

SR-Schindler Steinbearbeitungsmaschinen und Anlagentechnik GmbH, 93057 Regensburg, Germany

## Highly modern manufacturing and refinement line in Kazakhstan

As the largest land-locked country and the ninth largest country of all in the world, the republic of Kazakhstan in Central Asia has experienced a genuine economic miracle since the end of the 1990s. The enormous deposits of raw materials, in particular oil, gas and ores are making the country's economy boom. The beneficiary of this development is the local building industry, which is realising a wide variety of large-scale projects, especially in the new capital city of Astana and the country's second-largest city Almaty. The Basis-A Corporation, one of the leading construction companies in Kazakhstan, therefore decided to establish their own manufacturing works for refined concrete stones and slabs in Almaty. The intention was to place the emphasis here on the production of concrete slabs. The new works, which were intended to be built here in the open countryside, were under the control of the Concrete Products company, whose name was subsequently changed to Company Concrete and which is a subsidiary of the Basis-A Corporation.

The initial planning discussions between Concrete Products and SR-Schindler Steinbearbeitungsmaschinen und Anlagentechnik GmbH from Regensburg took place in the autumn of 2004. Inspections of similar plants built by SR-Schindler in Germany and Poland followed and all technical requirements and conditions were clarified. The contract between the two parties was finally signed in Kazakhstan in October 2005. Today, one of the most modern slab works in Central Asia, with a combined refinement and packing line for paving stones and slabs, stands in Almaty.

SR-Schindler had taken over the overall management of the project in a tried-and-tested manner: everything was supplied from one source, from the mixing plant, presses, moving platform and vaporisation to refinement and packing. The necessary cement silos, day silos for aggregates, mixing platforms and drying chambers were provided by the customer to SR-Schindler GmbH specifications in accordance with the overall planning.

The facing concrete mixing plant, which is decisively responsible for the quality of the visible side of the final products and their refinement options, has 6 aggregate silos. Weighing takes place via 6 dosing conveyors, which transfer the grains to the movable scales. Aggregates, or cement, bonding agent and water are transferred to the 375 litre Haarup facing concrete mixer via skips and feed augers. A concrete conveyor belt then transports the ready facing concrete mixture to the facing concrete doser for the presses.

The core concrete mixing plant, which is fed by four aggregate silos and one cement silo for grey cement and has a 750 litre Haarup mixer, operates according to the same principle.

A Sauter mixer controller for the facing and core concrete mixing plants regulates dosing and mixing in the entire plant and can in addition optionally communicate with an external additive doser and an external liquid colourant dosing unit.

The centrepiece of the slab production is the SR-Schindler/OCEM hermetic press from the latest Top 9000 generation with 1200 tonnes main forming pressure and mould frame for the 40/40 cm formats in quadruplicate. Products in thicknesses of up to 100 mm and sizes of max. 900 x 1000 mm can be manufactured using this press. The production cycle time is around 15 seconds, which makes for a maximum production capacity of 1500 sq. metres in 8 hours.

The doser for the press, which is movable in height, is equipped with double planetary mixing gears and has an automatic dosing disc aperture for secure sealing and rapid exchange of the dosing bush. High frequency vibrators under each mould provide for the distribution of the facing concrete mixture and a bubble-free, closed microstructure. The core concrete is always distributed evenly in the mould via a special core concrete valve.

After the mould has been completely filled with facing and core concrete, the pre-

pressing station, with a forming pressure of 80 tonnes, and the main pressing station, with a forming pressure of 1200 tonnes, provide for optimum compaction. The finished slabs are pressed gently out of the moulds by ejectors and transferred to a slab finger car.

A Siemens S7 with ASI bus system controls the presses. Local operation is made possible by Simatic MP 270 mobile touch panels.

The attachment of an SR-Schindler FMC colouring and marbling machine to the press further enlarges the variety of products in addition to the various refinement variants on the dry side.

A fresh slab turner takes the products from the slab finger car and transfers them with the facing side upwards to the vacuum



*Horizontal depositing device on the hermetic press*

transfer device of the SR Syncro 2000 horizontal depositing device. Here the slabs are deposited on self-stacking steel pallets. The slabs can also be deposited with the facing side downwards by means of the vacuum transfer device taking the green slabs directly from the slab finger car and placing them onto the pallets without turning them over.

The horizontal depositing device on the press is comprised of 8 stations and can be retrofitted with a patented SR-Schindler direct washer. On the dry side, the horizontal depositing device has 6 stations including a pallet cleaning station.

A fully-automatic moving platform with a 180° rotation facility takes the pallets, which are stacked into towers and filled with green slabs, to the drying chambers. The products are stored there on top of one another in double towers in order to save space and are cured for around 8 to 10 hours by means of the Kraft Energy Vapor Mite concrete curing system. Following this curing period, the products can pass through all of the high refinement processes.



*Drum turner with grinding machine in the background*



*Star 8902 calibrating machine with 2 stations for levelling the core concrete side*

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*Star 8909 grinding machine for 2-rows of 40/40 cm slabs with drying section*



*KFC 800 chamfer miller*

For this purpose, the cured slabs are taken from the horizontal depositing device on the dry side by the vacuum transfer device and placed on a belt conveyor. From here there is a possibility to transfer the cured slabs without refinement directly to the packing station via an approximately 70 m long belt conveyor, or to feed them into the refinement line by means of an angled transfer unit and a belt conveyor. According to requirements, products with a maximum thickness of 200 mm can be processed in the individual refining machines at a throughput speed of 1 to 6 m/min. (depending on the age of the product, the composition of the facing concrete and the desired final appearance). The transport sections that take the slabs or layers of stones to the individual processing stations are designed as accumulating roller conveyors with positioning slides in front of the calibrating and grinding machines, so that the endless strands necessary for processing can be formed.

The paving stones to be refined are taken as paving packages by means of fork lifters from the storage place to a lamella conveyor, which transports the packages to the layer destacker. There the individual stone layers are taken from the packages, placed on a depositing table and fed to the refinement line by means of positioning sliders.

The entire high refinement line is composed of a drum turner in front of the calibrating machine to turn the paving layers or slabs from the facing concrete side onto the core

concrete side, an SR-Schindler Star 8902 calibrating machine with 2 stations for levelling the core concrete side, a drum turner to turn the products onto the facing concrete side, an SR-Schindler Star 8908 high-performance grinding machine with 8 stations, the chamfer milling machine implemented as a bypass and arranged at an angle, a shot blasting unit with a working width of 800 mm, a bush hammering machine with a unit that is used mainly for the processing of the stone layers and a curling machine with a working width of 800 mm and 6 brushes. At the end of the refinement line the slabs are visually inspected by an operator and classified into 1st, 2nd and 3rd choice products by means of identifying blocks. 1st and 2nd choice products are impregnated, then all product groups are transferred via angled transfer units and belt conveyors either to the slab packing station or are detected by optical switches as 2nd or 3rd choice products and removed from the line.

The stone layers also pass through the visual inspection. The operator removes faulty products manually and replaces them by perfect products. A positioning slider positions the inspected stone layers on an inspection table, where they are collected by a layer fork lifter and placed on empty pallets supplied from an empty pallet magazine. With the net inserter, which lays netting or foil between each stone layer to protect against damage, the horizontal packing of the paving stones begins with placement of the cover sheet and vertical

packing. Finished packages leave the hall on a heavy duty roller track.

The calibrating and grinding machines are operated wet. Using the calibrating machine, 1.5 to 2.0 mm can be removed per station by means of diamond milling segments. The first four stations of the grinding machine are equipped with diamond milling or diamond polishing segments, the remaining four segments with Steckfix rapid-change grinding tools. All of the machining tools can be used on any of the frequency-controlled stations according to requirements. The 900 mm working width of the calibrating and grinding machine allows double-row processing of both the 40/40 cm and 40/60 cm products. In this particular case the bed of the grinding machine has been extended so that, if necessary, two further stations can be added at a later date. Naturally the machine controller has been designed for this future expansion.

The Star 8000 grinding machines work synchronously to the output of the press and can therefore keep pace with the production speed of the press.

The cast iron passage with high-precision ground austenitic manganese steel plates and constant thickness, multi-layer reinforced Siegling conveyor belt ensure flat transport free of vibration and jerks. The tunnel segment execution, with tool spindles mounted on twin bearings in the column guides, guarantees the required performances and enables all common degrees of grinding

for hard and soft aggregates, small and large grains in the facing concrete, whilst maintaining low tool and energy costs.

All SR-Schindler refining machines can be adjusted flexibly to the individual products via the respective operating panel or via the plant control panel and the settings stored there. In other words throughput speed, processing speed, pressing force, height adjustment and the number of processing stations can be adapted to suit the individual product, taking into account the age, the hardness and composition of the aggregate in the facing concrete and the desired final appearance.

A high-performance drying section with special fans ensures that the slabs are as dry as possible for the subsequent chamfering and shot blasting processes.

The SR KFC 800 chamfer miller machines the products in a dry state. At Company Concrete the chamfering machine is implemented as a bypass with angled transfer units. The machine is composed of two processing bridges each with a chamfer milling station at the left and the right sides of the bridge. In this particular case the bridges are arranged at an angle, but if need be they can also be arranged linearly and provided with a 90° turntable. In this manner the machining of all four product sides in continuous flow operation is guaranteed in all cases.

Products which are not intended to be chamfered are transported via belt conveyors past the bypass directly to the shot blasting machine. The shot blasting machine is equipped with 2 high-performance turbines, each rated at 15 KW. The slabs and stones are transported through the machine on a perforated rubber conveyor belt. Slabs and stones up to a height of 200 mm can be treated on a working width of 800 mm. The turbines thereby propel steel balls against the slabs at high speed in order to remove the cement layer and expose the grains. Following processing of the products, the blasting abrasives are removed in a cleaning zone and fed to the air separator via a bucket conveyor. Here the reusable blasting abrasives and cement dust are separated. The cleaned blasting abrasives are returned to the machine circulation.

The shot blasting machine is followed by a bush hammering line with a processing station equipped with 6 quick exchange beams and a total of 87 bush hammers. The bush hammering line essentially processes only stone layers or products with a minimum height of 50 mm and a maximum width of approx. 1000 mm. In bush hammering, the surface is struck and the grain broken up. Two types of product can be manufactured using this plant - a bush hammered, unchamfered product with a beaten surface and broken edges and a chamfered product with only a stockhammered surface, but without damaging the chamfers.

If Company Concrete should wish at a later date to manufacture aged stones, i.e. stones with broken edges only, this is also possible using this machine. It is merely necessary to install quick exchange beams fitted with aging tools. The conversion of the machine is hence very simple and can be performed quickly. The range of products can thus be extended once again with little expenditure.

The advantage over the well-known drum method is that the order of the stone layers or the laying patterns is retained and sorting is not necessary.

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The shot blasting machine is equipped with 2 high-performance turbines, each rated at 15 KW.



Bush hammering line with 6 rapid-change bars and a total of 87 bush hammers

The last refinement stage before impregnation is curling with 6 brush rollers. The brushes are provided with a carborundum coating of a varying thickness, depending on their position in the machine, and are counter-rotating and arranged with a 25° tilt. Thanks to the working method and the brush arrangement, even structured slabs with coarse structures can be machined evenly. Depending on the product, curling can be applied as the only refinement process or in combination with grinding and/or shot blasting. In any case the removal of the cement layer and the abrasion of the grains, which have been exposed or cut open by the previous grinding process, gives the products a matt polish and a noti-

ceably softer surface, which is in addition non-slip.

In the subsequent impregnation process, it must be noted that curled products require less impregnating agent and the hardening time is shorter.

As already mentioned, the 1st choice slabs are discharged after refinement via angled transfer units and belt conveyors to the vertical packing station. Here they are transferred via a double lifting platform to the vertical positioning device with cord feeding device. The slabs are assembled into slab packages standing on edge behind one another, the format 40/40 cm in pairs, the

format 50/50 cm and larger formats singly. The products can be positioned face to face or core concrete to face, as desired. Since Company Concrete require packing without pallets, a foam polystyrene feeder supplies foam polystyrene slabs for the slab packages, which are placed onto the foam polystyrene base by the package transfer device. A package roller track then transports the double packages to the cover sheet feeder and vertical strapping unit. Here the cover sheet, slab package and foam polystyrene base are combined into a total package and subsequently transported to the outside via a lamella conveyor. Further transport takes place via fork lift.



Curling is accomplished with 6 brush rollers



Impregnation with upstream curling machine

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*The 1st choice slabs are discharged after refinement via angled transfer units and belt conveyors to the vertical packing station.*



*Transfer device for packing paving stone layers*

The Company Concrete line can be expanded by a further refinement plant at any time. For this purpose the 70 metre long transport section, which currently conveys unrefined products from the horizontal depositing device on the dry side to the packing station, can be equipped with slab refining machines. Hence, in future, Company Concrete could process paving stones in the existing refinement line and at the same time refine slabs in the expansion line. In this way, Company Concrete has the

possibility to react quickly and flexibly to increasing demands and different customer requirements.

In the planning and fitting out of the works, Company Concrete not only placed importance on high quality, German-made technical equipment, but also requested after-sales support and advice. The on-site assembly team were able to fulfil these expectations. During the entire assembly period, the employees from Company Con-

crete were not just trained to operate and maintain the machines, but also received advice on mixtures and recipes.



*Double packages after passing through the cover sheet feeder and vertical strapping unit*

#### FURTHER INFORMATION



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