

SR-Schindler Maschinen-Anlagentechnik GmbH, 93057 Regensburg, Germany

Fully automatic paving stone refinement plant for Beton Complex in Kiev

The Beton Complex company, which belongs to the Kovalska Group, is one of the leading manufacturers of concrete products and building materials in the Ukraine and was adopted by the 'Ukrainian Investment Newspaper' into the group of the five best building material manufacturers in the Ukraine in 2010. In October 2010, Beton Complex ordered a refinement line for paving stones from SR-Schindler Maschinen-Anlagenbau GmbH from Regensburg. The plant was delivered in spring 2011 and was already in operation by June. The refinement line was conceived by Schindler in such a way that further refinement lines can be connected to the existing plant at any time and a multitude of different products can be manufactured from the raw paving stones, which are produced by a new block making machine from Hess.

The plant essentially consists of two independently working lines – a blasting line and a splitting line, the full and empty pallet transport and the packet assembler.

Function

The raw products are fed to the refinement line in packets on wooden pallets by an almost 60-metre long heavy-duty roller conveyor and a subsequently connected trolley car that runs on rails. The loaded wooden pallets are brought by fork-lift truck from the storage area to the heavy-duty roller conveyor and then transported on the conveyor to the trolley car.

The trolley car, which has a driven roller table, takes up one pallet at a time and takes it to the intake conveyor, which then takes the paving packet to the destacking position of the layer stacker. The rails of the trolley car are designed in such a way that the splitting line can be equipped with its own intake conveyor in a subsequent expansion stage. The trolley car can transfer the packets either to the intake conveyor of the blasting line or to the intake conveyor of the splitting line.

The layer stacker, which is approx. 18 m long, stands at a right-angle to the two refinement plants and straddles the input positions of both lines. It is built with excess length, so that a further refinement line can be installed parallel to the existing lines at a later date and supplied with products by means of the layer stacker.

At the present time the layer stacker is equipped with a travelling crab with an electro-mechanical four-sided clamp. The clamp can be swivelled by 90° so that layers can be input to the respective line in the desired processing direction independent of their alignment on the pallet.

The travelling crab with the clamp drives to the destacking position, picks up a layer of paving stones from the packet and sets the layer down either on the belt conveyor of the blasting machine or on the belt conveyor of the splitting machine. If the refinement plant should be extended at a later date by a further refinement line, the layer stacker can be equipped with a second travelling crab with clamp, so that two refinement lines can be supplied at the same time.

Once the layers have been placed on the respective belt conveyor, they pass through either the blasting line or the splitting line.

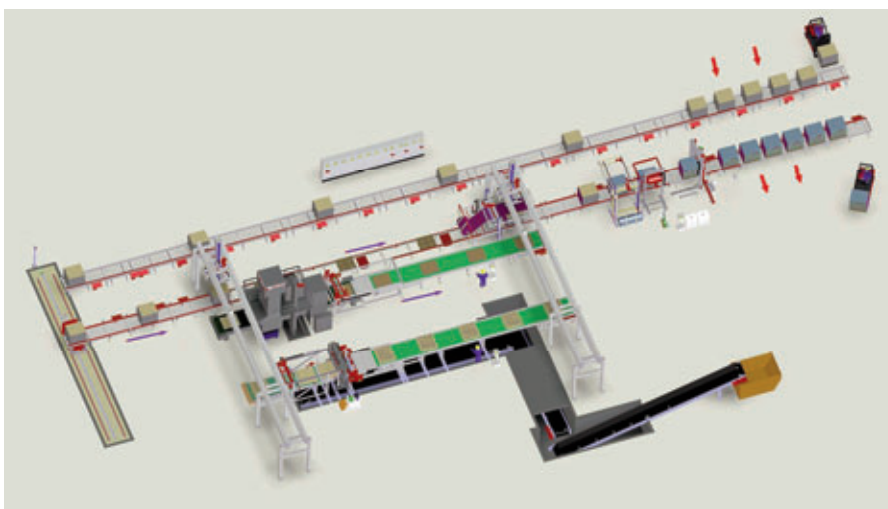
The empty wooden pallets are transported to the loading position by the empty pallet chain conveyor, which runs parallel to the blasting line. Here, the processed stone layers are stacked to form packets once again and are packaged in the packet assembly line.

Blasting line

The products are placed by the four-sided clamp of the layer stacker directly onto the perforated rubber conveyor belt of the blasting machine and pass through the machine in cyclic operation. The blasting machine has a working width of 1,200 mm and is equipped with two 18.5 kW turbines, which blast the surface of the product inside the blasting booth with stainless steel balls with a diameter of 0.6 to 0.8 mm. The quantity of blasting abrasive, the blasting speed, the blasting angle and the throughput speed can be adjusted. This allows the product surfaces to be varied and different types of product can thus be manufactured.

In order to treat block steps and/or kerbstones, one turbine is switched off and the direction of rotation of the other turbine is changed. The guide sleeve must be adjusted manually so that both the top surface and one side of the product can be blasted evenly. Alternatively, a third turbine could be installed later for the treatment of the sides.

After treatment the blasting abrasive is blown off the product surfaces and falls through the perforated conveyor belt onto a screw conveyor, by means of which it is transported to a bucket conveyor, which in turn brings the blasting abrasive to the blasting abrasive cleaner. The cleaned blasting abrasive is taken to a silo and re-used for further blasting procedures.



3D illustration of the new paving stone refinement plant at Beton Complex in Kiev



Raw product intake

The blasting machine is provided with a sintered lamella filter. The filter is installed in the hall and requires no piping to the exterior. The generated dust is fed to dust collectors, which are fastened to the filter unit by means of clamps. The dust can be re-used as filler material for the concrete mixture.

The treated paving stones leave the blasting machine and are placed onto a belt conveyor by a layer pusher. Here, the stone layers pass through the visual inspection, which is carried out by a plant operator. He manually sorts out second quality products.



Blasting plant with sintered lamella filter



Splitting plant

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Layer destacker

The belt conveyor brings the layers cyclically to the take-up position of the second layer stacker which, with an excess length of 18 m, is also installed at a right-angle to the two refinement lines at their discharge and is equipped with a travelling crab with an electric motor-driven four-sided clamp with a 90° swivelling mechanism, which drives to the discharge position of either the blasting line or the splitting line. The excess length and the possibility to install a second travelling crab with a four-sided clamp ensures that, if the plant should be extended by a further refinement line, the products from this line can also be picked up and transferred to the packet assembly line.

Splitting line

The stone layers are set down by the four-sided clamp of the layer stacker on the belt conveyor of the splitting line and pushed under the splitting blade of the splitting plant by a layer pusher equipped with a measuring system. The measuring system ensures precise positioning of the individual stone rows in the splitting position.

The splitting machine has a working width of 1,200 mm and is arranged at an angle of 90° to the conveying section. Splitting takes place using the pincer principle, in which the lower row of splitting blades drives upwards to the product to be split while the upper row is simultaneously pulled downwards to the product to be split. Splitting then takes place with a splitting force of 120 tonnes from bottom to top. A lateral blade on the right and another on the



Layer discharge on the splitting line

left support the splitting procedure if the product concerned is a continuous product. Products up to a height of 350 mm can be split.

At Beton Complex the splitting machine is additionally equipped with a hydraulic height adjuster for the upper blade in order to be able to adjust the machine quickly to a different splitting height. The blades may need to be exchanged depending on the width of the stone layer to be split. Here too, there is a quick change system in which the blades are guided in a support for time-saving re-tooling. In the case of products with large height tolerances within a layer, moving upper blades can be used that are able to compensate these tolerances due to their flexibility.

The splitting machine's high-performance hydraulics are equipped with oil cooling and oil heating in order to ensure a constant temperature at the start of work.

A waste belt runs under the splitting machine. This removes the splitting waste and deposits it into a container provided by the customer. The splitting waste falls onto the belt through a flap arranged at the discharge of the splitting machine.

Following the splitting procedure and the discharge of the splitting waste, the products are pushed onto a belt conveyor by a layer pusher, their quality is visually inspected and the split stones are combined once again into a stone layer that can be assembled into a packet. This layer is transported by the belt conveyor to the take-up position of the layer stacker. The belt conveyor presently has a



The layer is pushed under the splitting machine in rows



Splitting procedure

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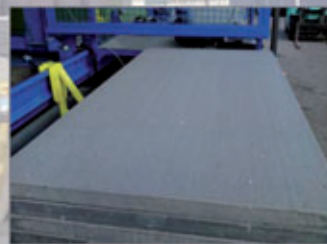
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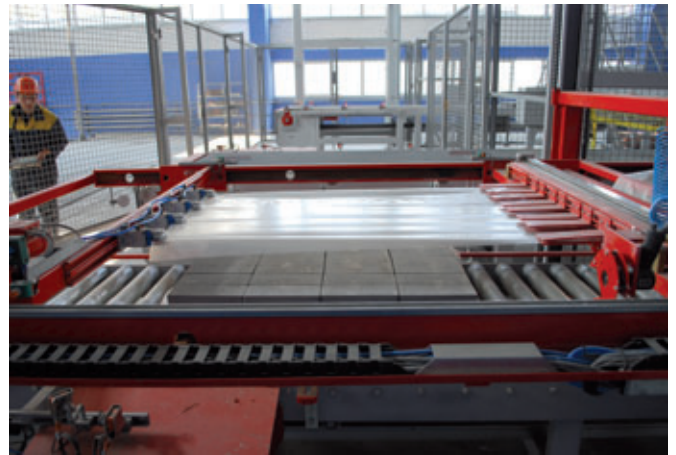
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Packet assembly section



Intermediate layer dispenser with film as medium

length of approx. 15 m. At a later time it can be shortened and replaced by a 90° turntable with layer pusher and a second splitting machine. It is then possible to rotate the products split in the first splitter by 90° and to split them again in the opposite direction in the second splitter. In this way, for example, many small individual paving stones can be produced from one large stone block.

Packet assembly line

The layer stacker places the layers treated in the blasting or splitting line onto the empty pallet waiting at the loading position. In the case

of blasted products, netting or a film is automatically placed between the individual layers by a dispensing mechanism in order to protect the surfaces against damage.

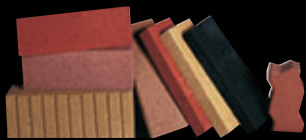
Once the packet assembly is completed, the loaded wooden pallet travels along a heavy-duty roller conveyor to the upper film dispenser and then on to the horizontal and vertical strapping. The film placed over the packet by the upper film dispenser protects the final layer of the packet against the influences of the weather. The horizontal and vertical strapping stabilises the packet and holds the upper film in place. The finished package finally travels along the

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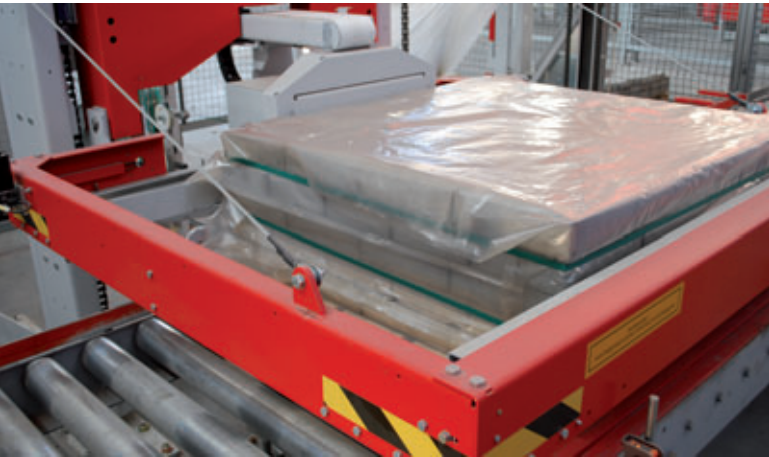
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Horizontal strapping

roller conveyor to the pick-up position and is picked up by the fork-lift truck.

Electrical controller

The refinement lines and the packet assembly line have a common Siemens S7 controller and two mobile tablet PCs with touchscreen, which enable local operation via wireless LAN. Beyond that the entire plant can be controlled by means of an Ethernet-based operating and monitoring system. The operating and monitoring system is equipped with user administration and access hierarchy. It features

operating data logging and recipe administration, allowing up to 1000 treatment programs to be saved and called up. On calling up the respective program, all product-specific machine parameters (e.g. positions, speeds, times, etc.) are assigned to the respective drives over Profibus or Ethernet.

Conclusions

In its present implementation - equipment level 1 - the plant can already manufacture a large number of blasted or split products with low personnel requirements and is designed in such a way that further modular refinement and packet assembly lines can be connected. In this way the Beton Complex company can continue to react quickly and flexibly to new trends and rising demand in future.

FURTHER INFORMATION



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