Improvement is a responsibility

The continued improvement of technology and operating practices often lies with individual companies taking responsibility to drive innovation in their product range. In the area of filter bags, a need to reduce resistance to air flow led to the development of new filter bags by WL Gore.

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Marie Curie once said: "You cannot hope to build a better world without improving the individuals. To that end, each of us must work for our own improvement and, at the same time, share a general responsibility for all humanity, our particular duty being to aid those to whom we think we can be most useful."

This philosophy of improvement has been applied to cement production, leading to advances in production technology. Through the years, cement producers have changed the composition, cost and lead time of their final product, resulting in improvements that gradually permeate throughout the industry. But who initially drives these changes and how?

Improvements to cement production must be measurable and demonstrable in today's competitive cement market

Change through measurable improvement

Drivers of change are those who invest in new materials and better products to improve the way they produce cement. To gain traction in today's competitive cement market, such improvements must be measurable.

Producers constantly compete for lower costs, stricter compliance to government-imposed environmental restrictions and market demand for higher-quality products. There is also the ongoing challenge of investing in a profitable part of the production process without ignoring the maintenance cost of currently-efficient equipment.

Cement producers must collaborate with cement industry providers to mutually pursue their common goals. When improvement is considered a responsibility, as Marie Curie suggested, one proactively pursues the cement producer with a proposal in hand, offering partnership and positive change.

However, how can a supplier convince its customers that its product is a driver of change? Not through hypothetical improvements. Improvements need to be proven in practical applications in areas customers may not expect.

At present the cement industry is focussed on expansion with specialised reports confirming that infrastructural development is accelerating. Innovation is the key for opportunities as today's technology will be gradually replaced by smarter products that allow producers to do more with less.

Identifying opportunities for improvement

Driving change begins with identifying the opportunities for improvement. By starting to monitor the process where improvement would be implemented and noting where there is room for a product to make a positive impact, one can make a proposal, which then must be delivered in an effective way.

Therefore, decision makers need to be identified and made aware of the benefits of this change, ideally by sharing metrics-based expectations in a formal presentation.

Driving change through airflow

In the area of filtration, an example of a driver of change is reflected by the need to reduce the resistance to airflow. As the team of US-based WL Gore identified this need for improvement in the global cement industry, the company became a driver of change and developed GORE® LOW DRAG™ filter bags.

To explain this advance, the resistance to airflow through a medium is key: the less resistance, the greater the airflow. The challenge is to apply this to a process that must also meet environmental emission limits. How can a filter be created that complies with limits without restricting airflow?

Airflow means different things for processes taking place in a kiln or mill. Increasing filtration capacity without increasing the size of the baghouse benefits those processes in different ways. Depending on the process, reducing filter resistance results in one of the following value propositions:

1. Reducing ΔP while maintaining airflow leads to a lower load on the fan

Table 1: control room data relating to reduced filter resistance

Product	Date	ΔP (mbar)	Gas flow (m^3/min)	Filter resistance $\left(\frac{\text{inches } H_2O}{ft^3/min/ft^2}\right)$	Improvement (%)
GORE® SUPERFLEX	28 June 2011	6.83	6987.65	17.2615686	
GORE® LOW DRAG™	14 December 2018	5.5	7594.3	12.789805	25.9

and reduced energy costs.

2. Maintaining ΔP and increasing airflow lifts overall production and the potential to burn more alternative fuel.
3. A membrane that is easier to clean leads to a reduced number of pulses per hour and lower pulse pressure, which lengthens bag life.
4. Reducing ΔP while maintaining airflow means there is the potential to reduce the number of bags in service, thereby reducing bag costs.

GORE LOW DRAG filter bags have delivered on these value propositions in a variety of ways.

Operating one of the top cement plants in Mexico with high production rates, a cement producer did not foresee any room for improvement. The plant's existing GORE filter bags had been working successfully for eight years. However, ΔP was at a critical level and, according to a lab analysis of the bag, it was the right time to replace the 7040 fibreglass filter bags that were in place. The obvious option was to replace them with the same part number, but the Gore team identified the need for improvement following the previously-described process. As a result, the cement plant chose to replace its existing bags with GORE® LOW DRAG™ filter bags.

After installing 7040 GORE® LOW DRAG™ filter bags, the plant resumed operations. Process engineers were advised that they could experience lower resistance to airflow, which could vary some of the previously near-constant parameters. One potentially-varying parameter was the set point of negative pressure on the inlet of the baghouse, which drives the speed of the variable frequency fan motor. The purpose of this is to move the airflow from the kiln to the baghouse.

After some meetings with the involved departments, the Gore team managed to lower pulse pressure and change cleaning parameters previously established for the replaced fibreglass filter bags. The plant decided to maintain all other parameters and see how the system responded to the new filter resistance.

Table 1 shows data taken from the control room, demonstrating a 25.9 per cent reduction in filter resistance. In other words, the plant could move more gas flow at a lower ΔP.

The benefit of reducing filter resistance

Before the installation of GORE LOW DRAG filter bags, a financial analysis is conducted to estimate the benefit according to customer needs. For the Mexican cement plant, the benefit was reflected in fan energy savings: a reduction of 13.7 per cent compared with the previous bags in the first trimester.

"At the beginning, we did not expect a change to the parameters. We are pleased to realise we made an informed decision with the communication we have had. Yet, we need to analyse a broader sample. We are pulsing at a lower pressure, having lower emissions and a stable process," according to a process engineer at the cement plant.

As a determined driver of change, Gore will continue to acquire results in cement plant settings to quantify projected benefits. At the Mexican cement plant, operation is now stable and two kilns are operating at full capacity throughout the year.

Moreover, it will soon be much easier to conduct ongoing data analysis. Two more mill grinding applications are forthcoming and data has been collected to compare the performance of the filter bags. This enables Gore to prove that GORE LOW DRAG filter bags and other products are improving the filtration process.

Continued drive for improvement

Engineers at cement plants are often challenged to find opportunities to improve the facility's impact on the environment, cost of production, quality of finished product, and the health of the plant workers and surrounding community. They attempt to solve this challenge as part of their professional development.

Cement is a product made using finite resources, but room for improvement is infinite. Gore believes that improvement is a responsibility. Together with its customers, the company aims to drive change in filtration, finding opportunities to innovate in the unseen corners of the cement industry. ■

The installation of GORE LOW DRAG bag filters led to a 25.9 per cent reduction in filter resistance, enabling increased air flow at lower ΔP