At Laumans the roofing tiles stand on their heads
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The new Lingl setting and firing technique for pressed clay roofing tiles and specials has passed the test: at the end of October 1996 the new clay roofing tile works of the Gebrüder Laumans GmbH & Co. KG at Brüggen-Bracht, in which cassettes are no longer required to fire the roofing tiles, was inaugurated.

The trend-setting patented process, which was developed in close cooperation between the Laumans and Lingl companies and saves up to 15% energy, is particularly suitable for engobed and glazed roofing tiles which are not allowed to have any points of contact on the visible surfaces.

In addition it reduces the investment costs because a return transport system for setting plates can be much simpler than a cassette transport plant. The most important design feature for the new plant was the demand of the client for easily transportable kiln furniture for the automatic setting and unproblematic firing of two layers of roofing tiles standing upright on tunnel kiln cars with as light a substructure as possible in order to minimize energy losses.

The main suppliers for the new works were the Rieter-Werke for preparation, clay bat press with bat feed and three-field revolver press, and Lingl for the transport system on the wet and dry side, continuous dryer, grouping and setting plant, steel casing tunnel kiln, unloading, sorting, packaging and packaging.

Preparation

The central preparation plant, which was installed by Rieter in 1994, was designed with the instructions that daily 350 t raw material for Poroton and 300 t raw material for clay roofing tiles have to be transported and stored fully automatically in boxes; therefore the production values for a new clay roofing tile plant were already fixed.

The complete preparation plant was to be run with night current and without manned operation. With the Rieter SPS controls and several monitoring and camera supervision devices, which transmit their values and pictures to the control station of the tunnel kiln plants some distance away, this fully automatic operation can be run as demanded.

Once the conditions for a correct material supply had been established, the planning of the new clay roofing tile works commenced in 1995, which was to employ the patented process of free-standing roofing tiles – with a ground interlocking header seam – on the kiln cars. Consequently plastic shaping with gypsum moulds was also defined, a prerequisite for the highest quality of the end products according to the present state of the art.

Shaping

The Rieter-Werke delivered the entire shaping plant including SPS controls from the souring house to the clay roofing tile press in accordance with the contract. Fresh material coming from the souring house and pressing waste are homogenized in a circular screen feeder and supplied by means of variable speed drive in exactly dosed quantities to the clay bat press. The clay bat unit is deliberately laid out for a low auger shaft speed with a cylinder diameter of 360 mm at the infeed and 500 mm at the pressing head. Taking into consideration the steam supply and a large vacuum chamber for maximum vacuum a well dimensioned double shaft mixer was chosen.
Drying and grinding

The freshly pressed flat tiles are dried in 35 hours in the continuous dryer, in which rotary fans are arranged on both sides of the train of cars, then unloaded from the dryer cars and transported on a belt conveyor road through the grinding plant which characterizes the process. Here the exactly aligned and fixed roofing tiles are smoothed on the interlocking header seam so that a safe standing surface results. Subsequently the flat roofing tiles pass through two glazing/engobing stations and are then distributed by means of belt points onto two grouping conveyors.

Setting the tunnel kiln cars

The two groups of eight roofing tiles each positioned singly and lying flat are lifted up alternately by a gripper, swung into a vertical position and placed – with the interlocking header seam at the bottom – onto a grouping belt. From here a transfer gripper takes over eight groups of roofing tiles at a time and places them directly onto the kiln car deck, so that they form a setting standing free on the interlocking header seam.

With two superimposed clay columns the clay bat exit is centric to the auger shaft, thus resulting in symmetrical extrusion conditions.

The clay bat cutter for the two superimposed clay columns operates with a horizontal cut in order to avoid crumbs on the clay bats. In spite of the controlled variable speed drive on the clay bat unit, a clay bat magazine section is installed so that even extremely sensitive machine adjustments are possible.

Being the heart of the clay roofing tile production the Rieter press DR 6-IV/III was installed, which generates a pressing power of up to 200 t and has a drum width of 1890 mm, but is fitted with only three moulds. This results in a mould spacing of 680 mm, which offers an excess for pressing waste. In addition this mould spacing is identical with the tray configuration of 340 mm – i.e. in a two-stroke cycle of 680 mm.

The automatic take-off system for the green tiles is controlled separately – electro-hydraulically – so that long suction lifting and depositing times can be run with optimum distance curves.

The cycle output of the clay roofing tile press of 16 pressings/minute was defined taking into consideration the pressing and flow values for highest quality features of the pressed tiles such as the interlocking seams, surface image etc., also for large sized roofing tiles.
The second layer of roofing tiles standing upright is then set automatically on setting plates with lateral securing pins.

Alternatively roofing tile specials, brought in with a suspended conveyor from the neighbouring works, can be set manually onto the setting plates.
New grinding and setting techniques for the firing of roofing tiles standing freely upright

1. Formgebungsanlage / Forming plant
2. Trocknerwagenbe- und -entladung / Dryer car loading and unloading
3. Durchlaufrockner / Continuous dryer
4. Schleifanlage / Tile head rectifying plant
5. Engobier- und Glasieranlage / Engobing and glazing plant
6. Ofenwagenbeladung / Kiln car loading plant
7. Stahlmantel-Tunnelofen / Steel casing tunnel kiln
8. Leitstand / Control station
9. Ofenwagenentladung / Kiln car unloading plant
10. Paketieranlage für Zubehör / Pack-forming plant for specials
11. Qualitätsprüfung / Quality control
12. Paketier- und Verpackungsanlage / Pack-forming and packaging plant
Firing

The loaded kiln cars pass through a preheater into the steel casing tunnel kiln which is side-fired with natural gas. Including locks, the kiln is 116 m long. The firing channel is 4.65 m wide and 1.01 to 1.40 m high.

The car passage time amounts to 26 hours. The dryer and kiln are controlled via Simatic process computer with LINGl software.
Unloading

Fired flat roofing tiles and setting plates are unloaded automatically with grippers, while the unloading of roofing tile specials is carried out manually.

The flat roofing tiles are marshalled into singles, pass through the quality control, are grouped into small packs and bundled. These are then positioned in a program controlled process on the following grouping conveyor by a turning and tilting gripper, by which the required layers are produced.

Pack-forming and packaging

By means of a transfer gripper the layers are stacked in packs with vertical and horizontal protective cardboard. Subsequently they are fed to the shrink film wrapping machine.
Specials are unloaded manually from the setting plates, bundled and stacked in packs by a robot. They are then transferred into the packaging line. The finished packs of clay roofing tiles and specials are held available on a two-level buffer shelf on the outer wall of the hall.

Résumé
The entire production technology is well thought-out functionally, highly modern, cost-effective, easy to operate and extremely economical.

Technical Data

Production capacity net: 10 million flat roofing tiles/year
2 million roofing tile specials/year

Continuous dryer for flat roofing tiles
Rotary fans on both sides of the dryer cars
2 forward tracks, 1 return track, 72.6 m
62 cars = 60,264 flat roofing tiles in the dryer
Drying time: 35 hours

Grinding plant for 3,000 flat roofing tiles/hour

Setting plant
for free-standing flat roofing tiles: 48 tiles/min.

Steel casing tunnel kiln
with chamotte thin walls, side-fired,
for free-standing flat roofing tiles and specials
Fuel: natural gas
Length of kiln with locks: 115.80 m
Length of preheater: 9.60 m
Width of firing channel: 4.65 m
Height of firing channel: 1.01 - 1.40 m
Car passage time: 26 hours

Unloading plant
for flat roofing tiles and specials
Quality inspection automatic and manual
Pack-forming of specials with robot

Packaging plant
for flat roofing tiles and specials
Securing of transport packs with shrink film
Capacity: 10 transport pallets/hour

Plant controls
for dryer and kiln
Simatic process computer with Lingl software