

ESP Case Study



Iron Ore Pelletisation Application in Steel Industry – Grate Kiln Process



Primary Downdraft Drying ESP

Vale Pelletisation Company LLC, Sultanate of Oman

THE CUSTOMER PROFILE

Vale S.A. is a Brazilian multinational diversified metals and mining corporation. In addition to being the second-largest mining company in the world, Vale is also the largest producer of iron ore pellets. Vale S.A. opened a 9 MTPA (2 x 4.5) Iron ore pelletisation plant in Sohar, Sultanate of Oman., on March 3rd, 2011. High grade iron ore for the plant is imported from Brazil & finished product is sold to Steel plants globally as a raw material feed for Blast furnace or Electric arc furnace.

THE PELLETIZATION PROCESS

Pelletisation process turns fine –grained iron ore into hardened balls of approx. 8 to 16 mm diameter, which are used as feed in Blast Furnace, Electric arc furnace or DRI plant.

Fine grained high quality Iron ore is mixed uniformly with Lime stone, Coke Breeze along with Bentonite & moistened with water & taken to a balling drum where in centrifugal force reduce the moistened raw material to 'Green Pellets' of required size as specified by customer.

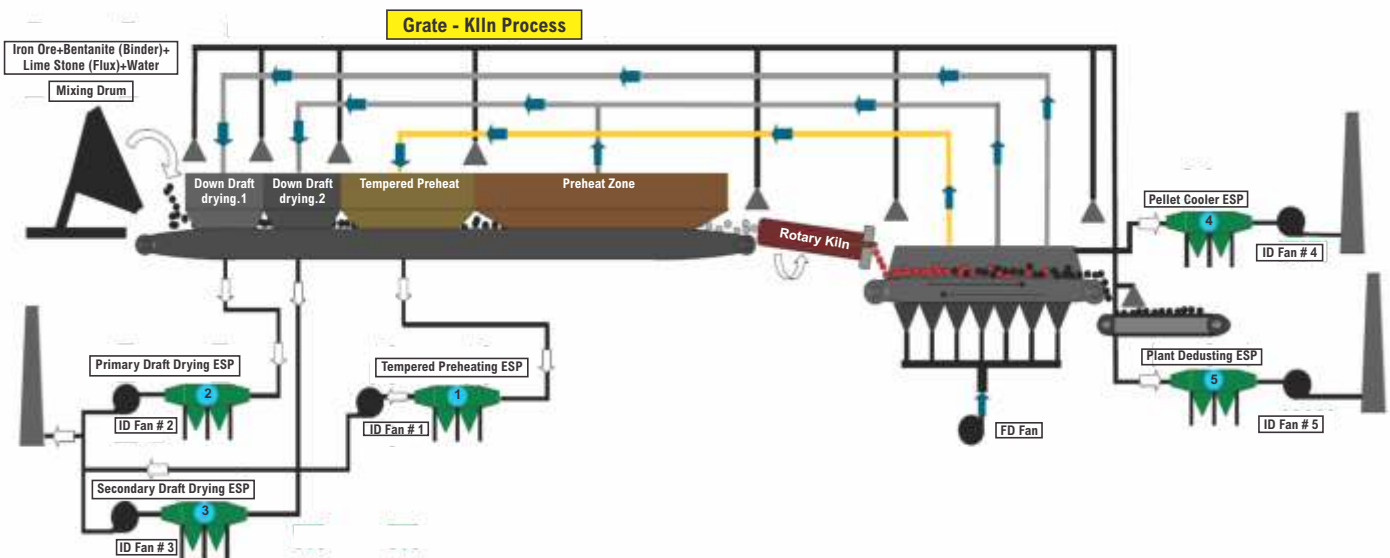
The Green pellet thus obtained is taken to an indurating furnace having heat resistant perforated cast iron traveling grate bars arranged on two rotating drum to make an end less belt.

Green Pellet is evenly placed at the feed end & burners are arranged opposite each other on longitudinal sides of the preheating & firing zone. As the belt progress a series of heavy duty fan draw air through the pellet bed & coke breeze in the Green pellet catches fire. The speed of the belt is arranged in such way that the pellets harden uniformly & emerge as red hot pellet at discharge end.

The dust laden gases are treated in Pollution control equipment before letting out through stack. Unlike in 'Straight Grate' process a 'Grate Kiln' process employ only one burner situated at the discharge end of the Rotary Kiln.

Forced 'Annular coolers' are located at discharge end to uniformly cool pellet by an updraft of ambient air before transporting to storage silo.

Schematic of a Iron Ore Pelletisation Process showing ESP location



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THE CHALLENGE

Grate Kiln process is unique process designed to evenly indurate pellets to increase its mechanical properties. This process employ a conventional 'Straight Grate' followed by a 'Rotary Kiln' designed to churn the pellets & thus increase even heating as well to avoid fragmentation in transportation.

As against a conventional burner the hot gases from the Rotary kiln are reused to preheat the green pellets so that the moisture in the Green pellet is gradually released & avoid steam formation inside pellet which would otherwise rupture the pellets.

Technology for the Project was offered by KOBELCO, Japan. who has recommended Grate Kiln Technology of Metso Minerals.

'Grate Kiln' process was then a 'first- of- a-kind' application for Thermax, despite having supplied numerous Air pollution control equipment on 'Straight Grate' Pellet plant. The challenge in this case was the high dust load generated due to churning of pellet inside the Kiln as well space constrain in Location of ESP's.

THE THERMAX ENVIRO SOLUTION

Process engineers at Thermax carried out extensive study & based on performance data of 'straight grate' Pellatisation Process derived optimum design of ESP for 'Grate Kiln' Process & accommodated in the given floor space without compromising on technical parameters .

The performance Guarantee test was done after commissioning of ESP & all ten units of ESP shown an emission of less than 50mg/Nm3



Tempered Preheating ESP



Date: 05th December 2011

TO WHOMSOEVER IT MAY CONCERN

This is to certify that Enviro Division of Thermax Limited, Pune, has designed, engineered, manufactured, supplied and assisted the commissioning the following Electrostatic Precipitators supplied against the contract no 0018/2008 dated. March 01, 2009 at our Pelletizing plant located at Falaj Alqubail, Sohar, Sultanate of Oman:

Details of Electrostatic Static Precipitators supplied

ESP no 01:

Parameter	Units	Value
Source of pollution/ Application	-	Iron ore Traveling grate Tempered Pre heating
Gas flow rate	Am3/hr	720000 Am3/hr
Inlet dust load	gm/nm3	05 gm/Nm3
Outlet emission	mg/nm3	50 Mg/Nm3
Year of commissioning	-	April 2011

ESP no 02:

Parameter	Units	Value
Source of pollution/ Application	-	Iron ore/ Traveling grate Primary down draft drying
Gas flow rate	Am3/hr	570000 Am3/hr
Inlet dust load	gm/nm3	05 gm/Nm3
Outlet emission	mg/nm3	50 Mg/Nm3
Year of commissioning	-	April 2011

ESP no 03:

Parameter	Units	Value
Source of pollution/ Application	-	Iron ore/ Traveling grate Primary down draft drying
Gas flow rate	Am3/hr	7,80,000 Am3/hr
Inlet dust load	gm/nm3	05 gm/Nm3
Outlet emission	mg/nm3	50 Mg/Nm3
Year of commissioning	-	April 2011

Vale Oman Pelletizing Company LLC
P.O.Box 1918, Muttrah 114, Sultanate of Oman

ESP no 04:

Parameter	Units	Value
Source of pollution/ Application	-	Iron ore fines/ Annular Cooler
Gas flow rate	Am3/hr	1,56,000 Am3/hr
Inlet dust load	gm/nm3	10 gm/Nm3
Outlet emission	mg/nm3	50 Mg/Nm3
Year of commissioning	-	April 2011

ESP no 05:

Parameter	Units	Value
Source of pollution/ Application	-	Iron ore fines/ Product Screening
Gas flow rate	Am3/hr	1,38,000 Am3/hr
Inlet dust load	gm/nm3	07 gm/Nm3
Outlet emission	mg/nm3	50 Mg/Nm3
Year of commissioning	-	April 2011

Thermax has also been providing us services of their services engineers as & when we need for trouble shooting & tuning the systems. We are fully satisfied with the services provided by Thermax.

For Vale Oman Pelletizing Plant
ROBERTO MARCO FERRARI
PROCEMENT MANAGER



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