30% reduction in energy by cooler modification with IKN Pendulum cooler
Energy consumption of a kiln line

Fuel Consumption

- 135 Kcal/kg (20%) Equipment dependent
- 180 Kcal/kg (25%) Equipment dependent
- 410 kcal/kg (55%) Raw & Fuel Dependent

Fuel consumption = 730 kcal/kg

Electrical energy for Pyro

- 6 kWh/t (35%)
- 8 kWh/t (47%)
- 3 kWh/t (18%)

Total electrical energy consumed = 17 kWh/t
Pyro Line

Preheater: 31,800 MTOE
Kiln: 68,000 MTOE
Cooler: 23,200 MTOE

IKN...cool down
Current challenges
- High Clinker temperature: 200 °C
- Low efficiency: 65%
- Higher Power consumption: 6 kWh/t (fans, drive, crusher and CV fan)
- Maintenance cost: Rs.9/ton
- Unscheduled Stoppages: 1 to 2/year
Reasons for the Challenges!
- High Clinker temperature loading too high for the used technology
- Low efficiency technology not made for the increased requirements
- Higher Power consumption higher pressure and drive power (fans, drive, crusher, CV fan) used to compensate inferior design
- Maintenance cost price for operating at the absolute max
- Unscheduled Stoppages equipment operating at 150% of design

IKN...cool down

Reason for Challenges
How to conquer the challenges?
- High Clinker temperature: New grate design able to handle high load.
- Low efficiency: New grate design geared for high efficiency.
- Higher Power consumption: New grate design with high and equal precision to avoid unwanted pressure drop (useless pressure drop because of protective layer or regulators).
- Maintenance cost: New grate design able to operate at high demand.
- Unscheduled Stoppages: New grate design made to operate more than 355 days at max load.

IKN...cool down

Current Challenges
IKN way
to address
the challenges
✓ Grate Design to handle High Load with high Efficiency
  ❖ Horizontal Aeration (COANDA effect)
  ❖ Fixed inlet distribution system (KIDS)

✓ Low Power Consumption
  ❖ Full control of all gaps by special design and Pendulum suspension (LPS), thus making any throttle tool unnecessary

✓ Low Maintenance Cost and High Availability
  ❖ Wide grates with slow forward and quick backward motion
  ❖ Less mobile rows
  ❖ A special Hydraulic drive located outside the cooler
Coanda Effect

ca. -100 dPa

1.0 m/s
KIDS

(Klinker Inlet Distribution System)

- Uniform distribution of clinker
- Excellent heat recuperation
- Coanda effect adds transport capacity to the clinker bed avoiding special blaster
Special hydraulic drive

✓ Upto 5000 tpd single drive cylinder and upto 10,000 tpd two drive cylinders are sufficient. Beyond 10,000 tpd coolers need only four cylinders.

✓ All cylinders are fitted outside the cooler and hence Easy for inspection and maintenance.
Simple enough: Every 3rd row movable
Roller crusher

- Less dust emission to the vent air
- Perfect sealing against false air from the clinker conveyor
- Smaller range of particle size distribution after the crusher
Case study - 1
Cooler replacement in UTCL, Rajashree#3

- Existing cooler has been replaced with energy efficient IKN Pendulum Cooler.
- Main reason for modification was to improve the energy efficiency of the plant.
## Case study - 1

**Cooler replacement in UTCL, Rajashree#3**

Operation parameters by comparison after IKN upgrade:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameters</th>
<th>Before IKN</th>
<th>After IKN</th>
<th>Savings/advantages</th>
<th>MTOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power kWh/ton</td>
<td>5.5</td>
<td>3.75</td>
<td>1.75</td>
<td>241</td>
</tr>
<tr>
<td>2</td>
<td>Cooler losses (zero deg C Kcal/kg)</td>
<td>135.8</td>
<td>105</td>
<td>30.8</td>
<td>4962</td>
</tr>
<tr>
<td>3</td>
<td>Clinker temperature (deg C)</td>
<td>181</td>
<td>61</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Fuel</td>
<td>40% Pet coke</td>
<td>100% Petcock</td>
<td>Able to fire 100% petcock now</td>
<td></td>
</tr>
</tbody>
</table>
Case study - 2
JK Lakshmi Cement Ltd

Operation parameters by comparison after IKN upgrade:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameters</th>
<th>Before IKN</th>
<th>After IKN</th>
<th>Savings/advantages</th>
<th>MTOE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power kWh/ton</td>
<td>4.6</td>
<td>2.8</td>
<td>1.8</td>
<td>298</td>
</tr>
<tr>
<td>2</td>
<td>Cooler losses (zero deg C Kcal/kg)</td>
<td>158</td>
<td>139</td>
<td>19</td>
<td>3292</td>
</tr>
<tr>
<td>3</td>
<td>Clinker temperature (deg C)</td>
<td>193</td>
<td>100</td>
<td>73</td>
<td></td>
</tr>
</tbody>
</table>
Case study - 2
JK Lakshmi Cement Ltd – Recirculation of Hot vent gases

Hot air recirculation tapping from stack

IKN...cool down
Case Study-2 Partial recirculation of cooler vent
Case study - 2

JK Lakshmi Cement Ltd – Standard cooler operation

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Case Study-2 Partial recirculation of cooler vent
Case study - 2

JK Lakshmi Cement Ltd – Recirculation of Hot vent gases
Make Indian cement plant world class - Green

If all the 250 MTPA clinker produced is cooled by IKN coolers (based on savings of power by 1.5 kWh/t on average)
YOU can supply free power for 9 months for a city like Jodhpur
Make Indian cement plant world class - Green

Savings of Thermal = 20 kcal/kg cl (on average)

Savings in Coal if all clinker in India is cooled by IKN = 20,000 Wagons of coal per year
Make Indian cement plant world class - Green

Let US make Indian cement plant green

Let US save our resources for our children
...cool down

Thank you for your attention!
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