Smartcast

Production system
for monolithic concrete base sections
with any configuration
of flow channels

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The Challenge with Inspection Chambers and Manhole Shafts

Smartcast is a production system for the manufacture of customer-fitted concrete base sections.

A base section - or a manhole base - is the bottom part of an inspection chamber. It has the purpose of allowing inspection and maintenance of a pipe line - in particular at points where more pipe lines are jointed. The consequence of this is that manhole bases are needed in many different configurations as the different connecting pipe lines often are of different sizes, different materials, varying gradients and invert levels. The challenge with many inspection chambers is therefore to form all the individual channels in the manhole bases, so that each pipe line has an unobstructed flow through the manhole minimizing the risk for build-up of solids.

Traditionally, the forming of the flow channels has been done manually by making a concrete benching on site. For quality reasons, though, the responsibility for making the benching has often been given to the concrete producer as the job here can be done indoors under factory controlled conditions. But still the method for making the flow channels has been a manual and rather difficult job.

Now, Smartcast offers a solution where the manual operations are replaced by more automated routines and at the same time giving more flexibility towards the customer's needs as well as resulting in higher product quality.

The Most Flexible Solution for Concrete Manhole Bases

The Smartcast system mills channel-forming moulds out of a single piece of industry-standard EPS (Expanded Polystyrene) with a programmable industrial robot. There is no need to tape, glue and screw or use proprietary-shaped foam sections. A user-friendly PC-human interface is used to create the world's easiest system for manufacturing monolithic manhole bases of the highest quality.

A Smartcast robotic cell can be used as a simple, stand-alone EPS milling station or integrated into an automated production system featuring filling, demoulding and handling. Smartcast is available for manufacturing manhole bases from 600mm diameter up to 1600mm diameter.

Benefits with Smartcast

- Day-to-day delivery of any manhole base is possible as all mould parts can be manufactured immediately after customer's order.
- Optimum hydraulic profile is automatically calculated for each flow channel ensuring an unobstructed flow through the manhole.
- Innovative web based software allows manhole bases to be designed from anywhere - the office, the job site and even from home.
- With the Smartcast Designer software and an integrated six-axis computer-controlled robot, flow channel combinations are virtually unlimited.
- Smartcast utilizes EPS blocks available from competitive sources. There is no requirement to purchase preformed EPS components solely from the equipment supplier.
- Self-locking mould parts allow quick and easy mould setup.
- The manhole bases are manufactured in just one single pour with no need for any additional finish work - leaving a true monolithic product.
- Efficient production without any hard manual operations.
- Specialized tooling and an optional coating allows the EPS to be shaped with an incredibly smooth casting surface - resulting in flow channels with glass-like finishes.

Smartcast Infrastructure

A Smartcast setup fundamentally consists of three members: the user, the server and the robot.

The User

The user is the person at the precast company who has the overview over what products need to be manufactured. This person logs on to the Smartcast server with the username and password. This gives access to the Smartcast Designer and all the company's specific production details in the company's preferred language.

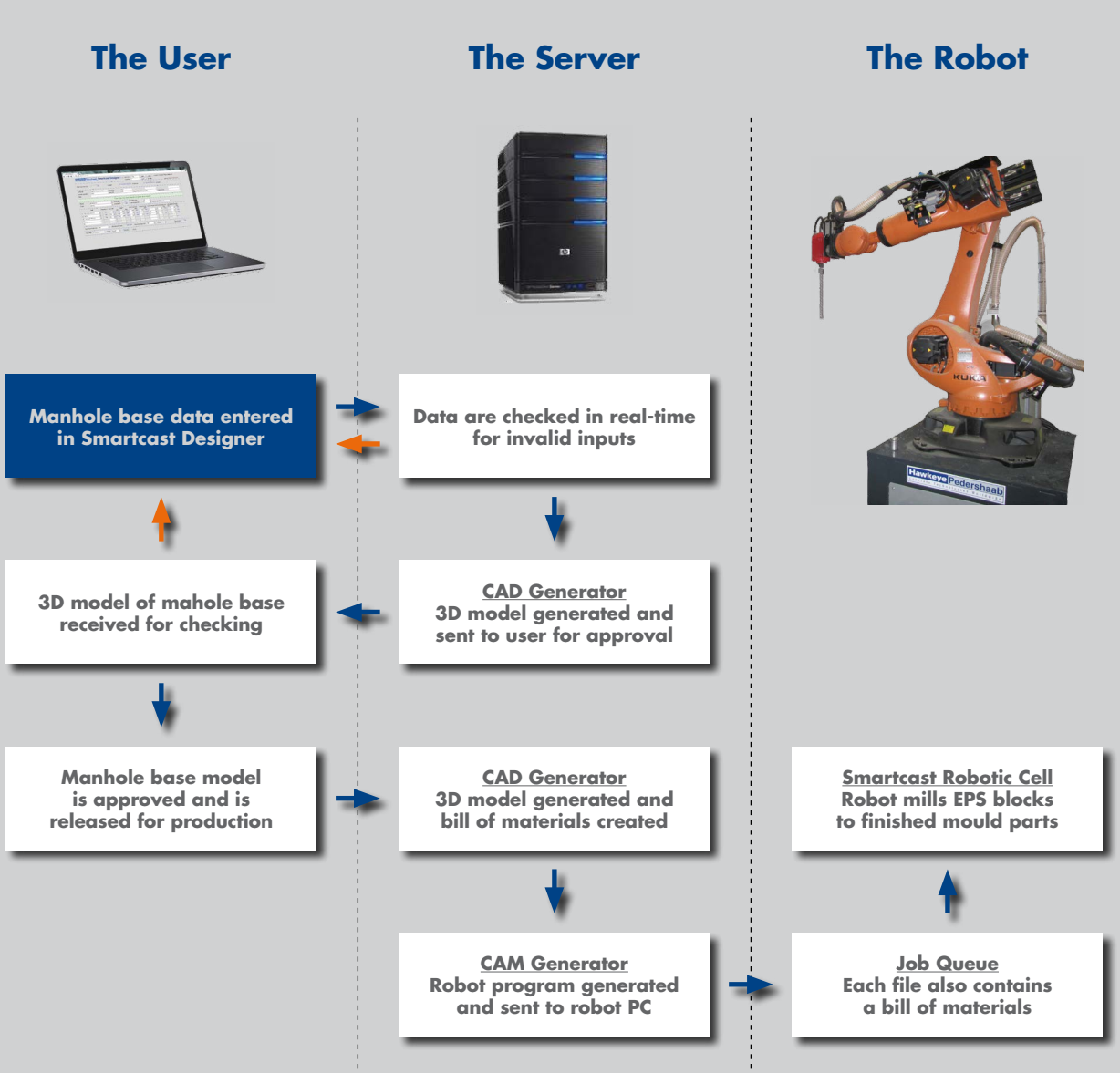
The Server

The server containing the Smartcast software is the corner stone in our solution. It is located in a hosted environment and is accessed via the internet. With this solution the customer does not have to pay for CAD and CAM licenses and there will be no unexpected costs for maintenance of the hardware or the software. Furthermore, automatic backup of all data is provided as standard.

The Robot

The robot is a Kuka industrial robot and comes together with an industrial PC. This PC controls the robot as well as the safety system.
The PC receives the jobs from the server via the internet and puts them in a queue. The operator can get all info - including the bill of materials - for each job and it is from here that the robot is started.

This unique relation between the three members makes out the flexible and yet very efficient infrastructure of Smartcast.



Advanced in Technology - Simple in Operation

Smartcast offers state-of-the-art robot technology. It is presented in a very user-friendly setup allowing any person to operate it. Only skills required are experience with manhole base production.

1. Six-axis milling robot

The heart of a Smartcast plant is the robot operated milling station. A multi-axis, high speed KUKA robot equipped with a precision grinding head mills expanded polystyrene (EPS) blocks into a negative mould of the manhole base flow channels.Depending on the size of the manhole base and the configuration of its flow channels, the robot is able to produce up to 5 EPS channel formers per hour. The robot runs without supervision and is extremely reliable. Also included is a suction and bagging system that accumulates the milled EPS so that residue can be recycled.

The robot can optionally be supplied with standard robot programming software which allows the user to use the robot for other purposes in case the manhole base production does not take up all the production capacity of the robot.

2. Smartcast Designer

The programming of the robot for the Smartcast base system is done automatically after entering the manhole base data in the Smartcast Designer. This software is accessed from a standard office PC via the internet.

The manhole base is designed by inputting the key parameters, including the number of inlets, the diameter and orientation of inlets, the height (invert level) of the inlets, the amount of fall in the flow channels, the type of connection, the angle of the banquette, etc. It is all done through a user-friendly, cloud based interface. It can be run as a stand-alone system or integrated into the company's existing ERP system.

Being web based, the Smartcast Designer allows manhole bases to be designed from any computer station (being a PC, laptop, tablet or even a Smartphone), including from the job-site or from home. After the manhole base has been designed, a full manufacturing drawing can be emailed to the end-user for final approval.

After approval, the manhole base design is released for production with just one single click.

3. Refined CAD and CAM software

Behind the Smartcast Designer are some very refined CAD and CAM software systems. The key variables entered into the Smartcast Designer are constantly being checked for any invalid inputs by the software. This ensures a smooth and reliable input of data.

When all manhole base data have been entered, a 3D model of the EPS former is automatically generated by an advanced parametric model. This allows the negative EPS former - as well as the manhole base - to be visually inspected before approval. When the CAD model is approved, the CAM software then automatically generates the robot program and transfers it to a queue on the robot PC. From here an operator starts the job by selecting it from the queue, once the EPS raw material has been placed in the milling station.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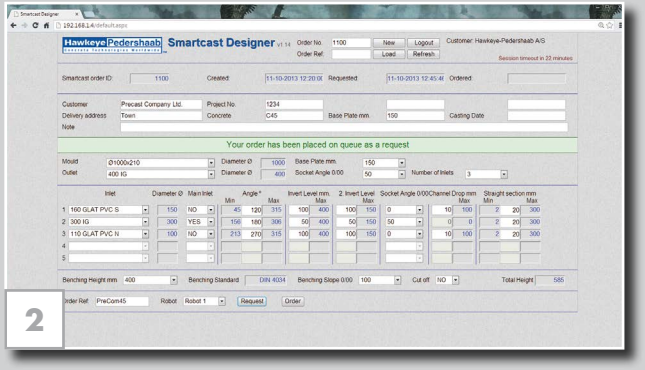

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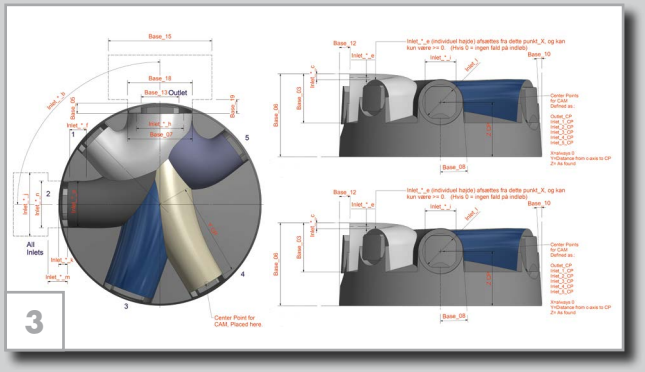
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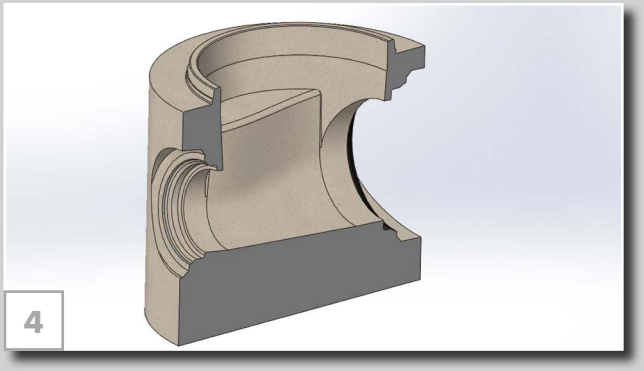
The possibilities for responding to the end user's needs are virtually unlimited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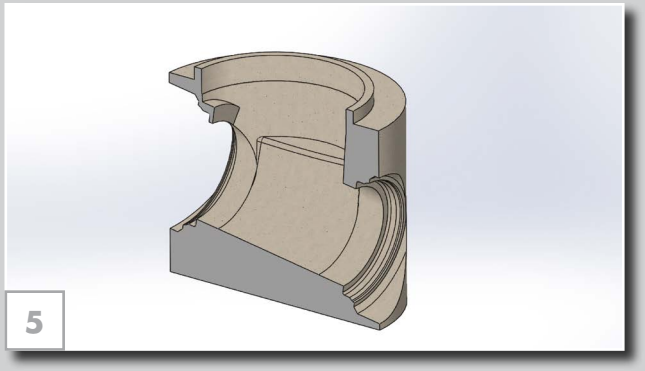
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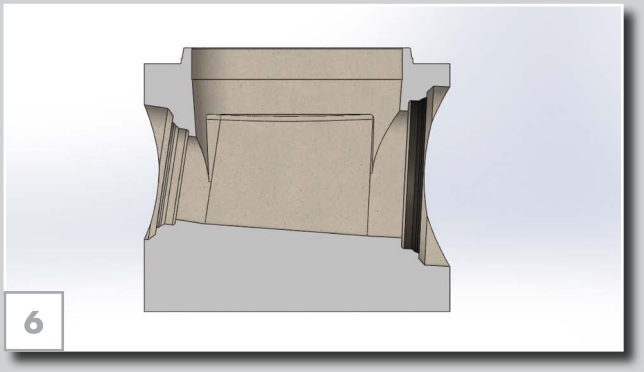
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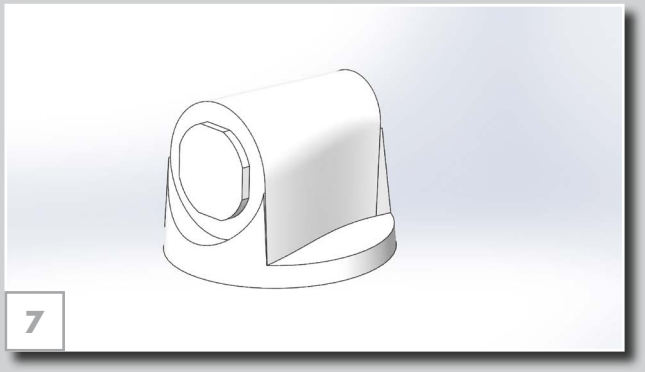
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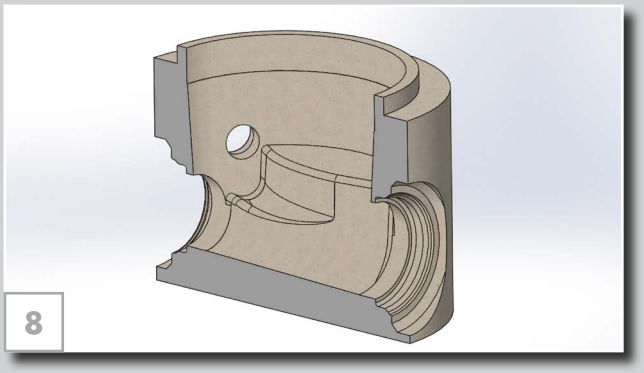
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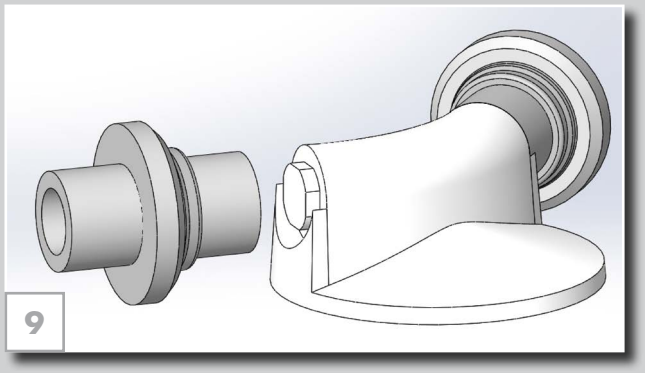
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4. Smooth change of channel diameter

If the main inlet is of another diameter than the outlet, the channel in the manhole base will have a smooth transition between the two pipe connections.

5. Big diameter pipe connections in thin-walled bases

In some places it is allowed to reduce the inner diameter in a manhole base to allow connections of bigger pipes without increasing the general wall thickness. This feature is also possible with Smartcast.

6. Socket angle up to 15%

To accommodate pipe lines with a gradient, the sockets in the walls can be rotated with an angle up to 15% depending on pipe diameter and wall thickness of the manhole base.

7. Deep channels milled in just one operation

Because of the nature of a robot, EPS models for making very deep channels are possible to make in just one single operation. No need for cutting and gluing individual EPS pieces together to achieve this. For example a 1200mm channel in a DN1600 manhole base is possible in just one milling operation.

8. Overlapping channels

Even channels which are overlapping in the horizontal plane but displaced vertically can be accommodated. This could be the case when an inlet is connected at a signifcantly higher level than the other inlets.

9. Easy assembly of EPS mould pieces

The connection of the side core formers with the EPS channel former is done with a simple interlocking system. This ensures that the side core formers stay in position without any use of glue or screws.

10. Stand with tools for automatic tool change
The robotic cell can be supplied with features for automatic tool change. This requires a magazine with the different tools pre-arranged.

11. Surface coating of EPS
After milling, a coating is applied to the surface of the milled EPS parts. This both result in a very nice concrete surface on the finished product and it makes it possible to remove the EPS former easily in one single piece when demoulding.

12. Trimming of EPS assembly to correct OD
When the EPS parts have been assembled and coated, it is trimmed to the correct outer mould diameter by a hotwire cutter.

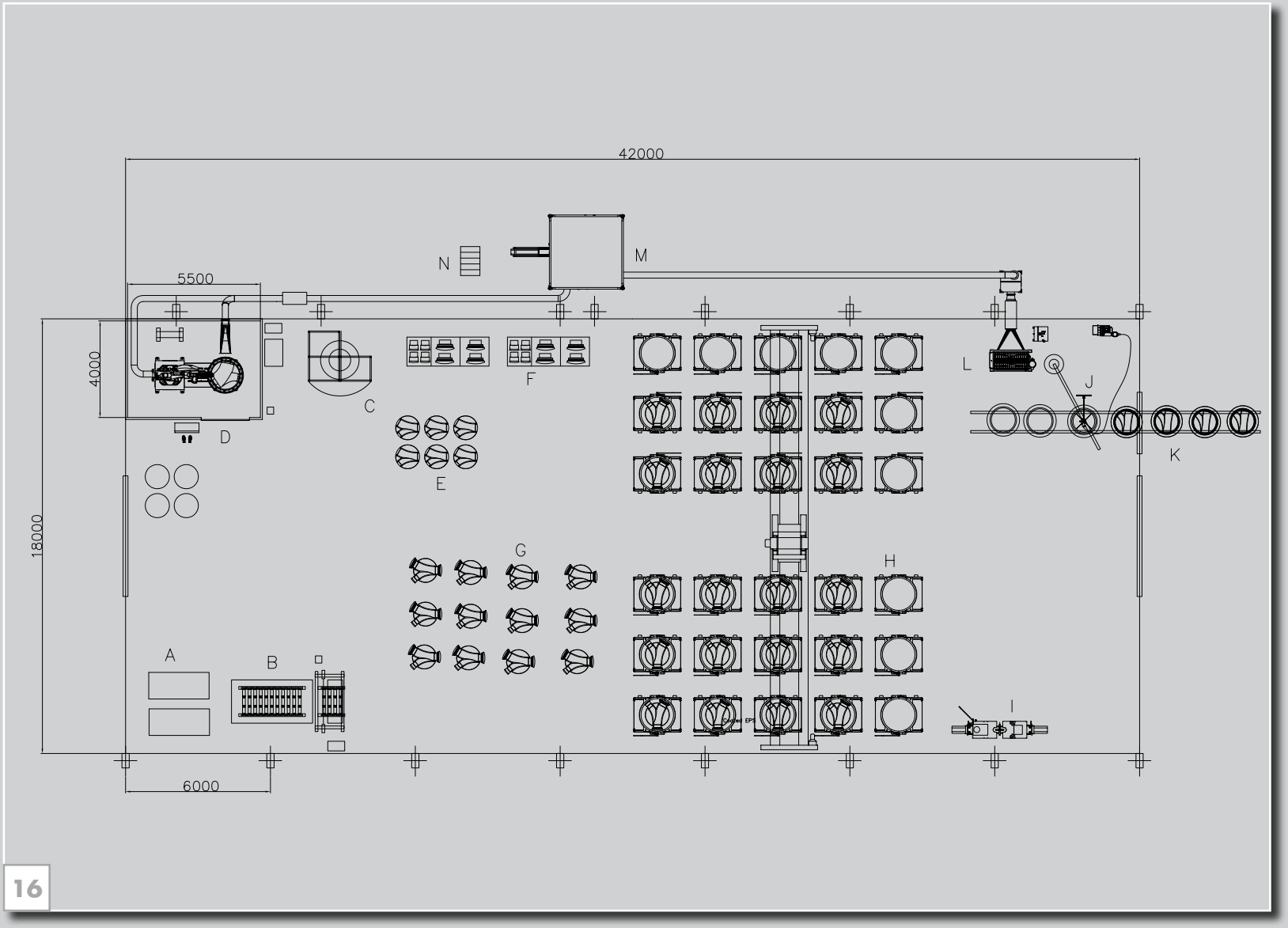
13. Hydraulic lifting and turning yoke
For demoulding, a hydraulic operated lifting and turning yoke is used. This turning yoke can be suspended in an overhead crane or built into a portal structure for automatic operation

14. Vacuum lifter for EPS demoulding
Because of the geometry of the EPS mould this can very easily be lifted out of the concrete base in one piece by a vacuum suction lifter.

15. Finished product
As a consequence of the easy demoulding system the finished product can quickly be transported to the stock yard.

16. Layout drawing (>>)
An example layout drawing with Smartcast in a stand-alone configuration is shown.

Stand-alone or full-automatic production plants



A. EPS raw material

B. Hotwire machine for cutting EPS raw material in correct lengths

C. Hotwire machine for cutting EPS blocks circular

D. Smartcast robotic cell

E. Milled channel formers

F. Inventory of EPS side core formers

G. The EPS mould assemblies ready for coating

H. Steel moulds for SCC concrete

I. Lifting and turning yoke

J. Vacuum lifter for removing EPS formers from base

K. Product outfeed conveyor

L. EPS shredder

M. EPS compactor

N. Compacted EPS blocks ready for recycling

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