

Prinzing GmbH Anlagentechnik und Formenbau, 89143 Blaubeuren, Germany

Production of individually milled monolithic concrete manhole bases successfully started at the Rinninger company

The name Rinninger has stood for quality and reliability for more than 100 years. The company, which is based in Kisslegg in the German region of the Allgaeu and is now in the 4th generation of family ownership, supplies its customers with various concrete products. Hans Rinninger u. Sohn GmbH u. Co. KG specialises in underground construction, building construction, garden and landscape construction and prefabricated elements for the most diverse applications. The Rinninger company offers many different solutions which are used, for example, in houses from the cellar to the roof, in road construction, in sewer construction and in many other areas of application. What began in 1909 with a construction business and a building material retail store has developed over the years into a medium-size enterprise with 180 employees. Not only has the size of the workforce increased, of course; the process of growth has always been accompanied by modernisation measures. Hence, Rinninger has always had modern production plants at its disposal in order to be able to offer its customers the desired products in high quality.

The trend of the past years from the classic to the monolithic concrete manhole base has been precisely pursued at the Rinninger company. The market wanted monolithic manhole bases, hence the company wanted to offer them, too. Following the company's own initial attempts to develop an economical solution, it was then decided to invest in a new production line for these products. After inspecting various reference plants, the decision was ultimately taken in favour of the Primuss method by Prinzing GmbH of Blaubeuren, in which the channels and connections are milled in pre-produced concrete manhole blanks using modern robot technology.

■ Mark Küppers, CPI worldwide, Germany ■

The history of Hans Rinninger u. Sohn GmbH u. Co. KG began when Johann Rinninger founded a construction business and building material retail company in 1909 in Kisslegg in the Allgaeu. Large, complex buildings were already being planned and built at

this time. In addition, Johann Rinninger manufactured the first concrete products in the form of Terazzo sink units and small-size cement pipes.

In the second generation, Franz Rinninger began in 1946 with the industrial production of hollow blocks and further concrete goods. The company expanded from year

to year – the range was continuously supplemented by new products. Large-size pipes, manholes and ceiling elements as well as simple precast parts supplemented the product range.

In 1969 a new precast plant was built for the production of structural precast parts, such as walls, stairs and balcony slabs. Hans Rinninger joined the company as the 3rd generation and dedicated himself consistently to this area. Production of concrete paving stones and further products for garden and landscape construction began shortly afterwards. In the years that followed, the company continued to develop; new production plants were put into operation and innovative products were successfully introduced into the market, such as the 'Grano Nostaliti' paving system, which began a triumphant advance in 30 countries and on all continents. Reinforced concrete slot channels were manufactured for the first time in 1988 using a new production process. The high quality of the products convinced customers and planners, so that RIKI slot channels were soon being used in important road projects and at nearly all European airports.

Jörg Rinninger joined the company in 2005 as the 4th generation. In the same year the underground construction division was sup-



View of the production site of Hans Rinninger u. Sohn GmbH u. Co. KG in Kisslegg during the celebration to mark the 100th anniversary of the company

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With 25 vehicles of its own, Rinninger is able to accommodate special customer requests at very short notice

plemented by a modern plant for the manufacture of large pipes in diameters up to 2.50 m. 2007 saw the market introduction of the Topliner system, a manhole system with integrated seal and integrated load transfer. This system succeeded in saving time and personnel in the assembly of manhole systems. With the aid of seals integrated in the manhole system and built-in load transfer, the assembly time can be shortened significantly and the number of fitters reduced in comparison with conventional manhole systems. Thanks to this innovation, errors during the installation on the building site are virtually impossible. The family-owned company celebrated its 100th anniversary in September 2009.

Full-range supplier with system expertise

The Rinninger company has set itself the goal of being a full-range supplier with system expertise in all of its product divisions. The fair and constructive partnership with

customers, suppliers and cooperating companies is thereby an important principle of the company's dealings. The Rinninger company orientates itself to the needs of customers and business partners with the objective of strengthening its own importance on the market still further. Where research and development is concerned, the company concentrates on innovative products and procedures for attractive, modern and economical concrete solutions. The employees are accorded a high degree of appreciation. For the Rinninger company they are an essential factor in the company's success. Therefore the commitment of the employees and their qualifications are continually fostered further. Short in-plant communication routes and flat hierarchies ensure short response times in the case of orders. With 25 vehicles of its own, Rinninger is able to accommodate special customer requests at very short notice. Special transport vehicles are also available for extra-large precast parts.

Continuous quality monitoring

The Rinninger company has established a quality assurance system that helps to permanently maintain the high quality standards. The monitoring of the recipes and the aggregates for the concrete products is carried out in the in-house research laboratory by two concrete technologists. The quality of the products is continuously monitored by these experienced employees during the production process. The results are concrete products with a maximum of functional reliability and an appealing look. Quality expertise is ensured by long-standing memberships in the Concrete and Precast Quality Auditing Associations and



Prinzing machine for manhole ring production, manufactured in 1982

the Concrete and Steel Reinforced Concrete Pipe Association (FBS) in Germany as well as several certifications in Switzerland and in Austria.

Extensive range of products and domestic and foreign markets

On average Rinninger processes over 1,000 tonnes of sand or gravel and up to 250 tonnes of cement per day, which, mixed in a total of five mixing machines, are processed to make various concrete products, e.g. steel reinforced concrete pipes, manhole systems, stairs, balconies, slot channels, precast slabs with in-situ topping, walls, the widest variety of concrete paving stones or special concrete parts. The company's main markets are in South Germany and the neighbouring countries Austria and Switzerland. However, Rinninger also finds numerous customers for its precast concrete elements in Italy and France. Furthermore, the company also produces ready-mix concrete, which is sold within a radius of about 30 km.

Such product variety necessitates a large number of production plants. Hence Rinninger has amassed an impressive machine pool over the years. Apart from care and maintenance, the plants are renewed or equipment parts from a production line are replaced or added if necessary.



New reinforcement welding machine from MBK



The concrete manhole monoliths are produced by the proven Atlas machine



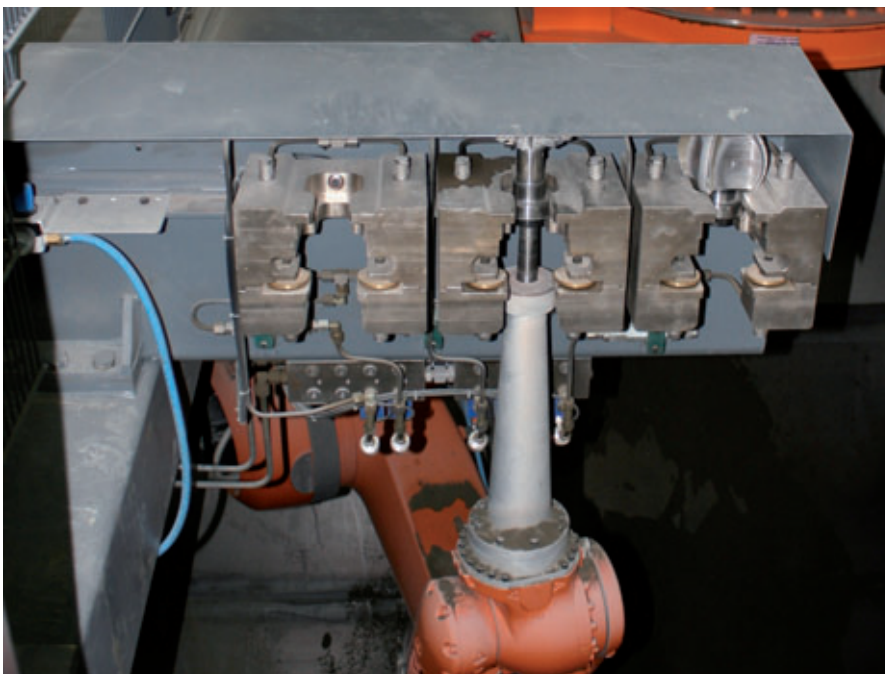
Support core and sleeve magazine



The Primuss milling station has two floor-level machining stations



The pit under the machining stations serves as the movement area for the milling robot



The tool magazine: in the centre is the side milling cutter used for milling the side connections

Hence, a circulation plant from Sommer for the production of double walls and precast slabs with in-situ topping was put into operation some time ago and the existing large pipe production line has been equipped this year with a reinforcement welding machine from the MBK company, which is likewise based in Kisslegg.

A long-standing partnership with Prinzing GmbH precedes the investment in the new Primuss production system. Besides the new plant, Rinninger operates two other production machines from Prinzing. The plants concerned are for the production of manhole rings. One of the plants was installed in 1982 and has thus been producing manhole rings in Kisslegg for almost 30 years.

Primuss production process for arbitrary channel types as well as the associated inlets and outlets

The program-controlled manufacture of arbitrary channel types and the associated



Milling the channels from below

inlets and outlets for any desired pipe connection is fully automatic with the Primuss production method. Mould expenditure is minimised as a result of early demoulding and short throughput times. Just four moulds are in use at Rinninger for the monolith production.

No mould parts and models are required for the channels and connections at all, just a milling robot with the appropriate software. The method is suitable for manholes in nominal widths 1,000, 1,200 and 1,500 mm. The manhole bottoms are made monolithically from highly-compacted fine-grained concrete. Dimensionally exact manhole bottoms are created due to the partial hardening in the formworks. The channels are designed for optimum flow. Primuss manhole bases are made from concrete with high strength (C 60/75) and a low water-cement ratio or from high performance concrete. Thanks to the high degree of automation of the plant, only one employee is required to monitor the production process.

Materials management system for entering the manhole parameters

The manhole bases manufactured using the Primuss method consist only of concrete and all common types of pipe can be connected. When a manhole base is ordered, the order is entered into a materials management system together with all manhole data, including the intended connections.

The concrete manhole base thus created on the computer can be sent to the customer for checking if necessary. On the basis of the order data and delivery times, the element is included in production planning and is manufactured at the given time. The computer system of the Primuss production system was linked with the Gesys order administration program, which ensures transparent production at Rinninger.

Manufacture of the manhole base blanks using the flexible Atlas production system

In the next step of the Primuss production method, concrete blanks are manufactured on the Atlas plant. The Atlas is a modular system made by Prinzing that has proven itself on the market. The plant is characterised by high flexibility and can be used for the production of different products such as drains, rectangular elements, pipes up to 3,000 mm as well as manhole rings, cones and bottoms. As a component of the Primuss production process, the Atlas is primarily intended for the production of concrete manhole bases at Rinninger. The manhole bases, which are still without channels, can be produced in various diameters, wall thicknesses and heights. The concrete elements are produced on a base ring pallet fitted with a support cap. The earth-moist concrete is compacted by frequency and amplitude controlled vibrations.

Only the mould jacket needs to be changed in the Atlas in order to change the diameter and wall thickness. The mould jacket table is hydraulically clamped in the machine to allow quick changing. Basic cores, mounting cores and manhole linings are not required. The production process is thus made very simple for the machine operator.

The monoliths are taken out of the Atlas via the base ring pallet and are set down again in the curing area. At this point the monoliths are resting upside down on the support caps and base ring pallets and remain there for a while until they have reached the requisite initial strength.

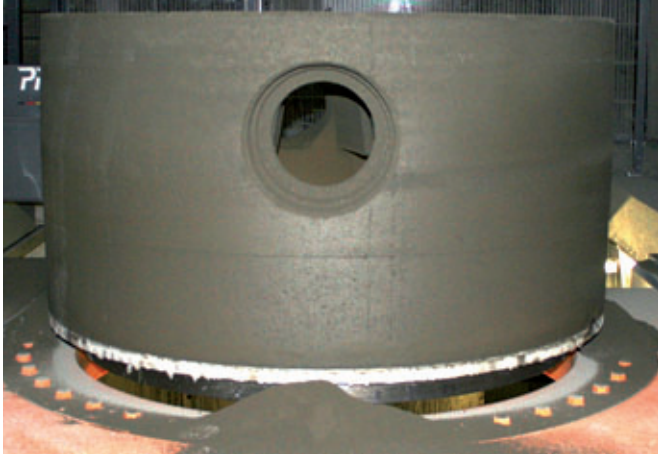
Milling of the channels and connections with the robot

Once the concrete manhole base blanks have reached the requisite partial hardness, they are taken by fork lift truck to the milling station. The milling station has two floor-level machining stations, enabling the milling robots to work continuously even during the exchange of the monoliths. The robot equipment was installed in a pit in order to enable the machining stations to be arranged at floor level.

In the first step the robot mills the channels out of the monolith from below. A spherical milling head is used here. Once the channel is completed, the robot drives to the miller magazine and changes the tool fully automatically. The connections are then milled from the outside using the side milling cutter which is now fitted. Once a connection is completed, the machining station rotates the monolith by the appropriate angle so that the next connection can be milled directly.



Milling the side connections



Finished monolithic manhole base in the machining station

The feeding speed is regulated automatically by the robot during milling and adapted to the respective hardness of the concrete. This enables the maximum preservation of the material of the milling heads, which are equipped with PKD cutting plates.

The concrete removed during the milling procedure falls down freely and is removed fully automatically from the plant. For this purpose, steeply aligned skid plates were mounted under the machining station, via which the material slides onto a permanently running conveyor belt. The conveyor belt takes the material to a second con-



Control panel directly on the milling station

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Finished concrete manhole base



Milled manhole base, NW 1,200 mm, overall height 1,400 mm with milled connections and channels for FBS concrete pipes, NW 800 mm



Primuss Pro manhole base

veyor belt, which conveys the removed material directly out of the building. The concrete residues are subsequently recycled and returned to the production cycle. Constant cleaning of the milling station is therefore unnecessary. The robot cleans itself virtually automatically due to its fast movements and no deposits accumulate on it during a day's production.

Once the milling procedure is complete, the monolith is removed from the machining station again by the fork lift truck, any remaining milling debris is swept out of the connections and the element is placed in the warehouse area for final hardening. The concrete manhole base is subsequently turned over and the seals can be installed if necessary. The finished element is then transported by a conveyor belt to the outdoor area and placed into storage.

Great satisfaction after the first weeks of production

The managing directors Hans and Jörg Rinninger are convinced that the monolithic concrete manhole base is the way to go. Their goal is the manufacture of high-quality concrete manhole elements from high performance concretes which, with penetration depths of less than 10 mm (Primuss Basic), or less than 5 mm (Primuss Pro) at the surface, can face up to competing products. The quality of the later product directly depends on the quality of the concrete used. Primuss Pro manhole bases, for example, are manufactured from high-strength C 90/105 concrete. The aforementioned quality assurance at Rinninger guarantees the customer high-quality concrete products that can measure up to the positive characteristics of plastic surfaces.

A further advantage emphasised by the managing directors is the fact that earth-moist concretes are processed. This allows great flexibility in production and requires few moulds, since the blanks are already demoulded when taken out of the Atlas. Hence, an ordered manhole can be supplied within a day in principle and the production output does not depend on the number of moulds. In pure order-based production, around 20 to 30 monolithic concrete manhole bases are currently manufactured daily. The target is a capacity utilisation of approx. 40 monoliths per day.

Following the first weeks of production, the résumés of the two managing directors are absolutely positive and they are certain that the investment in the Primuss method is a big step in the right direction. ■

FURTHER INFORMATION



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