

The Open House at IDRA is a giga success –

# Industry experts present trend-setting technology for die casting

| Text and image Friederike Schmedding

The foundry industry is being severely impacted by the effects of the global pandemic. In particular, supply bottlenecks for raw materials and electronic components as well as logistics and the associated cost increases are causing problems worldwide. The bright spot is that these problems are of a temporary nature. Sooner or later, the markets will level out again.

In contrast, the automotive sector is confronted with a permanent structural change resulting from the trend away from the combustion engine and towards alternative drive systems, especially the electric motor. This is causing a profound change in the demand for castings produced by die casting. An electric drive requires different and altogether fewer different parts than a conventional combustion drive. Many foundries are therefore confronted with the challenge of repositioning themselves.

In this context, the industry is breaking new ground. Innovative technology is being used to open up fundamentally new approaches and applications for the die casting process. The first manufacturers are already producing not only larger structural components but also entire vehicle structure assemblies in the form of integrated parts using the die casting process.

This enables a radical reduction in the number of individual parts required. Previously pressed and joined elements are replaced by a single integrated casting. This opens up cost reduction potential in production and parts logistics.

The use of light metals also promotes the urgently needed reduction in vehicle weight.

Another trend is the use of multi cavity dies to produce interconnected parts within a single casting cycle in a casting cell.

The basis for these developments is the availability of die casting machines capable of supporting the large molds and delivering the necessary clamping forces of 6,000 t, 8,000 t and more. However, success is not only guaranteed by large and powerful die casting machines, but also by the right molds and peripherals that enable the castings to be produced in accordance with the requirements for economy and quality.

The demand for sustainable manufacturing processes is of particular importance in this context. Foundries worldwide are actively working to reduce their energy consumption and the environmental emissions they cause.

Efficiency and environmental compatibility are therefore key premises for innovative foundry technology.

This opens up forward-looking development prospects and opportunities for the die casting industry.

IDRA Group is a pioneer in the development of large die casting machines of the NEO product line, also called 'Giga Press', which are already successfully used in the USA, Europe and Asia. The European manufacturer currently offers models for 5,500, 6,100, 8,000 and 9,000 t clamping force.

He works closely with a network of independent industry experts to equip high-performance and efficient casting cells around the Giga Press.

This cooperation of leading companies in their field has been brought together under the title of the Foundry Star Alliance (FSA).

In addition to IDRA, the FSA includes Støtek - manufacturer of melting and dosing furnaces, Costamp - manufacturer of molding tools, Fondarex - manufacturer of vacuum systems, I.E.C.I. - manufacturer of tempering systems, Wollin - manufacturer of spray systems, KMA Umwelttechnik - manufacturer of exhaust air filters and heat recovery systems, Meccanica Pi.Erre - manufacturer of trim and post-treatment systems.

Together, the companies offer innovative solutions for the complete equipment of casting cells - both for models of traditional size, but especially also for the new generations of large casting cells. After all, the production of casting parts with a dosing weight of up to 160 kg of aluminum per shot is quite a challenge. The impressive dimensions of the systems present foundries and technology providers with new challenges. For example, a Giga Press casting cell measures approx. 30 m in length, approx. 22 m in width and approx. 11 m in height. Molds have external dimensions of more than 3 m and a total weight of up to 120 tons. Under these circumstances, it takes a lot of experience to realize casting cells that produce economically, sustainably and with the required quality. The strong market dynamics and the ongoing structural change in the die casting industry make it clear how important interdisciplinary cooperation is for technical progress.



Figure 1: Foundry Star Alliance (from left to right): Bjoern Wollin of Wollin GmbH, Dr. Stefania Calubini of MEC-CANICA PI.ERRE, Marco Corti of Costamp, Steve Schackemy of Fondarex, Dr. Holger Wagner of KMA Umwelttechnik GmbH, Hanz Würzt of STØTEK, Riccardo Ferrario of IDRA, and Mauro Inverardi of IECl.

Due to the great interest in the industry and the great success of the success of the Open House in December, a repetition of the event is currently being considered. The further development of the pandemic and the development of the pandemic and the consequences for international travel. In any case, however, all companies will be present at Euroguss 2022 in Nuremberg. Irrespective of this, there can be continuous information about the technologies and innovations of the companies on LinkedIn at <https://www.linkedin.com/company/fsa-foundrystar-alliance/>.



Fig. 2: IDRA's new premium product line NEO covers the entire range of presses from 300 up to 9000 tons clamping force



Figure 3: Open house presentations by FSA members. Two sessions of technical presentations were held daily at the IDRA Technical Center, followed by plant tours.



Fig. 4: Each FSA member was available to answer questions at his or her own information stand.

The interest was therefore very high when IDRA, together with the companies of the Foundry Star Alliance, invited to an Open House from December 01 to 03, 2021 to an Open House at the plant in Brescia, Italy. The growing pandemic situation in many European countries shortly before Christmas and the travel restrictions associated with it could not slow down the rush to the international event. The organizers of the Open House had conscientiously worked out an effective hygiene concept in advance. Two sessions of technical presentations were held daily at IDRA's Technical Center, followed by a tour of the plant, with a special attraction being a working Giga Press in fully automatic cycle operation. Over the course of the day, a total of more than 100 international participants took advantage of the information offered in limited groups, including managers from many well-known automotive manufacturers and their suppliers, as well as other interested members of the industry. While it had already been announced that Euroguss 2022 would have to be postponed due to pandemic, a certain trade fair atmosphere set in at the Open House - described by Riccardo Ferrario, CEO of the IDRA Group, with a twinkle in his eye as 'Giga-Guss'.

Essential experiences and contributions of the presented solutions are: IDRA NEO is a large system with high power, reliability and energy efficiency. The IDRA NEO is a large system with high power, high reliability and high energy efficiency that opens up new dimensions

for the production of die-cast components. The use of the new patented 5S © injection system (named after the 5 attributes simple, sustainable, smooth, stable and strong), which is designed as a regenerative injection system with a high dynamic force required for filling difficult castings. The DCP hydraulic system, with separate pumping systems for injection and closure is the heart of the system and energy savings of up to 54% over previous systems compared to previous systems.

The side modular protective enclosure for the massive machine is easy to install and provides very good shielding of emissions during the casting process. It can be ideally combined with solutions for local above the die casting machine, for example, by means of a capture hood.

All systems of the Foundry Star Alliance have an interface to the to the central cell controller from IDRA and allow operation via the central screen.

STØTEK reliably supplies the casting cell with large volumes of light metals. The focus is on fast dosing with short cycle times, a high quality of the metal and the lowest possible energy consumption. The proven overall system for supplying the casting cell consists of the SMGS melting furnace with 3.5 t/h melting capacity, 7 t stand-by capacity and automatic loading, the automatic conveying pump to the AMET crucible

furnace for alloying and cleaning the material as well as the conveying into the DTI PRO-DOSE 6020 dosing furnace.

Special strength of the dosing system: the closed and effectively insulated furnace allows energy savings of up to 40% compared to other systems. The melt is protected against oxidation and is thus the basis for a very good quality of the metal. The dosing volume of up to 160 kg at a dosing speed of more than 10 kg/s is matched to the machine output.

COSTAMP makes a significant contribution to successful casting production with the development of long-life molds for Giga Tools. COSTAMP makes a significant contribution to successful casting production. Particular challenges can be derived from the requirements for manufacturing tolerances and the rigidity of the molds. The weight optimization of the molds is decisive for the overall process.

A special know-how in the design of the castings for a fast filling of the mold and a high quality of the castings was developed.

The availability of a crane with a lifting capacity of approx. 125 t is a prerequisite in the foundry operation in order to be able to move the large molds.

IECI supplies the temperature control systems for reliable and efficient control of the mold temperature zones. Different solutions are possible, depending on the temperature control requirements. From the combined use of groups consisting of several temperature control units in the usual design, to the use of several Mega Thermo® temperature control units to the innovative Giga Thermo® solution with the supply of up to five different temperature sources, each of which is fed via centrally controlled temperature control units.



Fondarex offers a complete range of vacuum systems for the die casting industry. The aim of the vacuum system is to produce, in a few milliseconds, the air and gases present in the cavity to evacuate the air and gases in the cavity in order to structure of the castings. The concept of the vacuum system has been completely revised for the Giga Press - not only to realize ever larger systems, but also to offer an improved user experience with advanced process controls, an intelligent user interface and modular integration into the die casting machine. This new line is called MODULAR and has been designed from the beginning of its development for the Giga Press. With the spray system, WOLLIN ensures reliable and economical application of release agents with short cycle times. Particular challenges arise due to the large molds with a large surface area, which must be reached quickly with the spray tools. Large spraying tools have a high weight and pose high challenges for the support systems. Various solutions exist, ranging from the combined use of several, to a gantry system for the fast and flexible moving of the mold with large spraying tools to the new linear spray system specially developed for the Giga Press. The latter uses a multi-stage telescopic system simultaneous spraying of both mold

halves for optimum both halves of the mold for optimum cycle times, with a horizontal and vertical stroke of more than 3 m each and a load capacity for molds of up to 500 kg. With the application of the minimum quantity spray system, without the addition of water for cooling the mold, the concentrated release agent is applied in small doses. This results in high resource efficiency in terms of water consumption and wastewater treatment. Equally considerable energy savings in mold tempering are also possible.

KMA UMWELTECHNIK enables effective and energy-efficient capture and cleaning of the exhaust air generated in the casting process. The systematic treatment of exhaust air is nowadays a core component for every casting cell. The global movement for environmentally friendly production processes and the corresponding demands automotive manufacturers on their suppliers, require effective environmental management of the foundries. Energy-efficient exhaust air purification and conservation of thermal energy of thermal energy, energy costs can be significantly reduced. A clean working environment reduces the costs for cleaning and maintenance of the foundries and helps to attract and retention of qualified employees.

In this way, the use of technology becomes a competitive advantage for foundries.

Customized acquisition systems for large die casting machines, for example various designs of acquisition hoods for the Giga Press, were developed in close dialog with the engineers at IDRA:

- flexible solutions for access to the die casting machine as required,
  - Capture of emissions directly at the point of origin and thus limiting the volume of exhaust air to be treated,
  - use of proven ULTRAVENT® exhaust air filters of the new, completely 3rd generation with high efficiency in particle separation with lowest energy consumption by means of electrostatic filtering process,
  - energy saving due to the possibility of synchronizing the fan frequency with the spraying cycle,
  - integrated cleaning system (CIP) for automatic cleaning of the filter cells.
- MECCANICA PI.ERRE supplies the high performance and fully automated trimming tools for the large castings. The trimming presses have a clamping force up to 300 t and use customized tools for precise finishing of the castings. Systems for automatic loading and unloading of the punching dies on the trimming press are integrated.

## In conversation with the industry experts

### What were the driving forces for the development of machine engineering and technology?

Riccardo Ferrario (IDRA):

In March 2016 IDRA hosted the first international forum on advanced light metal applications for the automotive industry. During this forum, we brought together the foundry world and the international automotive industry. The idea was to discuss in an open format discuss what the automotive industry needs from the die casting industry. The message we received was very clear:

Automotive industry representatives from many of the major OEMs wanted, that we find a way to reduce manufacturing costs in die casting. Together with our partners in the Foundry Star Alliance, we were determined to help the automotive industry achieve their CO2 reduction targets with aluminum structural parts.

The key takeaway from the forum for us was that the best way to reduce costs is to produce more components in a single shot on the die casting machine. To achieve this, we needed a larger die casting machine that could produce large components or multiple

impression components from the same design. For many years, IDRA has been at the forefront of engineering design and innovation when it comes to bringing together individual small components into a complex structure. As a direct result of this forum, we decided that we needed to design a larger machine.

For many years, the 4000-ton machine was the largest machine available, so we started designing the 5000-ton machine, which very quickly became a 6000-ton closing force machine due to customer demand.



Managing Director Riccardo Ferrario next to the IDRA Giga Press

The rest, as they say, is history and we have now received orders for more than 21 machines from various global automotive manufacturers. Inquiries from automotive designers have now taken us to 9000 tons of clamping force, and the requests for larger machines are getting louder. However, having a big machine is not enough. We have had to develop many new technologies for the IDRA 5S injection system, which allows us to produce such a large amount of aluminum in Managing Director Riccardo Ferrario next to the IDRA Giga Press a very short time (100 milliseconds) into the mold

The chassis components that we now produce with the with the Giga-Press machines revolutionize the way the automotive industry manufactures vehicles. At the moment, this is mainly done with battery-powered electric vehicles but it is clear that there is also a very real application to use the same technology for hybrid or small combustion-powered vehicles where vehicle weight is an absolute priority. Together with our partners in the FSA, we are poised to change the world of aluminum die casting and automotive manufacturing

**How important is knowledge of the planned die casting machine design for the required melting and casting technology in the foundry operation?**

Hans Würtz (STØTEK):

As far as the dosing furnace is concerned, the furnace must be designed according to the specifications layout, dosing weight, cycle time, filling sequences, etc. to optimize the operation of the casting cell operation. In addition, the required quality of the final product has a major influence on which of our technologies we can offer to the customer. For high quality structural parts, we need to ensure that the metal quality entering the casting machine is of the highest quality, which means that we offer our DTI dosing furnace with the installed Pro-Dose system.



Hans Würtz, CEO STØTEK

**What performance increase of the vacuum systems has to be planned and realized for this die casting machine dimensions?**

Steve Schackemy (Fondarex):

To achieve optimum vacuum, Fondarex engineers have further developed and increased the number of vacuum channels and increased the tank volume and capacity of the vacuum pumps to meet the customer's requirements. At the same time, new chill vents, mechanical and hydraulic valves with a stronger suction volume were developed.

Steve Schackemy,  
Sales Manager Fondarex



**What investments are required for the production of large die casting molds and how have the personnel been prepared for this?**

Andreas Kant (COSTAMP):

Several key factors have made the production such large tools possible:

- the comprehensive restructuring and upgrading of our tooling shop to create dedicated areas for the assembly of such large tools create,
- the preliminary development of a special network of suppliers to assist in the initial stages of the production of tool holders and cavities,

- special training of our production, assembly and quality personnel for the handling of oversized components,
- extremely precise planning of our machine utilization, coupled with careful procurement activities to make the main steel blocks available in good time to meet the very demanding time requirements of our customers.



Andreas Kant, Distribution COSTAMP



Federico Di Giovanni, Sales Manager IECI

**What special features were taken into account for the design of the temperature control systems and what guarantee of success do simulation programs offer?**

Federico Di Giovanni (IECI):

IECI, thanks to its direct experience with Giga applications, has developed completely new solutions for the temperature control of Giga molds. At the next EUROGUSS, IECI will present its new concept of thermoregulation with specific solutions for OEMs and Tier1 die casters. IECI's new technology offers modular and scalable systems that can reduce energy consumption and components by up to 80%. Simulation software helps die casters and mold makers select the right flow rates and temperatures, we do the hands-on work to make this happen in the most efficient way.

**What influence do the spray systems have on the total cycle time of the die casting cell?**

Martin Lutz (Wollin):

The spray systems can significantly influence the cycle time of the die casting cell. of the die casting cell considerably. With a mask spraying tool mounted on a linear spraying system, the cycle time can be reduced to about 12 seconds compared to traveling spraying with a robot, which requires up to 45 seconds or more to completely run down the mold. This can lead to saving one or more die casting cells for larger quantities, in any case it saves costs and increases the utilization rate of the cell.



Martin Lutz, Sales Manager Wollin

### How important is the safe control of exhaust air from the die casting machines for the climate neutrality of the entire plant?

Dr. Holger Wagner (KMA):

The planning and implementation of a casting cell is a demanding task, especially for the production of particularly large and complex parts. Optimally matched to the product, in which the experts contribute their special experience and innovations, achieve significantly higher productivity and efficiency in operation. This applies not only to product quality, cycle times or plant efficiency - especially in energy efficiency, holistic concepts, including the consideration of exhaust air treatment open up major potential savings in energy costs and CO<sub>2</sub> emissions. In dialog, we can tailor the collection and purification of polluted exhaust air and cleaning in such a way that maximum efficiency is achieved while at the same time accessibility for set-up processes and maintenance work remains optimally maintenance work. With an integrated control system all essential information and functions are available to the operator on the central screen of the enormous entire plant. Direct and communication channels also promote fast implementation up to the start of production. To this end with die casting machine manufacturers and other system suppliers. The strong network of the Foundry Star Alliance is a particularly good example of how this can be can be successful.

### How important is the safe control of exhaust air at the die casting machines for climate neutrality of the entire plant?

Dr. Holger Wagner (KMA):

Modern foundries are high-tech workplaces. A clean and productive environment is a matter of course, and good air quality is an expression of consideration for the health of employees. Ventilation and exhaust air purification are key levers for increasing energy efficiency and reducing CO<sub>2</sub> emissions in foundries. This is also clearly emphasized in the current guidelines of the German Energy Agency dena: The operation of exhaust and supply air systems is in most cases the second largest energy consumer in foundries - after the melting and casting of the metal. Energy-efficient exhaust air technology thus plays a major role in the foundry's competitiveness. With our environmental technology, we capture the exhaust air in a focused manner at the point of generation. Thanks

to minimal air resistance, our UL-TRAVENT® electrostatic filter separates the particles in a particularly energy-efficient manner and thus consumes up to 85% less electricity than mechanical air filters. At the same time, it enables direct recirculation of the air (recirculation mode) - this is the most energy-efficient form of exhaust air treatment. Where this is not possible, we implement ventilation systems with recovery of thermal energy from the exhaust air. This has already enabled us to save 85% of CO<sub>2</sub> emissions compared with conventional heating systems. Climate neutrality of foundries is not possible without suitable filter and ventilation systems. For this reason, exhaust air treatment is a central component of the casting cell.



Dr. Holger Wagner,  
CEO KMA Umwelttechnik



### What are the requirements for trimming tools for the application of large castings in the foreground?

Dr. Stefania Calubini (Meccanica Pi.Erre):

It's not just about size, but also about all the consequences and risks that come with size. We usually say that each individual part has its own background. This means that for each individual part a feasibility study must be carried out for each individual part in order to optimize the trimming and machining optimized. Just one example: for one part, we can focus specifically on an initial rough trimming step and a subsequent step for finishing and straightening, or we could do integrate all these operations into the trimming tool itself. As I said, this depends on many factors, but most importantly on the "history" of the part. A major risk with these types of parts is that they tend to become more likely to be deformed as they get larger. The tool for the upper half is designed and manufactured in such a way to respond to the deformation: a puzzle structure that acts on different places of the part and also serves for straightening

Last but not least: loading the trim tool. The larger the parts, the higher their weight, of course. For example, we offer our customers automatic loading and unloading system for the trimming press, for example, which works without human presence. This saves time when setting up and start-up of the die casting cell. The combination of trimming press and trimming tool is of fundamental trimming of large castings in order to castings in order to reduce the dimensions and weight of the parts as far as possible and to facilitate handling easier.



Dr. Stefania Calubini, Sales Meccanica Pi.Erre