Eliminating Build Ups and Flow Problems

Jean-Maurice Morque, STANDARD INDUSTRIE, describes the company's solutions to build-up and flow problems.

Introduction

STANDARD INDUSTRIE is a specialist company that undertakes the elimination of build-ups in the cement manufacturing process. The company undertakes the planning of the project, the equipment supply, onsite installation, maintenance, ensuring all regulations are respected, training of the operators and organising the financing of the whole project.

Build-ups: a major problem

Build-ups are one of the principal obstacles to the smooth running of a cement plant. Cement producers do everything they can to avoid their formation, with actions including:

- Regular control of the chemical composition and particulate size.
- Fuels, which are regulated according to their content of sulphur, chlorides and other volatile materials.
- Excellent combustion, thanks to a burner pipe that is specially designed, well installed, correctly regulated, without CO, and an oxidising agent.
- Running the kiln without over burning.
- A layout to suit the equipment.

Unfortunately, these actions cannot completely prevent build-ups, which form in different parts of the manufacturing process, such as:

- The preheater tower, including the kiln inlet, riser duct, horizontal gas duct, cyclone base, feed pipe, and precalciner.
- The by-pass (chloride).
- The clinker cooler, with the fixed grate type suffering "snowman" build-ups.
- The burner pipe.

Reduced performance and risk

These build-ups can usually be eliminated while still running, but the price is a slowing down of production, and sometimes a complete stoppage is necessary. Any shut down of the kiln brings down the efficiency of the plant and the site performance.

Operators can use pokers or hammers while production continues, but they are taking risks and numerous accidents have occurred. In addition, any ingress of air contributes to build-ups, and thus to a loss of performance.

High pressure water jets or explosive CO_2 cartridges are traditional solutions and are still used, but they are dangerous and risk damaging the refractory brickwork, which in turn leads to a further loss in performance.

AIRCHOC®: Force, precision and prevention

This equipment is installed on the preheater tower and the cooler, without any danger to their structure. It is equipped with a device that allows a given volume of

Figure 1. AIRCHOC® on preheater.

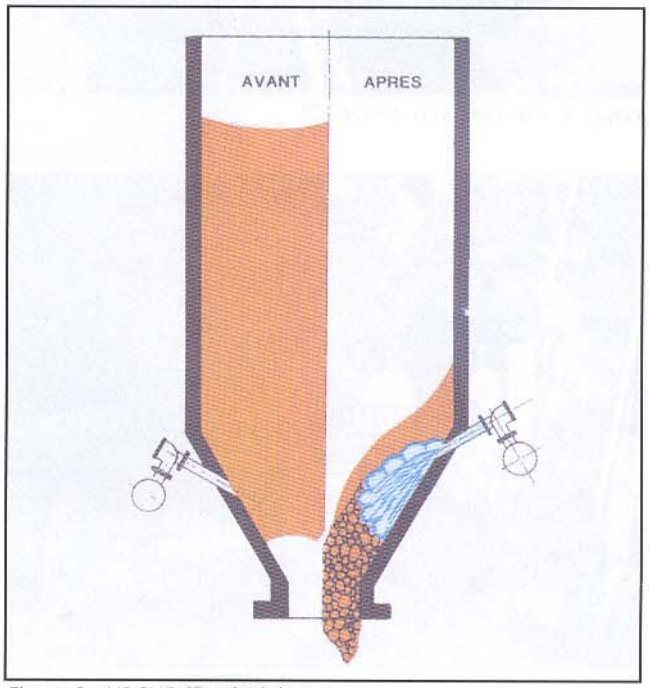


Figure 2. AIRCHOC® principle.

Clean Out SYSTEMS

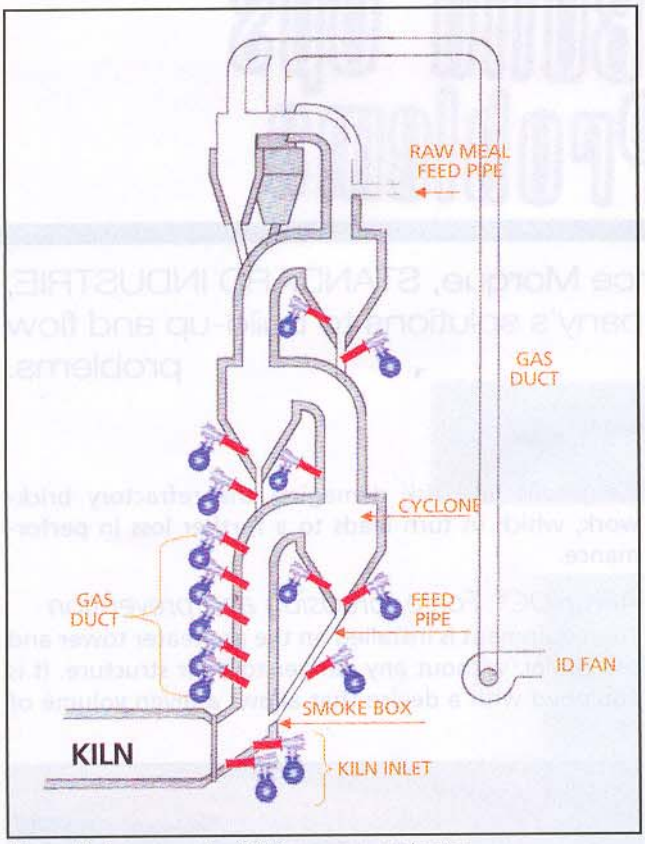


Figure 3. An example of fittings on a preheater.

Figure 4. Kiln inlet with AIRCHOC®.

Figure 5. Cyclone inlet equipped with AIRCHOC®.

compressed air to be released instantly in the material, resulting in the immediate break-down of the build-ups.

The AIRCHOC®, which is more powerful, quieter and safer, is recognised as an optimum solution for build-up problems, whilst also being more energy-efficient (compressed air). This equipment has been specially developed to be used in areas where temperatures are high, such as are experienced in cement plants.

The build-ups are destroyed by this equipment before they can affect the manufacturing process.

This operation is fully automatic. Safety of the operators is assured; the reliability of the process is improved, and the performance of the plant is guaranteed.

Each AIRCHOC® is fired automatically and precisely in a programmable sequence. Fitted with suitable nozzles, it directs the air blast towards the target to be eliminated.

The rules for installation

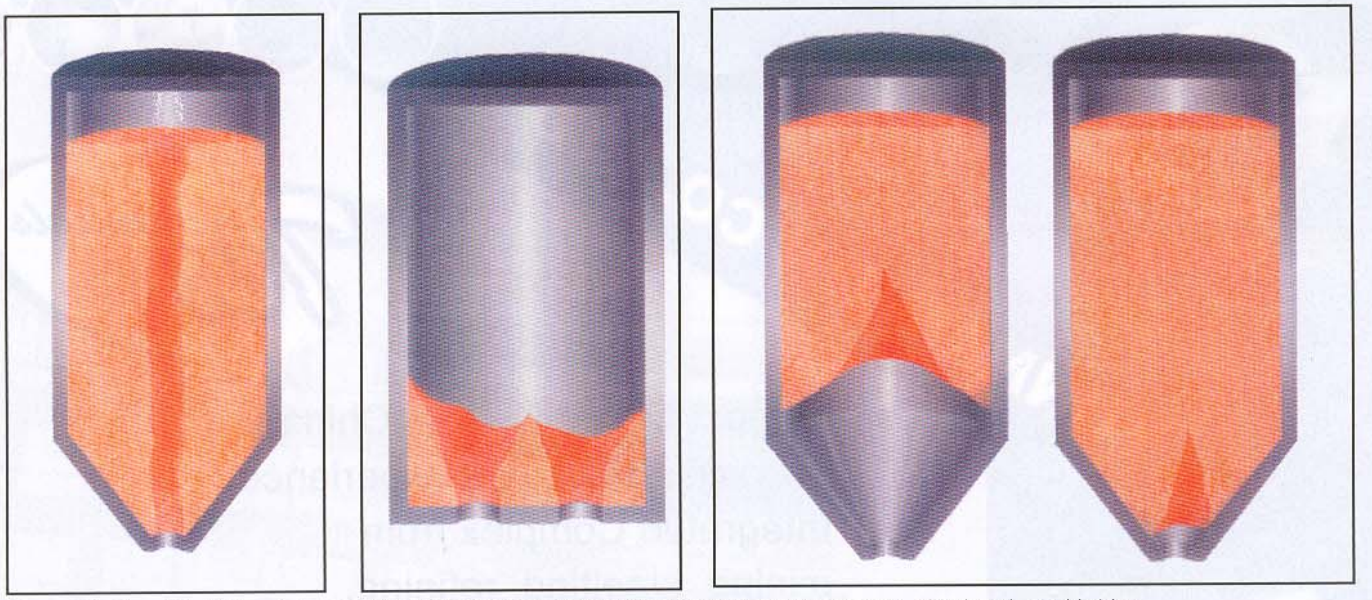
The operator must carry out a precise investigation to locate the problems. The first method consists of taking photographs when the plant is cold during a shut-down. The disadvantage of this is that some build-ups can disintegrate at low temperature.

The second method is to measure the temperature on the outside walls with an optical pyrometer. The orientation of the connecting pipes is fundamental to avoid damaging the refractory brickwork especially in the kiln inlet and the plates in the cooler. In addition the connecting pipes must always be fitted in the same direction as the material flow. The general arrangement of the banks of AIRCHOC® on the different levels of the pre-heater tower is essential to ensure the efficiency of the declogging process. They are installed facing each other on one level, with an alternating alignment at each subsequent level.

Operators often ask how many AIRCHOC®s they need to install in their plant. Contrary to the opinion of some, the number of units cannot be calculated by means of a simple formula. Cement production is an extremely complex process, with many parameters to take into account. There are no two production lines in the world that are completely identical. Given this situation, it is not at all unreasonable to state that there is no firm rule. One must simply install the number required.

A global strategy gives the best results

The most spectacular results have been obtained with those customers that opted for a total declogging solution with the installation on a production line of 100 to 150 AIRCHOC®s, in accordance with the company's technical recommendation on the location of the cannons, the orientation of the connecting pipework and the firing sequence. The main obstacle to such an installation is the cost. Far too many cement companies opt for a gradual investment. The serious disadvantage of a partial installation is the transfer of the build-ups. This migration is further accentuated by the use of alternative fuels with irregular SO_2 content. To improve the efficiency and performance of the kiln, all build-ups must be eliminated.



Figures 6, 7 and 8. Different types of flow problems, including (from left to right) ratholing, deadstock, and bridge.

To achieve this result, the plant must define a coherent strategy, taking account of:

- Its policy on combustibles.
- Efficiency and kiln performance targets.
- Clinker quality targets.
- Personnel safety targets.
- Environmental targets.

Getting the logistics right

The efficiency of an AIRCHOC® installation also depends on the logistics. A separate compressed air system supplying dry lubricated air at a pressure of 10 bars should be planned as the optimum solution. A system of AIRCHOC®s justifies this planning. The firing sequence must be able to be easily altered. The company recommends the automatic operation of the AIRCHOC® by means of control boxes, which are very simple to programme by any operator. This management system can control up to 240 AIRCHOC®s. Each is equipped with a manual control button, which is normally only used to test that it is operating correctly.

A production tool

Each AIRCHOC® should be considered as a production tool, and as such should be carefully maintained. Each should be clearly identified both onsite and on the drawing. Finally, visits should be planned to check that it is operating correctly. This maintenance can be the subject of a contract between the cement producer and the company with a performance commitment.

Continuous research

Conscious of the comments of some of the customers concerning the noise engendered by air discharging, the company has created a new AIRCHOC® with a noise level of less than 70dB at 3 m. The design office and more particularly the Research & Development department are constantly seeking ways of further improving the technique.

Today the company is concentrating its efforts on the savings in energy (compressed air) to be gained by this declogging technique (currently reduced by 50%).

Safety: the top priority

Safety is the priority of each plant manager. No longer can any cement company take the risk of somebody being burned, injured or even killed at one of its production sites. Precautions must always be taken whether working on the outside or inside the equipment. All personnel must be equipped with the necessary protection and be trained to respect the control procedures in order not to be exposed to an air cannon discharge or a fall of any material or build-up, which can in some cases be fatal. Before anyone enters a kiln, a tower or a cooler, every AIRCHOC® must be isolated.

Training

Training of personnel is an essential element. STANDARD INDUSTRIE offers training courses aimed at both maintenance engineers and technicians in cement plants. This training covers each particular aspect of the operation and maintenance of the equipment in use. The courses are based on interactive teaching and consist of theoretical learning and practical working experience. Each session concludes with an evaluation procedure and an individual action programme.

Flow problems in silos and hoppers

Clogging problems that prevent materials from flowing freely during material recovery operations constitute a real headache for businesses, affecting production, reducing storage capacity and sometimes to the detriment of the product quality. This phenomenon is likely to appear in all storage units and for all kinds of materials.

The company has 27 years of experience in both preventing and curing these problems to ensure that the material flows freely.

Permanent preventative solution

The equipment is installed on the silos (without any danger to their structure) and is equipped with a device that allows a given volume of compressed air to be released instantly in the material, resulting in the immediate break-down of bridges, channels and other build-ups present on the inner walls.

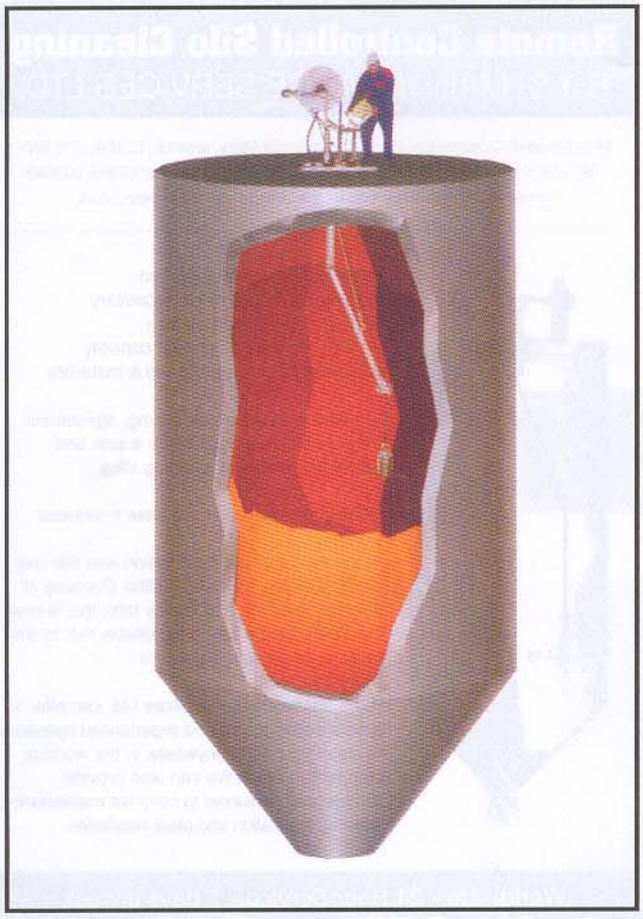


Figure 9. GIRONET® in a silo - principle.

AIRCHOC® is intended for applications involving silos, hoppers, chutes, piping, etc.

Occasional curative solution: GIRONET® cleaning system

Cleaning silos (channels, bridges, etc) can be unpleasant, difficult and dangerous work, particularly when the technique used involves having operators going inside a silo to clean it. Numerous accidents have occurred because of sudden collapses, falls or suffocation.

To avoid such risks, the company offers a remote high performance cleaning system (GIRONET®), which is fully automatic and ensures the total safety of cleaning operations as there is no human presence inside the silo.

This cleaning system allows all types of material to be cleaned, even the most resistant, whatever the type of storage unit. Cleaning is possible without stopping production.

A camera allows inspection of storage units and inside walls, before and after cleaning.

An excellent return on investment

The AIRCHOC®/GIRONET® solutions for cement plants stop build-ups and flow problems. The plant increases its capacity to burn alternative (cheaper) fuels, reduces its operating costs, improves the efficiency and performance of its kiln, improves the quality of its clinker and especially ensures the safety of its employees. The company's calculations in certain plants have shown a net contribution after depreciation and financial costs for a total AIRCHOC® installation of €0.46 per t of clinker produced.