

Cam Pha cement – Twin Horomill®

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1 Introduction



Figure 1: location of the plants

The Cam Pha cement project was initiated in 2003 by VINACONEX, aiming at the production of 1.8 mtpy of cement. It includes two new plants:

- The main plant for the production of clinker, located in Cam Pha, Quang Ninh province in the North of Vietnam.
- A cement grinding plant, installed in My Xuan, Ba Ria Vung Tau province, in the South of Vietnam.

The first step of the project was the erection of this second plant, which capacity is 240 tonnes per hour of PCB40.

In 2004, Fives FCB was awarded the order as the main supplier and coordinator for design and supplies. The handling and storing portion has been awarded to FAM, the electrical and automation portion to SIEMENS.

2 The choice of an innovative solution

VINACONEX selected the Fives FCB HOROMILL® as the most advanced technology for its grinding plant.



Figure 2: Horomill N°2

With more than 15 years of experience and 40 mills running over the world, the HOROMILL® grinders are cumulating more than one million hours of operation. The HOROMILL® workshops with the valued TSV™ classifier have proven their advantages, and their value in sustainable development:

For the HOROMILL®:

- ↪ 40 % energy savings in cement grinding compared to the ball mill, and 20% compared to vertical roller mill,
- ↪ It is a compact machine installed in a compact grinding plant,
- ↪ The small quantity of materials present in the milling circuit enables to minimise duration of the transition periods when changing cement qualities, which avoids the production of out-standard cement.
- ↪ Industrial tests made with cement produced with HOROMILL® clearly show that the fineness of the cement (expressed as Blaine) can be reduced compared to other systems, for a given target of concrete characteristics (water demand, resistance). Additional power savings can therefore be achieved.
- ↪ The HOROMILL® is a stable machine that does not need any water injection in cement grinding, be it to control the machine or to control cement temperature. This leads to a better cement quality and avoids water consumption.
- ↪ The production capacity of the HOROMILL® does not decrease when the lining gets worn.
- ↪ The HOROMILL plant is a fully automatic system

For the TSV™ dynamic separator :

- ↪ A patented turbine with blades leaving room for a separation zone which is 5 to 10 times longer than in other classifiers. This leads to high separation efficiency, with a very low bypass value and no oversized particle.
- ↪ A patented anti-vortex device, allowing very low pressure drop and power consumption.
- ↪ It can be fed through both the top and the bottom, offering a wide range of installation possibilities.

For the Cam Pha cement grinding plant, Fives FCB proposed an innovative concept: the “Twin HOROMILL®”, which consists of a couple of identical HOROMILL® grinders using a common gas and selection circuit, with only one TSV™ classifier and one filter, and also only one materials feeding system.

This particular arrangement allows:

- ↪ A more compact building structure that leads to a reduction of the investment costs.
- ↪ A high production flexibility: periods of low production rate (>50 %) can be achieved with a normal operation of the mills.
- ↪ A more flexible maintenance program.
- ↪ Less disturbance at start on the power network.
- ↪ An optimised spare parts management and minimum spare parts investment cost

So VINACONEX in Vietnam was the first one in the world to engage in this advantageous and innovative solution.

3 Description of the mill plant

The process arrangement of the plant is displayed on the flow sheet hereafter (fig 3).

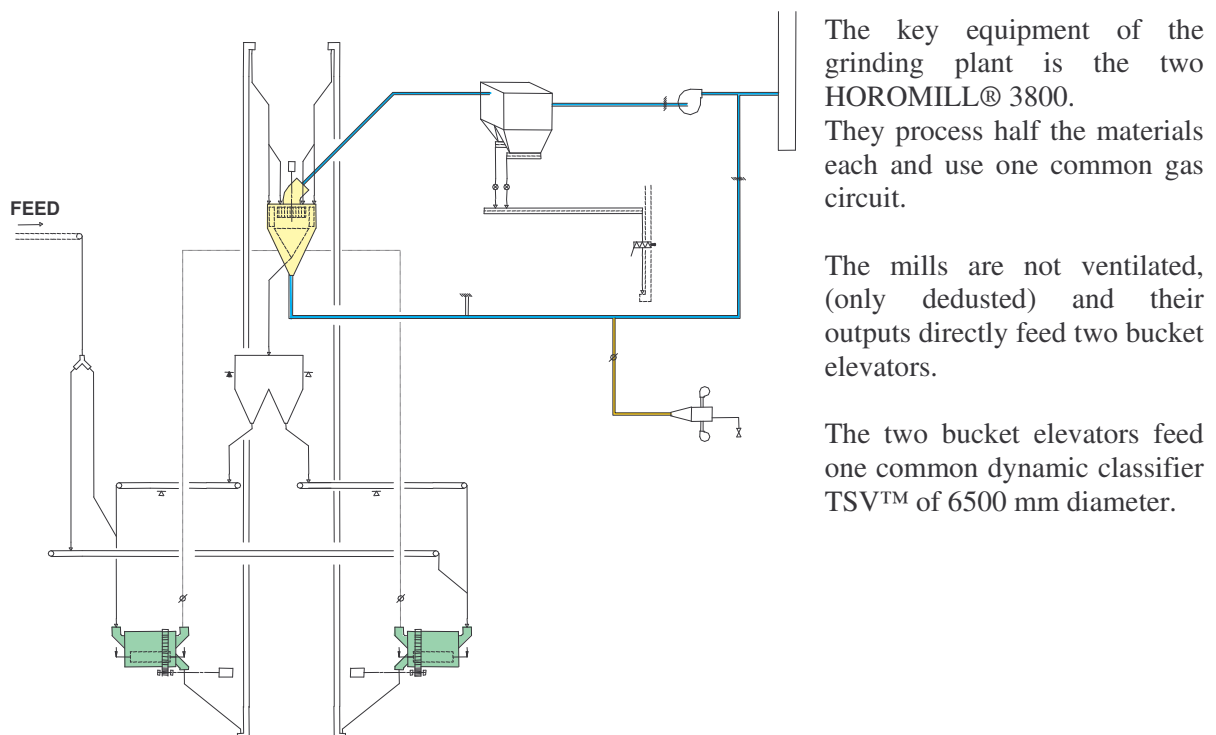


Figure 3: flow chart of the Twin HOROMILL® Workshop

The finished product is collected through the bag filter and transported to the cement silo by airslides. The classifier rejects fall into the intermediate reject bin, the two outlets of which feed two belt conveyors transporting the materials back to the mill. These return belt conveyors are equipped with two belt scales and have variable speed drive to control the flow of materials recycled to each mill.

A split gate at fresh feed inlet is used to balance material feed between the two mills. One of the mill is fed with the fresh feed directly after the split gate, whereas the feeding of the second one is done with a belt conveyor. This simple system is sufficient because there is no need to control precisely the split of fresh feed between the two mills, the mill load being controlled through the reject flow.

A part of the gas is recirculated from the outlet of the bag filter to the classifier. The remaining part is sent directly to the chimney stack. Fresh air can be introduced into the gas circuit to control the finished product temperature. A hot gas generator has been added to the workshop for the use of high moisture additives (pozzolana). Cement temperature is thus precisely controlled to the production of constant quality cement.

The main equipment of the grinding plant is:

Equipment	Supplier	Size / Type	Inst power kW
2 HOROMILL®	Fives FCB	Ø 3800	2300
1 TSV classifier	Fives FCB	Ø 6500 – HF	280
2 chain bucket elevators	Aumund	2 x 1060 t/h	160
1 bag filter	Intensiv	8000 m ²	
Main fan	Fläktwoods	552000 m ³ /h	1160
Hot Gas Generator	Gupsos	8.75 MW	

4 “Commissioning”

The contract was effective in October 2004. The main equipment, i.e. the HOROMILL® machines with the reducers were delivered on site within only 16 months. This must be underlined in a period when steady demand for steel and equipment over the world is inducing high delays for big equipment parts.



The first of the two HOROMILL® was started on December, 27th 2006, and the second one on January, 6th 2007.

From January 11th on, full automatic Twin-mill operation was effective and successful.

Figure 4: the mills during mechanical erection

Same as for a classical single HOROMILL® plant, the Twin-mill operation is fully automatic. The complete start-up of the plant is ensured from the CCR by the operator according to the production needs with only three mouse clicks:

- Selection of the operating mode: Single or Twin,
- Selection of the product recipe, including all the grinding plant settings to ensure the final cement production and quality, from the cement composition to the target silo.
- Auto-start.

The mains steps of automatic start-up can be described as follows:

- start of the hydraulic pressure unit and of the lubrication system
- start of the cement transport
- start of the gas circuit and setting to its nominal operation
- start up of one mill (The fresh feed split gate is set to feed 100% material to this mill). After the lift-up of the roller and starting of the mill main motor, the roller goes down and the mill is fed with material. As soon as the roller turns, the grinding pressure is applied. The return flow-rate is regularly increased up to the nominal setpoint within three minutes.
- Three minutes later, the circuit is stabilised, and the other mill can start without disturbing the first mill. At the material feed, the setpoints are modified: doubling of the nominal fresh feed flow and of the speed of the main feed belt, quick positioning of the split gate to its intermediate position, start-up of the reject feed to the second mill.

The stability of the system is ensured by regulation loops and automatic procedures. The quantity of material through each mill is adjusted thanks to the reject belts, the total fresh feed flow is controlled according to the material level in the intermediate hopper, and the stability of the final product quality is ensured by the constant air flow through the TSV™ classifier and its rotor speed.



Figure 5: the HOROMILL® twins

Stoppages are also managed in a full automatic way.

Should one mill stop (for any reason, planned or unwished), the split gate is quickly moved to feed the only running HOROMILL® and the nominal fresh feed flow is cut by half. The stoppage of one mill has no influence on the operation of the second one nor on the finished product quality.



Figure 6: the Twin HOROMILL® workshop

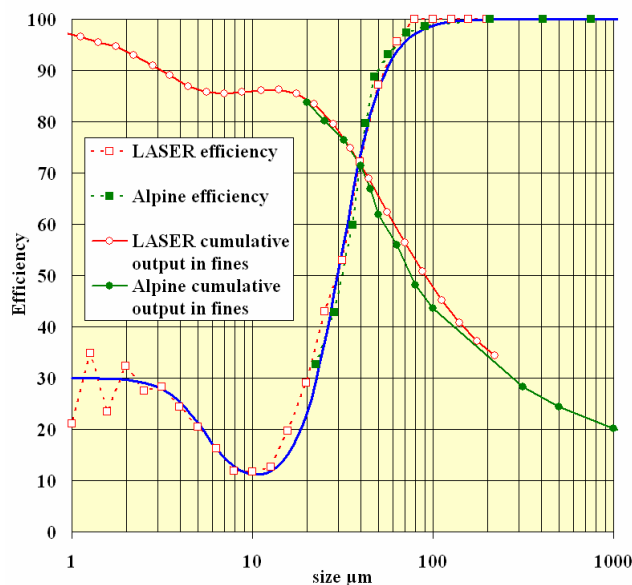
Automation is one of the most important parts of the commissioning period. All the sequences are previously tested without material. In Cam Pha Twin HOROMILL® plant, they were successfully validated during the on-load commissioning.

5 Performances

As the main plant of Cam Pha was not yet in operation at the time of commissioning, imported clinker has been used for the performance tests. In spite of this and of the variations of the clinker quality, the plant fulfilled the guarantee figures in terms of productions rate, cement quality, and energy consumption.

The results are, for PCB40 with 4% gypsum and 16% pozzolana:

	Workshop kWh/t	Production t/h	Compressive strength 28 days - MPa
Guarantee figures	24.0	240	40.0
Period A	21.5	249	42.8
Period B	23.2	255	48.2



The performances of the TSV™ classifier are also very good, with a cumulative fines efficiency over 83%.

Figure 7: the TSV separation curve

6 Conclusion

Once more, Fives FCB proves the performance of its grinding equipment, the HOROMILL® and the TSV™, in term of efficiency, of product quality and of behaviour. Its plants are operated in a full automatic way, allowing easy and smooth production. They are the best available technology for cement grinding.



Making a step further, Fives FCB has introduced the “Twin HOROMILL®” very innovative installation design, and made it successful in the Cam Pha new grinding plant. The stable operation of the plant was obtained very quickly during commissioning, and the new concept has proven its flexibility. The grinding workshop produces more than 240 t/h of cement with a total electrical consumption below 24 kWh/t.

The relatively short delivery time of the heavy mechanical equipment – the HOROMILL® and their reducers were delivered 16 months after the coming into force of the contract – must also be mentioned, considering the difficult context of world supplies.

This success in Vietnam opens the way to other new innovative plant projects; Fives FCB is ready for the start-up in 2009 of the next Twin HOROMILL® units to be erected: two for Rizhao Jinghua (P. R. China) plant, and a third one for VINAICON Thai Nguyen (Vietnam) plant.