Qatar's new 5000tpd plant

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The new 5000tpd Qatar National Cement Company (QNCC) cement plant, designed and built by Fives FCB, is now in operation. Producing its first clinker in April 2009, it has realised its industrial production tests, and has achieved its performance tests in less than two months. The clinker production line has demonstrated its reliability and has already reached a high production average level in the very first months (respectively 59, 79 and 85 per cent). To ensure stability and optimisation, it has also been equipped with the Optikiln system.

Located on the west coast of Qatar, the new Umm Bab plant started production in September 1997, with a 2000tpd greenfield line built by FCB. Taking advantage of free space, it has been laid following a straight line, from the limestone crusher to the cement packing plant. This first contract granted to FCB initiated fruitful and confident relations between FCB and QNCC. So, 10 years after, a second 4000tpd line was built, installed parallel to the first one. In late 2006, with the second line still under erection, QNCC ordered the 5000tpd plant again from Fives FCB. This was to bring the plant clinker production capacity up to 11000tpd. So it contributes to fulfil the still growing cement needs of rapidly developing Qatar.

In fact, the new project was split in two steps, with a first one concerning a cement grinding workshop bound for an early start. The cement grinding facility is now equipped with five identical Fives FCB ball mills, 115tph capacity each, associated to TSV separators. The present project has completed the plant with mills No 4 and No 5. Two new 15000t cement silos were also built thus doubling the storage capacity. A new bulk loading stand and a new bagging plant have also been added. Two rotary packers have been installed, with automatic bag applicators; they are associated to two automatic truck loading lines.

The cement mill No 4 started in April 2008 and the next one in June. Cement demand in Qatar is high and QNCC has ground 60 per cent more cement in 2008 than in 2007. Over its first year of operation, the new workshop has been producing cement for 78.5 per cent of its rated capacity, with only seven per cent of the shut-down time due to mechanical, electrical or process reasons.

The clinker production line is based on a five-stage, one-string preheater with precalciner and a three-support rotary kiln (Ø4.8 x 76m). Clinker is cooled down in a reciprocating grate cooler, with fixed inlet, short pendulum suspension and hammer crusher. As a common feature in the Middle East cement plants, raw materials contain chlorine. So an alkali bypass system has been installed. It extracts about 15 per cent of the kiln fumes and most of the collected dust is returned to the cement mills. Natural gas firing equipment is supplied by Fives Pillard. Process fumes are cleaned by electrostatic precipitators. Preheater gases are conditioned by dual fluid water spraying in the downcomer. This avoids the installation of a large gas conditioning tower, and achieves a high level of reliability.


The new QNCC Umm Bab plant with its three lines by Fives FCB

As in the two other lines, the precalciner is a Zero-NO_x Fives FCB precalciner, appreciated for its stability. Equipped with its meal annular distribution chamber, it ensures a good centring of the flame and an efficient protection of the lining (see Figures 1 and 2). So, no over-heating and no build-up is encountered in the combustion chamber. On the first line, which started production in 1997, the refractory lining of the precalciner hot spot zone showed very little wear up to now, and the burner itself has not been moved even once over 11 years.

For the new Umm Bab line, great attention has been brought to the design and installation of the large preheater cyclones in the unique new string: the diameter of the lowermost cyclones is 9m. The part played by splash boxes and tilt valves to achieve a successful lifting and dispersion of the meal is essential. The overall result is a good thermal efficiency, with temperatures at top below 290°C. The raw grinding plant may even have difficulty to keep its 440tph nominal production level when fumes temperatures come down to 280°C and the raw materials moisture reaches seven per cent.

With this new realisation, Fives FCB has implemented its Burning Line Optimisation System, called Optikiln. This system is in fact a modular one, based on the

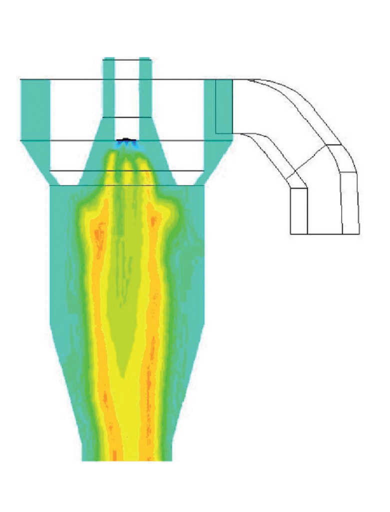

Figure 1: a well-centred flame

co-operation of individual control and optimisation units. Its concept differs from the former global optimisation concept (see Figure 3).

Indeed, two decades ago, the target in optimisation was often to build a general model of the burning line and to refer actions to the results and trends of this model. Expert systems have also been developed. The difficulty with models is to render them realistic and accurately as well as their lack of flexibility. With expert systems, high assistance is also needed. So operators often do not get familiar with them and they are sometimes not used.

The Fives FCB approach aims for a high flexibility, a high stability of the controls, and the easiness of adjustment by operators. So, the Optikiln system is split in individual units which associate their stabilities into a global optimisation. The interruption of one element (eg, because of a failing sensor) does not stop the entire optimisation as it is the case with global modelling. Most of the units are based on non-dimensional reference operation curves. Some can use restricted modelling.

Figure 4 shows an example of the stability which can be reached with the calcination temperature. The curve displays the temperature at the lowermost cyclone gas outlet, displayed each minute over one day. The achieved parameter value is stabilised at the set point within a ±2.5°C range, and the fluctuations of the tertiary air temperature and other factors are all compensated.

The plant has also been equipped with new in-situ 'Oxatex' probes measuring the oxygen content of preheater gases. Such a device is less sensitive to clogging than classical suction probes and does not suffer the risk of wrong values due to false air sucked into the analysis line.Thus an automatic operation of the ID Fan can be performed aiming at minimum oxygen content. Because of the late installation of the in-situ probes, as additional equipment, this control has not been used continuously yet.

Generally-speaking, the burning line is working very stably, and over the first six months of operation, no interruption has ever been encountered because of a CO peak or 'unburnt' material.

Optimisation modules have also been connected to create automatic production start programmes, for the burning line in any conditions – either cold or warm – and for the alkali bypass. For example with the kiln restarting from a cold stoppage, the programme begins at the moment when meal is fed, and goes on over about six hours, up to the reaching of the nominal production level. Figure 5 shows the diagrams of such an automatic production raise. This procedure relieves the operator from a part of tedious tasks, and allows him to give more attention to process evolutions and alarms. It also ensures that the production raise is carried out at a suitable pace. This comfort makes that operators today do work with Optikiln 'on'.

All this contributes to make the new 5000tpd Fives FCB production line more energy efficient, less sensitive to fluctuations, and in a word, better.

This year, two other production plants supplied by Fives FCB have been commissioned: the Quang Son 4000tpd plant (Thai Nguyen, Vietnam) and the Titan 4000tpd plant in Beni Suef (Egypt). They also benefit from the Optikiln control system. Following in early 2010 will be the Holcim-Apasco 3500tpd plant in Hermosillo (Mexico).

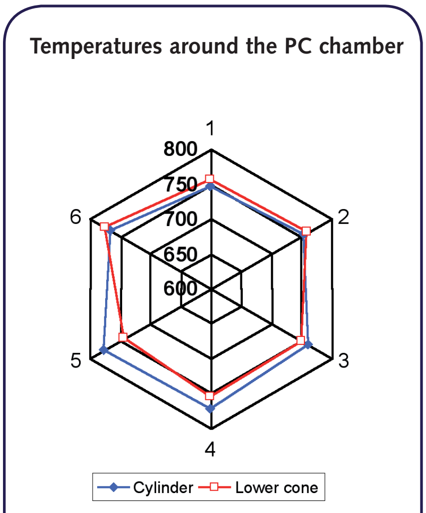

Figure 2: no overheating of the lining

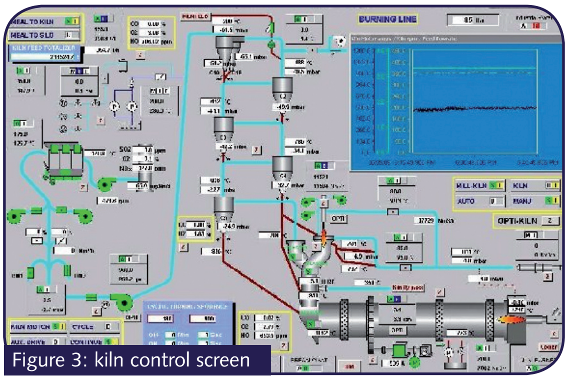

Figure 3: kiln control screen

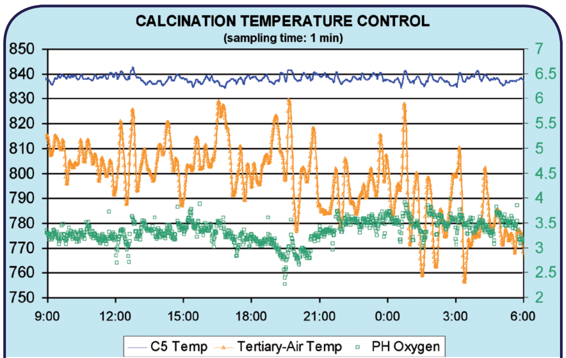

Figure 4: performance of the calcination temperature control

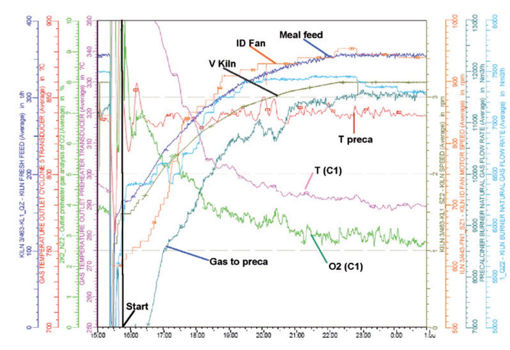

Figure 5: automatic production rise with a cold start