FEASIBILITY REPORT
CAPACITY ENHANCEMENT OF PELLET PLANT
FROM 2.0 TO 2.5 MTPA

MONNET
ISPAT AND ENERGY LIMITED
Raigarh, CG

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Preamble

M/s MONNET Ispat and Energy Ltd., (MIEL) Raigarh, is a joint venture company of AION and JSW steel Ltd. The company has 2 million tons per annum capacity Iron ore pelletising plant at Raigarh in the state of Chattisgarh. The plant is in the process of restarting after a long shutdown.

The pellet plant has a 336 sq meter travelling grate indurating machine, designed to produce 6060 dry metric tons (DMT) of iron oxide pellets on daily basis.

MIEL intends to enhance the pellet plant production capacity from existing 2 MTPA to 2.5MTPA. Fe Techno Engineering and Power Solutions, Bangalore, has been assigned to prepare a feasibility report for enhancement of annual production capacity to 2.5 Million tons.

As part of the assignment Fe Techno Engineering team visited the pellet plant at Raigarh from 26th to 29th of September 2018 to study the existing facility.

Pellet plants are always maintenance intensive due to the complex operating conditions such as material handled, operating temperature and dusty atmosphere. It is therefore essential that the equipment should be well maintained to ensure smooth and uninterrupted operation. Good operating practices and timely maintenance of equipment are the key requirements for sustained production level.

This feasibility report indicates the short falls and suggests the modifications to be implemented for smooth operation of the plant at 2mtpa capacity. Further the additions and modifications required in the plant to enhance the capacity to 2.5mtpa are provided with supporting calculations.
Summary and recommendation

In summary this report provides the details of different activities for execution of the changes and modifications for smooth plant operation and for capacity enhancement.

Priority 1: Installation and corrections
- Supply feed ore with ‘Fe’ content > 63%.
- Using both agitators
- New slurry filters 2 nos
- New mixer.
- New product handling and evacuation system

Priority 2: Installation and corrections
- New Wet screen and associated equipment.
- New Cooling air fan and connecting ducts
- Raw material handling system
- Surge bin discharge modification
- Disc feed chute modification.

Priority 3: Installation of
- New DDRS
- New Hearth layer screen
- New Filter cake storage
- Upgrading of Mixer feed conveyor and Product conveyor P-2.
**Cost estimation for capacity enhancement:**

The details in the table below will provide the cost estimated for plant modification and installation of new equipments for the capacity enhancement.

<table>
<thead>
<tr>
<th>SN</th>
<th>Equipment</th>
<th>Qty</th>
<th>Cost (CR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wet Screens weigh feeders, rubber lined pipes- supply, erection and commissioning with electrics</td>
<td>2 nos</td>
<td>2.00</td>
</tr>
<tr>
<td>2</td>
<td>Pressure filters, slurry pumps, water pumps, compressors</td>
<td>2 set</td>
<td>25.00</td>
</tr>
<tr>
<td>3</td>
<td>Horizontal Mixer  450TPH with electrics ( Little Ford/Lodige)</td>
<td>1 Set</td>
<td>6.00</td>
</tr>
<tr>
<td>3</td>
<td>Hearth layer Screen, vibrating feeder with electrics</td>
<td>1 Set</td>
<td>1.00</td>
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<td>4</td>
<td>Cooling air fan 40m3/Sec with electrics</td>
<td>1set</td>
<td>1.50</td>
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<td>5</td>
<td>Double Deck Roller Screen</td>
<td>1set</td>
<td>6.00</td>
</tr>
<tr>
<td>6</td>
<td>Other Utility equipments like compressor, water pumps, fuel pumps, compressors, Conveyors ( After detailed study)</td>
<td>Lot</td>
<td>2.00</td>
</tr>
<tr>
<td>7</td>
<td>Electrical, instrumentation and automaton system</td>
<td>Lot</td>
<td>2.00</td>
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<tr>
<td>8</td>
<td>Civil and structural work</td>
<td>Lot</td>
<td>1.00</td>
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<tr>
<td>9</td>
<td>Engineering, supervision, commissioning and integration</td>
<td>Lot</td>
<td>0.50</td>
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<tr>
<td></td>
<td><strong>Total cost</strong>:</td>
<td></td>
<td><strong>47.00 Crore</strong></td>
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</tbody>
</table>

To achieve the capacity enhancement it is required to carry out plant modifications as well as equipment up gradation in line with the priorities detailed in the summery.

After the implementation of above process requirements the plant will be capable of producing 2.5 million metric tons of Iron Oxide pellets on annual basis.

**General requirements for smooth operation of the plant at 2 MTPA capacity**

Following are the changes to be implemented for smooth operation of the existing plant at 2mtpa capacity.

**a) Feed Ore Quality:**

Quality of Iron Ore feed to pellet plant is very important to get desired product quality. Iron ore better than 63% ‘Fe’ content shall be used to make pellets, which will have good metalisation properties. Good feed quality will help in achieving rated plant output.
b) Mixing of raw material at receipt and storage yard:
At present receipt of coke and Iron Ore are through wagon tippler. Use of common raw material transfer facility for unloading and use of same stock yard for coke and iron ore alternatively are causing mixing of the two raw materials. As a result the coke lumps get into the wet grinding circuit and pass into the slurry tank without being ground to required size. Lighter Coke particles reach the slurry tank and then travel to the concentrate filter. Coke particles present in the slurry filter cause damage to the filter components. It is essential to avoid bigger size coke particles entering the slurry. It is therefore essential to eliminate mixing of the coke and Iron ore in the material handling system during raw material handling operation.

As a standard operating practice following activity shall be observed at all times.
✓ Clearing/Emptying of the common raw material handling conveyors before switching of material handled from coke to Iron ore and vice versa.
✓ Separate stock yards for iron ore and coke lumps shall be designated so that there shall be no mixing of coke iron ore in the mill feed.

c) Boulders in the Iron ore receipt:
Receipt of boulders through railway wagons is a common problem. These boulders while passing through the conveyors, feed chute and discharge chutes can cause chute jam and damage the chutes or conveyors. A strict vigil on the iron ore loading point shall be kept to avoid boulders being filled in to the wagons. A grizzly shall also be installed in the material handling system to separate all boulders from the ore feed.

d) Concentrate Filters:
For a production of 2mtpa pellets, the filter cake to be produced will be 357.54tph (say 360tph) on wet basis considering 20hrs of filtration process per day. There are only two filters installed with a design capacity of 160tph each. However these filters output will reduce due to varying process parameters such as slurry density, particle size which affects the filtration cycle time. The net output from these filters is 120-125tph. With two filters in operation the net output filter cake will be 240-250tph on wet basis as against
required 357.54 tons per hour.
This filter cake output is not sufficient to achieve 2mtpa pelletising plant.

Calculations:
Filter Cake feed required for 2mtpa output = 2000000/330/24 x1.18 = 297tph.
Filter cake output required from 20 hrs filter operation (297x24)/20 = 356 tph (wet).
To deliver 360tph the filters required = 360/120 = 3 filters
*** Minimum three filters are required for the 2mtpa production.

e) Operation of both Agitators:
Both agitators shall be put in to service for increasing the slurry storage capacity. At present only one agitator is in service. This will limit the operation flexibility of grinding and filtration system.

f) Filter cake stock yard:
A covered storage yard for at least 2days of feed requirement (minimum 15,000 tons capacity) of filter cake shall be constructed. Proper precaution shall be taken to avoid mixing of foreign particles in the storage. This facility will make the grinding circuit independent of pelletising process. In case of grinding circuit shut down or shortage of filter cake production, stored filter cake can be reclaimed and fed to the pellet plant. This flexibility will improve plant availability to deliver consistent production.

g) Mixer:
Existing Mixer is of Eirich RV -24 Conti with 2700 Ltrs.
Mixer volume = Filter volume /feed density
= 2700*1.8
= 4860Kg.(4.86tons)
At feed rate to mixer for 2.0mtpa production rate =357.54tph wet basis
=(say 360)
Required mixer feed per Second @2mtpa rate = 360 x1000/3600= 100kg/Sec
The retention time available in the mixer at this feed quantity
= Mixer capacity kgs/ feed rate kgs /Sec
= 4860/100  
= 48.6 Seconds  
= Say 50 Secs  

Considering a minimum of 60 Sec retention time required for good mixing

Mixer volume = Feed per sec x retention time On wet Basis.  
= 100 x 60  
= 6000 kg  
= 6000/1.8 = 3333 Ltrs

****Existing mixer RV -24 Conti has a volume of only 2700 ltrs against required size of 3333 liters, for 2 mtpa production and is smaller in size.

h) Balling disc Surge bin discharge modification:
The surge bin discharge is a constraint for feeding the balling discs at constant rate, due to regular discharge choking. Surge bin discharge shall be modified to enable free flow of green mix to the weigh feeder. Bin discharge shall be modified with a discharge hopper, hopper vibrators and air cannons to enable free flow of material. This modification is already carried out in one surge bin and similar modification must be implemented in other surge bins.

i) Balling disc feed chute modification:
At present weigh feeder discharge chute is installed in a slope instead of an angle of 90 degree to weigh feeder platform. Because of this chute inclination the weigh feeder discharge material falls on the chute and scatters before falling to the disc pan at 4 O’ clock position and also jamming the chute frequently. To eliminate this problem, weigh feeder shall be moved towards the discharge end and chute shall be installed vertically. This arrangement will facilitate the feed material to fall directly on the disc pan at 4 O’ clock position. This will help improve green ball quality and reduce green ball recycle.

j) Hearth layer screening facility:
Screening facility for the hearth layer pellets is essential in the product handling system. Generally above +12mm diameter fired pellets are an ideal size for use as hearth layer. Using bigger size pellets as hearth layer will help to overcome the pallet grate bar choking
due to under size pellets and pellet chips on the hearth. Good quality hearth layer pellets will reduce choking of grate bars. This will facilitate uniform gas flow through the bed & improve the quality of machine output. It is suggested to install a hearth layer screen in the hearth layer feeding circuit.

k) Product dispatch system:
Present product storage facility is an open yard dumping through HLS bin over flow chute. A small product bin with truck loading facility is also available. It is not possible to evacuate 6000 tons of pellets from this dump yard by trucks on daily basis. It is essential to install and commission the product handling system which will help transfer the product to the stock yard as a permanent solution for product dispatch.

** These modifications have to be carried out to ensure smooth plant operation.

| 10 | Product handling and dispatch system including stacker & reclaimer. | Lot | 10.0 Crs |

Capacity Enhancement from 2.0 to 2.5mtpa

Following are the plant requirements which have to be added to enhance the pellet plant production capacity from 2MTPA to 2.5MTPA.

1. Modification in Iron ore grinding and filtration circuit:
At Present two ball mills each of 145tph capacity are operating in closed circuit grinding. The output from two mills together is just sufficient to feed 2mtpa pellet plant. The feed ore has more fines than estimated during plant design. More fines in the feed to mill will cause generation of ultra fines in the mill output. The ultra fines more than 30% are not desirable for pelletising. It is required to avoid over grinding and also increase the mill output, to meet the enhanced production capacity. At 2.5mtpa production rate the net pellet output will be about 315 Dry metric tons (DMT) per hour on continuous basis. To achieve this production target, several process equipments have to be upgraded and some of the process circuits have to be modified.
1.1 **Wet Screen:**

The ball mill feed contains fines more than 40% below 0.5mm size. It is required to separate these fines from the mill feed to avoid the generation of ultra fines due to over grinding. Excess of ultra fines in the pellet feed will affect the physical properties and blain number of ground ore. It will also influence the product quality. Hence the -0.5mm fines in the ROM should be separated from the mill feed. A wet screen of 300 TPH capacity with 0.5mm screen mat, is proposed to be installed in the feed line of the ball mill. This will remove the <0.5mm fines from the mill feed and send to mill discharge pump box. The +0.5mm size will be fed to mill for grinding. After installing a wet screen in each mill feed line, the total grinding circuit output will increase to 2 x 250 = 500 TPH, which is sufficient for enhanced plant capacity.

**Recommendation for Capacity enhancement:**

# 300 TPH wet screen in each mill circuit shall be added with suitable modifications.

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**Proposed grinding circuit with Wet screen in Ball Mill Feed**

1.2 **Ball Mill**
The Ball mills are maintenance prone and only 20 hrs of equipment availability is considered for design.

Existing 2 Ball Mills: 4.6 M Dia X 8.5 M Long with design capacity 145 TPH.
The required filter cake output to produce 2.5MTPY pellets in 24 hours

\[ = 450 \text{ TPH.} \]

When the grinding circuit operates 20 hours per day,

The mill product with a design margin \[ = 500 \text{ tph (wet basis).} \]

The feed ore has an estimated 40% fines of -0.5mm size.
These fines have to be separated by screening.

By feeding the ball mills with screened fines the total filter cake output can be increased to 500tph.

a. Required concentrate \[ = 500 \text{ tph} \]
b. Each mill feed \[ = 500/2 \]

\[ = 250 \text{ tph.} \]

Assuming introduction of wet screen with a 0.5mm screen mat, 40% of the (100 tons) feed will be separated and sent to mill sump.

c. Screen under flow to mill discharge sump: \[ = 250 \times 0.4 \]

\[ = 100 \text{ tph} \]

d. Each mill feed \[ = (\text{screen feed} - \text{screen under flow}) \]

\[ = 250 - 100 \]

\[ = 150 \text{ tph/each mill.} \]

The same two ball mills are sufficient to grind and deliver the total feed to plant.

** Recommendation for Capacity enhancement:**

- Install 2 Nos. of 300 tph wet screens in the mill feed circuit to separate 100 tph fines of <0.5mm size from the 250tph feed.
- Operate the ball mill in closed circuit grinding.
- 500 tph ground ore can be produced to feed the pellet plant at enhanced capacity.
- The filter cake output tonnage can decrease or high moisture in the filter cake can influence the production rate below 500tph. To overcome this problem a vertical roller mill of 60-75tph shall be installed. This will help to makeup the feed ore short fall and also help control the moisture in filter cake feed.
1.3 Slurry pump for ball mill discharge sump:

Calculations

a. Feed to ball mill = 250 TPH
b. Screen under flow considering 40% fines (<0.5mm) in the feed = 100 tph
c. Mill feed after removing fines in the wet screen = 150 tph
d. Cyclone over flow @ 33% solids = 250 tph
e. Mill recycle load considered 200% of mill feed
f. Cyclone under flow = 300 tph @ 50% solids
g. Total mill feed/output = (c+f) = 450 tph solids
h. Total cyclone feed = (b+g) = 100+450 = 550 tph
i. Solids % in cyclone feed 40% by Weight
j. Cyclone slurry feed or mill sump pump discharge tph = (h/i)
   = 550/0.4
   = 1375 tph
k. SG of slurry to cyclone feed considered = 1.4 t/m³
l. Volume of slurry at pump box m³/hr = (j/k)
   = 1375/1.4
   = 983.14 m³/hr
m. Pump volume required with design margin ~ 1156 m³/hr
   = Say 1200 m³/hr

**Recommendation for Capacity enhancement:**

Slurry pump of 1200 m³/hr capacity shall be procured for 2.5 mtpa capacity. Pump shall be suitable for handling 60% solids in slurry.

1.4 Cyclones:

A set of 3- D20 (20 inch) cyclones are installed with 2 working & 1 no as standby. Each cyclone is designed for maximum input of 360 m³/hr.

Based on the mill discharge sump pump calculation above, 983 m³/hr of slurry has to be handled by cyclones. Hence 3 cyclones will be required to operate during the enhanced plant capacity. A fourth new cyclone can be added as standby.
I. Mill Sump discharge = 983m3/hr
II. Each cyclone capacity = 360m3/hr
III. The cyclone feed tph = 550 TPH (Over flow 250 TPH & Underflow 300 TPH.)
IV. The cyclone over flow product = 250 TPH, which will be sent to thickener.
V. The cyclone under flow recycle = 300 TPH sent back to ball mill.
VI. Total slurry including screen under flow (iv+v) = 250+300
= 550tph (983m3/hr)
VII. No of cyclones required = slurry volume/ 360 = 983/360 = 2.7 say 3numbers.

All the three cyclones are required in operation for enhanced capacity.

** Recommendation for capacity enhancement: **
a. 1 new 20 Inch cyclone is required as Standby.
b. Few spare sets of vortex and Apex of different dimension may also be procured as spare for replacement in case of process correction and cyclone performance improvement.

1.5 Thickener:
With enhanced production capacity, the thickener capacity will be at threshold. Existing 45 M Dia thickener ‘Tenova Delkor’ make is designed to handle feed slurry of 1688.00 M3/Hr at 20% solids.

The thickener input includes cyclone over flow, filtrate water from filters, slurry distributor over flow, WBE & HE ESP dust slurry, discharge end scrubber slurry, HLSB de dusting system slurry and the floor wash slurry.

The lines feeding lean slurry will be disconnected from thickener feed and will be connected to a separate sump and sump over flow will be connected to the thickener overflow line. This arrangement will avoid thickener slurry dilution and create space for additional quantity of slurry from grinding circuit/cyclone over flow.

- The underflow slurry volume is = 304 M3/Hr at 65% solids.
- The equivalent solid TPH of the thickener feed is
  
  =1688 / ((1/4.5)+(100/20)-1)
  
  =399.78 = Say 400 TPH

- The equivalent solid TPH of the thickener underflow is
The required plant design capacity to produce 2.5MTPY is 450 TPH (Wet basis).

\[
\begin{align*}
= & 450 \times ((1/4.5)+(100/65)-1) \\
= & 342.37 \text{ M3 /Hr} \\
= & \text{say 343 m3/hr}
\end{align*}
\]

**Recommendation for capacity enhancement:**

i. Existing thickener under flow pump is 300 m3/hr @65% solids. Under flow pump has to pump 343 m3/hr at 65% solids.(say 400 m3/Hr including 15% design margin). To consult the pump supplier and find out whether same pump can be used with pulley modification to handle the 400 m3/hr volume.

ii. 2 no of new slurry pumps of 400 m3/hr capacity shall be procured.

iii. Divert lean slurry lines. This will reduce lean slurry feed to thickener & improve the thickener feed slurry density (% of solids & SG). Higher feed density will enhance the settling rate and the thickener under flow slurry will have consistent solids better than 65%.

iv. Dosing of better quality flocculants that can increase the settling rate of solids in the thickener.

1.6 Slurry Filters:

There are 2 nos. of pressure filters with active filtering area 480M2. This filter has a provision to increase the filter area up to 576M2 by adding additional plates.

The existing filters as per design can handle 120.2 M3/h slurry per filter with 65% solids, SG 4.72. Corresponding design cycle time 10 minutes and output moisture is 9.5 to 10%.

The design TPH per filter

\[
\begin{align*}
= & 120.2 / ((1/4.72)+(100/65)-1) \\
= & 160.19 \text{ TPH} \\
= & \text{Say 160.2/480} \\
= & 0.333 \text{ T/m2/h}
\end{align*}
\]

However this design output and cycle time are not achievable in operating conditions, because of the fluctuating filter feed slurry parameters such as particle size distribution & slurry density. Due to these parameter variation the cycle time required for average filter cake output moisture of 9.5 – 10% will increase to 15-18 minutes. This increased cycle time will have direct effect on the output tonnage of filters.
Considering the above the achievable productivity will be around 0.25 T/m2/ h.

\[ 480 \times 0.25 = 120 \text{ TPH (Max)} \]

Existing Two filter output will be only

\[ 120 \times 2 = 240 \text{ TPH.} \]

To produce 480 tons of filter cake

\[ \frac{480}{120} = 4 \] filters required.

** Recommendation for Capacity enhancement:**

a. Total 4 Nos. of slurry filters each of 480M2 filtration area are required to produce filter cake of 480tph to feed at 2.5 MTPY production capacity.

b. Additional Two filters of same capacity with associated auxiliary equipments like compressors, feed pumps, water pumps and connecting pipelines are required to achieve 2.5MTPY production.

2. Mixer:

The required design capacity of plant to produce 2.5MTPY is 450 TPH (Wet basis).

\[ \frac{30,00,000}{330/24} = 378.7 \times 1.18 = 446 \text{ including losses} \]

\[ \text{say 450 TPH} \]

The design retention time in the mixer shall be minimum 60 seconds for delivering quality mixed material.

Mixer tonnage is:

\[ 450 \times 1000 / 3600 = 7.5 \text{ Tones,} \]

With a fluidized density of the mixer feed as 1.8 T/m3

Required mixer volume is:

\[ \frac{7.5}{1.8} \times 1000 = 4166.6 \text{ Liters} \]

** Recommendation for Capacity enhancement:**

A new mixer of 450 TPH with a volume of above 4200 Liters shall be procured.

3. Balling Disc:

There are 4 balling discs are 7.620M dia of Roto Auto make, PD -77 model with design capacity 175 TPH on wet basis. Practically these discs can only be loaded up 140-145 tph (wet) on continuous basis.

For 2.5mtpa DMT, (3mtpa design) pellet production about 581 tph mixed material (wet
basis) has to be fed to the balling discs including 30% max. recycle load.

\[
\frac{581.06}{145} = 4.0
\]
say 4 discs have to be in operation

**Recommendation for Capacity enhancement:**
All 4 discs will operate during 2.5mtpa operation capacity.
Every week one disc shall be scheduled for maintenance so that disc availability shall be optimized to allow maximum production.

4. DDRS for Green ball screening:
Double deck Roller screen: Present DDRS efficiency is inadequate to cater the quality green balls to the indurating machine. It is necessary to replace this DDRS with an efficient roller screen which is be operator friendly and easy for maintenance. A new DDRS capable to deliver quality green balls for enhanced production level of 2.5mtpa is required for capacity enhancement.

For producing 2.5 MTPY, The screen with 95% efficiency shall have
Upper Deck with 24 No. of Rolls
Lower Deck with 31 + 4 = 35 No. of Rolls

Upper deck feed @ 3mtpa design with 10% moisture and recycle load of 30%

\[
\frac{3000000}{330} \times \frac{1.18 \times 1.3}{24} = 581.06 \text{ tons}
\]

The Screening area of Upper deck:
Number of gaps = 24 - 1 = 23 gaps of 15mm
Screening area of upper deck = 23 \times (15/1000) \times 4 = 1.38 \text{ M2}
Screening TPH through upper deck with 10% of +16mm green pellets,

\[
581.06 - 58.10 = 522.9 \text{ tph,}
\]
Upper deck Screening rate /Sq mtr = \frac{522.9}{1.38} = 378 \text{ tph.Sq mtr}

The Screening area of Lower deck:
Number of gaps = 35 no. of rolls - 4 Transfer Rolls - 1
= 30 gaps of 9mm
Screening area of upper deck = 30 \times (9/1000) \times 4
= 1.08 M2

Considering 20% of -8mm under size green pellets in the DDRS feed

The fines tph to be screened in lower deck

= 581.06 x 0.2

= 116.22 tph

Screening rate of lower deck/Sq mtr = 116.22 / 1.08

= 107.604 tph/Sq mtr

** Recommendation for Capacity enhancement:**

New DDRS with 24 Rolls in Upper Deck, 35 Rolls in the Lower Deck and roll dia of 85mm shall be installed.

DDRS can handle feed up to 600 tph approx on continuous basis.

5. **Induration and burners:**

Existing indurating machine (84x4 = 336 Sq Mtr process area) has sufficient in built grate area to deliver at the enhanced production capacity of 2.5mtpa.

Calculation

There are 36 burners to supply heat energy for indurating furnace.

Each burner Capacity 12MMBTU/Hr = 3.5168 MW

= 30,23,903 K cal/Hr.

1. Installed total burner heat out put as supplied in the furnace

26 x 30,23,903 K Cal = 78621478 K Cal/Hr

2. Enhanced Pellet Production/Hr = 315.6 TPH

3. Total Heat Energy required /Hr from 26 burners for production of 315.656t of pellets

= 315.656 x 2,50,000 K Cal = 7,89,14,000 K cal/hr

4. Heat supplied by solid fuel assuming addition of 10kg of coke with coke CV @6500 Kcal/Kg

= 315.656 x 10 x 6500

= 205,17,640 K Cal/hr

5. Net Heat required from 26 burners for 315.656tph of production

= 7,89,14,000 - 205,17,640

= 58396360 K Cal/hr
6. Installed burner capacity- Required heat input from burner

\[ = (78621478 \text{ K Cal/Hr} - 58396360 \text{ K Cal/Hr}) \]
\[ = 20225118 \text{ Kcal/Hr} \]

** Installed burners have surplus capacity to supply heat energy over and above the enhanced capacity heat requirement**

6. Process gas fan and duct modification:

At the 2.5mtpa production levels additional cooling air has to be supplied to the indurator. Existing Cooling air fan installed is just sufficient to cater the cooling air requirement of 2mtpa production rate. A second cooling fan with associated equipment such as dampers, silencer & inter connecting ducts shall be installed for second cooling zone.

In the pelletising process pellets have to be indurated in excess of air. Every ton of quality pellets produced a minimum of 2.5 - 3.0 tons of air is required.

For calculation 2.75ton of air /Ton pellets is considered.

For a rated capacity for 2.5mtpa TPH production design capacity will be 3mtpa.

Accordingly the production tph at enhanced capacity with design margin

\[ = \frac{30,00,000}{330} = 9090.91 \text{ TPD/24tph} \]
\[ = 378.79 \text{ TPH Pellet} \]

To produce Maximum 378.79 TPH of Pellets qty of Air required

\[ = 378.79 \times 2.75 \]
\[ = 1041.667 \text{ T PH} \]

Equal lent Volume of Air (Maximum Design) of Cooling Air fan is required.

\[ = \frac{1041.67}{0.001225} \]
\[ = 8,50,344.90 \text{ M3/hr} \]
\[ = 236.20 \text{ m3/s} \]

The existing cooling air fan capacity =195.5 m3/s

Additional cooling air fan required =236.20–195.5

\[ = 40.70 \text{ m3/s} \]

** Recommendation for Capacity enhancement:**

a. Addition of cooling air fan ( CA fan -2) of 40 m3/s is required to be installed to achieve enhanced production capacity of 2.5 MTPY
b. Recommended to connect cooling air fan – 2 (CA Fan -2) to wind box no. 21 and connection of wind box no. 19 with cooling air fan -1 will be retained.

c. Present process gas duct connections to the furnace wind boxes may need modification.

d. After the existing plant capacity reaches the rated production and the operation parameters are stabilized, the dummy wind boxes shall be connected to respective fans and if required modification in the fans shall be made.

7. Hearth layer screen:

The indurating machine discharge will generally contain about 30-40% fired pellets of +12mm in size. These pellets shall be screened and supplied to the hearth layer system. This will avoid grate bar choking and improve the bed permeability in the indurating machine.

A new hearth layer screen shall be installed to deliver around 120tph of (+12mm ) fired pellets to the hearth layer bin.
HL Screen sizing:
HL volume required at the production rate of 2.5mtpa.

Volume of Hearth layer per minute considering the speed of grate @2.2mtr/Minute
\[ = \left( (4.0 \times 100 + 0.450 \times 0.100) \right) \times 2.2 \]
\[ = (0.4 + 0.045) \times 2.2 \]
\[ = 0.979 \text{m}^3/\text{Minute} \]

Volume of Hearth layer required per hour \[ = 0.979 \times 60 \text{m}^3/\text{mtr} \]
\[ = 58.74 \text{m}^3 \]

HL required TPH \[ = 58.74 \times 2.1 \]
\[ = 123.354 \text{t/hr}(125\text{tph}) \]

Considering 40% of +12mm size fired pellets in the machine discharge

Screen feed TPH required \[ = 125/0.4 \]
\[ = 312 \text{tph} \]

** Recommendation for Capacity enhancement:**
HL Screen of 300tph feed and output 120tph with Screen aperture +12mm shall be installed.

8. Material handling system:
An design capacity study of the existing material handling system conveyors has been carried out to establish whether the installed conveyors are capable to handle the enhanced plant capacity.

Accordingly SI No 29: MF-1 Mixer feed conveyor, and SI No 53: P-2 Product discharge conveyor have to be upgraded to next higher tph for smooth plant operation.
<table>
<thead>
<tr>
<th>SL. NO</th>
<th>Conveyor</th>
<th>Description</th>
<th>Existing Design/Rated</th>
<th>Req for 2.5 MTPY</th>
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<td><strong>From HLSB to Junction House</strong> 303/253 450</td>
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<td>From JH to Product building 600/500 450</td>
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**Recommendation in material handling system for Capacity enhancement:**
Conveyors at Sl No 29 & 53 have to be modified to handle the material at enhanced production rate of 2.5 MTPY.

DL Saralaya
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