

Schlüsselbauer Technology GmbH & Co KG, 4673 Gaspoltshofen, Austria

New large moulds used to successfully expand the concrete manhole range

Kaprin Sp.z o. o. was established in the autumn of 1989 and produces modern precast concrete parts. Its production sites are located in Dabrowa Krzeszowice near Krakow and in Dabrowa near Opel. Along with sewerage system components, the company also produces precast concrete products for utility companies, road construction and special bespoke components. The product range includes foundations for pylons, gullies, square road culverts, road segments and noise-reduction panels. Currently production is running in three shifts due to the increased demand for finished parts. Kaprin markets its products primarily in central and southern Poland through its own sales offices in Dabrowa Gornicza, Sosnowiec and Krzeszowice.

■ Mark Küppers, CPI worldwide, Germany ■

However the bulk of the production capacity is reserved for manhole components. These are manholes with polygonal and circular cross-sections in three types: conventional moulding of channels, Perfect manhole bases and monolithic manhole cones based on the Perfect manhole base system. "Back in 1996 we began collaboration with the reputable Austrian machinery manufacturer Schlüssel-

bauer. The production facilities we purchased from Schlüsselbauer made us one of the first Polish manufacturers of sealed manholes and in 1997 we installed one of their modern, efficient manhole ring machines. We first saw the Perfect manhole bases at Schlüsselbauer's stand at the Bauma exhibition in Munich in 2004 and in 2007, as the second company in Poland and the fifth worldwide; we launched that technology in Krzeszowice", said Andrzej Dziadkowiec, CEO of the company.

Perfect production launched in 2007

Alongside the high quality features of the monolithic manhole bases, Perfect production also has other advantages that Kaprin considers important. The Perfect system allows virtually noise-free production, and, with a lack of compression energy, the method is also extremely easy on the mould. Casting with SCC also gives the end products a smooth surface and thus an attractive



The Kaprin Sp.z o.o. plant in Krzeszowice



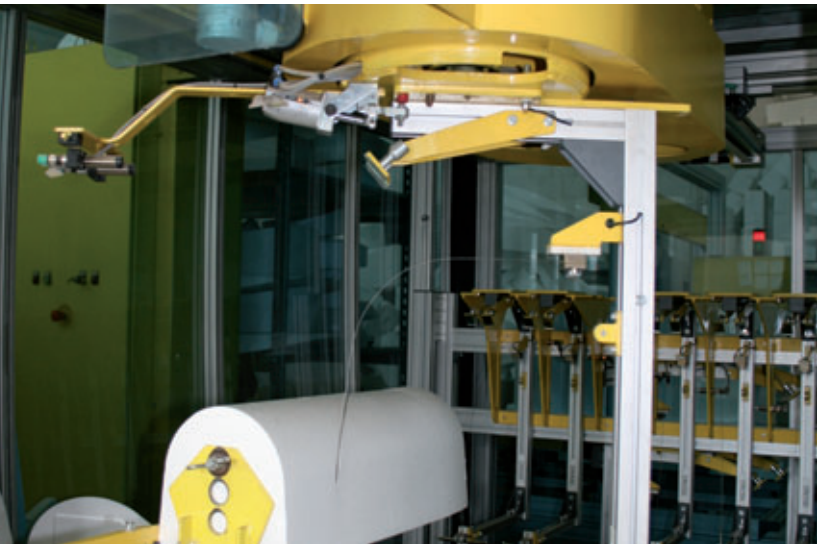
In total since it was established, Kaprin has produced and dispatched around 1.6 million concrete products for infrastructure projects



Kaprin produces manhole rings with the Schlüsselbauer Precise manhole ring machine installed in 1997



A look at the Perfect production with over 60 moulds



The individual negative channel runs made of EPS hard foam are produced with modern sawing technology (here 3D hot wire saw)



Hardened manhole base after the mould is opened

appearance. The monolithic structure with a consistent, uniform concrete quality is the result of single-cast production. All told, Kaprin has more than 60 moulds of different diameters available for manhole base production and at the current capacity of about 80%, 45-50 monolithic concrete manhole bases leave Kaprin's production facilities each day.

Negative channels made of EPS hard foam

The start of the Perfect production involves the creation of negative channels made of EPS hard foam, which are set into the moulds as recess units for the channels. The complete manhole element is first designed on the computer, giving all the parameters

required for the creation of the negative channel. Negatives are created out of EPS hard foam with two- and three-dimensional hot wire saws for the individual channel runs. These are then bonded together to an overall channel negative with hot glue, there are special EPS hard foam units available with mounted seals, which are glued onto the ends of the channels.

Casting with SCC

The two-part moulds in the Perfect line can be opened in the middle and taken apart. Once opened, the mould can then be prepared for subsequent filling with concrete. To do this, the shuttering walls are first greased with release agents. Here Kaprin

uses the Ortolan SEP 791 release paste from MC Bauchemie. The negative channels of EPS hard foam are then inserted in the mould and fastened with magnets. The mould is pushed together again and firmly sealed with a clamping device. Then the element can be filled with concrete. Kaprin runs two Teka mixers for concrete production. One produces only normal concrete; the second one is used for the production of SCC for the Perfect production. To achieve the best flow characteristics in the concrete, fluxing agents from Mapei or MC Bauchemie are added to the mixing process. The concrete is then brought to the mould in a concrete bucket via the crane rail and this is then filled to the required



The three new moulds for up to 2,350 mm high concrete manhole cones with nominal widths of 1,000, 1,200 and 1,500 mm



Greasing the formwork surfaces with Ortolan SEP 791 release paste from MC Bauchemie



A special template is hung on the mould core for the exact setting of the bushings for the steps

height. Kaprin has its own laboratory where the quality of the concrete is monitored on an ongoing basis and a Heckert testing machine is used for stability tests.

De-moulding and removing the EPS channels

In the next step, the concrete manhole bases have hardened sufficiently to be removed. To do this, the mould is opened and the concrete elements are lifted out of the mould using a turning gripper. The



Concreting is done with a forklift and concrete bucket; as with the Perfect System, only self-compacting concrete is used



After sufficient hardening time, the moulds are opened again and the manhole cones are carefully lifted by crane out of the mould

gripper, also a component of the Perfect system, then turns the element 180° and sets it on a conveyor belt. Now the negative channels are removed manually from the concrete monolith and the finished concrete manhole base is driven on the conveyor belt out of the production hall. From here it is then taken on to the temporary storage area on a forklift. The EPS hard foam materials removed are crushed in a shredder, collected in sacks and sold.

Manhole cones made of SCC

As well as the monolithic manhole base made of self-compacting concrete, Kaprin now also offers its customers manhole cones made from SCC. These new pre-cast parts offer several benefits compared to traditional components. In the future, the complete manhole will consist of only two components, the base connected with only one



After de-moulding, the steps are knocked into in designated bushings



The height of the manhole cones can be variably adjusted up to a maximum component height of 2,350 mm

seal and the cone. Customers therefore get the whole construction in the same quality from one cast and from one source.

The shaft structure of SCC has a significantly lower water penetration depth and increased vertical compressive strength of up to 900 kN. And those are not all of the advantages offered by this solution.

Kaprin sees great benefits for the overall quality of a shaft construction in this new method, as, in addition to the high strength of the individual components, complete manhole systems can be made with a single joint. Gone are the usual gaps between the cone and manhole ring or further manhole rings due to the monolithic structure of the cone-manhole ring elements. This is a feature that benefits construction work. The reduced error rate caused by the elimination of joints also speeds up the assembly time on the building site.

The production process is fairly straightforward and requires only simple instructions for the workers. As with the method for manufacturing the monolithic Perfect manhole bases, the manhole cones are also produced in a mould with two outer shells that can be pulled apart. Once opened, there is a mould core that forms the inner formwork for the manhole cones.

When open, all formwork surfaces are first greased with formwork paste and the bottom of the mould is set to the desired height of the subsequent concrete component. The mould base is formed by a steel ring running around the inner core in manhole element width, which can be moved vertically across a special sub-structure. This means that the various heights for the concrete manhole elements can be variably adjusted with little effort and in no time.

Bushings are then fixed exactly to the mould core with strong magnets and using a special template. Later only the steps need to be knocked into these bushings and into the finished concrete manhole element. Magnets are also used to fasten anchors on which the concrete manhole element is later lifted.

The mould is then closed again and is now ready for concreting. A forklift brings a concrete bucket in position over the mould and the filling process can begin. To prevent the SCC from segregating, the concrete does not run directly out of the bucket but is fed in gently with a hose. When the mould is completely filled, a ring element is placed on top to form the cone surface.

After hardening, the mould is re-opened and the finished concrete cone is lifted out of the mould with the loading crane. No post-processing is required, only the steps must still be knocked into the bushings. The mould is quickly cleaned and is available for production again.

Kaprin sees SCC as the future

Kaprin's CEO Andrzej Dziadkowiec sees Schlüsselbauer's Perfect manufacturing process for the production of manhole bases and manhole cones as a trend-setting manufacturing principle, and he and his company will continue to follow this modern manufacturing technology. For example, in the future Kaprin would like to replace conventional production using vibrated concrete with manufacturing processes using SCC. In pipe production, the company also sees the future in casting with SCC.

SCC technology is also consistent with the principle of sustainable construction. This was recently confirmed in the autumn of 2010 at the concrete conference in Wisla, where renowned scientists highlighted the relevance of this principle.

Twenty-one years ago, Andrzej Dziadkowiec formulated objectives that have been achieved today with consistent work. The current success of these is due to the efforts of employees from all departments in the company.

The company's CEO Andrzej Dziadkowiec and his second in command Waclaw Orczykowski see more exciting challenges that will be solved with new technologies offering almost unlimited possibilities for construction. ■

FURTHER INFORMATION

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