Teka Maschinenbau GmbH, 67480 Edenkoben, Germany

One of the world's largest dosing and mixing plants for state-of-the-art precast plant in Russia

The Russian construction and property group Morton of Moscow was established in 1994. Morton specialises in the construction of large settlements and housing complexes and has constructed buildings with a total area of around 7.5 million m² since its establishment. The precast concrete elements and ready-mix concretes are manufactured in the company's own plants. Morton is one of the three largest companies in Russia in terms of the construction of living space. In the context of the strategy for the expansion of its own production, Morton has erected the DSK Grad precast plant in the Greater Moscow area. The latest developments, modern machines from leading suppliers and innovative solutions in the new DSK Grad precast plant will contribute to it occupying a top position in the Russian building market. The building of its own precast plant will also help strategic goals to be attained. This means that having its own precast plant makes GK Morton a full-range supplier, from the development and design to the construction, commissioning and operation of the housing complexes. As a result, the product quality is increased and the costs are minimised. The German company Prilhofer Consulting was hired as the project consultant. The equipment in the DSK Grad plant encompasses three circulation plants, a plant for the manufacture of special structural elements and a further plant for the manufacture of structural elements such as columns and beams. A high-performance, state-of-the-art concrete centre was installed by Teka of Germany for the supply of all production lines with concrete. Teka Maschinenbau GmbH has set a high standard on the market with the delivery and installation of the concrete mixing plant, whose dimensions make it one of the largest in the world. A further Teka dosing and mixing plant with even larger dimensions is currently at the planning stage and will be built in 2015.

DSK Grad is located very favourably on a plot of land with an area of 25 hectares in the Kotowo Industrial Estate in the district of Naro-Fominsk in the Greater Moscow area, only 2.5 km from the new planned central ring motorway. This allows the precast elements to be delivered quickly and at low transport costs to the building sites.

The new precast plant has a production capacity of 525,000 m², of which 450,000 m² are to be allotted to housing construction and 75,000 m² to the construction of public buildings. The large area of the property will allow an extension of the production capacities later on.

The production plants were put into operation in several stages; the first production line was started up in spring 2014, full capacity being reached in the third quarter of 2014.

DSK Grad differs from most other Russian precast plants in that all of its processes are automated to a very high degree. All production plants are located under one roof. This method of organising the production flow leads to a reduction in costs and to an increase in the production performance. Through this flexible approach to production organisation it is possible to react very quickly to the changes on the market as well as to customer requests. The entire production plant is controlled by the integral, computer-assisted CAD/CAM system, wherein this system unites the functions of CAD technologies and those of the special software.

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Teka binding agent silo installation

Teka mixing stations

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Teka mixing and weighing platforms with bottom-discharge feeder and silo installation in the background

for the delivery of the elements from the works to the building site is used for the optimisation of the business procedures. Precast concrete elements are assembled into special transport packages and these packages are stored in the works on pallets. The delivery of the complete transport packages from the works will then take place on low loaders. Inloaders have been acquired for this, with which the precast concrete elements can be transported to the building site without further reloading.

State-of-the-art dosing and mixing plant from Teka

The complete concrete mixing plant at DSK Grad consists of five completely autonomous and independent mixing stations situated next to one another. Four mixing stations are equipped with the proven Teka TPZ 3750 high-performance planetary mixer (with an output of 2.5 m^3 per batch), while the Teka THT 1500 high-performance turbine mixer (with an output of 1.0 m^3 per batch) produces the concrete in the fifth mixing station.

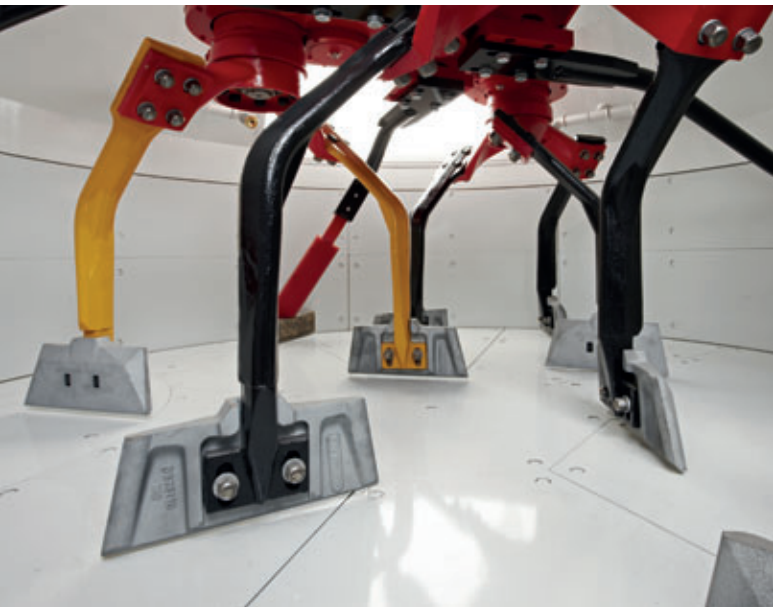
Teka mixing platform with TPZ 3750 high-performance planetary mixer

Dosing of the aggregates from 24 chambers

The complete feeding system, silo installation and mixing stations are very generously sized to allow optimum accessibility for cleaning and maintenance work. Of course, the complete dosing and mixing plant is also equipped with state-of-the-art safety technology.

The aggregates are taken up by two truck charging hoppers, each with a volume of approx. 20 m^3. Both charging hoppers are fitted with a cover for protection against the weather. The material is transported to the silo installation by the 109 metre long conveyor belt. Both hoppers are kept warm with hot air so that the aggregates do not freeze. The long conveyor belt feeds two mobile and reversible belts above the silo installation. The silo installation, which was built on site of concrete, is divided into four rows of six compartments, making a total of 24 compartments. All openings of the silo compartments are fitted with gratings as safety measure. All compartments are heated and monitored by temperature sensors. Similarly, all compartments are equipped with modern level indicators and a total of 12 air-blast devices in the form of shock blowers.

Reversible heads belts are attached at both ends of the mobile belts. All conveyor belts are equipped with the latest technology, such as speed monitors and skew monitoring. Local operating panels are installed both on the hopper and on the silo platform in order to enable local intervention.



Teka TPZ 3750 planetary mixer with countercurrent principle

Underneath the silo installation there are 22 shutters on the batching segments in three different sizes, which are precisely matched to the different grain sizes. Two dosing belts ensure the precise dosage of the sand. Under each silo row is a weighbelt with a post-container that allows continuous weighing. The four weighbelts are driven by soft-start devices. All four post-containers are equipped with a wearing lining and a vibrator.

The aggregates are transported from the weighbelts to the mixers via proven Teka feeders with a bottom discharge design. Four feeders supply material to the four Teka high-performance planetary mixers as well as to a Teka high-performance turbine mixer. This means that each feeder supplies material via a two-way distributor to a double unit with one planetary mixer and the turbine mixer.

The Teka high-performance planetary mixers have proven themselves worldwide and have been the core of every Teka dosing and mixing plant to date. Since the introduction of the Teka turbine mixers at the bauma 2013, the new turbine mixer is becoming increas-

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Teka THT 1500 turbine mixer

ingly popular. Its flexibility and performance, even with very difficult concrete mixtures, impress an ever growing number of customers.

Teka planetary mixer

The 2.5 m³ planetary mixer is equipped with three mixing stars, one of which turns in the opposite direction to the other two mixing stars. Furthermore, all three mixing stars run with different radii, so that the base of the mixer trough is covered. This unique mixing principle results in very intensive mixing and makes this mixer a genuine countercurrent mixer, which is also very well suited to all possible special concretes or special products.

The counterflowing material streams cause the permanent movement and shifting of the aggregates and thus an optimum mixture quality in a very short time. The mixing principle also makes this planetary mixer very suitable for small and very small quantities. This targeted input of energy is extremely efficient. The countercurrent principle guarantees fast and clean emptying of the mixer via a large discharge opening. The actuation of the discharge unit takes place reliably by means of a hydraulically actuated slew drive with a high breakaway torque.

Teka turbine mixer

The Teka turbine mixer has so far been used mainly in Germany and Western Europe for the production of facing concretes, dyed concretes, self-compacting concretes and ultra high performance concretes. It is thus a very good supplement to the Teka planetary mixer. The turbine mixer can perfectly mix batches of less than 10%, has a considerably lower degree of contamination, an extremely quick discharge time and is generally very well suited to frequently changing batches.

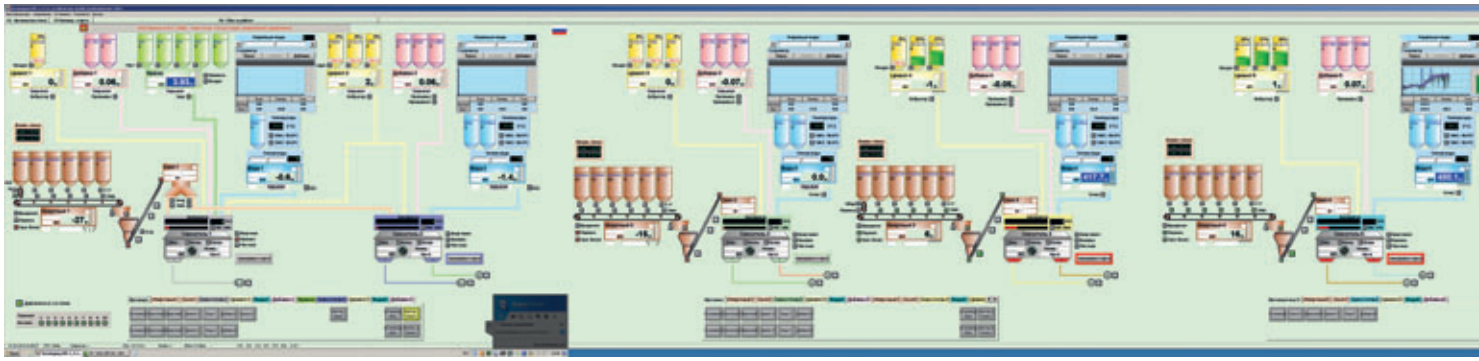
The central position of the rotor and thus the even distance between the mixer/scraper paddles and the mixer trough are ensured by the dimensionally stable upper mixer section with integrated mounting flange for the gearbox.

The cast steel mixing stars and mixing arms are functional, robust and lift-proof. The results of this are minimal wear of the paddles and wearing lining, no unmixed material at the base of the trough and proper wiping of the moisture sensors. Due to the special shaping of the paddles and mixing arms an efficient mixing effect is achieved and the 'accumulation effect', especially in the case of small quantities, is avoided. Mixture deposits are avoided, which minimises cleaning work and simplifies the adjustment of the mixing tools. Furthermore, large self-opening cleaning hatches allow good accessibility for cleaning and maintenance work and sufficient space for inlets and additional devices.

Extensive special equipment

All the mixers at DSK Grad are equipped with a powerful high-pressure water cleaning system with mobile three-dimensional high-pressure nozzles made by Walter Gerätebau GmbH. The bucket tracks for the transport of concrete to the machines are also kept clean by this cleaning system.

A total of five fully automatic dedusting devices with fan and pneumatic cleaning are used in the works. Each mixing station is supplied with different binding agents by eight binding agent silos, which were manufactured on site on the basis of Teka drawings. All binding agent silos are equipped with state-of-the-art environmental and safety technology, such as exhaust air filters, vacuum/overpressure valves and level indicators. A total of 19 screw conveyors are in use. All mixing stations are equipped with independent binding agent weighers. All water weighers are executed as negative weighers with dosing valves for an adjustable outlet quantity. This allows the use and exact dosing of both fresh water



Five 24-inch flat-screen monitors were necessary in order to display the entire plant on the Bikotronic process visualisation.

Fully automatic dosing equipment for dyes type TFW from Würschum during its installation

via the water dosing device and process water from the recycling plant. The system is also equipped with temperature sensors and water dosing computers with microwave moisture measuring sensors from Bikotronic.

Each mixing station is equipped with a separate and independent admixture unit with a double-chamber design for four different chemical admixtures supplied by the Würschum company, comprising a total of 14 filling pumps.

Control equipment from Bikotronic

The complete automation of the mixing processes, material fillings and concrete deliveries for one of the largest precast plants in the world, from the project engineering and the manufacture of the control cabinets to the measuring peripherals and the commissioning, was not an everyday task for Bikotronic. The experienced technicians gladly took on this task and designed a system that leaves nothing to be desired for the customer and fulfils the high expectations with regard to quality, robustness, user-friendliness and, last but not least, sustainability with regard to spare part availability and support. Over 40 years of experience and the feedback from over 3000 satisfied customers all over the world are an inestimable help with projects of such an order of magnitude.

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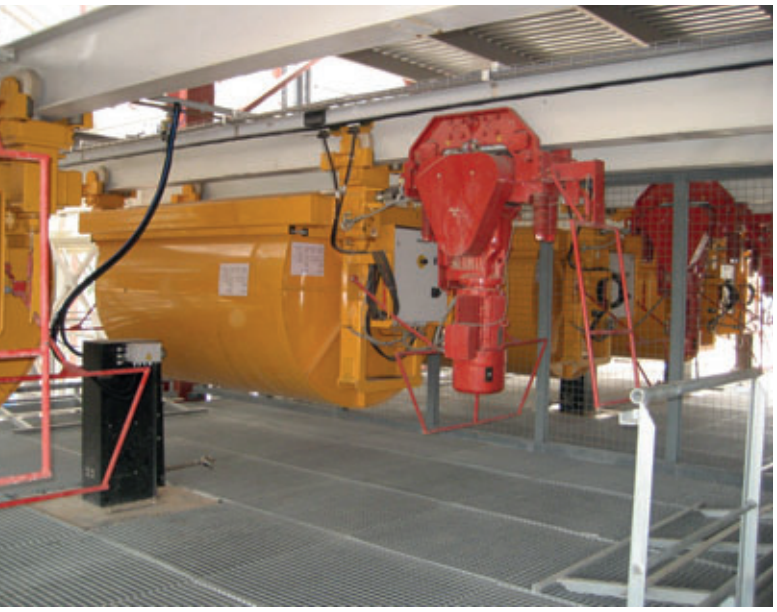

The production workshops are supplied with concrete by six bucket tracks from Dudik

The total length of the six bucket tracks is 1,600 m

The latest generation of the Bikotronic BWD combined process control and administration system was used. The modular concept of this powerful software makes it possible, with both the control and administrative applications, to cater especially to the various requirements of this plant with its extensive product range. An SQL server forms the basis for data storage. It enables amongst other things a very high functionality in linking to local ERP/bookkeeping or laboratory systems, as implemented with this application.

Due to the extreme expanse of the plant, the installation of the control cabinets was decentralised; to this end a total of 17 control cabinets are distributed in the plant periphery and connected via the Profibus system. The complete plant is operated and controlled from the control centre. Five 24-inch flat-screen monitors were necessary in order to display the entire plant on the process visualisation.

The basic control platform is a Siemens S7 system with a Profibus or Profinet periphery. Particular importance was attached here to networking the plant parts in such a way that no interferences arise between the individual modules outside the bus periphery. For example, all controllers that move with the bucket tracks are equipped with high-performance Profibus data radio modules, which ensure very high functionality in the handling of the buckets among themselves, as well as an extremely flexible link to the individual mixing processes and to the various processing machines. Apart from that, this system structure enables full remote maintenance with regard to support or production supervision measures.

Various moisture measuring systems with microwave-based sensors from Bikotronic's own development and production represent a further important plant detail. The proven combination of sand moisture measuring

Bibko recycling system type ComTec

Stirrers in the agitator tank of the Bibko recycling system

sensors in the material silos and moisture sensors in the five Teka mixers was adapted here. This combination and the latest generation of the process control software with the fully integrated functionality of the BT7000 module guarantees a very high degree of continuity and reliability with regard to water management and a constant grading curve. The quality standard and the reproducibility of the individual mixtures are thus very high.

Fully automatic dosing equipment for dyes from Würschum

In order to be able to meet all customer requests, Morton uses fully automatic dosing equipment for dyes from Würschum for the turbine mixer. This system currently operates with four different powdered dyes, which are delivered in big bags. A large number of resulting secondary colours can be manufactured from these four basic colours. Small dye components can also be dosed with high precision by the use of frequency converters to control the dosing screws.

The fully automatic TFW equipment for the dosing of dyes operates according to the dry-liquid principle, i.e. the powdered dye is stored dry and dosed dry. However, the desired dye batch is then mixed in the weigher with water and pumped as slurry into the mixer. Due to the transport with water, the compressed air supply requirements (quantity, quality) are reduced and there is also no need for dust extraction from the mixer. This reduces the plant costs and also the maintenance work.

Morton plans to expand the four-dye system by two further colours to make a six-dye system, which is simple to do thanks to the flexible plant concept. Expansion to further dye components, as well as the supply of a second mixer is possible, since the majority of production is implemented with dyed concrete. The Herocrete company from Moscow has been commissioned with the development of this colour concept and is drawing up a complete concept that will meet these high demands.

Bucket tracks from Dudik

The production workshops are supplied with concrete by six bucket tracks from Dudik. These are implemented as twin-rail tracks and the rotating buckets have a capacity of 2.5 m^3. The buckets move at speeds of up to 3.5 m/s along the tracks, which have a total length of 1,600 m. The bucket tracks are controlled by the Bikotronic equipment. The automatic cleaning system from Walter in each track carriage takes care of the regular automatic cleaning of the buckets.

Residual concrete recycling system supplied by Bibko

Morton ordered a second residual concrete recycling system from Bibko. The delivery was preceded by a corresponding project planning phase in which the customer's requirements and local conditions were considered.

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The ComTec residual concrete recycling system features a 1.5 metre long hopper and was placed at floor level. A 4 metre long screw conveyor provides for optimal discharge of the washed-out material. The discharge height is 3.2 m.

The ComTec 20 system supplied offers a recycling capacity of 20 m^3/h and is equipped with a suitable recycling water treatment facility. The rinsed material mix goes directly from the charging hopper into the machine. Here, solids > 0.2 mm are washed out and removed appropriately.

In order to maintain the separating layer even at the maximum feeding speed of the residual concretes, the washing unit was equipped with a rotary partition. To this end a plate was fixed to the shaft after the material inlet area. The plate has the task of separating the inlet area from the residual water overflow. The plate separates the two areas – the residual material is forcibly guided around the water overflow. This prevents material from entering the outlet area during heavy discharges. The separation layer is kept thus constant.

The water with the fine particles < 0.2 mm moves from the washout machine into the existing agitator tank. This is equipped with two stirrers which keep the fine particles of the residual water in motion by means of cyclic stirring, thus preventing settling. The water containing the fines is fed back to the mixing process.

The Bibko ComTec system includes the patented bearing that has proven itself 1,500 times over. It is positioned outside the water bath and offers an increased life span. All plant components are supplied hot-dip galvanised with increased life span.

FURTHER INFORMATION

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