

WAX MATTERS

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Process Related Testing for improved Injection Performance

In order to improve wax injection performance it is clear that a better understanding of how wax performs in the die is essential. A rethink on testing regimes and new developments in both tests and technology are already leading to improvements in the consistency of wax patterns produced. The tests also enable information on optimised injection press settings to be given to users.

Current wax testing is not necessarily based on giving the customer information that will be beneficial to their process, but instead on ensuring that a wax meets a given specification. The result is that the foundry needs to modify injection parameters on the basis of initial injection results from a particular batch of wax. The best example of this is the viscosity test, which is analogous to wax fluidity. However as foundries are aware, two similar viscosity readings do not necessarily result in the same wax fluidity. This results from several causes/reasons:

Some are process dependent

- Die temperature
- Pressure and flow variations

Some are wax dependent

- Wax setting characteristics
- Filler particle distribution

Blayson has for some time been working on a new series of process related tests and now regularly uses these to develop and control wax products. One test in particular is proving extremely beneficial, the use of a 'Spiral Die' as a practical indicator of rheological properties. This overcomes the weaknesses highlighted above and gives the batch by batch information needed by the wax room for both fluidity and solidification at a given temperature, flow and pressure. Wax Fluidity can be measured by comparing results injected at:

- Fixed wax temperature
- Fixed die temperature
- Fixed injection pressure
- Fixed flow rate



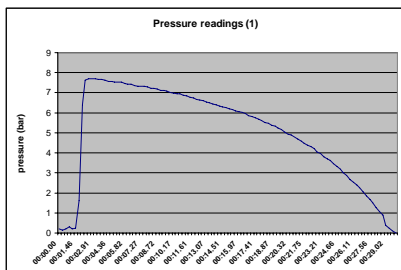
When different batches of wax are compared using the same press settings any variation can be measured and adjustments made to compensate accordingly.

When the spiral die is used in conjunction with 2 other recently developed pieces of equipment then the possibilities for significant improvements in the wax room become even greater.

The first of these developments is a die fitted with a pressure sensor. This was developed by Blayson to better understand how pressures and flows set on the injection equipment translate into wax behaviour inside the die. The pressure sensor is connected to a

PC and gives a read out that indicates and measures:

- Evacuation of air from the die
- Transfer of pressure to the die
- The probable effect of crystallisation on pressure
- The effect of premature cessation of injection pressure



It can be seen from the chart above that the wax pressure does not stay constant as the injection press setting might suggest but falls over time. It is also possible to measure differences in performance between presses, which can be significant and explains the difficulties often experienced when dies are moved from one press to another. When ceramic cores are inserted then a whole new dimension is introduced making the picture much more complex - it follows that understanding the flows and pressures inside the die becomes much more advantageous as it can aid in alleviating expensive core breakages.

The second piece of equipment is the **20-20 Process Vision Graphing System** recently introduced to the market by **MPI Systems**. This utilises touch screen technology and control and has network capability. Its use leads to significantly reduced set-up times and much more consistent, repeatable pattern quality from press to press. Whilst the latest MPI presses come with the 20-20 technology already installed, the 20-20 unit can be quickly connected to any make of press by making simple connections. It therefore gives an accurate measurement of actual

injection pressure, temperature and flow rate as opposed to indicated settings. The 20-20 facilitates die transfer as successful settings can be recorded and used to correctly set the die on another press.



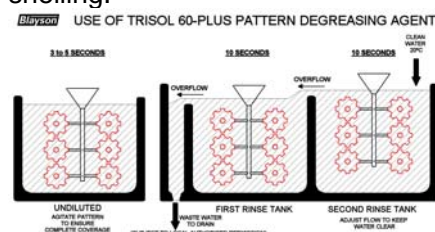
It is easy to see that any company utilising all the foregoing techniques will be able very quickly to develop a clear understanding of wax injection as it affects all parts they produce. This will allow fast and effective adjustments to be made reducing set up times and maximising production rates and quality.

Pattern Washing

Often overlooked a critical part of the investment casting process is pattern washing. Having put all the effort into producing perfect patterns it is vital that the quality is transferred into the shell. Pattern cleaning is often overlooked but is absolutely essential in ensuring that the prime coat is able to adhere to the pattern without spalling or hairline cracks that can propagate into full blown shell cracking in the boilerclave. To this end a pattern wash should be used to thoroughly clean wax assemblies prior to shelling. 'Trisol 60 Plus' is one such pattern wash and has been purpose designed for investment casting. It operates by chemically

combining with silicones (from mould release agents) and grease on the surface of wax patterns and removes them, with fast acting emulsifying agents releasing the contaminants safely into the rinse water. The cleaned pattern has a micro etch imparted by the Trisol, this aids prime coat adhesion and helps prevent spalling and shell cracking.

The whole pattern cleaning process takes only seconds, 3 to 5 seconds in undiluted Trisol, followed by 10 seconds rinsing and the patterns are ready for shelling.



Trisol is Non-hazardous and non-flammable with no maximum exposure limit. Furthermore rinse water may normally be released direct to foul drain, subject to usual local consents.

A Life of Riley

After 10 years as Blayson Admin Manager, John Evans retired recently.

John's infectious enthusiasm will in future be focused on his family and also on his beloved vintage Riley that he has lovingly restored to concours condition.

John and his Riley have won many prizes and the car has been exhibited at Earls Court as well as other prestigious locations.

