

ausSICHT

News from the **Steel Foundry** Division



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Left: Rolf Peuten
Right: Dietmar Ruland

Editorial

For a successful future – on a global level
One step closer towards the future “Industry
4.0” project

Dear Readers,

There have been exciting developments and advancements in the Dörrenberg Steel Foundry Division: after more than a year of basic research and continuous development, we have now implemented the 3D printing process for sand prints with huge success. The lead time for small sand moulds could be reduced from several weeks to a few hours. In conjunction with optical 3D surface measurement, we are realising the control and optimisation of networked production processes.

Regarding our sales activities for steel rolls, we have meanwhile developed a global market presence. In this context we have, for example, established a cooperation with a sales representative for the Indian market, following our participation at Tube India, which was held from 28 to 31 October 2014, in Mumbai. This year again, you will find us at a variety of trade fairs. For detailed information please visit our website at www.doerrenberg.de.

We hope you enjoy reading this issue, and look forward to continuing our successful cooperation.

Rolf Peuten
Head of Steel Foundry Division

Dietmar Ruland
Sales Manager: Steel Foundry Division

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Title story





3D printer sand moulds

The future is finding its way into the foundry industry

One of the latest 3D printer systems from ExOne has been in operation in the Steel Foundry Division at Dörrenberg Edelstahl GmbH for more than a year. In close co-operation with ExOne we have advanced this technology, leading to a successful breakthrough in the Dörrenberg foundry.

3D printer sand moulds do not only provide numerous advantages for the foundry, but more importantly for our customers, ranging from shorter lead times and less reworking to improved surface quality and, ultimately, a reduced environmental impact.

Conventional mould production – a comparison

In addition to the familiar hollow-mould casting process, where a hollow mould is created in sand, using a pattern made of wood or a composite material (plastic), castings for the automotive industry are also made by using the full-mould casting process. A pattern milled from Exportit is moulded in sand and gasified during the pouring of hot steel. The hollow cavity created in this manner is filled with molten steel.

The advantages of 3D printing technology

In contrast to the conventional production of moulds, where the manufacturing of pattern plates or core boxes alone can take several weeks, smaller sand moulds can be produced in only a few hours using 3D printing.

Our experienced staff process the CAD data provided, considering and incorporating casting requirements. Labelling and the required radii are added. The 3D printer then implements the processed data along with the required machining allowances. Moulds are thus realised fully automatically without time-consuming and expensive mould equipment, but purely on the basis of CAD data. Employing the so-called layering manufacturing process, mould sand layers with a thickness of approx. 0.3 mm are repeatedly applied and selectively adhered with a binder, using the system print head. On completion of the printing process, the job box needs to be unpacked and sand residue has to be removed.

Sand printer system



A printed sand mould is cleaned of excess sand



Prototypes and individual parts in record time

Short production times are particularly important when dealing with prototypes or individual parts. This particularly applies in the automotive sector where, in general, only one casting is required for each part and version.

The time-consuming and expensive detour via previously required mould equipment can now be dispensed with: "Even complex geometries with undercuts and complicated cores can be generated in exact detail and with a high degree of precision using 3D printing technology. Depending on the size of the workpiece, we can divide the sand mould into two or more parts, assembling it in a sand bed following production. Printing takes one to two days, depending on the size of the workpiece," explains Dietmar Ruland, Sales Manager in the Steel Foundry Division. The sand moulds created in this manner are then embedded in sand and cast in a moulding box of appropriate size.

Printed sand moulds



Divided printed sand moulds are embedded in moulding sand

Environmentally friendly process design

Moulds are created in the shortest-possible time with the modern high-performance 3D printer system. The moulding material bonded from furan resin can be regenerated with greater ease and rapidity, thanks to the low binder content. This advantage influences a further special feature of Dörrenberg Edelstahl GmbH: “For many years, we have been using a moulding material which is repeatedly reprocessed and regenerated. The level of reusability achieved exceeds 90%, and this is probably unique throughout Europe,” emphasises Rolf Peuten, Head of the Steel Foundry Division.

A further advantage compared to the full-mould casting process is the elimination of substances harmful to the environment created through the combustion of Exportit. In addition to considerable quantities of CO₂, the combustion process also releases other environmentally harmful substances and gases which are no longer present in the printed sand mould.

Advantages at a glance

- No complex and expensive mould equipment
- Short lead times
- Sand mould corresponds 1:1 to the CAD pattern
- Application-specific design of constructions
- Highly flexible realisation of geometry modifications without additional costs
- No storage and maintenance of patterns
- Cost-effective execution of complex moulds
- Reduced delivery times
- Increased design freedom compared to conventional pattern production



Quality assurance

Scanning of surfaces

Optical 3D surface measurement

For reliable quality inspection and targeted process optimising

Processes for non-contact optical measurement and inspection of three-dimensional objects are increasing in importance in today's state-of-the-art engineering – particularly in the area of quality assurance and process monitoring, because they are both rapid and reliable.

3D surface measurement is primarily employed to inspect target and actual geometric dimensions. Following practical trials and the evaluation of different equipment and processes available on the international market, our engineers have opted to use a product from Creaform: the HandySCAN 3D EXAScan, a high-resolution precision scanner able to scan patterns and castings up to a size of approx. 5 x 5 m.

Mobile and flexible on-site 3D measuring technology

Complex parts of varying sizes need to be scanned in different environments during the quality control of castings. "The compact design of the portable optical CMM

scanner enables our staff to conduct scanning operations in pattern construction, the fettling shop and the mechanical workshop, but also flexibly on-site at our customers' premises," Dietmar Ruland, Sales Manager in the Steel Foundry Division, points out in explaining the particular advantage of this process.

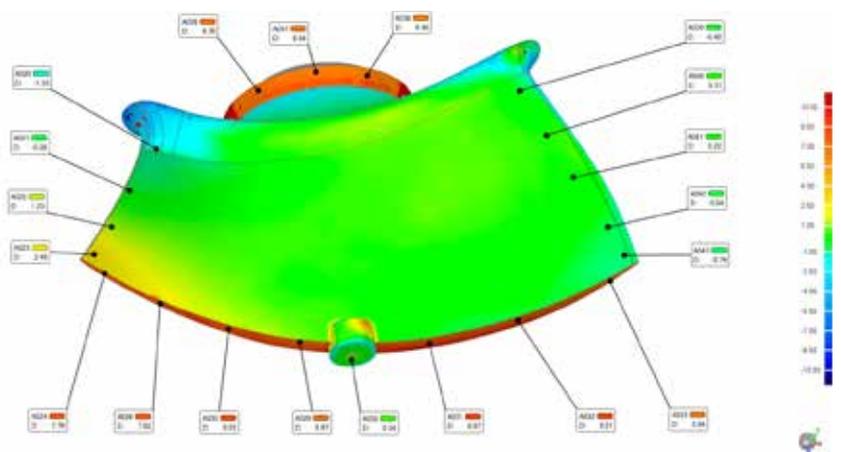
The scanner is equipped with comprehensive 3D data acquisition software which we use for the entire range of company 3D scanning and measuring technology. In addition, we also work with the Geomagic® Control™ inspection software for the geometric and dimensional inspection of 3D data.



On-site dimensional inspection

The advantages – our services

- Complete geometric and dimensional analysis
- Dimensional deviations are depicted in colour
- Target/actual comparison for available CAD data acquisition or prior measurements (point cloud)
- Inspection of wall thickness and allowances for further machining
- Inspection sections with tolerance band
- Compilation of standard protocols or specific customer 3D measurement reports
- Automation of more complex, recurring tasks
- Dimensional inspection of patterns and core box equipment



Optical measurement and comparison of target/actual dimensions



Focus: steel casting

Wear-resistant cast steel rolls

Made of our special material GP4M®

A new focus in the production of wear-resistant special steels at Dörrenberg Edelstahl are cast rolls (for tube production) and straightening rolls (for sectional steel production).

Roll and roller tools are subject to cyclic pressure loading. In addition to adequately high hardness and good wear resistance, the tool materials employed should also exhibit appropriately high fatigue resistance against over-rolling. Use of the GP4M® material has simplified the realisation of complex roll geometries compared to conventional standard materials such as 1.2382 and 1.2602.

The special GP4M® material – an advanced technical development from Dörrenberg

The special GP4M® material is particularly resistant to wear, durable and extremely resistant to surface breakdown during operational use. This material was developed by us in the 1990s and originally only intended for tool casting. However, its special properties and advantages consequently led to its use in the most varied applications. With an adjustable working hardness of up to approx. 60 HRC, greater dimensions can also be through-hardened.



Assembly of a split top roll



Straightening roll

Our services

We produce rolls in a wide variety of designs and dimensions:

- Unit weight up to approx. 6 t
- Wall thickness up to 500 mm
- Max. diameter up to 1,800 mm
- Finish machining according to drawing
- 100% US and FE inspected

For further information, we will gladly send you our technical documentation on roll production and the special GP4M® material.



*From left: Guido Römer, Mark Spicher,
Dietmar Ruland, Frank Baumhof*

The Steel Foundry Sales Team

Each division manager enjoys the support of a strong and exceptionally qualified team of employees responsible for the entire order processing, from the generation of offers through to shipping. Team spirit and a high degree of personal responsibility have, over the years, shaped a young, dynamic team with ambitious goals, working with enormous success in this area.

SALES MANAGER: STEEL FOUNDRY

Dietmar Ruland

Born 1952
Joined Dörrenberg Edelstahl in 1998.
Sales Manager in the Steel Foundry
Division since 2008.

CORROSION AND ACID-RESISTANT SPECIAL STEEL CASTINGS

Guido Römer

Born 1970
Joined Dörrenberg Edelstahl in 1991.
Switched within the company from the
Investment Castings Division in 2008.

TOOL STEEL CASTINGS

Frank Baumhof,

Dipl.-Ing., graduate engineer in casting
Born 1964
Joined Dörrenberg Edelstahl in 1998.

HEAT AND WEAR-RESISTANT SPECIAL STEEL CASTINGS

Mark Spicher

Born 1973
Joined Dörrenberg Edelstahl in 2003.

Legal Notice

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