

Lafarge's powerful savings

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Yibitas Lafarge's Yozgat plant is located in central Turkey in the historical area of Hitits. The preheater and kiln system were originally designed by KHD with a nominal production of 1600tpd.

However, increases in capacity resulted in high velocity in the preheater tower (riser ducts, cyclones and immersion tubes). A velocity profile of the system is shown in Table 1. The high velocities resulted in a high pressure drop (high power consumption) and partial in relatively low retention time (slightly increased heat consumption).

Production before modification averaged 2250tpd with a specific heat consumption of approximately 3380kJ/kg and a pressure drop in front of the preheater fan of approximately 90mbar.

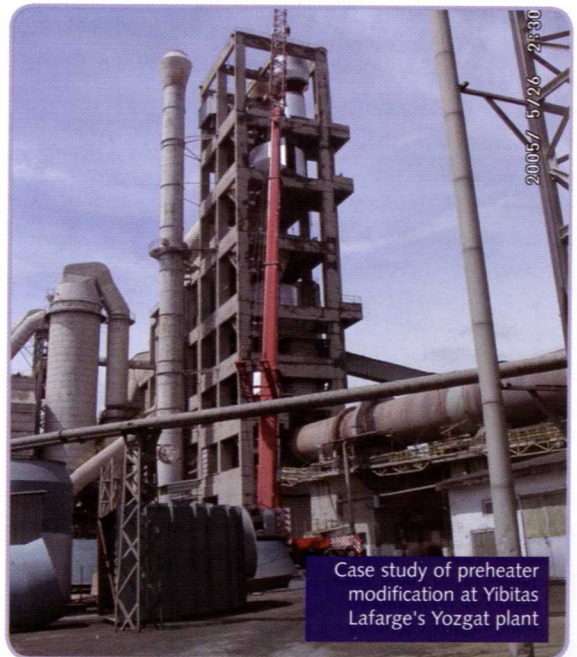
A TEC of Austria describe work undertaken to the preheater at Yibitas Lafarge's plant in Yozgat, Turkey where it aimed to reduce velocity without altering the preheater's concrete structure. The project description is documented below together with performance results which show significant reductions in power consumption.

Therefore, Yibitas Lafarge decided to modify its preheater equipment to reduce the velocity with the precondition of avoiding modification to the existing main concrete structure. The contract for this work was awarded to A TEC GmbH of Austria.

Work executed by A TEC

A TEC's scope of supply for the Yibitas project included the following:

- plant investigation to measure exact pressure drop, process parameters and evaluate design possibilities



Case study of preheater modification at Yibitas Lafarge's Yozgat plant

Table 1: velocity profile

Location	Area before modification m ²	Area modified	Velocity before m/s	Velocity after m/s
Cyclone 4 inlet	5.46	8.55	29.80	19.00
outlet	4.71	8.55	33.70	18.60
Riser duct C4/C3 before feed	4.71	8.04	33.80	19.80
Riser duct C4/C3 after feed	5.06	8.04	30.00	18.90
Cyclone 3 inlet	5.46	8.33	28.10	18.40
outlet	4.71	8.04	33.20	19.40
Riser duct C3/C2 before feed	4.71	8.04	33.20	19.40
Riser duct C3/C2 after feed	5.06	7.07	24.80	17.80
Cyclone 2 inlet	5.46	7.43	23.00	16.90
outlet	4.71	7.07	24.80	17.80
Riser duct C2/C1 before feed	4.71	7.07	26.80	17.80
Riser duct C2/C1 after feed	4.45	6.16	23.40	16.90
Cyclone 1 inlet	1.95	2.63	26.70	19.80
outlet	3.14	3.80	17.00	14.10
Hot gas duct	7.07	7.07	15.10	15.10

- system layout
- general arrangement drawing of the modified section
- load data of the new equipment for the calculation of the civil works
- design and calculation of the equipment supplied by A TEC
- preparation of the project time schedule
- basic data for dip tube stage three and four
- basic data for lining
- position of maintenance platforms
- position of manual measurement openings and shock blower flanges
- data for ID-fan
- delivery of workshop drawings for cyclone modification
- delivery of workshop drawings for dip tubes stage one and stage two
- delivery of workshop drawings for new riser ducts stage including support, man hole, expansion joint and poke holes
- delivery of workshop drawings for new hot gas duct parts
- delivery of workshop drawings for modification of feed, meal pipes top stage and meal pipes second-stage
- supervision of erection
- commissioning and performance test.

Realisation time and weight

Weight of the new steel parts for the cyclones and ducts was approximately 180t and the weight of the refractory lining was approximately 380t. Parts to be dismantled consisted of approximately 150t of steel and 240t of refractory lining.

The contract between Yibitas Lafarge and A TEC was signed in November 2004. Design, mechanical and static engineering was completed in February 2005. Kiln downtime period was between May and June 2005 (during weeks 19-25), and the successful restart of the kiln was at the end of week 25. The total stoppage period was seven weeks. Thus, from contract signing to restart of the kiln took just eight months.

Results

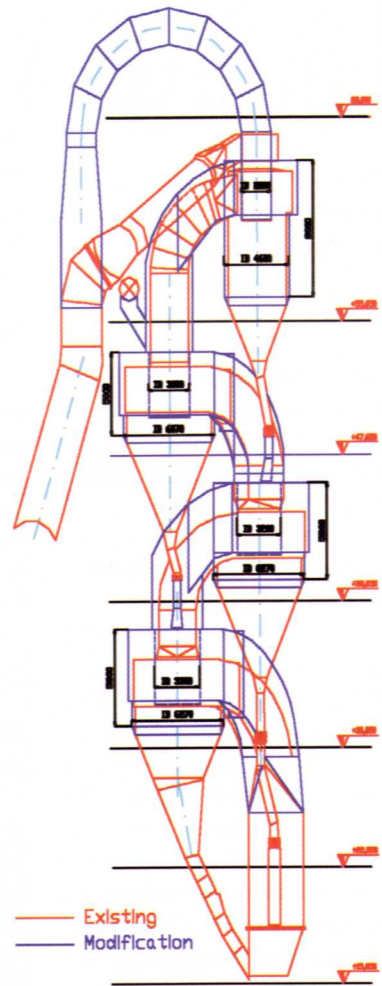
Expected figures:

- pressure drop reduction: >36mbar
- power saving: >480kW

Description of modification works

Below is a description of the modification works and together with a simple drawing of the general arrangement.

- ▶ New upper part of hot gas duct
Diameter of duct: 2200mm
- ▶ Modification of preheater feed arrangement
- ▶ New upper part of top stage cyclones
Inner diameter of cyclone: 4600mm
- ▶ HURRIVANE® including dip tubes for top stage
Diameter: 2200mm
- ▶ New riser duct stage 2-1
Inner diameter of duct: 2800mm
- ▶ Modification of top stage meal pipes
Inner diameter of duct: 400mm
- ▶ New upper part of cyclone 2
Increase of cyclone height: 1000mm
- ▶ New dip tube cyclone second-stage
Inner diameter of dip tube: 3000mm
- ▶ New riser duct 3-2 inside
Inner diameter of duct: 30000mm
- ▶ Modification of second-stage meal pipe
Inner diameter of duct: 500mm
- ▶ New upper part of cyclone three
Increase of cyclone height: 1500mm



- ▶ New dip tube cyclone third-stage
Inner diameter of dip tube: 3200mm
- ▶ New riser duct 4-3
Inner diameter of duct: 3200mm
- ▶ New upper part of cyclone four
Increase of cyclone height: 1500mm
- ▶ New dip tube cyclone fourth stage
Inner diameter of dip tube: 3300mm

- reduction of return dust: >1.5 per cent
 - reduction of heat consumption: 10kcal/kg
- *All data are shown at a production rate of 2250tpd.

Realised figures:

- pressure drop reduction: 46mbar
 - power saving: 600kW
 - reduction of return dust: 2.5 per cent
 - reduction of heat consumption: 15kcal/kg
- *All data are shown at a production rates of 2384tpd.

Conclusion

With modifications to preheater tower, including the preconditions of maintaining the concrete structure, it is possible to dramatically improve the performance and cost situation of a system.

The return on investment in the described case was less than two years. The following benefits were also achieved:

- higher annual production is approximately €550,000
- annual amount of power saved is approximately €300,000.