

Prinzing GmbH, 89143 Blaubeuren, Germany

# Production of milled monolithic manhole bases successfully commenced

The Ruf concrete production facility in Germany has been in existence for more than 120 years and are well known for innovative and efficient solutions in construction work. In their Wilburgstetten production facility, concrete pipes and precast manholes are produced on a large scale. Ruf's attention was drawn to the new Primuss manufacturing process for monolithic manhole base units - made by Prinzing from Blaubeuren, Germany - on account of several articles in the relevant press and, in particular, a report published in CPI 04/2008. Ruf formerly manufactured manhole bases upside down on a Prinzing Tornado with the drain channel being inserted manually afterwards. After making several visits to a Primuss pilot plant at Prinzing's headquarters and carrying out profitability calculations, Ruf became convinced of this new technology's value because of the quality increase in the monolithic manhole bases.

An optimum manhole base is made monolithically from concrete, permits any sort of drain channel geometry and connection eventuality, exhibits uniform circular channel-

ling and provides excellent flow properties. The newly developed Primuss plant covers all the characteristics specified here and is highly cost-effective on top. During the

period from 8/2007 up to 10/2008, Prinzing advanced this entirely new, efficient process, in which the drain channels and connections are milled into the prefabricated monolith, to serial production maturity.



Producing monolithic manhole bases with the Primuss

## Primuss achieves a systematic simplification of the production process

In times past, the production process for manufacturing manhole bases to job order was time-consuming and manpower-intensive. In its development of the Primuss plant, Prinzing proceeded systematically to simplify production and add still more automation. Their success in this undertaking can already be seen in the simple overall design of the plant.

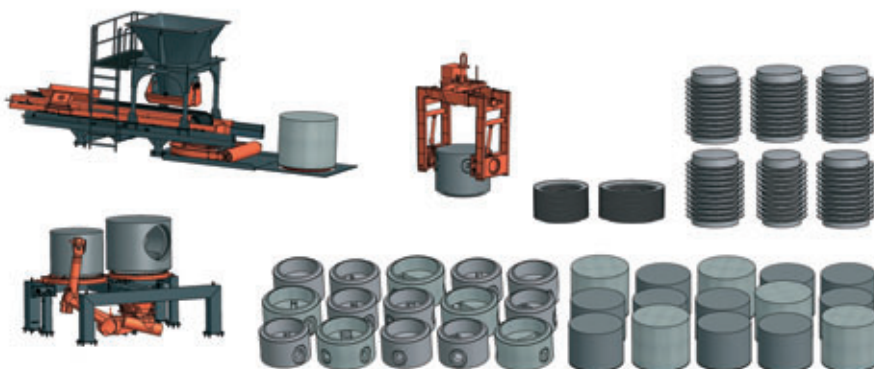
The Primuss comprises the following main components:

- ERP system for issuing offers and recording manhole data
- Atlas for manufacturing the monoliths
- Crane apparatus for handling products and mould components
- Milling bay for creating channels and connections

The production sequence for manufacturing blanks on the Atlas is entirely automated as is the milling process. Only one person is required for monitoring the plant and handling the crane manipulator.

## Sales and customer orders

Offers for manhole bases are issued in the sales department. Here, the customer is informed both about the monolithic construction method of Primuss manholes and the advantages of the optimum design of the



In developing the Primuss plant, Prinzing proceeded to automate and simplify production



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*Right after the milling stage, the manhole bases are turned to their normal position*

drain channel course in terms of flow technology. This avoids blockages and turbulence plus protects the channel from damaging deposits. The manhole bases are made up entirely of concrete and all common types of pipes can be connected to them. Their corresponding sealing rings are firmly built into the pipes' ends. When an order is made, all manhole parameters are fed in with the aid of an ERP system. The computer carries out a plausibility check automatically. The customer then receives the manhole data by fax for checking and confirmation. Production is planned and carried out on the basis of order data and delivery times.

### Automatic monolith production on the Atlas

The Atlas plant is a Prinzing modular system which makes it possible to adjust the machine in an optimum way to the product being manufactured on all occasions. This, of course, means that the Atlas is also configured for producing monoliths.

The machine operator receives his production cards at the beginning of a shift. Once he has positioned the bell end forming unit with support cap in the Atlas, an automatic product length adjustment takes place. The zero-slump concrete is compacted by means of both frequency and amplitude controlled vibration. When the pouring equipment is retracted, the mould surface is evenly rolled and the product subsequently ejected at floor level. The machine operator now attaches a production card to the monolith and places it in the curing area via the crane manipulator.

All nominal widths and wall thicknesses required are manufactured on a daily basis. Only the outer mould has to be changed in the Atlas for this purpose. The outer mould table in the machine is hydraulically braced to enable rapid changeovers. No inner or intermediate cores are needed and absolutely no manhole lining -

making the production sequence very simple for the operator. Errors have to a great extent been ruled out since the order data from the ERP system is automatically transferred into the manufacturing programme. The monoliths spend a short time upside down resting on their support caps and bell end forming units at the curing bay. This results in precise smooth spigot ends and contact surfaces in line with the pouring procedure and hardening in the mould.

The Atlas lives up to the most recent demands of mutual assurance associations and is protected by safety features, such as light curtains, during the automatic sequences. The noise level is very low because manufacturing takes place below floor level and the mould table is sealed off from the foundation, with additional benefits on account of the amplitude and frequency controlled vibration. The Atlas has been systematically configured for this special monolith product and safety at work.

### Hydraulic crane manipulator

This device also finds its origins in the Atlas modular system but has been adapted especially to fit the requirements of the Primuss plant. The crane manipulator possesses multi-functional abilities so that no additional forklift or other handling devices are necessary.

The sequences and operations during production are as follows:

- A support cap with bell end forming unit is positioned in the Atlas machine.
- Once the monolith has been manufactured and ejected above floor level, the manipulator grabs the support cap with the monolith and places it in the curing bay.
- The next support cap with bell end forming unit is then placed into the Atlas and the cycles are repeated. All monoliths in daily production can be manufactured in this extremely economical way.
- Once the monolith has been partly cured, the crane manipulator intervenes between the support cap and bell end unit to press the support cap out.
- After this, the monolith is deposited at the milling bay.
- The milled manhole base is then removed from the milling bay with the crane manipulator and the bell end unit is removed.



*The monoliths, still resting on the steel end ring in a semi-cured state, are deposited at the milling bay and then centred with great precision*

At the same time, the manhole base is grabbed on its outer diameter and lifted.

- Finally, the completed manhole base is immediately turned to its natural position (installation position).

The crane manipulator is configured for a maximum manhole base weight of 6,000 kg with a maximum outer diameter of 1,700 mm and a maximum design height of 1,500 mm. The turning device's contact pressure on the manhole bases is adjusted both in terms of weight and dimensions.

The manhole bases are grabbed in the drain channel area, i.e. not on the wall area. This former area is located approximately at the product's centre of gravity and is very resistant to pressure on account of the manhole base's monolithic make-up – even in a partially cured state. This permits the manhole bases to be turned to their normal position directly after the milling stage.



*Channels are milled out from below*

### Milling the channels and connections per clamping

It is well-known from mechanical engineering that components can be manufactured with the greatest precision when all processing stages can take place in a clamped down state. In accordance with this principle, the monoliths are deposited at the milling bay and then centred with great precision still resting on the steel end ring in a semi-cured state. The monolith's own weight generates a firm connection to the milling machine's rotary axis so that no additional means of clamping are needed. The milling bay has two processing stations to ensure that the robot is always working even when monoliths are being changed. Manhole data is transferred to the robot via bar code readers. The drain channel is subsequently milled out from below and then the connections from outside, with the monolith being turned horizontally with maximum accuracy for each connecting angle position. A spherically shaped milling cutter is utilised for the channel and a side milling cutter for the connections.

Changing tools takes place entirely automatically and at high speed. The milling cutters are fitted with PKD cutting tools and possess a very long operational life. As the concrete is only partially hardened, the channel and connections can be milled extremely rapidly. The robot has six axes and is mounted hanging at the milling bay. The concrete removed falls freely downwards and can easily be evacuated from there.

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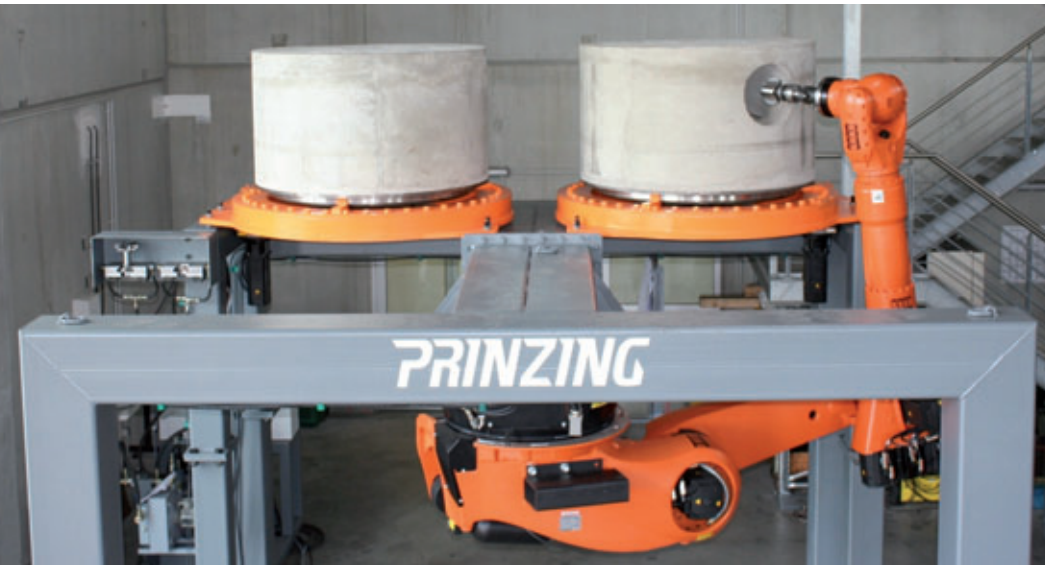
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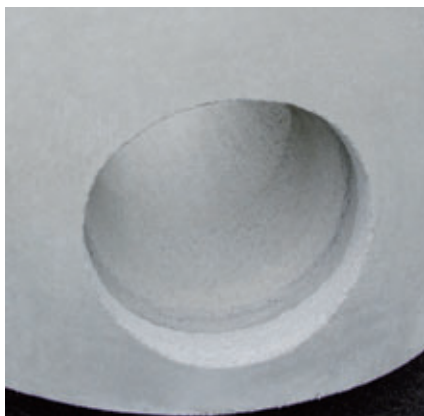
Connections are milled from outside

All pipe seals are firmly built in

All seals for the connections are glued in place with a polymer adhesive in the recess provided. The adhesive is spread on the seal by machine and the seal rammed into the groove. The seal is somewhat larger in diameter and berths itself perfectly in the groove. A very strong waterproof connection between the seal and the manhole base is thus created. Seals for all types of pipe with their appropriate adhesive are supplied by DS-Dichtungstechnik from Nottuln, Germany. Inserting manhole linings and the expense associated with this is a thing of the past.

Summary

Ruf has further improved its competitiveness as a company with this investment in Primuss technology. The manhole bases are made monolithically from concrete and possess a smooth surface. The channels exhibit uniform circular arcs and always live up to the highest demands from a flow technology point of view. All types of pipe can be connected up. Manhole linings are not necessary for this any longer as the seal is always firmly built into the pipe end. The entire manhole base production process from the order to delivery is simple and clearly laid out. Both the monolithic manhole bases and the production method itself fulfil the latest specifications as regards sustainability and ecology.



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