

Putting the lid on emissions

As the Indian industry expands, there are opportunities to improve the current filtration technology employed. Italian environmental specialist Redecam has formed a joint venture with a strong local partner to meet this challenge in a sustainable way. Using its experience on projects such as the Cemex Caracolito ESP-to-baghouse conversion in Colombia, Redecam is highlighting how it can bring similar benefits to the Indian cement sector.

■ by **Niccolò Griffini and Christian Guadagnin**, Redecam Group SpA, Italy, and **Suman Jain**, Isgec Heavy Engineering, India

In many cases the latest round of stringent emission norms requires an upgrade of emissions control technology in which mechanical filtration is able to achieve a higher performance, usually lower than $10\text{mg}/\text{Nm}^3$ of dust at the stack. As a result, Redecam has been part of several projects converting electrostatic precipitators (ESPs) into hybrid or bag filters. One such market is India, where many cement plants require such upgrades, leading to the study of specific designs on a case-by-case basis. Often computational fluid dynamics (CFD) are a key tool in optimising gas distribution into existing ESP casings.

Expanding business in India

India has seen a boom in infrastructure and housing projects in recent years and cement producers have expanded their production base accordingly. This drive



Plenum lifting at Cemex Colombia's Caracolito plant



Penthouse lifting

continues and the country aims to achieve a staggering 600Mta of clinker production by 2022.

To improve its service to this key market, Italy-based Redecam Group SpA created with its joint-venture partner Isgec Heavy Industries, a new company called ISGEC Redecam Enviro Solutions Pvt Ltd, which is headquartered in Noida, Delhi. With this joint venture, both partners are geared up to be a complete provider for flue gas treatment systems for the cement, power and metals industries.

“Air pollution is one of the major environmental issues facing India and the rest of Asia today. It is a serious problem with the major sources being industrial emission and biomass burning, vehicle emission and traffic congestion,” said Niccolò Griffini and Suman Jain, board members at Isgec Redecam Enviro Solutions. They added: “In an effort to reduce the country's air pollution and to

help companies to grow with a sustainable development approach, Redecam and Isgec aim to build a strong business in Asia, drawing upon Redecam's global expertise combined with the skills and knowledge of Isgec, a strong partner headquartered in India.”

ESP-to-baghouse conversion

Case study: Cemex's Caracolito plant, Colombia

In this case study Cemex required the reuse of the ESP casing to reduce costs of the ESP-to-baghouse conversion project at its Caracolito plant in Colombia. Redecam saw this as an opportunity to provide the customer with a highly-effective yet lower-capex solution.

The existing ESP with capacity of $800,000\text{Am}^3/\text{h}$ was transformed into a Redecam DPT model bag filter, including a Simple Pressure System (SPS). The SPS bag fixation system guarantees that the



tightness of the casing between the dusty and clean sides is 100 per cent effective. It prevents dust leakage at weak points as a result of two main design features:

1. Individually-punched and -drawn tube sheet holes increase the contact surface area of the bag against the tube sheet by extending and contouring the tube sheet opening. Therefore, the surface contact is not limited to the pure thickness of the plate but is extended to the entire internal surface of the drawn hole.
2. The pressure of the bag collar on the drawn edge of the tube sheet hole is increased, firmly securing the bag's cloth. The collar is also designed to take advantage of the temperature. The tube sheet is carbon steel and the collar is aluminium, resulting in higher useful pressure being generated on the sealing surface.

The filter bag cages were designed to maximise the lifespan of the filter bags. It is crucial that the filter bag fits perfectly around the support cage, because if the bag is too big, it will rub on the cage during cleaning, causing premature wear and tear. The bag cages for this customer were made of carbon steel with cathodolysis painting and were tailored to fit with fibreglass bags with PTFE membrane stitching.

The baghouse was engineered to include a jet-pulse Bi-Jet bag cleaning system. This system has a dual venturi arrangement, minimising the dispersion of compressed air during the injection phase and thus increasing the volume of air forced into the bag. In turn, this reduces the quantity of air needed to pulsate the bag and achieves a higher flow velocity than in systems equipped with one venturi. The dual venturi also ensures more accurate air pulses and therefore, less wear on the bags due to misaligned equipment.

Redecam supplied Cemex Caracolito with an online model, which provides less



stress on mechanical devices (since there are no compartments to be closed for cleaning operations) and consequently reduces power consumption. The maintenance of a steady pressure drop value across the filter further contributes to reduced mechanical stress on the bag and eliminates a peak of negative pressure over the exhaust fan, which in turn lowers power demand. Redecam also provided and installed the new dust transport and compressed air systems, and revamped the ID fan.

Reducing capex

In addition to transforming the ESP into a baghouse, Redecam designed other parts of the system to reduce costs. The ID fan downstream of the baghouse needed a new impeller, due to the increased pressure drop of the new filtration system. As much of the existing,

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ductwork was reusable, the existing raw gas duct reaching the baghouse and the existing stack were kept. While this added complexity to the installation, it also reduced its direct costs.

Installation and commissioning

Redecam was instructed by Cemex Colombia to perform an ESP conversion to baghouse filter in 21 days “flame to flame” shutdown time, which gave the Redecam crew 19-20 days to achieve the result.

During the kiln outage, Redecam used a 750t crawler crane to perform the ESP dismantling and installation of the new components that conform to the Redecam baghouse filter.

The Redecam team included:

- 109 full operative workers on site
- four site engineers from local erection contractor
- one head of site management
- one mechanical supervisor
- one fan engineer
- one commissioning engineer.

The 50t Clean Gas Plenum lift was executed during a late Sunday afternoon with all the major components already installed and pretested on the ground (dampers, electrical panels, compress air collectors, solenoid valves). Installation of the 3500 bags and cages was achieved in a total of 42h, thanks to a dedicated crew that worked on a 24h basis. Before the first passage of fumes a fluorescent powder test was performed to check the perfect sealing of the clean gas plenum. The kiln start-up was then successfully performed within the guaranteed time.

“All these activities were carried out in the middle of the rainy season,” said Cristian Guadagnin, Redecam’s head of site management, “which affects the schedule due to the impossibility of performing several working tasks such as welding and major lifts. The great effort of the Redecam team with the collaboration of our main contractor was the key to this successful project.”

Conclusion

Since its foundation in the 1980s, Redecam has been committed to providing tailor-made solutions to customers’ needs. Being flexible and finding innovative solutions is a must to remain focussed on this approach. These projects, which transform underperforming ESPs into bag filters, are perfect examples of saving considerable capex costs, while potentially meeting India’s emissions reduction requirements. ■