Article no. 1: GIFA 2015

Foundry industry:

Focus on resource optimisation and energy efficiency

Traditional past, versatile present and sound future

GIFA – the 13th International Foundry Trade Fair – will be presenting innovative solutions for the foundry industry from 16. to 21. June 2015.

Metal castings are an essential feature of everyday life. They are necessary to enable cars to drive, wind generators to produce electricity, pipe systems to transport gases, liquids or other free-flowing substances and many other technical systems to work. For this reason, the foundry industry is a vital link in the value chain of the most important industrial sectors and is therefore a high-tech industry with a sound future too. It is estimated that total global production of castings in 2015 will probably reach a volume of the order of 100 million tonnes [1]. Analyses made by CAEF – The European Foundry Association – indicate that there are more than 4,000 foundries processing iron or non-ferrous metals in Europe alone, with over 200,000 employees overall (2012 figures).

Reducing operating costs while still being able to increase manufacturing strengths has top priority at the companies in the foundry industry as well. Computer-based processes have, for example, become indispensable, so that castings and the moulds and cores required to produce them can be developed and manufactured rapidly. The many different processes that are carried out at a foundry can only be monitored, administered and analysed with the help of electronic systems too. Optimisation is in full swing in all these areas as well as in the production and operating materials sector; traditional casting processes are being modified too, however, while new ones are being developed by combining processes.

The International Foundry Trade Fair GIFA 2015, which is taking place in Düsseldorf from 16. to 20. June 2015, will be reviewing these diverse

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developments and will be giving an insight into the future of foundry technology.

Traditional past

Casting is one of the oldest processes for shaping materials. A number of different casting processes that have been modified over and over again in the course of recent years are in use today, but the principle behind them is always the same: a liquid material is poured into a hollow mould, takes on the shape dictated by the mould and solidifies to form a semi-finished product or a finished product that is ready for immediate installation. Cores integrated in the mould create cavities inside castings. Practically all kinds of products can be manufactured by casting processes – particularly those that have complex geometry, interior cavities and a filigree internal structure, which cannot be made at all by other manufacturing processes. This explains why there are many different application areas for casting processes. Another advantage is that 100% of castings can be recycled.

Typical casting materials are iron and carbon alloys based on cast iron and steel – cast iron and steel casting not being one and the same thing – as well as non-ferrous metals based on copper, aluminium, magnesium, titanium, lead, tin, zinc, nickel and castable alloys of them. While castability is a general precondition for it to be possible to shape a metal material by casting, the material's individual properties – such as strength and ductility as well as resistance to fracturing, wear, corrosion, chemicals and high / low temperatures in addition to specific weight – are the key features that determine which material is chosen, in view of the subsequent application for the finished product.

Innovative future

The biggest customers of the foundry industry are car and machine manufacturers, plant engineering companies, the railway industry, the aerospace industry, the power generation industry, shipbuilding and marine engineering. Manufacturers of data processing equipment, musical instruments and such medical products as implants source

materials from the foundry industry too, however. In view of the increasingly exacting demands made on industrial companies, these industries – particularly the automotive industry – act as “innovation drivers” for the foundry industry. Typical automotive components that are manufactured from – different – metal materials by casting processes are engine blocks, pistons, cylinder heads, valve covers, crankcases, gearboxes, crankshafts, camshafts, connecting rods, chassis components, brake discs and wheel rims, but also switches, levers, door handles, belt retractors, airbag parts and, last but not least, car logo badges.

Most small and medium-sized engine blocks consist of cast iron, spheroidal cast iron (a specially alloyed kind of cast iron designed to satisfy more demanding requirements) or aluminium cast alloys (because of the relatively low weight). One of the components with the most complicated structure is the cylinder head. The inlet and outlet ducts for the valves, cavities for the engine control unit, control chains and the cooling system, holes for lubricant and, possibly, fuel as well as part of the combustion chamber need to be combined in it. Such a cylinder head needs to have not only exacting strength properties but also high dimensional stability, good heat conductivity and low thermal expansion, while it must also withstand very high pressure levels for long periods of time in the case of diesel engines. The progress made in engine manufacturing is attributable to a major extent to the developments made by the foundry industry.

Competition and competitiveness

Like in other industrial sectors, the companies in the foundry industry have to face growing international competitive pressure. They are forced to make economical use of resources and energy in order to be able to continue operating profitably.

There is no doubt that foundries which increase efficiency in this area are in a position to reap tremendous future benefits. Other ways to improve a company’s competitive position are to make sure the machinery available is always state-of-the-art, to optimise production

processes, to keep up-to-date with ongoing developments in the areas of casting materials, moulds, cores and casting processes and, finally, to be capable of supplying clients with castings that have customised properties. In spite of all the advances that impact the casting process directly or indirectly, whether a foundry is competitive or not depends to a crucial extent on the skills of the company's employees. It is an enormous challenge to recruit well-qualified young staff.

Technical trends

As is the case with companies in other industrial sectors, foundries need to reduce operating costs and keep them low, while also continuing at the same time to be in a position to supply sophisticated products with shorter and shorter development lead times. Economical use of energy and raw materials for castings, cores and moulds is an absolute necessity to cut costs and to reduce the impact of casting production on the environment. Since many other processes – such as production of moulds and cores, emptying of the moulds, cleaning and testing of the castings, recovery or recycling of the mould and core sands – are taking place more or less at the same time parallel to the casting process, electronic process control systems have become essential in order to be able to monitor and control all the production operations. Electronics are just as vital in the development of castings and the production of prototypes, moulds and cores. With computer-based processes, the operations in the casting process and the impact on casting quality can be simulated in detail, with the result that castings can be designed rapidly which are an optimum fit for the assignment in question. Computer-based 3D printing processes, with which synthetic resin-bonded sand moulds and cores can be manufactured relatively quickly, are replacing what used to be the very time-consuming and laborious production of moulds for sand casting, a very common casting process. Developments are continuing in the areas of casting materials and casting processes too: material manufacturers are, for example, working on the optimisation of existing casting alloys and the development of new ones, while research institutes are trying out new processes in liaison with machine

manufacturers and foundries – such as composite casting processes, with which different metals like steel and copper can be combined with each other. Special die casting processes known as squeezing processes are another relatively new development. In these processes, the castings – non-ferrous metals with relatively low melting temperatures – are compacted additionally before they solidify completely.

The GIFA 2015 trade fair

Foundries need innovative machines, equipment, software systems and much more besides in order to be able to operate efficiently. The International Foundry Trade Fair GIFA, which is taking place in Düsseldorf from 16. to 20. June 2015 at the same time as the trade fairs METEC, THERMPROCESS and NEWCAST that focus on associated fields and all share the same motto ("The Bright World of Metals"), will be providing information about this and the innovative developments that are being made.

The Bright World of Metals

The four international technology trade fairs GIFA (International Foundry Trade Fair), METEC (International Metallurgical Trade Fair), THERMPROCESS (International Trade Fair for Thermo Process Technology) and NEWCAST (International Trade Fair for Precision Castings) are being held in Düsseldorf from 16. to 20. June 2015. Visitors from all over the world will be coming to the city on the River Rhine for five days at this time to focus on castings, foundry technology, metallurgy and thermo process technology. A programme of high-quality additional events will again be taking place alongside the trade fairs, involving seminars, international congresses and lecture series. All four trade fairs and the programmes co-ordinated with them will be concentrating on the issue of resource optimisation and energy efficiency. A total of 79,000 experts from 83 different countries visited the stands of the 1,958 exhibitors at the previous events in 2011. Further information is available in the Internet at www.gifa.de, www.metec.de, www.thermprocess.de and www.newcast.de.

Messe Düsseldorf organises not only GIFA, METEC, THERMPROCESS and NEWCAST with the joint motto "The Bright World of Metals" but also other high-quality trade fairs for the metallurgical and foundry industries all over the world. They include FOND-EX (International Foundry Fair) and Stainless in the Czech Republic, Metallurgy India, Metallurgy-Litmash (International Trade Fair for Metallurgy Machinery, Plant Technology and Products) and Aluminium Non-Ferrous in Russia, indometal in Indonesia, metals

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middle east in Dubai, ITPS (International Thermprocess Summit) Americas and Asia and the Aluminium trade fairs in China, India, the United Arab Emirates and Brazil. The range of events held for the metal industries at the Düsseldorf location is rounded off by: Valve World Expo (International Trade Fair and Congress for Industrial Valves and Fittings) and ITPS Düsseldorf as well as the international trade fair ALUMINIUM organised by Reed Exhibitions and Composites Europe.

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