

HURRICLON INSTALLATIONS IN LATIN AMERICA

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Due to the development of its pyroprocessing and grinding technology capabilities, A TEC - the former PMT-Zyklontechnik - can now be considered to rank among the 'big boys' when it comes to complete plant engineering. Here the company details its high-efficiency installations of Hurriclon and Hurrivane technology, with an emphasis on case studies in Latin America.

A TEC GmbH has evolved in the last few years from being a cyclone specialist and equipment supplier to a globally active engineering and construction company with its own key technologies in the pyro-process and grinding process areas. The company's key markets are the cement and the lime industries. A TEC Company has locations in Austria (Krems - Goedersdorf - Eberstein), in Kuala Lumpur - Malaysia, Delhi - India, as well as sales offices in the USA, Italy, Switzerland and Poland.

Previously A TEC was known as PMT-Zyklontechnik. However due to the rapid development of new technologies it was decided to change the company's name to A TEC Advanced Process Technologies GmbH. This change is only about the name of the company. The owners, management, engineers, and the staff remain the same.

Process optimisation

Optimising processes in the cement industry with the target of maximising production at the lowest costs with emphasis on sustainability offers a wide range of possibilities for improvement. Saving specific energy consumption is therefore a main objective in designing and upgrading cement plants. Pressure loss and separation efficiency are two key characteristics in providing potential for more efficient processes. Typically reducing the pressure loss in so called low-pressure cyclones meant less separation efficiency. A

TEC has developed a specially-designed double dip-tube cyclone equipped with HURRIVANE® (vortex finder vanes) to overcome this bottleneck in the cement production process.

The HURRICLON® technology combines the advantages of lower pressure loss with better separation efficiency leading to a higher production rate. Additionally, the residual dust in the clean gas also has significantly smaller particle size that reduces the wear in the downstream installations (mills, baghouses). Since introducing the HURRICLON to the industry, it has been a remarkable success-story in cement plants all over the world.

Positive response from the company's customers and further development in the most modern cyclone test facility at the A TEC research centre offer the possibility to enhance the application range. After numerous successful installations in preheaters and in clinker cooler dedusting, A TEC has developed new possible applications in other areas of cement production. The full potential of HURRICLON technology for improving the efficiency of cement plants has certainly not yet been reached and there are several additional applications where low pressure loss combined with high separation efficiency is crucial.



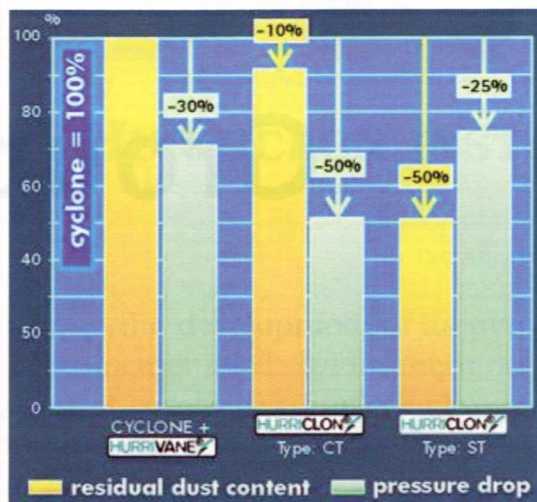
HURRICLON

The first target in developing a new cyclone was to increase the air volume to be handled. As the dimension of a cyclone is primarily limited by the dip-tube area, the solution was to introduce a second dip-tube at the bottom of the cyclone. Of course, both dip-pipes are equipped with HURRIVANE to allow minimum pressure loss at high separation efficiency to start with.

The HURRICLON can handle larger gas flow than conventional cyclones, while keeping the same velocity. Reducing the spin velocity compared to conventional cyclones also reduces the pressure drop and therefore lowers the costs of the ID-fan.

During extensive research campaigns, a substantial improvement in the separation efficiency could be observed due to higher circumferential velocities caused by the smaller diameter of the outside shell. The HURRICLON uses the inertial forces present on solid particles suspended in rotating gases. The vacuum effect found on conventional cyclones and multicyclones is eliminated as far as possible. This vacuum effect is caused by the change in the moving direction of the gas and causes already separated dust to re-enter the gas stream thus increasing the emissions.

Further developments in optimising separation efficiency or pressure loss by modifying the shape and the proportions of the HURRICLON lead to



Above: Pressure drop vs dust content for Hurrivane and Hurriclon installations.

the design of special types for different applications.

Depending on the main target of the application the CT type HURRICLON is mainly used in the preheater where lowest pressure drop is essential, while the ST type HURRICLON is focusing on low residual dust, for example in clinker cooler dedusting or different mill purposes.

The design of the A TEC HURRICLON offers decisive advantages:

- Reduction of residual dust;
- Reduction of energy consumption;
- Reduction of space required and peripheral investment;
- Reduction of equipment wear;
- Increase of production;
- Better performance of the plant.

Cement plant applications

The main fields for using HURRICLON are:

- Clinker cooler exhaust gas pre-dedusting; to decrease the residual dust and reduce the wear;
- Grinding circuits; to decrease the consumption of energy;
- Preheater; to decrease the required energy and increase the production.

In the Latin American area, the main applications are in the clinker cooler exhaust dedusting and in the preheater top stage. The following examples show the successful improvement of the operating data after installing HURRICLON in different cement plants.

Cementos RioClaro

An existing multicyclone installation at the clinker cooler exhaust dedusting unit has been replaced by six units of the HURRICLON 1600 ST to handle a gas quantity of approximately 230,000Am³/h. This modification provided a reduction of the residual dust from 550kg/h to 44kg/h with a separation efficiency of 99%.

The essential advantages of this solution are:

- High separation efficiency at low pressure drop;
- Considerably reduced maintenance costs;
- Significant reduction of emission without ESP or bag filter;
- Increase in clinker production (~15t/day);
- Reduction of wear downstream (2% particle >17µm in residual dust).

Cementos Apasco

This project involved the modification of a Polysius 4-stage DOPOL preheater with an additional new top stage. In addition to modifications of lower stage cyclones, riser ducts and the down comer duct, two units of HURRICLON HU 2650 CT have been installed in the new top-stage. The improvement allowed an increase in the production from 1600t/d to about 1890t/d (+17%) with significant reduction of the specific heat consumption from 880kcal/kg clinker to 805kcal/kg clinker. At the same time the static pressure decreased from 9100 Pa to 8200 Pa; with a static pressure of 1200 Pa at the new top stage.

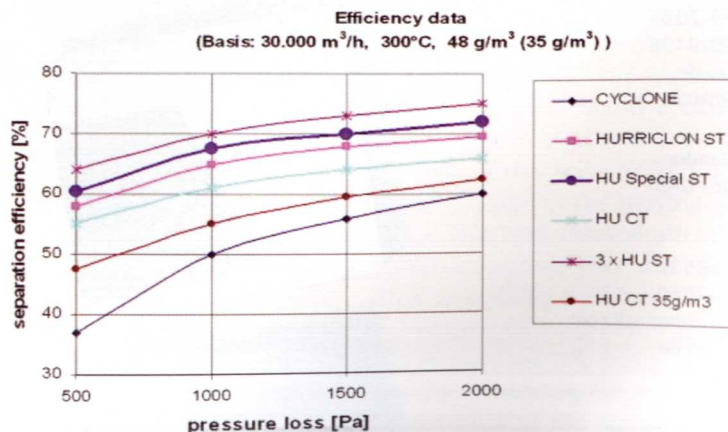
The main advantages of this solution are:

- Significant production increase (+17%) with minimum investment;
- Reduction of specific heat consumption by approximately 10%;
- Increase of separation efficiency (from 81 to 88%) is reducing wear in the ID-fan.

Hot gas dedusting

Several additional possibilities for improvement by applying HURRICLON technology were found, after extended research in the cement producing process. After the successful use in preheater and clinker cooler exhaust dedusting, the next step was the coal milling circuit. Although the operating conditions and requirements are similar it still required additional research in A TEC's test plant.

- Standard HURRICLON ST type for low pressure loss may be used with an existing fan for separation efficiency of about 65%;
- Special ST type HURRICLON can be used, if a pressure drop of 2000 Pa is acceptable, to increase the separation efficiency to about 70%;
- For the coal mill application with relatively low dust load and fine grain size, the separation efficiency of standard high-efficiency centrifugal separators is in the range of 30% to 50%, depending on the type of dedusting equipment and the acceptable pressure loss;
- With the HURRICLON ST type by A TEC, an efficiency of 65% to 70% can be reached under the same operating conditions, as shown in the graph shown below.



The separation efficiency strongly depends on:

- Type of dedusting equipment;
- Number of parallel dedusting equipment;
- Dust entrance load;
- Pressure drop of dedusting equipment;

In order to provide a constant separation over varying gas flows, it is necessary to install a return cycle to the dedusting (below right). This allows the operation of the installed HURRICLON at constant gas flow and provides constant separation efficiency and constant pressure drop.

Conclusions

The conclusion of several test runs shows clearly that the HURRICLON ST type combines best efficiency with reasonable pressure drop. It is the recommended solution for the application of fines dedusting before coal mill. Any improvement of the separation efficiency here has serious positive impact to the kiln fuel efficiency,

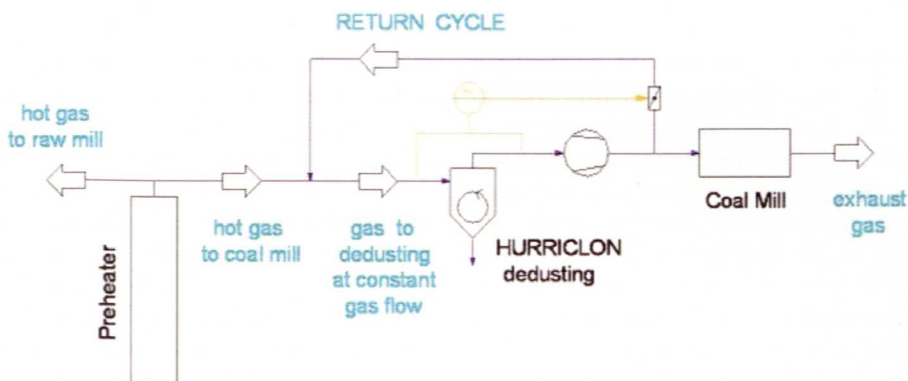
mill wear rate, mill capacity, and in certain cases to the clinker quality too (i.e. high silica content).

The installation of a return cycle is required because of frequent gas stream fluctuations due to moisture content. Additionally, the return cycle avoids turbulence and dust settling in the peripheral dust system, thanks to optimal fluid dynamic design.

By installing HURRICLON in the hot gas stream to the coal mill, the following advantages are guaranteed:

- Increase of the coal mill capacity
- Increase of the coal heating value

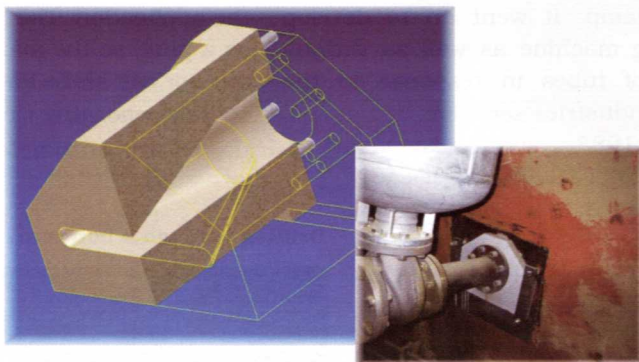
In a cement plant with 100t/h raw mill feed and a preheater separation efficiency of 92%, the return dust in the hot gas is about 8t/h. A TEC's HURRICLON installation in the coal mill reduces the dust load by approximately 60% and increases the production by about 4.8t/h. Indeed, a 30t/h coal mill shows a production increase of about 16% with a specific energy reduction of 16%. **GCL**



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