Hoever's great wall of silence

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Early in 2008 a large modernisation project took place at Holcim's Hoever plant in Germany. After more than 35 years of operation the existing satellite cooler was replaced by a state-of-the-art grate cooler. Extensive pre-assembly of the new IKN Pendulum Cooler reduced the kiln down-time. A large crawler crane was used to lift the equipment over a noise protection wall. This article describes the scope of work and the critical installation procedures.

The 3000 tons per day kiln line with a satellite-cooler has been in operation at the Hoever plant near Hannover since 1972. After more than 35 years of operation the cooler maintenance costs had increased dramatically and its thermal performance was poor. In 2006, Holcim decided to replace the satellite-cooler with a modern grate cooler. Different cooler concepts from various manufacturers were evaluated by the Holcim team against a set of predetermined criteria.

At the end of the evaluation Holcim selected the IKN Pendulum Cooler and the contract for supply and installation was signed with IKN GmbH, Neustadt, Germany, in late December 2006.

During the last 25 years IKN has developed into a specialist for satellite cooler replacements. More than 14 satellite-cuts have been carried out by IKN during the last 10 years and each of them was an engineering challenge in terms of installation procedures.

Kiln down-time is critical when replacing the cooler and IKN has developed several time-saving procedures and technologies such as cooler pre-assembly, shifting or lifting the entire grate as well as pre-installation of refractory materials.

As the village of Hoever borders directly onto the plant, a tall noise protection wall had been built next to the existing satellite–cooler. The building permit for the new grate cooler stipulated that the noise barrier was to remain in place. As a result all the new equipment had to be installed in a very narrow cooler pit below the satellite-cooler's existing footprint (see Figure 1).

Grate cooler and scope of the project

Design requirement for the IKN Pendulum Cooler was a capacity of 3000 tons per day with a clinker outlet temperature of 65°C above ambient and an efficiency of 72 per cent. A large kiln hood with a low air speed of 5m/s connects kiln and cooler. The existing burner was previously modified to burn alternative fuels and had to be re-used. A mid-air take-off is installed on the cooler roof to supply hot air at 400°C for slag grinding at a ball mill. Inside the grate cooler secondary-air and mid-air are separated by a hydraulically-activated heat shield. The new vent-air system consists of an air-to-air heat-exchanger with bag filter and a new cooler ID fan.

IKN's scope of supply and installation consisted of the following equipment:

- complete new grate cooler with IKN Linear Pendulum System (LPS) grate system, single cylinder hydraulic grate drive, hydraulically activated heat shield
- Pneumatic Hopper Drainage System (PHD) dust discharge system, electrically-driven IKN roller crusher with 4 rollers
- kiln hood for low air speed and fitted with large entry doors
- new kiln outlet section with discharge segments
- mid-air system with double cyclones, booster fan and 150m ductwork
- vent air ducting and cooler ID fan.

Figure 1 : Satellite cooler with noise protection wall

Holcim was responsible for the completion of the following:

- Vent-air: air-to-air heat-exchanger, bag filter (Scheuch)
- Civil works including a new burner platform
- Electrical installation
- Refractory works (Höganas)
- Kiln modification at the inlet.

Installation procedure

Planning

The Holcim project team and IKN had committed themselves in the contract to a kiln shutdown time (flame to flame) of 49 days. However, during 2007 the demand for cement was high and the plant was not able to produce sufficient clinker to stockpile, this situation forced the project team to reduce downtime for the installation. In 2006, IKN replaced an old satellite cooler at St Mary's Cement, Canada, within just 39 days.

The Holcim project team decided to adopt the tried and tested procedure from this earlier installation. For example, pre-assembly of the cooler and the use of heavy lifting devices to reduce the kiln downtime by another 12 days. A detailed time schedule of 400 tasks was prepared by the IKN project team and coordinated with all other contractors at site.

Civil Works

For health and safety reasons, civil works modifications cannot be carried out underneath the running satellite cooler. The necessary civil works modifications are therefore always on the critical path. To shorten the critical path most of the civil works for the cooler pit, the new foundations for the clinker cooler and the vent-air system were carried out in advance during a planned kiln shutdown in March 2007. On completion, the new cooler pit and the foundations were filled with gravel to protect the foundation work from the radiation heat of the satellite-cooler.

The room for the hydraulic pump station was constructed and a levelled area approximately 80m long was prepared next to the kiln for all the upcoming pre-assembly activities.

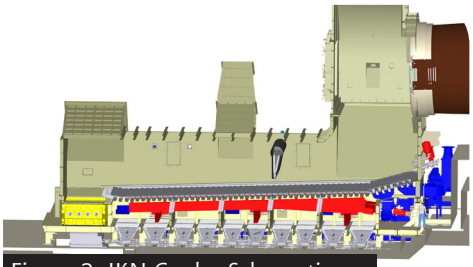

Figure 2: IKN Cooler Schematic

Pre-assembly

In November 2007 IKN started the pre-assembly of the grate cooler and the upper cooler housing at the Hoever plant. First, a custom made base frame was placed in the area. IKN then started to erect the grate from the top down. The lower cooler housing, movable and fixed structures as well as the grate plates were installed and fully aligned to a complete unit weighing 168 tons.

The panels of the upper housing were mounted, assembled and then moved into large heated tents for installation of the refractory lining. The extensive use of pre-cast refractory blocks in the cooler and kiln hood simplified and shortened the installation procedures at outside temperatures around 0°C.

A large 800 ton crawler crane was transferred to the site and the lane between the pre-assembly area and clinker cooler was covered with timber to pave the way for the crane.

Installation

On January 18, 2008 the kiln flame was turned off and the demolition of the old satellites began immediately after cool down. Piece-by-piece the individual satellites were taken out and transported to a nearby scrap-yard where they were cut up to suitable sizes for road transport. All the covering gravel from the cooler pit was removed and the previously cast foundations were freed for cooler installation (see Figure 5).

The cooler itself was lifted using a specially designed traverse to prevent any bending or torsion of the load, (see Figure 6). Subsequently, the roller crusher and cooler housing were lifted into their final position (see Figure 7).

The cooler housing consisted of three parts, complete with refractory linings. Connecting take-offs and ductwork for vent-air and mid-air were attached to the cooler housing, at the same time Holcim made all the required preparations for a swift erection of the burner floor.

By using precast concrete slabs Holcim was able to simplifythe work and to save time. As soon as the burner floor was finished IKN placed the large preassembled kiln hood on the new floor.

Figure 3: Pre-assembly area

Figure 4: A 800t crane was required

Once the heavy equipment was installed all other machinery such as fans, dust transport system and electrical facilities were also installed. Parallel to these activities IKN installed the kiln outlet sealing and Holcim finalised its kiln repair at the inlet side.

The flame was lit again after 43 days, the target to save 12 days with the crawler crane was not fully achieved. The main reasons were a storm with very high windspeeds resulting in 4 day shutdown of the crane. for four full days and other unforeseen delays.

Operation

After training and start up, the kiln operators had to adjust themselves to the new and more complex equipment compared to what they were used to. This phase of the project was completed quickly and the performance test in September 2008 proved to be a formality.

Conclusion

The cooler project at Hoever proves the case for completing an installation within a tight timeframe and under challenging conditions. The key decision was to pre-assemble the cooler and refractory lining into the cooler housing and kiln hood. But most importantly detailed planning and project management in close co-operation with all partners throughout the entire project proved to be the basis for success. Holcim's Hoever plant now operates with a state of the art IKN Pendulum Cooler with less maintenance and greatly improved heat recuperation.

Figure 5: Kiln being cut down

Figure 6: Lifting the cooler

Figure 8: Inserting the kiln hood

Figure 7: Lifting the cooler into place