Diecasting News

Diecasters - Italy bound

The next METEF-FOUNDEQ, the international exhibition dedicated to the technologies, machining, products and applications of technological metals and aluminium will take place from 14 to 17 April 2010 at the Garda Exhibition Centre in Montichiari, Brescia, Italy.

The organisers say this year's exhibition represents an important opportunity to restart the market and emerge from the economic and financial crisis as the industry looks to recover.

This year's event sees the launch of the Metef Innovation Award 2010, a new initiative that aims to enhance the innovative content offered by the exhibiting companies. The contents of the proposed innovation will be assessed on: originality and novelty, performance peculiarities and competitive advantages. Judging will focus on the aspects of energy saving, environmental sustainability and conservation of resources contained in the proposals.

A series of parallel events dedicated to the foundry and diecasting sectors will be held during METEF-FOUNDEQ 2010.

Classification of diecasting defects

During the show the Diecasting Quality Work Group of the AIM Diecasting Technical Centre will present research undertaken on the subject of 'Diecasting defects'. The presentation will look at how to improve defects to move the industry forward by showing a process of:

- elaborating a systematic and operative classification of defects;
- identifying the most significant morphological characteristics;
- describing the main causes;
- highlighting the most effective corrective interventions.

For more information visit www.metef.com

Magnesium under the research spotlight

Researchers at Munich University have been studying the effects of hot isostatic pressing of pressure die cast and sand cast magnesium castings.

HIPing is carried out to remove porosity in castings and to improve the mechanical properties. During HIPing the casting is subjected to a high temperature, just below the solidus temperature, and at the same time an isostatic gas pressure is applied (up to 100MPa) for an appropriate length of time.

Although significant studies have taken place on aluminium castings, according to the researchers, little research has been carried out on the effects of HIPing on magnesium castings. During the research, the researchers studied both sand cast and pressure die cast parts cast in AZ91 (MgAl9Zn1). The sand cast parts were cast in 0.2% grade Croning sand and the die cast parts were taken from the gating system of production parts, both were cast in the Zitzmann foundry in Germany. It is not clear from the published paper [1] what pressure was used to cast the pressure cast samples. Once machined the samples were measured and the densities were calculated before HIPing was carried out. Samples were then selected for hardness testing, tensile testing and microstructural examination.

The researchers found that HIPing increased the density and decreased the volume of samples cast using both sand and pressure diecasting, such that volume differences observed in the as-cast (non-HIPed) condition were largely removed. As might be expected the pressure cast parts exhibited the greatest density increases and volume decreases following HIPing and this was thought likely to be due to the greater degree of porosity present in the as-pressure die cast parts. Tensile strength, elongation to fracture and fatigue strength were however improved by HIPing, particularly in the sand cast samples.

(1) 'Hot isostatic pressing of magnesium castings', Ostermeier M, Brummer M and Werner E, Giessereiforschung International Foundry Research, 61, 2009, no 3, p2 – 7.

Rapid tooling for diecasting

There are now six primary techniques for rapid tooling all of which are aimed at reducing the time involved from prototype to production, says the North American Diecasting Association.

The production of tooling is generally considered to be the most time consuming step in the production of a die cast part with traditional techniques taking between five to 20 weeks from design to tooling. Rapid tooling techniques may be able to reduce this to under five weeks and may also be less costly. The tool life is usually considerably less than conventional tooling, and tolerances are also less accurate, however the process can be ideal for first run parts or short run prototype production until conventional tooling methods can be obtained.

Selective laser sintering (SLS)
In this technique a laser is used to melt metal powder. The powder is spread in thin layers and the laser then traces out the features, melting the metal where it is required and producing the die in thin layers. Any metal can be used and the dies can produce an estimated 1,000 shots.

Direct metal deposition (DMD)
Die inserts are produced by injecting powder into a laser beam. The laser melts the powder and deposits it where required. Using the technique, inserts can be made in virtually any metal, and good tool life is reported*. The process can be used to repair or modify existing parts.

Direct metal laser sintering (DMLS)
This technique uses a 3-D CAD driven automated machine which firstly spreads a layer of powdered metal and then the metal is sintered by laser, again building up the tooling in layers. Steel and bronze parts can be created and high tolerances reached.

Laser engineered net shaping (LENS)
In this process, a laser is used to create a metal pool on a metal substrate to which metal powder, in argon gas, is added. The work piece is moved on a programmed horizontal path to build up the die insert and the technique can be used to develop complex designs with high density. A wide range of materials can be used, including steel and titanium and the technique can also be used for repair and overhaul of tooling.

Electron beam melting (EBM)
A relatively in-expensive process, the metal powder is melted using an electron beam rather than a laser to build up the tool layer by layer. Good tool lives are reported but the technique can only be used for iron.

Rapid solidification process tooling (RSP)
Used to produce tool steel dies, the process begins with a prototype on the part from which a ceramic negative is produced. This negative is then sprayed with molten tool steel to build up the die, and once thick enough the die is cut to fit and polished for use. Again this is a relatively inexpensive technique, but produces dies with reasonable tolerance levels and die life possible.

** More information is available from the North American Diecasting Association, NADCA and a comparison table was published in the October 09 issue of Modern Casting.*

State of the U.S. diecasting industry

Daniel L Twarog, president North American Die Casting Association

Introduction

With the worst economic conditions in history slowly fading to the past, the diecasting industry is positioning itself to look ahead and develop sustained growth into the next two to three years. Many diecasting facilities, operating in a 'survival mode' over the last 18 months, have begun to transition out of this mode with an up-take in business in the fourth quarter of 2009. It's nothing to jump up and down about, but enough to give hope to businesses that are in dire need of some good news.

Macroeconomics

The macroeconomic data shown in fig.1 certainly does not show that a rapid turnaround is predicted. It's hard to believe that 2009 ended up worse than 2008. A large hole has been dug, and climbing out of the hole will be a long and slow climb. The best indicator in fig. 1 is the projected increase in automotive sales in 2010 over 2009. These estimates were made after the 'Cash for Clunkers' program was over. While there was some slippage in orders, experts still estimate some momentum in auto production building in the first quarter of 2010.

It is important to realise that diecasting, unlike most other metalcasting processes, relies predominantly on two end-use markets. The industry relies *directly* on automotive production (56.1%) and *indirectly* on new home construction, which is an indicator as to where most of the remaining markets are heading.

All of the other end markets combined don't equal the size of the markets that serve the auto and home-building industry.

So, where are these two important end markets heading? Fig. 2 shows the history of new US home sales from 1963 to the present. It is important to note that every recession sees a significant drop in new home sales, except for the recession of 2001. This is where all the problems of today started, by messing with the natural cycle of ups and downs. Mortgage gadgets were invented, and new home sales grew until the bubble burst. And because this is a natural cycle that was altered, the correction (downward) is twice as bad as it would have been if people who didn't qualify for mortgages hadn't received them. This created 'toxic assets' and record-low new US home sales. In fact, new home sales went from 1.4m in 2006 to less than 400,000 in 2009!

The indirect effect to the diecasting industry was a drop in appliances, hinges, electrical fittings, plumbing fixtures, etc. The indirect effect was that credit and equity dried up, leaving people without money to buy stuff.

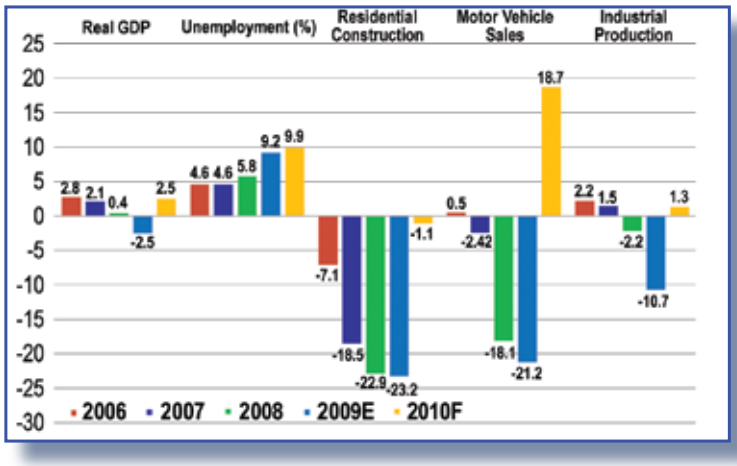


Fig.1 Macroeconomic data

	Al Pounds	Mg Pounds	All Zn Pounds
Custom	1,442,422,845	83,550,384	238,334,872
Captive	1,233,284,564	6,387,500	97,628,750
Total	2,675,707,409	89,937,884	335,963,622

Table 1 Split of custom/captive diecasting in the U.S.

This 'stuff' includes automobiles, so the annual production of automobiles dropped to levels last seen in 1980. Again, notice the change in automobile production during the 2001 recession. It's the only time in recent recession history that automobile production actually increased! The good news for diecasters is that auto companies continue to move towards lighter weight materials and the increase in aluminium and magnesium diecasting is at the forefront of these applications.

However, it will only help the U.S diecasting industry if the production for the autos is in the U.S. If the country climbs out of the 'recession hole' without keeping a good trade balance, the diecasting industry will never get back to where it had grown. Early indications are that the return to growth will be seen faster in countries like Korea and China. With these countries leading the world out of recession, the U.S. will be at a disadvantage and playing 'catch-up' because it won't be able to generate capital to buy more modern equipment.

People in the U.S. continue to move away from home-made automobiles. There was a 32% change in

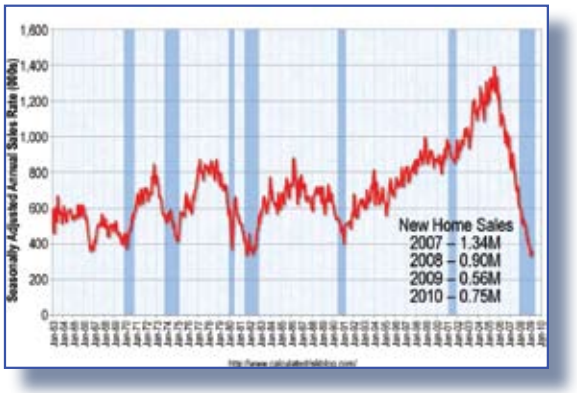


Fig.2 New home sales and recessions

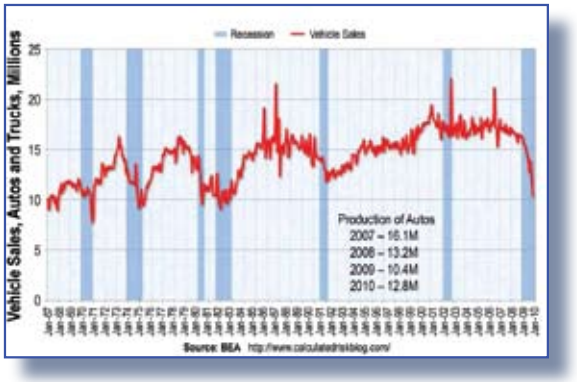


Fig.3 U.S. vehicle sales (seasonally adjusted annual rate)

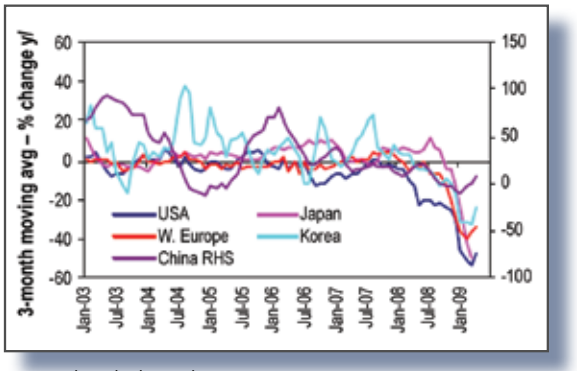


Fig.4 Light vehicle production

automotive sales between 2009 and 2008. A negative percentage in the mid-30s will come up many more times in this report. It seems that the automotive sales are beginning a climb out of a hole that is getting steeper and slipperier by the minute.

Industry data

In 2000, 584 diecasting operations existed in the U.S. The number from NADCA's 2008 census was pegged at 439, and since that report, at least seven additional operations have shut their doors. With tight credit markets and asset values plummeting, independently owned U.S. diecasters will become very scarce. If the switch moves to corporately owned facilities, money may be put into overseas operations before it is seen in the U.S. Without advancements in equipment and manufacturing technology, because of the lack of capital, the industry will be at a great disadvantage.

The geographic distribution of diecasting operations is becoming wider and wider. Sales for the industry are estimated at ~$6.3B in 2007. About $148,000 of sales per employee was estimated. The industry employed over 66,000 people.

As of 2009, the industry employs 25,000 less people and has an unemployment level of 37.5%. These numbers were collected in early September of 2009 and reflect the dramatic downturn of the diecasting industry and all manufacturing in the U.S.

Shipments

In 2008, the average selling price of an aluminium diecasting was between $2.63 and $3.21/pound. Zinc diecastings were higher at $4.02 to $4.14/pound.

According to the NADCA Census, more than 5,400 machines were in casting operations in 2008, Table 2. This is a drop of 2,200 machines since 2002. The industry has lost 30% of its machines in the last eight years. Additional estimates are that another 5% of machines were lost in 2009. While some of this can be attributed to newer machines with higher productivity, most of it is from company closures and increased offshore production.

Where are we going?

NADCA collected data from more than 70 diecasters in 2009 and compared it to NADCA's Census data from 2007 and 2008. Only slight drops occurred in shipments from 2007 to 2008, but a nosedive happened from 2008 to 2009 with shipments reducing by over 33% for Al, Zn and Mg. An analysis of the data shows projections that 2010 will see increases of 5% to 10% over 2009 numbers. Even with those increases, the industry will only be moving in right direction because 2009 was such a poor year.

Fig.5 graphically depicts the shipment level of aluminium in the U.S. Even at 10% growth/year, it will take at least three years to get back to 2007 shipment levels.

Zinc and magnesium show similar trends and their growth is projected to be slower than aluminium, fig.6.

CEO Barometer

In a September 2009 survey of CEOs from the diecasting industry, they reported very poor business conditions now (34% reporting business down 10% or more in six months, 21% reporting business down between 1-9%), and two out of every three said it would continue to be 'no change' to 'bad' six months from now.

Fifty percent of the CEOs reported that quoting had increased since the second quarter of the year. However, backlog and shipments do not reflect any dramatic changes (good or bad) as compared to the second quarter.

Forecasts

As the economy rebounds, the cost for raw materials will

Location	Region	Aluminum	AL-SSM	Zinc	Magnesium	MG-SSM	Other	Total
USA	Lakes	1887	1	737	119	0	13	2757
USA	Mid Atlantic	257		175	3			435
USA	North Central	243		229	35			507
USA	North East	55		130				185
USA	North West	46		43				89
USA	South	451		210	45			706
USA	South Central	184	3	98			9	294
USA	South West	294		136	6		1	437
USA	Total	3417	4	1758	208	0	23	5410
Non-US	Canada	264		284	28		3	579
Non-US	Mexico	192		46	0		0	238
North America	Total	3873	4	2088	236	0	26	6227

Table 2 Machine size and distribution

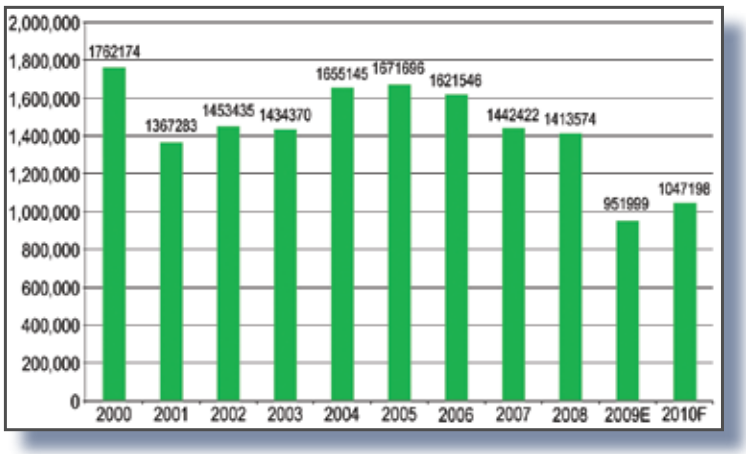


Fig.5 Custom aluminium diecasting shipments forecast (000 pounds)

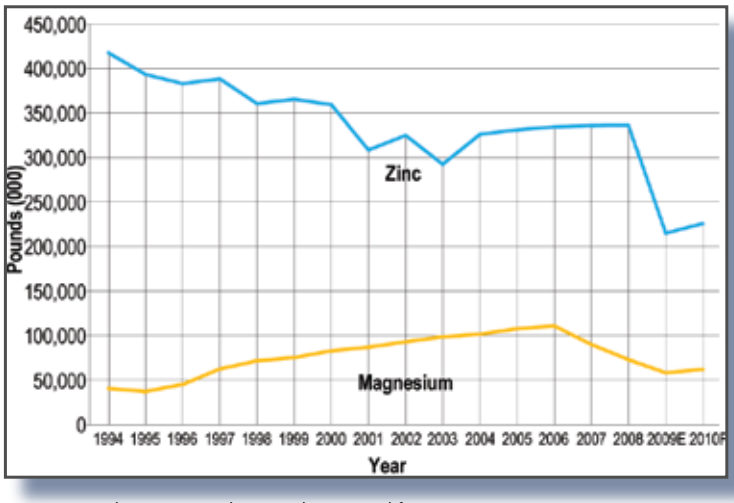


Fig.6 Zinc and magnesium shipment history and forecast

increase. The historical lows of aluminium will rise faster than the economy because of speculation. Speculators drove the prices up in 2006 through 2008. Once the demand dropped, they rushed out of the market and prices went down.

Zinc prices will also return faster than the economy will rebound.

Spot prices for natural gas will go up 25% between now and next year. Cap & Trade efforts will have a dramatic impact on the price of energy. Those factors are not accounted for in these projections.

Overall, the U.S. economy will slowly turn by the third quarter of 2010.

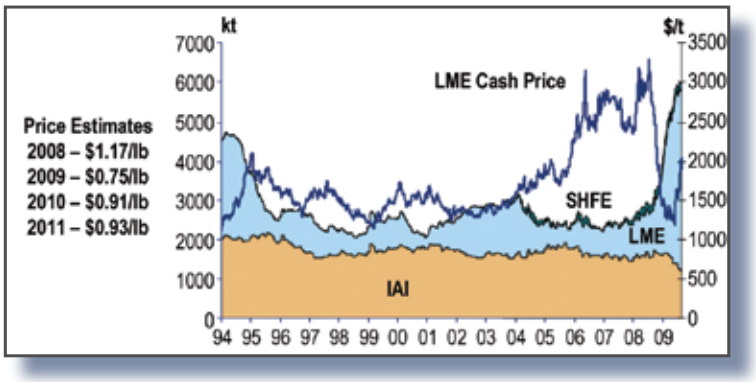


Fig.7 Aluminium alloy price forecast; LME prices and reported stocks, January 1994-August 2009

Fig. 8 Zinc alloy price forecast

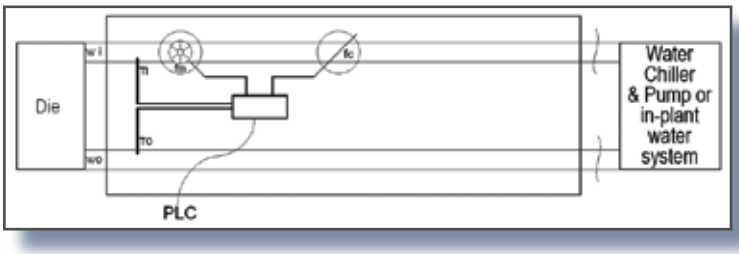


Fig.9 Schematic of Die Therm system

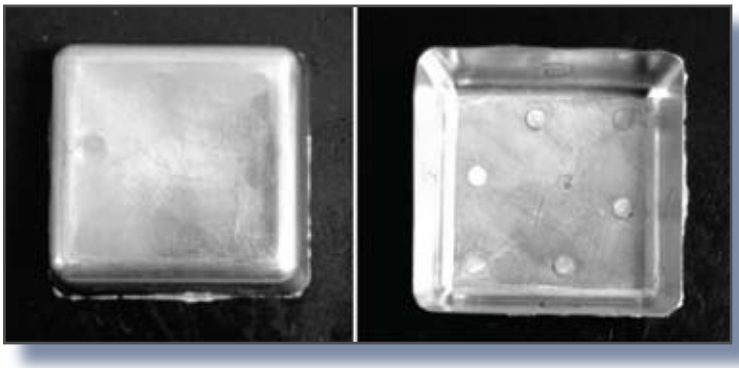


Fig.10 Three-inch by three inch box casting with 0.012 inch wall thickness, exemplifying the thin wall capability of the alloy

	Aluminum	Zinc	Magnesium
2007 versus 2008	2.9% decrease	.2% increase	1% decrease
2008 versus 2009	33.7% decrease	35.8% decrease	35.1% decrease
% 1st half 2009 to 2nd half 2009	1% increase	1% increase	1% increase
2010 Forecast	10% increase	5% increase	6.5% increase

Table 3 Shipment data year over year: 2007-2010

Unemployment in the U.S. and in the industry will stay high. With the slow recovery in 2010, increases in orders of 5-10% over 2009 will be seen. Metal prices will creep up in 2010, and zinc prices will get higher faster, figs.7 and 8. Energy prices will be 25-30% higher in 2010.

Technology innovations

One means by which the U.S. diecasting industry can stay competitive during this time is through productivity improvements. The following new technologies show advancements in diecasting that companies can utilise to increase productivity and improve their bottom line.

Computer control of cooling line water

Die Therm Engineering has developed a system for controlling cooling line water and software for establishing cooling line design and placement, fig.9. By measuring inlet temperature, outlet temperature and water flow rate, then using water density, specific heat and machine cycle time, the amount of heat in BTUs being removed by the cooling channel is determined every shot. Using a P/C and PLC, the calculation is used to control water flow with a fast acting valve. Heat removal, then, is controlled on a shot-by-shot basis.

Benefits of this process include:

- Reduced start-up scrap (60-80%)
- Reduced start-up time (6-8x)
- Reduced downtime
- Reduced cycle time
- Extended die life
- Controlled porosity

For example, scrap was running 14% on a part at a diecaster. Computer control for cooling water was implemented, and the software was used to modify cooling lines. The results were a reduction in scrap from 14% to 0.25%, and a reduction in cycle time from 37 to 32 seconds for a productivity gain of 27%.

Thin-wall zinc

A NADCA sponsored project conducted by ILZRO resulted in a new zinc alloy that has a 40% higher fluidity level compared to highest fluidity standard zinc alloy. Productivity gains can be made by thinning sections for faster solidification and by reducing scrap attributed to lack of fill. This New Zn-Al Alloy has higher Al and lower Mg than the ZAMAK alloys, and it has nominal composition of 4.5%Al, 0.006%Mg, 0.013%Cu, 0.005%Fe, 0.003%Pb, <0.0001%Cd and <0.001%Sn.

Although the alloy was initially developed to achieve thin-wall thicknesses for weight reduction, fig.10, other benefits are faster solidification and the ability to fill very complex configurations. Therefore, productivity gains can be made through faster solidification and reducing scrap due to lack of fill.

An example of how this alloy can be utilised to overcome the lack of fill problems is as follows. A diecaster had a reasonably high scrap rate due to the lack of fill in the boss shown in fig.11a & b. By utilising the high fluidity alloy, the diecaster not only reduced, but totally eliminated scrap. Fig.11c shows how the geometry is filled using the high-fluidity alloy as compared to the previously utilised alloy.

Composite cores for faster heat removal

Another means of providing faster cooling and reducing cycle time is through the use of high conductivity materials for die components. Fig.12 is an example from research conducted by CWRU. After testing bi-metallic samples in the laboratory, a bi-metallic core was produced by laser depositing H13 (as the outer working surface) over copper (used for its high thermal conductivity and heat extraction) and used in an application where an area of high heat or thermal load was posing problems.

The modeling predicted about a 38°C temperature

difference could be achieved between the bi-metallic core and the standard H13 core. Fig.13 displays how when a bi-metallic core is used, the die runs a lot cooler. Actual in-plant trials were run with the bi-metallic core and confirmed that the cooling was enhanced, resulting in shorter cycle times (by up to 15-20%). In addition, lowering the core temperature assists in reducing or eliminating soldering which causes down-time. Reducing down-time increases productivity. The 15-20% noted improvement does not take down-time into account.

HyperCAST overview

HyperCAST is a new exciting project with the potential for revolutionising the industry. The purpose of the project is to develop materials and processes for cast high-strength lightweight frame, body, chassis and powertrain components for fuel-efficient passenger cars and commercial and military trucks to meet the goals of both the FreedomCAR and the 21st Century Truck programs. The advanced materials and processes developed will focus on fuel efficiency and cost effectiveness to offer the potential for 60% weight reduction without compromising component performance, cost, safety or recyclability. The material technology is self-propagating high-temperature synthesis (SHS) also known as auto ignition combustion synthesis for the generation of composite materials, and is being developed at CSM.

Magnesium-based composites are the primary focus and project partners include: Worcester Polytechnic Institute, Purdue University, Case Western Reserve University, and Ohio State University.

The scope of the project is five-fold and entails: (1) the development of high-strength aluminium and magnesium base composite alloys/materials; (2) defining parameters for robust high-volume production rate casting processes for the developed alloys; (3) establishing material design data; (4) demonstrating and validating the materials and processes through the production of cast components; and (5) transfer of the technology to the industry through appropriate documentation.

The expected outcome of this project is a new generation of castable aluminium and magnesium composite materials that represent a major leap in technology and offer opportunities for cost-effective lightweight components with productivity enhancements of up to 25% and weight savings of 60% compared with current production cast components. Two specific outcomes include the ability to replace cast iron and other inserts to eliminate the time involved in placing the inserts (improved productivity) as well as the cost and weight of the inserts, and a dual pour technique for preferentially locating the SHS material in a die cavity/cast configuration.

Work on aluminium systems at CSM thus far has shown hardness, wear and compression strength comparable to cast iron, figs. 14, 15 and 16. Similar results are expected for the magnesium composites.

Conclusion

In less than 10 years, the U.S. diecasting industry has lost 25% of its companies and 35% of its machines. In the last two years, it has lost 37.5% of its employees -this is an industry in critical condition.

The diecasting industry will continue to consolidate through 2010. Private companies will loose asset leverage, and the banks will stop lending. Capacity will shrink another 10%! Profitability will be difficult to maintain as the rest of world seeks to recover faster and keep their prices very low.

Surviving diecasting companies will start to recover faster as orders increase in the second half of 2010.

This report was originally published by NADCA in the January 2010 issue of Die Casting Engineer. For additional figures and more information visit: www.diecastingengineer.org

Fig.11 This casting had fill issues, but the new alloy eliminated scrap due to lack of fill

Fig.12 (a) casting; (b) H13 laser-deposited over copper core

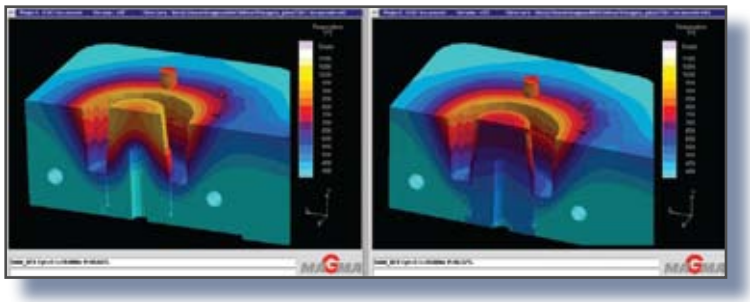


Fig.13 Modelling of die temperature differential (a) H13 core; (b) bi-metallic core

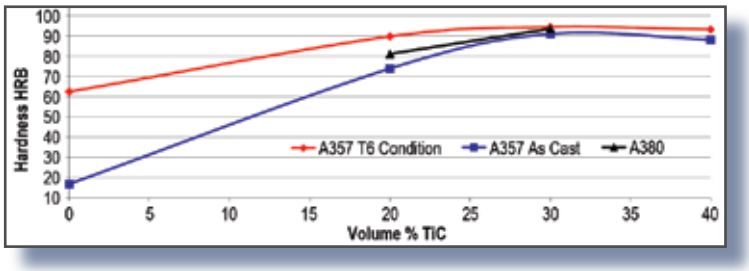


Fig.14 Hardness (HRB)

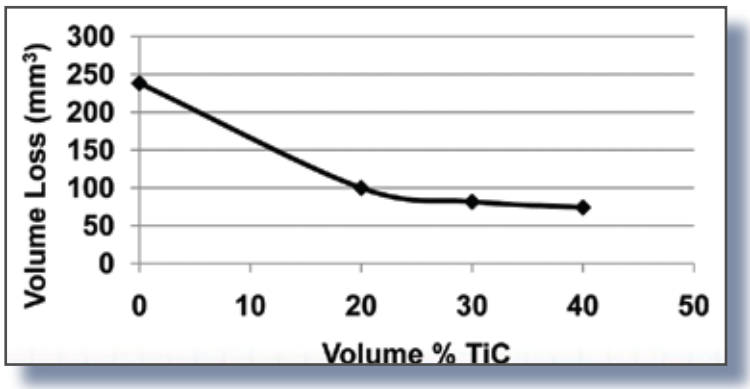


Fig.15 Wear tolerance

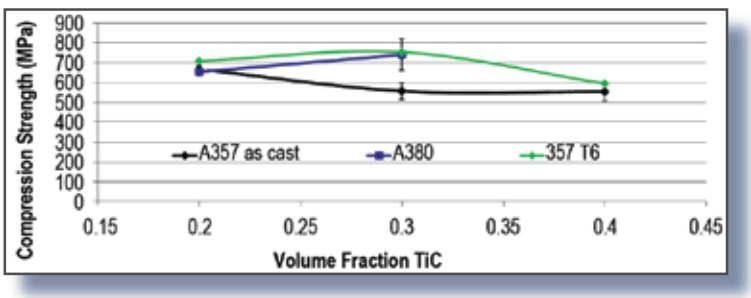


Fig.16 Compression strength

Long life diecoating for gravity and low-pressure diecasting of aluminium

There are several variables that affect the quality of a gravity or low-pressure diecasting. The cleanliness, hydrogen content and sodium or strontium level of the alloy, the pouring temperature and the level of air or water cooling in the die all have an effect on the structure and soundness of the casting. These factors along with the design of the running, gating and feeding system will all impact on casting quality and subsequent performance. A further major influence on casting quality, in gravity die and low-pressure diecasting, is the coating, which is applied to the face of the die.

Two basic types of coating can be used: lubricating or insulating. Lubricating coatings are applied to ease the release and removal of the casting once it has solidified, while insulating coatings are applied to assist the filling of the die cavity and to ensure feed paths are kept open during the feeding process. It is these insulating coatings, which can have most impact on casting quality.

A wide variety of insulating coatings are available ranging from very coarse, highly insulating coatings through to very smooth coatings which while being low in insulation will help produce a casting with a superb surface finish. These insulating coatings are based on a variety of different fillers, such as Alumina, Talc, Titanium Dioxide or Mica. The particle size of these fillers can be varied to control the roughness of the final coating as well as the degree of insulation offered.

Before the coating can be applied it is important that the die is clean and free of oil or grease. The preparation of the die is very important, as it will affect the bond and therefore the life of the coating. To fully clean the die it is blasted by sand, steel shot, glass bead or dry ice. The coating is then diluted and applied, by spraying, onto the hot die, while it is at 200-220°C. The die can then be put into service.

Once the coating becomes worn the insulation level of the coating will be reduced and the surface finish of the casting will be affected. It may also become more difficult to fill the cavity and short poured castings or poorly defined castings may be seen on removal from the die. At this point it is necessary to remove the die from production and clean by blasting before respraying with fresh coating. This process is time consuming and costly in terms of labour, shot blasting material and down time; taking the die out of service and replacing with a freshly coated die may result in several hours of lost production. The blasting process is also aggressive to the die surface and so the more often the die is blasted the shorter its life will be.

It is clear that a significant improvement in productivity can be experienced if the coating is harder wearing and remains in production for longer periods.

To answer the challenge of extended coating life, Foseco has developed a range of longer life coatings called DYCOTE DURA. This range of coatings is supplied in two parts and must be mixed in the foundry immediately before use. One pack contains the correct amount of both parts to make a complete batch but once mixed the coating is best used within 24 hours. Typically the coating life is double that of standard coatings; this means the foundry can plan its production more accurately leaving the die in continuous production for several days.

The DYCOTE DURA family of coatings is shown in the Table. There are coatings covering the full range of insulating applications. From a coating with a particle size of 15 micron, which will produce castings with a very smooth surface finish, to a very rough and highly insulating coating with a particle size of 78 micron.

Foseco says the new range offers the foundry:

- Excellent coating adhesion;
- Longer production runs
- Better production planning
- Less labour required
- Improved productivity
- Reduction in touch up coating repairs
- Excellent protection of the surface of the die ensuring longer die life
- Savings in shot blast materials
- Reduction in rejects due to more consistent casting conditions
- Lower manufacturing costs
- Controlled insulation
- Easy release of the casting from the die
- Complete filling of thin sections
- Good casting surface finish
- Ease of application
- Simple mixing and remixing

DYCOTE	Description	Application	Grain size µm
DURA 500	Coarse and highly insulating. Contains Boron Nitride	Thin castings where ejection is difficult or surface finish is important. Tilt poured automotive. Side cores and top core of wheels, cylinder heads etc.	78
DURA 510	Coarse and highly insulating	Thin castings where filling is difficult. Cylinder heads, manifolds, top core and side cores of wheels, which are difficult to fill.	78
DURA 400	Medium insulation with good release. Contains graphite	Cylinder heads and other automotive castings.	50
DURA 410	Medium insulation	Wheels, where slightly rougher surface finish can be accepted. Cylinder heads and Tilt-poured automotive	50
DURA 420	Medium insulation but better surface finish	General automotive	35
DURA 300	Low insulation but excellent surface finish. Contains Boron Nitride	Front face of wheels, internal cores of pistons.	15

Concept to production the secret to success

A prestige customer base, on-time delivery and process migration are all key factors in helping one diecasting company succeed in difficult market conditions. Here its 'partnership' approach to working with customers is examined.

Gravity, low and high pressure aluminium and zinc specialist The Alumasc Group plc has two UK-based production plants - Alumasc Precision Components, based near Kettering, and Dyson Dycasting, at Milton Keynes. The group also has a trading partner in China.

With around 100 employees Dyson Diecastings focuses on the production of small, intricate zinc and aluminium castings on 700t locking force high pressure machines. Sister company Alumasc Precision Components manufactures complex engineered aluminium components using gravity and low processes or high pressure diecasting machines with up to 2000t locking force. The Group also has machining facilities, along with painting, hand finishing and assembly and a rapid prototyping service.

The company is increasingly recognised as a supplier of niche components for automotive interior trims where the products and particularly surface finish need to be of the highest quality. These components, when veneered, form the interior surfaces of many prestige automotive brands, such as centre consoles for the Aston Martin and for Jaguar Land Rover. Other customers include Deutz and JCB which are supplied with components for power generation applications.

The group also supplies high quality parts to companies such as Lin Products and Bowers and Wilkins, manufacturers of high-end hi-fi equipment, again where quality and, particularly, surface finish are paramount.

Priding itself on the quality of service, on-time delivery performance and level of technical support, the company has recently been recognised with the 'Bronze level supplier quality excellence program' SQEP award from Caterpillar, in association with Perkins Engines. This award recognises the company's achievements in reaching sustained quality and delivery targets set by Caterpillar.

Centre console for Aston Martin, produced as a high pressure diecasting; prepared and ready for paint or veneer

Process migration

Process migration is an important term to Alumasc and its customers. Since the company can offer the full range of diecasting processes, its castings engineers are often able to migrate production from one process method to another, leading to very significant cost down benefits in production. Process methodologies are therefore available to customers for particular components which other suppliers would not even consider because of the part numbers under consideration. An example of this is the section covers for the MAK diesel engine, see picture below. These were historically a sand cast component but are now all produced by the low pressure diecasting process, a change that has resulted in substantial savings for the customer.

CAD and simulation modelling is used to maximise 'design for manufacture'. The overall objective is always to optimise the design to maximise the ease of manufacture, produce zero defects and reduce cost. A combination of highly experienced engineers and the utilisation of the latest software technology helps to ensure that the component's key features are achieved using the selected manufacturing process.

The company's approach for new products involves a series of planned process steps which include:

- full assessment of customer requirements
- feasibility analysis
- an examination of costs and process capability,
- advanced quality planning based on the final specification agreed with the client
- prototype manufacture (simulating as closely as possible planned production methods)
- quality checking and liaison with the tooling division and prototype departments
- manufacture of production tooling
- project management - APQP process
- production of samples
- full production

MAK diesel engine section covers produced by Alumasc

Valve component for Turner Powertrain. This high pressure diecasting was re-engineered from a gravity die component for cost saving and cosmetic improvement

CX28 transmission main case for Caterpillar produced as a low pressure diecasting. Ideal for the low pressure process - two machining operations holding 18 microns on diameter tolerances

Partnership approach to problem solving retains customers

Taking a partnership approach with all of its customers, the group is always seeking to add value to this relationship.

"Offering a complete solution to customers, from rapid prototyping to full production, is vital in today's market", says Alumasc Precision's technical director, Graham Storr. "We offer a partnership approach from concept to product, which customers value. We take responsibility and ownership of a component's integrity working with customers at all stages in production and production planning. The success of this approach can be measured by the fact that we have rarely, if ever, lost a customer!"

Cost down benefits

Graham Evans, sales and marketing director, puts much of the company's success down to its customer approach: "Because we can offer the full range of processes we are able to work with our customers, helping to reduce machine processes as well the elimination of historical concerns. We are able to offer tangible commercial benefits by manufacturing solutions that eradicate variation and waste, improving cycle times and quality control. This has led to significant cost down benefits being realised by our customers".

Government funding boosts diecasting research

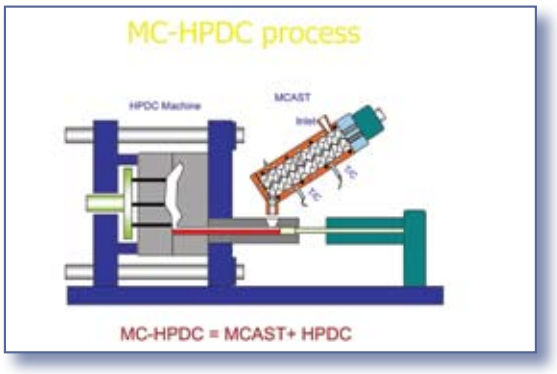
Brunel Centre for Advanced Solidification Technology (BCAST) has a number of projects underway that aim to take advantage of the melt conditioning technique that has been developed over many years of research, both for high pressure die-casting and continuous casting.

The high pressure die casting (HPDC) process is characterised by high efficiency, high volume and low cost. However, HPDC components contain a substantial amount of porosity and other cast defects, resulting in inadequate mechanical performance for demanding structural applications. The new work aims to develop a new shape casting technology, namely, the MC-HPDC process, which maintains the advantages of the HPDC process but provides components with improved mechanical properties. The MC-HPDC process combines the worldwide patented MCAST (melt conditioning by advanced shear technology) process for melt conditioning and the conventional cold chamber HPDC process for component shaping. Researchers are now working to continually optimise and develop the MC-HPDC process, for process efficiency, versatility with alloy compositions, equipment robustness and component quality.

Under the high intensive shearing effect of MCAST, MC-HPDC promises highly uniform and fine microstructure with optimised intermetallics morphology and limited cast defects such as defect bands, porosity, hot tearing and hence, enhanced application performance.

A number of specific development projects are underway in both aluminium and magnesium alloys such as a programme to reduce critical defects in the AM60 automotive seat frame components, which are produced in a series of industrial scale trials, and to improve the mechanical properties by achieving a fine and uniform microstructure through enhanced heterogeneous nucleation controlled solidification under intensive forced convection.

For more information about specific projects visit:www.brunel.ac.uk/about/acad/bcast/technology#MCHPDC



The barometer is rising

Speaking about the 7,141 trade visitors to this year's EUROGUSS exhibition in Nurnburg in January, Gerhard Eder, chairman of the Association of German Die Casting Foundries (VDD), said: "The die casting foundries have closed ranks at EUROGUSS and are approaching the expected upturn with great determination and new ideas, even though they are still concerned about turnover, equity development and returns," Dr. Gutmann Habig, general secretary of CEMAFON, The European Foundry Equipment Suppliers Association, said: "The European-based manufacturers of equipment for the diecasting foundries have regarded the exhibition as an early and key indicator of development in the demand for machinery and plant. It became clear at the exhibition that the barometer is rising at last! Although not all adjustment processes have been completed yet and project enquiries must first lead to actual investment, the mood was encouragingly confident."

A diamond moment in time

Well travelled Diecasting Society member Chris Lamont reflects on an enjoyable September weekend spent celebrating the 60th Anniversary of global diecasting machine supplier Frech Gmbh.

The link up with Muller Weingarten has extended Frech's range

UK Diecasting Society (DCS) members were invited to Frech's Pluderhausen facility to see what makes Germany's only manufacturer of diecasting machines instantly recognisable worldwide. A remarkable journey has to start somewhere, and in the case of Oscar Frech Gmbh, this was in the basement of the family home back in 1949. But few people know that the driving force in those early days was Oscar's wife, Emilie. Described as a farsighted, courageous and responsible lady, I am left wondering if even she could ever have envisaged the company as it is today. The new 'communication pavilion' proudly bears her name, and on 26 September 2009, just 60 years after the company was formed, it is in this pavilion that 1,200 delegates from around the world shared in the success of Frech.

But it is not just about the machines, and that is why the company, and the celebrations are of such interest to UK delegates. Die design, manufacturing technology and 210 patents have seen growth into international markets, which are key elements to this success story. International subsidiaries were put in place throughout the 1970's and 1980's. Today 15 such subsidiaries provide sales and service worldwide, supporting some 3,250 zinc machines, 650 magnesium and 1,140 cold chamber machines.

Now, two generations later, the 60th Anniversary of Frech was celebrated in the German town of Schorndorf, a town that lies exactly in the centre of Europe. Its other most famous son, Gottlieb Daimler was born here, so the town is well known for breeding manufacturing excellence. But where Oscar Frech was a pioneer in hot chamber diecasting, developing his own machines that would become the cornerstone of today's corporate group, it was his son Wolfgang who had the vision to incorporate cold chamber diecasting in the late 1960s.

For those who have not met Wolfgang, he is a remarkable man in his own right. Well known in The Diecasting Society, he has supported the organisation for many years and is highly respected. His speech was both brutally honest and inspirational, taking time to explain that the current economic climate had reduced what was to be a two day event into a single day. Of course there was to be no cutbacks in the quality, with a red carpet welcome, perfect organisation and a superb sit down meal delivered to each of the 1,200 guests. But acknowledging that the business had been forced to make some hard decisions, cutting back on staff and working hours, Wolfgang praised his staff for their continued support. This was backed by speeches from key political figures and the chamber of commerce, reiterating that business is showing signs of recovery, much earlier than many had feared.

Guests viewed some of Frech's equipment

But another remarkable journey took the DCS members to the event in the first place. Being British, they are adaptable, resourceful and it has to be said, a little less organised than their German counterparts. One member decided to drive to the event, a 16-hour marathon drive that was a feat in its own right. And yours truly nearly arrived two weeks earlier, due to a 'senior moment' when booking air tickets. The host, Calvin Higginbottom of Frech UK, did manage to achieve the impossible though, getting the group organised enough to take in the sites of the Oktoberfest where members contributed in a small part to helping consume 6.5 million litres of lager. Proudly, though none of the DCS members were amongst the 8,608 that needed medical assistance during the event. The group from the DCS were a well matched bunch, with members from several different foundries attending, which was extremely encouraging to see.

To conclude the weekend celebrations, and despite being given the opportunity of more antics at the Oktoberfest, we took in the more sedate sights at the Mercedes-Benz museum. Given the hospitality that we had already enjoyed with Frech, it was a chance to see exactly what that 'other' famous son of Schorndorf had achieved. Quite a bit actually!

Invited guests check out components made on Frech machines

60 years of Frech - a Swabian success story

Approximately 1,200 invited guests including employees, retired employees, representatives from global business associates and economic organisations as well as political dignitaries joined together to celebrate the 60th anniversary of the Frech company and the formal opening of the new facility in Pluederhausen.

Over 100 customers from 12 countries attended a special customer presentation early on the Saturday morning where an informative mix of speeches, product presentations and guided tours were arranged for them. They were also brought up to date about the changes within Frech since the taking over of the diecasting business of Mueller Weingarten AG.

Under the slogan '*Welcome to the World of Die Casting*', hot and cold chamber diecasting machines with various locking forces between 200 - 52,000 kN were available for viewing. Most impressive to the visitors was undoubtedly the cold chamber diecasting machine type GDK 4100 with a locking force of 44,000 kN, which was shortly to be delivered to a well known automobile manufacturer and was confirmation of the engineering expertise within Frech at the new facility. Furthermore customers used the opportunity to obtain information about the Frech range of peripheral equipment including heating-cooling units, magnesium dosing furnaces, zinc melting furnaces, extraction robots and dosing units as well as die casting and trim tools.

60 years of company history offered the possibility to look back proudly but also offered the chance to look ahead bravely at the future challenge.

For 60 years Oskar Frech GmbH & Co KG has continuously set new standards for the industry. It was the first to begin series production of magnesium hot chamber machines (1966) and introduced the first electrically driven diecasting machine in 1999. Frech has 19 international subsidiaries and partner companies and took over the diecasting business of Mueller Weingarten AG in 2008 expanding its manufacturing base in Germany and extending the locking-force range of the company's cold chamber diecasting machines up to 52,000kN.

DAW 20F

Left: Giesszelle DAK 720