Delivering opportunities

New president John Swift gives an insight into his career in the diecasting industry.

I entered the foundry industry as a 16-year-old foundry technical apprentice working for Aluminium Die Castings Ltd in 1977. Over the following 47 years, I had the pleasure of working for a number of companies (Birmal, BSK, Bridge Aluminium, etc.) in several roles, until 2003 when I was fortunate enough to purchase Alucast Ltd, where I am still the CEO today.

During those years I attended many technical and social Diecasting Society events and eventually joined as a council member in 2013.

It was with immense pleasure that I succeeded Stuart Gregory as the new president in November 2023. I would like to take this opportunity to give both the council's and my own personal thanks to Stuart and Simon Olive (as retiring Treasurer) for all their time and hard work, put in over a number of years, particularly with regards to restoring the Diecasting Society onto a good financial footing.

Anyone who attended *GIFA* last June and/or *Euroguss* a few weeks ago in January will realise that the foundry industry, in particular the aluminium diecasting industry, is starting to grow rapidly (driven by OEM's lightweighting and Giga casting requirements for EVs) the need to attract, educate, train and retain foundry employees and engineers in particular, is crucial for our industry's growth, success and future.

As an educational charity for the diecasting industry, I believe through both our technical visits programme and our social events, we deliver opportunities, at an extremely modest cost, for educational and networking experiences for all your employees, but in particular for the young people in our companies, who are obviously the future.

If you are not a member please join us, you will be very welcome and if you are a member, please support our technical visits programme and our social (networking) events, where you will have a very enjoyable time.

John Swift
Diecasting Society President

A night at the DOGS

Annie Gough of the DCS reports on the DCS evening out at Perry Barr Greyhound Stadium, Birmingham on 7th December 2023.

Members enjoyed a social evening at the Perry Barr Stadium on a very cold Thursday night in December.

The trackside package included food, a drink and race card for the evening and we enjoyed an evening to celebrate the festive season. Seated warmly inside overlooking the course we were able to watch the races, twelve in all, which were also shown on large television screens.

Jovial Alex, Apollo Lightyear, Cabana Scout, Clanagh Blue – some of the greyhounds we watched racing round the track. Did members study the form before a bet or put a pin in the list of runners – only they can tell us?

'Follow Ya Dream', was one of the winners at the races – not sure if any of our members had it has a winner – ah well, it was good fun anyway.

Image above, source: Shutterstock

Join the Diecasting Society

Membership is open to both individuals and companies who have an interest in the manufacture of die cast metal products. That interest might be as a foundry or a supplier to a foundry.

Each member receives the *Diecasting Society Newsletter*, and reduced rate attendance at all the Society events, both technical and social. Annual membership is £45.00 for an individual member and £235.00 for companies (which includes four reduced rate places for named employees at the company). The cost for a student or trainee is just £8.50.

To start enjoying the benefits of membership email: dcs@icme.org.uk or visit www.dcsoc.org.uk

DCS Website

The DCS website has been updated. DCS members are invited to submit entries to the website, news items etc. to populate it by emailing: dcs@icme.org.uk

CALENDAR OF EVENTS 2024

The following events have already been planned for this year.

Friday 17th May
DCS Midlands Golf Day
Barlaston Golf Club, Stone
Sponsored by Tandom Metallurgical Group

Friday 6th September
DCS National Golf Day
Moor Hall Golf Club, Sutton Coldfield
Sponsored by Coleshill Aluminium

For more information about all events, contact the DCS via ICME, email: dcs@icme.org.uk

Understanding material failures in HPDC

Diecasting Society member company Uddeholm held a Hot Work Customer Conference on 29th November 2023 at the AMRC in Sheffield (UK). DCS members were invited to attend the event. The following is a report on the presentation from Ben Broderick of Uddeholm.

Diecasting is an ancient technology. We have come a long way from the cast bronze statues found in the tombs of Tutankhamun to the incredibly complex castings found within the vehicles we drive every day. The principle of the process remains unchanged – pour a molten metal into a die to achieve a desired shape – but the capabilities and demands have also evolved over time.

HPDC is a multi variant process, there are several parameters that must work together to produce a quality part, free from surface defects, porosity and structurally sound. Problem solving is therefore difficult. Hopefully isolating the material used in the construction of these tools can help identify common problems in HPDC.

Generally, we can split the tool into five separate areas, each with their own specific material demands (fig.1).

1. Cavity insert.
2. Component cavity.
3. Shot block.
4. Core pins/vents.
5. The bolster.

We can separate the failures into five main categories although there is always likely to be some interplay between multiple failure modes.

Plastic deformation – core pins, component cavity

This failure is when the compressive load applied to the steel is pushed beyond its limits so the material will deform, this is further excarbated with the introduction of heat which will lower the ability of the steel to overcome the load. This issue can be resolved by increasing the HRC which will increase the compressive strength of the steel or exploring materials that have a higher resistance to temperback, a process whereby the steel hardness is decreased through the constant exposure to temperatures above the tempering temperature of the steel. (Fig.2)

Fig.2 Plastic deformation

Heat checking – cavity insert, shot block, component cavity

Heat checking is the bane of the quality department and probably the most common failure which will lead to parts being rejected. Caused by heating and cooling cycles between shot and spray, the material expands and contracts until the surface starts to split. It is a difficult failure to completely eradicate due to the nature of the process but it can be mitigated by lowering the HRC, this increases the ductility of the steel, its ability to deform and return to its previous form. Naturally, material options can be explored to resolve this issue i.e. increase the shot count, by trying materials that have a much higher ductility than grades such as H13 (1.2344) which is by far the most commonly used insert steel.

Erosion – cavity insert, component cavity, shot block

Erosion is forcable removal of steel from the surface, high injection pressure at the gate and mass of molten material on the shot block, coupled with the chemical reaction between steel and aluminium at elevated temperatures that severely weakened the contact area resulting in material loss over time. Here coatings can be really beneficial, creating a barrier between the steel and the aluminium which will reduce the chemical aspect of the failure, although the pressure and mass issues will remain. Coatings are only as good as the substrate (material beneath them) and increased HRC with a coating is a good way to mitigate this particular issue.

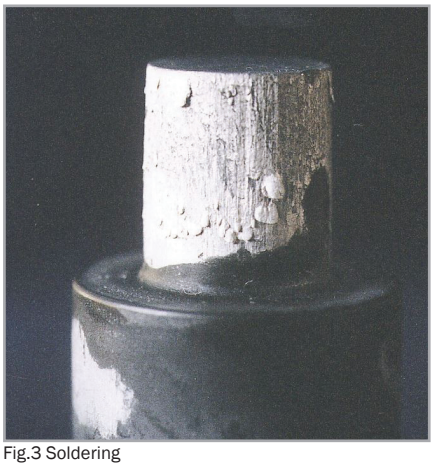

Fig.3 Soldering

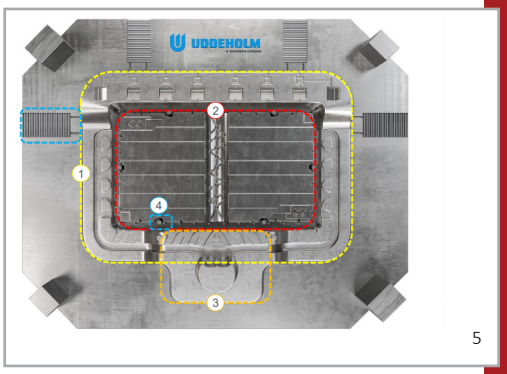

Fig.1 Die set

Soldering – cavity insert, component cavity, core pins

Soldering is very similar to erosion in many ways, it is caused primarily by the chemical interaction of aluminium and steel therefore solutions such as coatings can also work here. The main difference is that as these areas are generally not exposed to the material flow which cause erosion, the aluminium will adhere to steel and the primary issue tends to be heat in the area. Therefore, subsurface cooling is the best solution, overspray should be avoided as this will lead to heat checking which has the effect of increasing the surface area available for chemical reaction and will not resolve the issue. (Fig.3)

Gross cracking – all areas

Gross cracking is more often than not caused by manufacturing methods used to make the tool. Heavy machining on large sections impart large amounts of stress within, complex geometries in heat treat can also cause stress raised areas within the tool that are likely to crack. Material selection can also play a role here, carbide structure in the steel, the toughness of the steel (ductility to stop cracks forming, toughness to stop cracks spreading), but it is generally a processing issue. Good practice like stress relieving after first stage machining, big radii in the tool design, dummy blocks during heat treatment, double and triple tempers are all things to look at. A gross crack is indicative of an underlying issue, the above failures are inevitable to some degree, predictable and can be used to determine tool life. Gross cracking should never occur.