CUTTING-EDGE CLASSIFIERS

Yan Huerre, Fives, and Luc Papillon, Ciment Québec, answer questions on the importance of an efficient and effective classification process in the cement industry, both in terms of carbon intensity and cost reduction.

When evaluating grinding technologies, people usually focus on the mill selection such as ball mills, vertical mills, or the Horomill. In your opinion what is the importance of the classifier design in the global circuit performance?

Yan Huerre: The classifier is key to obtaining the best overall system performance.

The sharpness of the cut at the desired fineness, as well as the lowest global and total bypass on one side of the Tromp Curve, and the lowest coarse particle content in the final product on the

other side, maximise the mill throughout while lowering power consumption and allowing for an optimised cement recipe for each quality.

Our FCB TSV classifier's turbine blade profile allows for a given particle size and an accurate balance between the gas flow drag force and the rotating turbine centrifugal force and thus the best selection conditions resulting in high sharpness and low bypass (Figure 1).

Special sealing design between the coarse side of the classifier, and the fine side prevents the contamination of the finished product with coarse material.

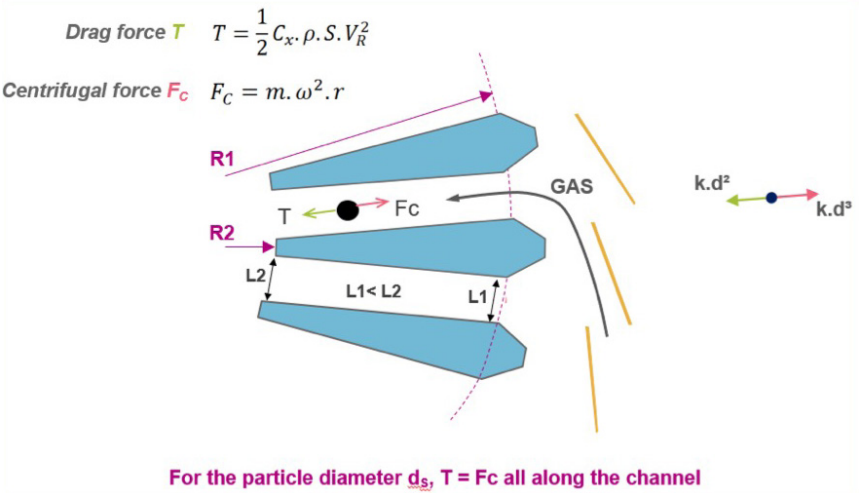

Figure 1. The effect of the turbine blade design.

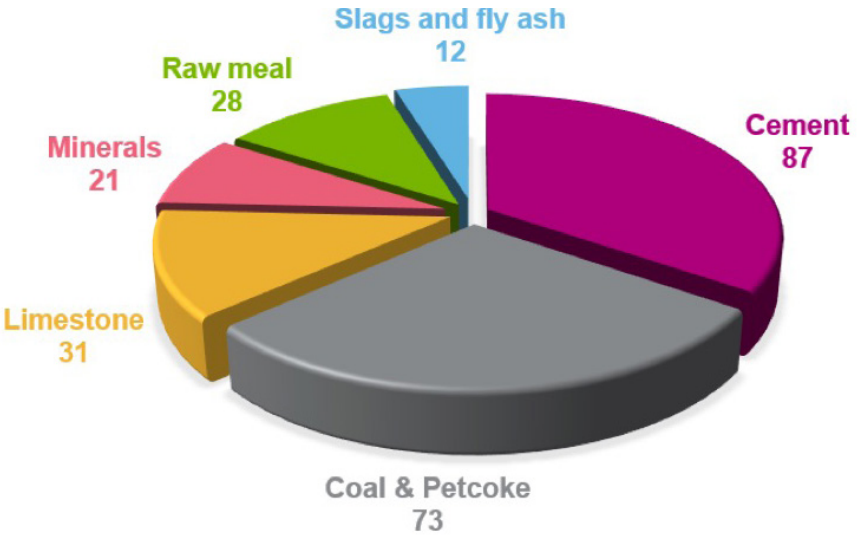

Figure 2. TSV references by applications.

Figure 3. Picture of Ciment Québec TSV THF 3600.

Today, more than 260 FCB TSV classifiers are benefitting customers worldwide (Figure 2).

Luc Papillon: In 2000, Ciment Québec bought a brand new TSV THF 3600 classifier that was installed on a 3.6 m x 12.8 m, 2235 kW cement ball mill. The classifier is driven by a 150 kW motor with VFD.

In our main market, cement needs to exhibit significantly higher strength properties (MPA) than required by the standards and thus, grinding Blaines are high. So, an efficient classifier is of the utmost importance to optimise the mill circuit's production capacity.

Right from commissioning, the TSV THF 3600 performed according to our expectations with a very low electrical consumption, averaging 18.4 kW. Changing production to a different cement type is achieved very smoothly with this classifier technology.

The classifier wear is minimal and with annual inspections during the mill repair shutdown, this component of the circuit is trouble-free.

What does 'THF' in the equipment name signify, and why was this the right choice for the Ciment Québec Plant application?

Yan Huerre: Our FCB TSV is used for a large

range of applications from relatively coarse products, such as 50 to 250 µm cut size for the BF type ('Basse Finesse' in French) to very high fineness, such as 10 – 60 µm cut size for the THF (Très Haute Finesse).

As Ciment Québec is producing a premium quality cement with early strength, a THF type has been selected.

Basically, the main difference between FCB TSV™ types is the turbine itself, whose characteristics are selected depending on the application range.

Do either of you, Yan from the cement and minerals manufacturers' side, and Luc from the construction companies' side, see an impact from high energy prices or the increasing awareness of cement and concrete's carbon footprint which may make the efficiency of classifiers even more important?

Yan Huerre: Definitely. Increasing electricity prices, especially in Europe, reinforce the importance of a good classifier.

Generally, our FCB TSV operates with higher material/gas concentrations than others. Also, specially designed anti-vortex blades in the inner part of the turbine contribute to reducing the pressure loss of the classifier. Combined, the gas flow and negative pressure at the exhaust fan are lower, and consequently so is power consumption.

As we know, the proven and widely available lever by which cement's carbon footprint can be shrunk is to reduce its clinker content.

A higher content of less reactive additives in the cement recipe usually necessitates increasing the material fineness (either in combined or separate grinding) and pushes most of the classifiers to their limits.

We recently observed an increased demand to replace existing classifiers with the TSV THF.

Last but not least, it is worth mentioning that customers may be willing to switch from wet to a dry classification process due to increased pressure on water use.

Luc Papillon: As part of various strategic investments to mitigate the environmental impact of cement, Ciment Québec is building a new cement grinding plant that will enable PLC production with maximum limestone content allowed by the standards.

For high limestone PLC to react like regular Portland cement in the concrete mix, and thus be 'transparent' for the clients, the Blaine will need to be increased significantly. Based on our

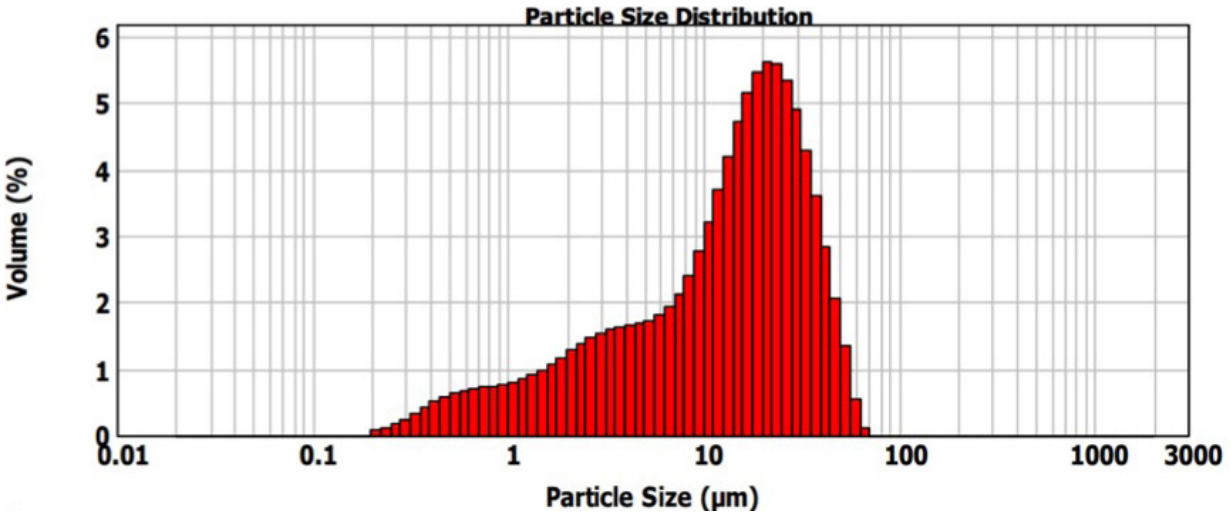

Figure 4. Typical PSD curve of Ciment Québec TSV THF (GU type – 5000 Blaine – d50 ≈ 15 µm).

Table 1. Industrial TSV UHF performances on limestone and BF Slag (from R&D testing).

Feed			Product			TSV UHF						Fan (*)
	tph	P8 (µm)	d97 (µm)	d50 (µm)	tph	Ø (mm)	Motor (kW)	Air (m^3/hr)	Speed (rpm)	ΔP daPa	kWh/t	kWh/t
Limestone	36	25%	7	2	4.0	2000	160	45 500	880	540	32	36
			10	3	5.8				704	390	14	20
BF Slag	33	44%	7	2	4.0	2200	200	55 100	810	520	31	42
			9	3	8.8				660	410	9	17

experience with the TSV THF classifier, we were comfortable selecting the same technology for the new grinding plant.

We are building two Fives FCB Horomill 4200 circuits and each will be equipped with TSV THF 5000 classifiers. Civil construction is actually well underway and mechanical erection will commence shortly. We expect the start-up of the two circuits in 2024.

Yan, are there any new developments you could share with us on this strategic process stage?

Yan Huerre: Indeed. We recently developed a new TSV type called UHF (Ultra Haute Finesse) as we observed an increasing interest for classification with d50 down to 2 µm.

The TSV UHF covers many applications in other industries using ultrafine mineral loads such as plastics, paints, paper, special civil works, etc.

Due to its high speed of rotation, mechanical simulations had to be performed first in order to properly design the dynamic parts of the system (Figure 6).

The concept was then tested in our R&D centre, equipped with a TSV UHF 400, on limestone and ground blast furnace slag.

Testing results have allowed us to define the performances of the two materials in industrial applications (Table 1).

In addition to the previously mentioned applications, we also conduct work in the micronisation field, with the aim to reduce cement clinker content.

We estimate that the first installation will be in operation in the coming year. ■

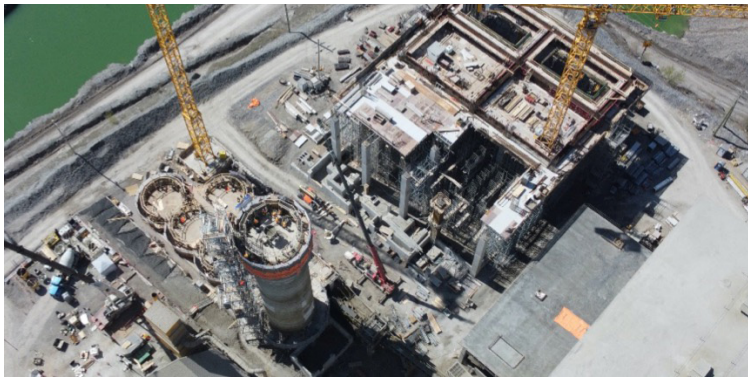

Figure 5. New Ciment Québec cement grinding facility under construction.

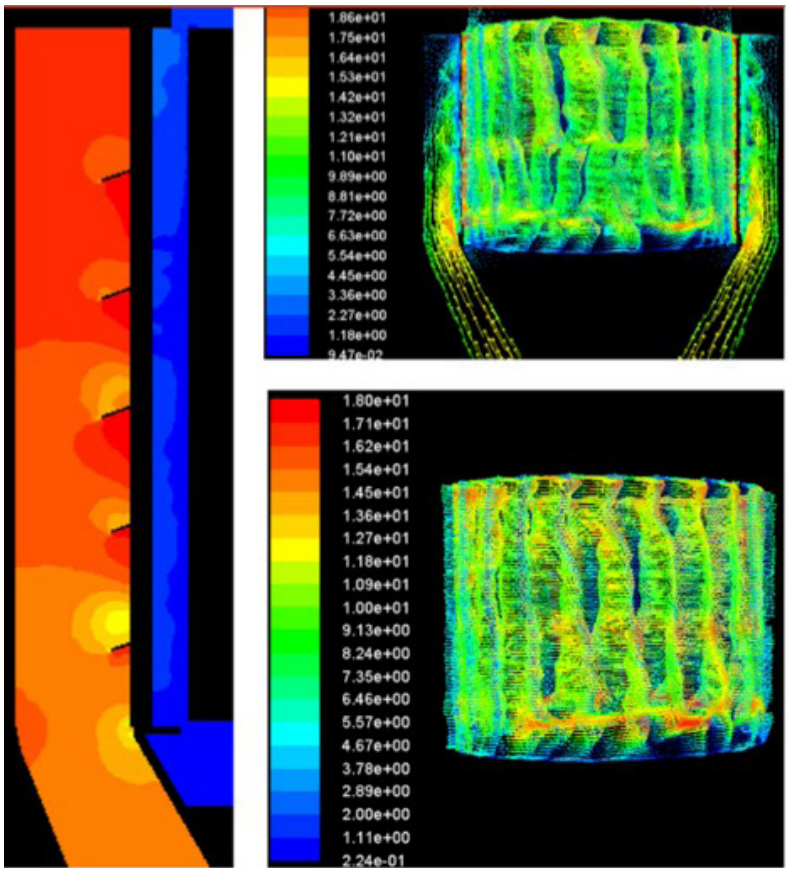

Figure 6. CFD numerical simulation of distribution and dynamic parts.

About the authors

Yan Huerre graduated as an Industrial Engineer from IMT Mines d'Albi in 1999, hold a Master of Business Administration from the Polytechnic University of Madrid in 2001, and has been a Commercial Director since 2021.

Yan joined Fives FCB in 2002. After around 10 years on the technical projects side, both in tendering, execution, and commissioning, he then moved to the commercial are of the business: first through an expatriation in Brazil and then taking the lead on sales in the Americas region.

Luc Papillon, is President & CEO of Ciment Québec Inc., which operates a state-of-the-art cement plant in St-Basile, 45 km west of Quebec City, Canada. The company distributes its cement in Eastern Canada as well as in the New England region of the USA. CQ is also integrated in the concrete and aggregate businesses in Quebec. CQ was founded in 1949 and Luc Papillon is the third generation at the helm of the family business.