measure and record the concentration of particulate matter present in the emission.
Condition No. 14 The solid wastes containing iron ore and coal filters shall be reused as raw material.
Condition No. 15 No bore well shall be provided for industrial purpose without clearance from the Ground Water Department.
Condition No. 16 Suitable species of trees shall be planted and maintained within and along the periphery of the factory premises, forming a green belt to improve the environment.
Condition No. 17 The applicant shall put up two signboards of size 6x4 ft. near the main entrance of the plant. One board shall display the name of the industry and important consent conditions. The other shall display the latest air, noise and effluent monitoring data against the standards specified.
Condition No. 18 Provision shall be made for rainwater harvesting within the industry compound before commissioning the industry.
Condition No. 19 All pollution control measures proposed by the unit/suggested by the Board vide above conditions and those suggested by the Central Pollution Control Board regarding clean technology shall be provided before commissioning the unit and in case of any non-compliance, the Consent to operate shall be withdrawn.
Condition No. 20 The used oil shall be properly stored in drums and sold out to authorized and registered recyclers only. The sludges from the cooling ponds and scrubbers shall be stored in an adequately designed secure land fill site as per CPCB guidelines or be delivered to TSDF of KEIL at Ambalamugal, Ernakulam.
Condition No. 21 No foundries shall be installed.
Condition No. 22 The height of chimney no. 3 to 8 mentioned in condition no. 4 shall be raised to 30m if demanded by the board subsequently.
Condition No. 23 Emission from any process stacks shall not be routed through chimneys 3 to 8 mentioned in condition no. 4.

For and on behalf of the
KERALA STATE POLLUTION CONTROL BOARD

MEMBER SECRETARY

To
The Director,
M.P.S. Steel Castings (P) Ltd.
476, Wise Park, Kanjikode,
Palakkad - 678621

Copy to:
1. The Environmental Engineer,
District Office, Palakkad
2. Stock file
CONSENT TO OPERATE – RENEWAL

Consent no. PCB/HO/PLKD/ICO-R/01/2014

Ref:
1. Your application dated 26.03.2012
2. Consent No PCB/HO/PLKD/ICO/R/01/2010 dated 03.01.2010

The ‘Consent to Operate’ issued vide ref. 2 to M.P.S STEEL CASTINGS (P) LTD., 476, WISE PARK, KANJIKODE, PALAKKAD-678 621 is hereby renewed up to 30.06.2015. The copy of the consent cited under ref. 2 attached herewith is part of this renewal order and this order is subject to the conditions stipulated therein and the following variations.

CONDITIONS NO: 1

<table>
<thead>
<tr>
<th>1.1</th>
<th>Validity</th>
<th>30.06.2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3</td>
<td>Communication</td>
<td>Telephone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fax</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e-mail</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Website</td>
</tr>
<tr>
<td>1.13</td>
<td>Fee remitted</td>
<td>Rs. 3.6 lakh</td>
</tr>
<tr>
<td>1.14</td>
<td>Capital Investment</td>
<td>Rs. 72.955 Crore</td>
</tr>
<tr>
<td>1.17</td>
<td>Date of application</td>
<td>26.03.2012</td>
</tr>
<tr>
<td>1.18</td>
<td>Date of enquiry</td>
<td>12.09.2012</td>
</tr>
</tbody>
</table>

6.1 Height of chimneys nos. 10 and 11 shall be increased to 4.5 m and Chimney no. 12 shall be increased to 5.5 m above roof level within 3 months.

6.3 E-wastes shall be disposed in an environmentally sound manner. The following details shall be submitted to the Board on or before 31st December every year.

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Particulars of e-waste</th>
<th>Quantity of e-waste disposed in previous year</th>
<th>Quantity of e-waste proposed to be disposed in current year</th>
<th>Mode of disposal</th>
</tr>
</thead>
</table>
6.4 Adequate fire protection equipment in accordance with the fire safety regulations shall be established / installed at salient places within the buildings and for ensuring the same, necessary certificate from Fire & Rescue Services Department shall be obtained.

For and on behalf of the
Kerala State Pollution Control Board

CHAIRMAN

To
M.P.S Steel Castings (P) Ltd.
476, Wise Park
Kanjikode
Palakkad-678 621

Copy to:
1. The Senior Environmental Engineer, Regional Office, Kozhikode
2. The Environmental Engineer, District Office, Palakkad
3. The Secretary, Pudussery Grama Panchayat, Palakkad
4. Stock file
PROJECT DESCRIPTION

The Proposed activity is an Integrated Steel Plant along with Melting Unit, Re-rolling Mill, Sponge Iron Plant, Power Generation and Ferro Alloys.

MANUFACTURING PROCESS / PROCESS DESCRIPTION

MS BILLETS

The greatest advantage of the Induction Furnace is its low capital cost compared with other types of Melting Units. Its installation is relatively easier and its operation simpler. Among other advantages, there is very little heat loss from the furnace as the bath is constantly covered and there is practically no noise during its operation. The molten metal in an Induction Furnace is circulated automatically by electromagnetic action so that when alloy additions are made, a homogeneous product is ensured in minimum time. The time between tap and charge, the charging time, power delays etc, are items of utmost importance are meeting the objective of maximum output in tones/hour at a low operational coast. The process for manufacturing steel may be broadly divided into the following stages:

- Melting the charge mixed of steel & iron scrap.
- Ladle teeming practice for casting.
- Continuous casting machine.

MELTING THE CHARGE

The furnace is switched on, current starts flowing at a high rate and a comparatively low voltage through the induction coils of the furnace, producing an induced magnetic field inside the central space of the coils where the crucible is located. The induced magnetic fluxes thus generated out through the packed charge in the crucible, which is placed centrally inside the induction coil.

As the magnetic fluxes generated out through the scraps and complete the circuit, they generate and induce eddy current in the scrap. This induced eddy current, as it flows through the highly melting rate depends primarily on two things,

1. The density of magnetic fluxes and
2. Compactness of the charge.

The charge mixed arrangement has already been described. The magnetic fluxes can be controlled by varying input of power to the furnace, especially the current and frequency.
In a medium frequency furnace, the frequency range normally varies between 150-10000 cycles/second. This heat is developed mainly in the outer rim of the metal in the charge but is carried quickly to the center by conduction. Soon a pool of molten metal forms in the bottom causing the charge to sink. At this point any remaining charge mixed is added gradually. The eddy current, which is generated in the charge, has other uses. It imparts a molten effect on the liquid steel, which is thereby stirred and mixed and heated more homogeneously. This stirring effect is inversely proportional to the frequency of the furnace and so that furnace frequency is selected in accordance with the purpose for which the furnace will be utilized.

The melting continues till all the charge is melted and the bath develops a convex surface. However as the convex surface is not favorable to slag treatment, the power input is then naturally decreased to flatten the convexity and to reduce the circulation rate when refining under constantly bringing new metal into close contact with the slag. Before the actual reduction of steel is done, the liquid steel which might contain some trapped oxygen is first treated with some suitable deoxidizer. When no purification is attempted, the chief metallurgical advantages of the process attributable to the stirring action are uniformity of the product, control over the super heat temperature and the opportunity afforded by the conditions of the melt to control de-oxidation through proper addition.

As soon as the charge has melted and de-oxidising ions have ceased. Any objectionable slag is skimmed off, and the necessary alloying elements are added. When these additives have melted and diffused through the bath of the power input may be increased to bring the temperature of metal up to the point most desirable for pouring. The current is then turned off and the furnace is tilted for pouring into a ladle. As soon as pouring has ceased, any slag adhering to the wall of the crucible is crapped out and the furnace is readied for charging again.

As the furnace is equipped with a higher cover over the crucible very little oxidation occurs during melting. Such a cover also serves to prevent cooling by radiation from the surface heat loss and protecting the metal is unnecessary, though slags are used in special cases. Another advantage of the induction furnace is that there is hardly any melting loss compared with the arc furnace.

**LADLE TEEMING PRACTISE**

The temperature of liquid metal is allowed to rise in the furnace till the correct pouring temperature is achieved which is checked with the help of Immersion Pyrometer. The hot metal is poured with the hydraulic system in the preheated ladle after adding certain fluxes so that the temperature is maintained at about 1600 degree centigrade. Ladle is then carried by EOT charge to the concast machine and (crucible is made free
for further charge of next batch) kept above the tundish of the concast machine. The bottom of the ladle is opened by hydraulic system and hot metal starts pouring out into the concast machine.

**CONTINUOUS CASTING MACHINE**

The molten steel from the IF or the ladle metallurgical facility is cast in a continuous casting machine (6/11 stand Billet Caster) to produce cast shapes including billets. In some processes, the cast shape is torch cut to length and transported hot to the hot rolling mill for further processing. Other steel mills have reheat furnaces. Steel billets are allowed to cool, and then be reheated in a furnace prior to rolling the billets into bars or other shapes.

Castings operations consist of following:-

- Preparation
- Match Plates (Patterns)
- Preparation of Moulds
- Pouring of molten steel into prepared moulds
- Knocking of moulds
- Finishing of casting billets

1. The process is continuous because liquid steel is continuously poured into a ‘bottomless’ mould at the same rate as a continuous steel casting is extracted.

2. Before casting begins a dummy bar is used to close the bottom of the mould.

3. A ladle of molten steel is lifted above the casting machine and a hole in the bottom of the ladle is opened, allowing the liquid steel to pour into the mould to form the required shape.

4. As the steel’s outer surface solidifies in the mould, the dummy bar is slowly withdrawn through the machine, pulling the steel with it.

5. Water sprays along the machine to cool / solidify the steel.

6. At the end of the machine, the billets are cut to the required length of 6 mtrs or 12 mtrs by gas torches.

7. Sized billets are lifted by crane to finishing yard for inspection and storage / dispatch.
Annexure - 2
Process Description

Raw Material Yard

<table>
<thead>
<tr>
<th>DRI</th>
<th>MS Scrap</th>
<th>Iron Scrap</th>
<th>Ferro Alloy Scrap</th>
</tr>
</thead>
</table>

Cool Water Inlet → Induction Surface → Hot Water Outlet

Ladle

CCM

Billet Mould

Billet to Yard

Process flow chart
THERMOMECHANICAL PROCESSING (TMT)

Thermomechanical Processing, also known as thermo-mechanical treatment (TMT), is a metallurgical process that integrates work hardening and heat-treatment into a single process. A description of its application in rebar steel follows.

Mild steel billets of sizes 100/110/125 mm² having the appropriate chemical constituent i.e. Carbon, Manganese, Sulphur and Phosphorus are heated to the temperature of appx. 1150°C – 12200°C in the reheating furnace. The heated raw material is passed through a series of electronically controlled Rolling Mills stands to produce the finished steel at a temperature of around 950°C – 1000°C.

TMT bars are produced using the latest quenching process in automatic rolling mill where TMT bars are hot rolled from tested raw material of required chemical specification in a series of electronically controlled finishing stands and online PLC controlled thermo mechanical treatment they are progressively rolled to reduce the billets to the final size and shape of reinforcing bar. After the last rolling stand, the billet moves through a quench box. The quenching converts the billet’s surface layer to martensite, and causes it to shrink. The shrinkage pressurizes the core, helping to form the correct crystal structures. The core remains hot, and austenitic. A microprocessor controls the water flow to the quench box, to manage the temperature difference through the cross-section of the bars. The correct temperature difference assures that all processes occur, and bars have the necessary mechanical properties.

The bar leaves the quench box with a temperature gradient through its cross section. As the bar cools, heat flows from the bar’s centre to its surface so that the bar’s heat and pressure correctly tempers and intermediate ring of martensite and bainite.

Finally, the slow cooling after quenching automatically tempers the austenitic core to ferrite and pearlite on the cooling bed.

These bars therefore exhibit a variation in microstructure in their cross section, having strong, tough, tempered martensite in the surface layer of the bar, an intermediate layer of martensite and bainite, and a refined, tough and ductile ferrite and pearlite core.

When the cut ends of TMT bars are etched in Nital (a mixture of nitric acid and methanol), three distinct rings appear;

1. A tempered outer ring of martensite,
2. A semi-tempered middle ring of martensite and bainite, and
3. A mild circular core of bainite, ferrite and pearlite.

This is the desired micro structure for quality construction rebar.
In contrast, lower grades of rebar are twisted when cold, work hardening them to increase their strength. However, after thermo mechanical treatment (TMT), bars do not need more work hardening. As there is no twisting during TMT, no torsional stress occurs, and so torsional stress cannot form surface defects in TMT Bars. Therefore TMT bars resist corrosion better than cold, twisted and deformed (CTD).
SPONGE IRON

The reduction process is carried out in a rotary kiln (which is inclined and rotates at a pre-determined range of speeds) at a stipulated temperature (850°C – 1050°C). The inclination & the rotary motion of the kiln ensure that the raw materials move from feed-end to the discharge-end of the kiln and it is during this movement that the actual reduction of iron ore to iron takes place. The material discharged from the kiln is taken to a rotary cooler for cooling and the cooled product, after being discharged from the cooler moves on to the next step in the production process viz., product separation and handling system.

For direct reduction f ore in the inclined rotary kiln, ore and coal normally pass through an inclined kiln in a counter current direction to the flue gases in the freeboard. The flat section, running nearly half the length of Kiln is called preheating zone, where Iron Ore, Coal and Dolomite are heated up to reaction temperature. In this zone, moisture of the material is driven off. After material heating, ore reduction and carbon gasification takes place in close association with each other in the second half of the kiln, which is called reduction zone. The volatile constituents of the coal and carbon monoxide from the bed material are burnt, over the entire length of the kiln under controlled air supply, thereby providing necessary heat required for the metallization process. The basic reactions for the process are as follows:

Step I: $3\text{Fe}_2\text{O}_3 + \text{CO} = 3\text{Fe}_3\text{O}_4 + \text{CO}_2$

Step II: $\text{Fe}_3\text{O}_4 + \text{CO} = 2\text{FeO} + \text{CO}_2$

Step III: $\text{FeO} + \text{CO} = \text{Fe} + \text{CO}_2$

The rotary kiln discharge is cooled in a rotary cooler connected to the kiln, screened and subjected to magnetic separation in order to remove the non magnetic material from the sponge iron.
Schematic line diagram / outlay indicating various sections including the positions of Kiln & WHRB boilers is as under.

**Sponge iron manufacturing process**
The overall process requires duration of approximately eight to ten hours inside the kiln, during which iron ore is optimally reduced and discharged to a rotary cooler for cooling below 120°C, before coming out into the finished product circuit, flowchart of the process is given below:
Annexure - 2
Process Description

POWER GENERATION

Power Capacity of 1 x 6 MW – WHRB Based and 1 x 4 MW FBC Based installation.

The proposed plant shall be configured with 1 Nos. of Waste Heat Recovery Boilers (WHRB) of capacity 1 x 6 MW.

The balance steam for generating the rated power of 1 x 4 MW will be generated by Fluidized Bed Combustion Boiler (FBC) using Coal and Char.

POWER GENERATION PROCESS

The Process-material flow chart: Captive Co-generation Power Plant

- Hot Flue Gases from DRI
- WHRB & FBC Boiler / Steam Generation
- Movement of Turbine & Generation of Electricity
- Power Transformers / Panels / Supply

Captive co-generation power plant
WASTE & WASTE MANAGEMENT

Air Pollution

The Stack height will be 30 m common for 2 x 100 TPD (Rotatory Kiln) & a separate 30 m stack for 1 x 100 TPD (Rotatory Kiln) and 45 m for 10 MW WHRB

A Stack proposed to construct with a height of 35 m for the rolling mill.

Stack Height Calculation

The daily consumption of coal is around 354 Tonnes
The rate of SO2 emission due to usage of coal is calculated as given below

\[
\text{Sulphur content} = 0.5\%
\]

\[
S = \frac{354 \times 0.5}{100} = 1.77 \text{ T/D}
\]

\[
\text{SO2} = 1.77 \times 2 \text{ T/D} = 3.54 \text{ T/D} = 147.50 \text{ kg/hr}
\]

SO2 emission = 147.50 kg/hr = 40.97 g/s

Stack height calculation:

\[
H = 14 Q^{0.3}
\]

Where,

\[
H = \text{height of the Stack}
\]

\[
Q = \text{SO2 Concentration in Kg/hr.}
\]

Hence

\[
H = 14 \times (147.50)^{0.3} = 14 \times 4.47 = 62.63 \text{ m}
\]

The stack height already constructed is however 105 meters, which is adequate.

Stack Emission Characteristics

<table>
<thead>
<tr>
<th>Stack No</th>
<th>1</th>
<th>1</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material of Construction</td>
<td>RCC</td>
<td>RCC</td>
<td>RCC</td>
</tr>
<tr>
<td>Stack attached to</td>
<td>2 x 100 TPD</td>
<td>1 x 100 TPD</td>
<td>1 x 10 MW WHRB</td>
</tr>
<tr>
<td>Stack height (m)</td>
<td>30</td>
<td>30</td>
<td>45</td>
</tr>
<tr>
<td>Stack diameter (mm) approx.</td>
<td>5250</td>
<td>6500</td>
<td></td>
</tr>
<tr>
<td>Volume Flow Rate (Nm3/hr)</td>
<td>48717</td>
<td>51811</td>
<td>34346</td>
</tr>
<tr>
<td>Velocity of flue gas (m/s)</td>
<td>3.98</td>
<td>4.11</td>
<td>4.67</td>
</tr>
<tr>
<td>Temperature of flue gas (°C)</td>
<td>157</td>
<td>144</td>
<td>98</td>
</tr>
</tbody>
</table>
Annexure -3
Waste generation & management

<table>
<thead>
<tr>
<th>Fuel Consumption (Kg/s)</th>
<th>4.16</th>
<th>2.08</th>
<th>1.94</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphur content (% w/w)</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Emission rate – SO₂ (mg/NM³)</td>
<td>90.00</td>
<td>66.00</td>
<td>62.00</td>
</tr>
<tr>
<td>Emission rate – SPM (mg/NM³)</td>
<td>72.00</td>
<td>58.00</td>
<td>54.00</td>
</tr>
</tbody>
</table>

The following environmental protection or pollution control systems have already been considered for mitigation of impacts on Air Environment.

- **60 m & 45 m** tall stacks for flue gas emission.
- Space provision for retrofitting FGD (Flue Gas Desulfurization) systems.
- High efficiency ESPs to reduce SPM level in the exhaust gas to <50mg/Nm³.
- Dust suppression and extraction system at Handling Plant area to Control Fugitive Emission.
- Green belt development and afforestation in the plant and ash disposal areas.
- A minimum water depth will be maintained in the ash pond to prevent fugitive dust emission.
- Use of bag filters at all transfer points.
- Use of limestone to limit SO₂ emission.

High efficiency Electrostatic Precipitator of 99.9% are provided for limiting SPM concentration in the flue gas to less than 50 mg/Nm³. The stack of **60 m & 45 m height** based on maximum SO₂ concentration in the flue gas is provided for natural dispersion at high elevation so that ground level concentration are within acceptable limits.

The emission of NOₓ is reduced by burning fuel at a lower temperature and shortening the throughput time of the fuel. NOₓ is also controlled by operating at low excess air.

**Fugitive Emissions**

To control fugitive emissions from process units in the plant, the following measures are already in place.

- Tarring of roads inside the factory.
- Preventive maintenance of valves and other equipments.
- Green belt on all sides within the project boundary, and community plantation around the unit with help of local area development authorities have already been done.
- Ambient air quality and stack/fugitive emissions monitored regularly.
- In-plant training provided to the plant personnel on operation and maintenance of dust collectors, techniques of dust emission measurements, particle size analysis etc.
Effective operation and maintenance of pollution control system is ensured to contain the emissions/keep them within the CPCB limits

A good house keeping consisting of simple, obvious task of cleaning up spills, removing accumulations around processing equipment and in general keeping things neat and clean form a part of normal operation and maintenance procedure

Measures for arresting fugitive dust emissions along with the envisaged pollution control equipments are adequate and will help to have a healthy and cleaner environment inside the plant thereby improve the productivity and the efficiency of the workers as well as that of plant machinery.

**WASTEWATER MANAGEMENT**

<table>
<thead>
<tr>
<th>Description of effluent generated</th>
<th>Qty (KLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Existing</strong></td>
<td></td>
</tr>
<tr>
<td><em>Sponge Iron Plant</em></td>
<td></td>
</tr>
<tr>
<td>Rotary Kiln</td>
<td>53.20</td>
</tr>
<tr>
<td><em>Power Plant</em></td>
<td></td>
</tr>
<tr>
<td>Boiler blow down</td>
<td>36.72</td>
</tr>
<tr>
<td>DM Plant Reject</td>
<td>3.06</td>
</tr>
<tr>
<td>Aux. Cooling tower blow down</td>
<td>30.60</td>
</tr>
<tr>
<td>Sewage</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Proposed</strong></td>
<td></td>
</tr>
<tr>
<td><em>Melt Shop and Rolling Mill</em></td>
<td></td>
</tr>
<tr>
<td>Induction Coil cooling blow down</td>
<td>33.46</td>
</tr>
<tr>
<td>Concat cooling blowdown</td>
<td>12.80</td>
</tr>
<tr>
<td>Rolling mill cooling blowdown</td>
<td>59.40</td>
</tr>
<tr>
<td>Sewage</td>
<td>12.60</td>
</tr>
<tr>
<td><strong>Total Trade Effluent generated</strong></td>
<td><strong>229.24</strong></td>
</tr>
<tr>
<td><strong>Total Sewage generated</strong></td>
<td><strong>19.00</strong></td>
</tr>
</tbody>
</table>

The cooling water blowdown will be taken to 2- consecutive Cooling Ponds, and then to Guard Pond. From Guard Pond the water will be used for green belt. The Treated Water will be reused for process. About 221.92 KLD of Fresh Water will be required.

The domestic sewage will be treated in septic tank and soak pit.
SOLID WASTE MANAGEMENT

- The solid waste generated will be slag from melting and dolochar from sponge iron plant. The ash handling system would include dry collection system for bottom ash and pneumatic type system for fly ash collection.
- Ash will be stored in two ash silos (Ash Silo 1 7m ht x 4.5 m dia & Ash Silo 2 3m ht x 3.5 m dia).
- Ash will be utilized as per the latest “Fly ash utilization Notification”.
- Dry ash will be sold to cement industries as well as fly ash brick manufacturing units.
- 100% fly ash will be utilized.

The quantity of solid waste that would be generated is as follows:

<table>
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<tr>
<th>Solid Waste</th>
<th>Quantity (TPD)</th>
<th>Mode of Disposal</th>
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<tr>
<td>Char Coal/ Dolo Char</td>
<td>4.5</td>
<td>Used in FBC Boiler</td>
</tr>
<tr>
<td>Slag</td>
<td>25.0</td>
<td>Ground slag will be Sold to Cement manufacturers</td>
</tr>
<tr>
<td>Returnable Scrap</td>
<td>10.0</td>
<td>Recycled in process</td>
</tr>
<tr>
<td>Mill Scale</td>
<td>16.0</td>
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<tr>
<td>Ash</td>
<td>18.5</td>
<td>Sold to cement industries</td>
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