



A TEC

World Leader in Cement Pyroprocess Technology

Narrowing the Gap

Kasernstraße 16-18
3500 Krems an der Donau
AUSTRIA

Tel.: +43 2732 75 680
Fax: +43 2732 75 680 201
E-Mail: sales@atec-ltd.com

www.atec-ltd.com

Please note:

In the following article A TEC GmbH could also be mentioned as A TEC Advances Process Technologies GmbH, PMT; PMT-Zyklontechnik GmbH, Zyklontechnik GmbH (= company name before 1st June 2005).

NARROWING THE GAP

Dr Franco Colaiacovo, President, Colacem SPA, Italy and Wolfgang Freimann, PMT-Zyklontechnik GmbH, Austria, describe an upgrading project to decrease the pressure drop and energy consumption of the preheater tower at Colacem's Rassina plant, Italy.

Introduction

The Colacem Group is one of the largest Italian cement producers. One of its production plants is located in Rassina, a small village in Toscana. The production capacity before modification was approximately 2300 tpd (maximum 2500 tpd). The preheater system was equipped with a calciner including tertiary air duct, one cyclone after the calciner, shaft, two cyclones and four cyclones as the top stage.

Colacem wanted to decrease the pressure drop in the preheater tower (for a production of 2500 tpd, by approximately 9000 Pa in front of the preheater fan) especially in the top and second stages and to equalise the exhaust gas temperature. The temperature difference of the four top stage cyclones was 60 °C.

Colacem was looking for proposals to solve these problems under the preconditions of a minimum kiln shutdown period, and employing a minimum amount of new or modified equipment.

PMT-Zyklontechnik's proposal was in principle to enlarge the second stage of the preheater, insert Vortex finder vanes and instead of four cyclones, install two new Hurriclon® cyclones as the top stage located between the existing cyclones, thus optimising the kiln feed.

Main works

The work performed by PMT-Zyklontechnik included the following, which are illustrated in Figure 1.

- Engineering work, including workshop drawings for Italian local manufacturing of the inlet bow to the cyclones in stage no. 2, the enlargement of the cyclones in stage no. 2 (enlargement of conical part, new cylindrical part, new entrance and new immersion tube), new riser ducts from stage 2 to the top stage including a new meal feed box and expansion joints, a new top stage including new meal pipes, pendulum flaps, expansion joints and meal inlet box in the riser duct and the modification of the hot gas duct.
- Supply of 2 units comprising Vortex finder vanes @ 2.5 m dia. for the second stage and 2 Hurriclon® 3700 CT units as the top stage.
- Supervision of erection and start up.

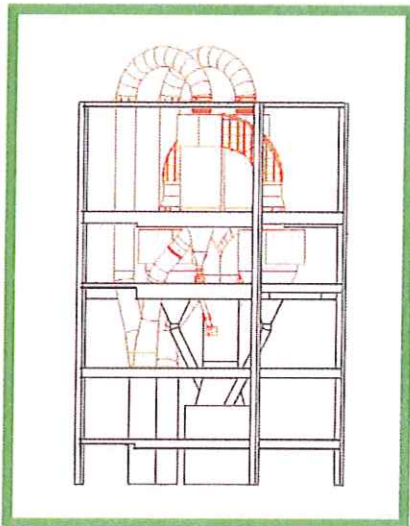


Figure 1. Preheater system.

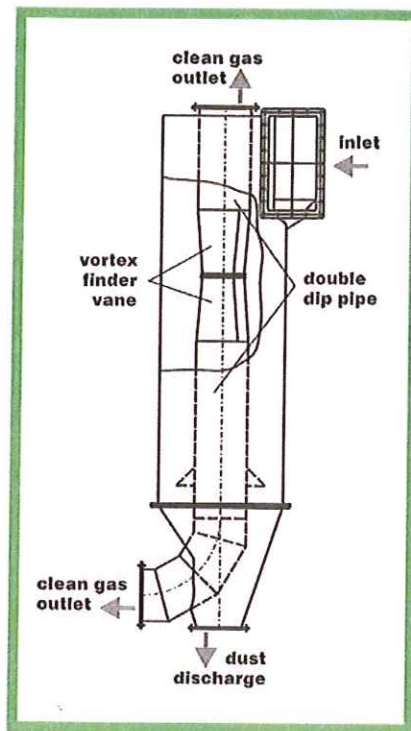


Figure 2. Hurriclon® cyclone separator.

Technical advance

International patents have been awarded and numerous installations have been constructed based on the technically advanced characteristics of the double immersion tube principle and integrated Vortex finder vanes.

The pressure drop and residual dust content are both reduced significantly compared to conventional cyclone separators. Operational use since 1990 has proven the practical application of this new technology.

Pressure drop and energy consumption

Compared to conventional cyclone separators, the level of pressure drop and energy consumption experienced with Hurriclon® is reduced substantially, with a simultaneous improvement of total separation efficiency.

By using the Hurriclon® it has been possible to meet the demands for high flow rates and low pressure drop commonly required in practical applications. In many of these, the desired level of volume flow can be achieved with a single separator.

In terms of rotary valves, wear linings and steel construction, this solution represents significant savings and results in a higher level of efficiency due to lower investment costs. To maximise energy savings, Vortex finder vanes are employed. Traditional cyclone separators require up to 100% more pressure drop.

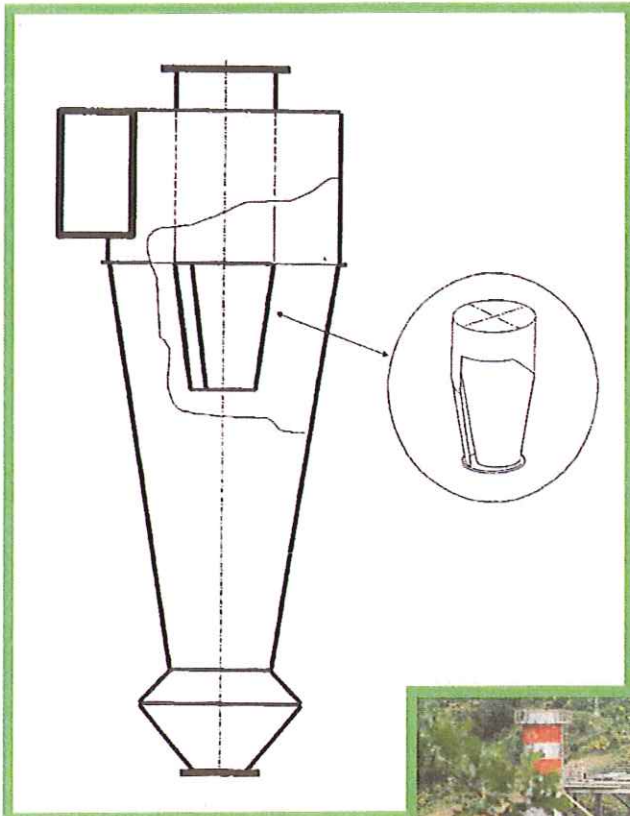


Figure 3. Vortex finder vanes for cyclone separators.

Separation efficiency

In addition to a separation of 98% of particles larger than 5 µm to 30 µm, depending on the type of cyclone used, a practical separation efficiency has been achieved in large-scale technical applications, which results in wear-free operation for downstream facility equipment.

The cost-efficiency aspect is reflected in the exceptionally high level of removal and lower costs for downstream equipment components, especially because the maximum particle is restricted to particle sizes which are classified to be wear-free.

Hurrlicon® cyclone separators have been used successfully for many years in the cement, lime, plaster, wood, foundry and sugar industries as well as in metal powder separation applications.

Vortex finder vanes

A number of installations since 1992 in the wood, cement, lime and plaster industries and the patents awarded have confirmed the energy savings which can be achieved by installing these vanes.

Existing and new cyclones can be fitted with them. This allows a reduction of 30% of the pressure drop of conventional cyclone separators, thereby helping to save precious energy.

For example this represents energy savings of some 140 000 kWh p.a. for a volume flow of 100 000 m³/h, pressure drop reduction of 5 mbar and 7000 operational hours annually.

Table 1. Operating results.

Kiln feed	170 - 175 tph
Preheater fan	
Speed	700 rpm
Power	850 kW
Pressure drop in front of preheater fan	6200 Pa
Oxygen content	4 %
Preheater tower	
Pressure drop of stage 1	600 Pa
Temperature after stage 1	320 °C
Pressure drop of stage 2	1000 Pa
Temperature after stage 2	530 °C
Secondary and Tertiary air temperature	1030 °C
Total fuel input	78.12 million kcal/h
Kiln feed	175 tph
Chemical clinker factor	1.54
Clinker production	2500 tpd
Heat consumption	750 kcal/kg clinker

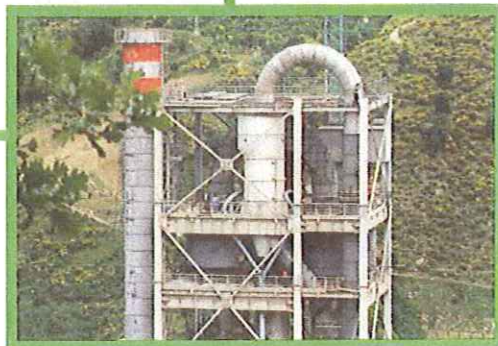


Figure 4. Modified upper part of the preheater.

Vortex finder vanes are almost as simple as the immersion tube itself, since they ensure problem-free operation and economical use in large-scale technical applications. The sizes installed range from a diameter of 3.6 m to 0.15 m, for operating temperatures up to 650 °C. Simple installation and low downtime guarantee the efficiency of the Vortex finder.

Commissioning

By the middle of June 1999 the erection including the refractory lining was successfully completed, after a kiln shutdown of 3 weeks, and the kiln could be restarted. After approximately three days, a capacity of 2500 tpd was realised with a pressure drop reduction of 2800 Pa. Figure 4 shows the modified upper part of the preheater in Rassina.

Conclusion

The power consumption of the preheater fan can be decreased by 350 kW which is approximately 2.8 million kWh per year.

The heat consumption was decreased by 20 kcal/kg clinker with the new optimised location of feed and lower velocity in riser duct.

In most cases, the limitations of preheater modifications are concerned with the structure of the existing preheater building, in terms of space and load. By using Hurrlicon® cyclone separators both of these potential problems can be fulfilled because of double gas throughput of Hurrlicon® compared to conventional cyclones. The double gas throughput can be realised because of two immersion tubes. This new technology places a new perspective on preheater upgrading projects.

Enquiry no: 15