Axel Jahn and Frauke Kretzer, Pollrich GmbH, examine the maintenance, retrofit, and upgrade of industrial fans.

The production of first class cement is an energy intensive process. Due to environmental issues and increasing competition, being mindful of energy efficiency is becoming increasingly important. Up to 70% of the cost of producing one tonne of cement is related to energy. The potential for improving energy efficiency during the production process is immense and industrial fans play a huge part in this. Industrial fans are high energy consumers and they are normally the second highest consumers within the plant, especially if they are not designed energy efficiently. Therefore, an intelligent retrofit or upgrade of the existing fans can lead to considerable savings both in energy costs and CO$_2$ emissions.

Retrofit and upgrade of existing fans
To meet the demands of growing competition, many cement plants operate at higher capacities than they have in previous years. Thus, many old fans are working under conditions for which they were not originally designed. To increase energy efficiency and reduce maintenance costs, these inefficient fans need to be overhauled or replaced. Given the fact that old fans consume an unnecessary amount of energy, they hold big opportunities for energy savings.
The largest potential for improving the energy efficiency of industrial fans can be achieved by the implementation of new, highly-efficient fans or by the intelligent upgrade and retrofit of existing fans. A given opportunity is, for example, the regular revision of the rotary kiln, which is usually done once a year.

Regular downtimes such as this offer the chance for a total retrofit and update of existing fans. With an experienced partner working closely with the customer, regular updates of existing fans can lead to considerable increases in performance and help to lower both production and maintenance costs. As a manufacturer of heavy-duty industrial fans, Pollrich offers not only spare and wear parts, but also services, maintenance, and supervision whenever needed. Included in the scope of supply are total retrofits, updates, and the revamping of existing fans, always concentrating on energy efficiency.

An important factor is the detailed planning of the retrofit. Short time frames allow for no delay. Detailed measurement of all data beforehand is mandatory when selecting the right fan layout. The service team gather all the information needed in advance and sketch a detailed plan of the remodelling. To avoid any unnecessary delay, assembly and startup needs to be planned meticulously to the last detail.

To ensure a long and undisturbed service life, regular maintenance is strongly advised. Preventative maintenance includes regular vibration measurements in order to minimise the vibration on all parts. Vibration, caused by imbalances or sticking and caking media, can lead to weakness in the entire construction. Torsion-resistant substructures should be considered, as they help to reduce the vibration on all parts. But the most frequent cause for imbalance is the incorrect balancing of the impeller. Balancing is normally the last stage of the impeller production and disassembling is not always necessary. balancing onsite, as well as laser alignment of the coupling.

**Wear protection, energy efficiency, and lifetime**

Often, the rotors (impeller, including the shaft and bearings) are the most stressed parts of the fans – especially the rotors of the raw mill and clinker cooling fans. Due to the extreme conditions in the raw mill and in the kiln combustion process, the rotors are extremely susceptible to caking and heavy wear. Without special measures, the nominal service life of such a rotor is approximately one year. With an upgrade, a new state-of-the-art wear protection, and intelligent blade geometry, product lifetimes and service intervals can be easily doubled. Modern fan technology also provides great potential for savings: at Pollrich, the R&D team works continually on prolonging the lifetime of fans that work under the harshest conditions. According to the repose angles of the raw material, as well as carbide mixtures and matrix according to the average dust particle size, different blade angles require vast experience on existing installations and the latest computational fluid dynamics simulation. Such R&D teams can pay off for the customer; not only does the lifetime increase, but the performance of the fan can also increase by up to 10 percentage points. In special cases, the payback period can be as short as one year.

Regular plant revisions or downtimes due to maintenance issues offer the opportunity to replace inefficient parts with new, state-of-the-art energy saving units. To reach energy efficiency targets, it is important to minimise the energy used for fan operation. It is advisable, whenever possible, to change older, mechanically-controlled fans for modern fans with variable speed drives (Figure 5).

Some of the major electric consumers are preheater induced draft (ID) fans, raw mill fans, and baghouse ID fans. At Pollrich, these fans are
fitted, whenever possible, with variable speed drives. Variable speed drives adapt the rotational speed to the actual need. The goal is an ideal ratio between energy consumption, volume flow, and rotational speed. Thus, the fan runs at its optimum performance range without energy being wasted.

An optimal balanced system of fan, motor, and frequency inverter allows maximum energy efficiency. Another benefit is that fans with variable speed drives run smoothly and show a lower risk of caking.

**Conclusion**

Cement plants, with their large-scale energy demand, offer tremendous opportunities for reducing energy consumption and CO$_2$ output worldwide. As industrial fans are the second-largest energy consumer in cement plants, lowering their energy consumption can lead to improving overall energy efficiency and reducing CO$_2$ emissions significantly. An additional benefit in enhancing the energy efficiency of industrial fans is the reduction of the carbon footprint. This is a very important topic – and not only for the cement industry. With experienced and reliable partners these goals can be achieved.

**About the authors**

Axel Jahn is Managing Director at POLLRICH GmbH. He has decades of experience in industrial fans and blowers and is an expert of industrial fans for the cement industry.

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