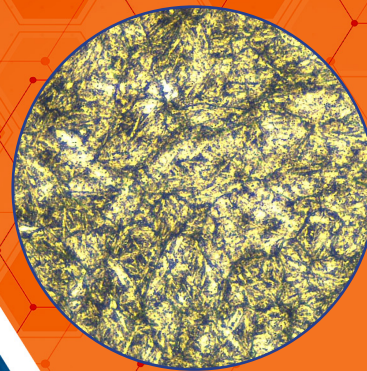
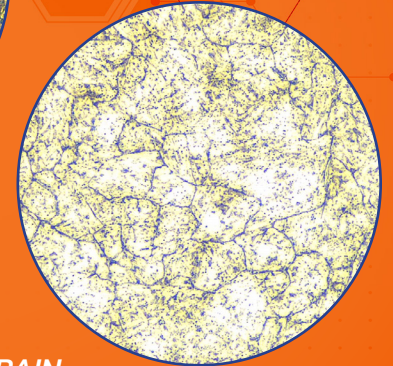


LABORATORY



MARTENSITE
TEMPERED 500X



GRAIN
STRUCTURE 500X

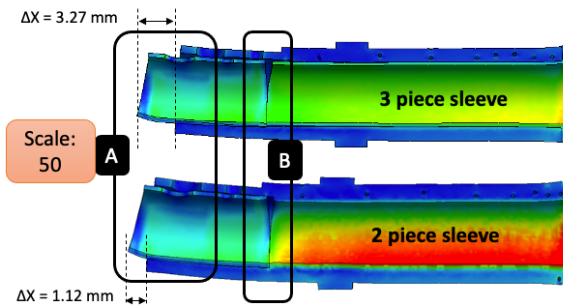
CASTOOL LABORATORY

Several services are available through Castool Lab including but not limited to:

- ▶ Extrusion process simulation : simulation of temperatures, stresses and deflections in workpiece and tooling (container, dummy block and die) during the extrusion process.
- ▶ Die cast process simulation: thermal and mechanical simulation as well as fluid flow and solidification during casting.
- ▶ Extrusion die simulation: with capabilities for flow simulation through the die, nose trip formation, charge weld and seam weld tracking, billet skin tracking and die deflection.
- ▶ Microstructure analysis: metallography techniques are used to look at the microstructure of received raw material, heat treated material or used material.
- ▶ Chemical composition: Optical Emission Spectroscopy is used to determine the chemical composition of different alloys.
- ▶ Numerical and Analytical Process Simulation: to help with design optimization, product development, problem solving, research, publication, and educating the industry about the process.
- ▶ Material Characterization: verify/certify received materials, study the failures, research and development on material selection/processing.

DIE CASTING SIMULATION

PROBABILISTIC CHALLENGES



Section A:

In this area the longitudinal expansion result in major displacement at the pour end which normally can be prevented by fixing the end but in 3-piece sleeves this expansion is much more than 2 piece sleeve

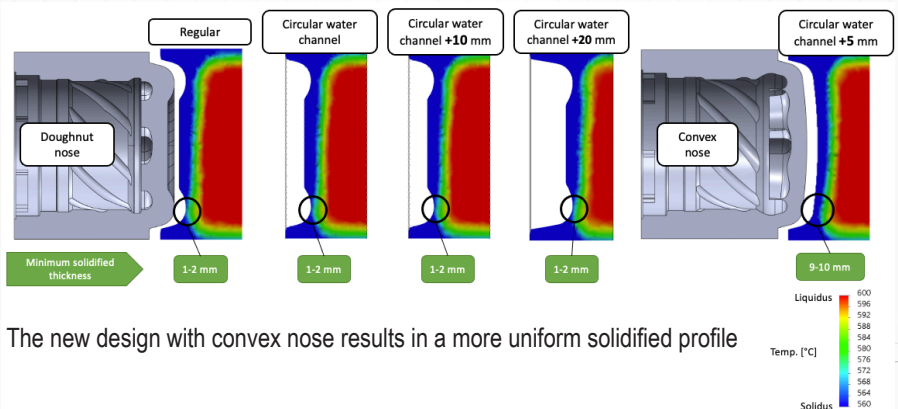
Section B:

In the contact face between pour insert and die insert a gap might form.

Banana Effect:

Despite of other challenges, the 3-piece shot sleeve performs better in terms of minimizing the banana effect.

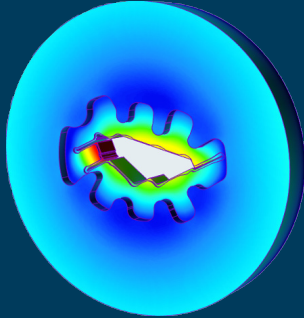
TEMPERATURES & BISCUIT FORMATION



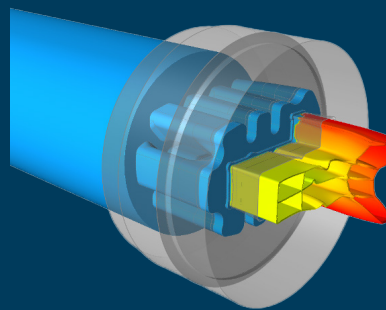
The new design with convex nose results in a more uniform solidified profile

EXTRUSION SIMULATION

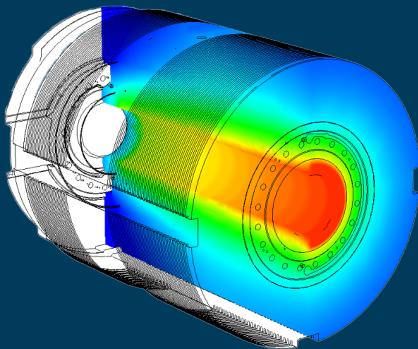
EXTRUSION SIMULATION



DIE DEFLECTION

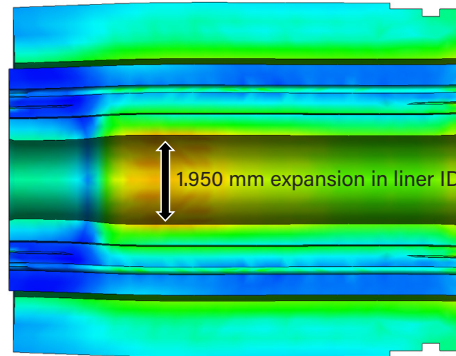


FLOW SIMULATION



CONTAINER TEMPERATURE

QR CONTAINER STRESS AND DEFORMATION

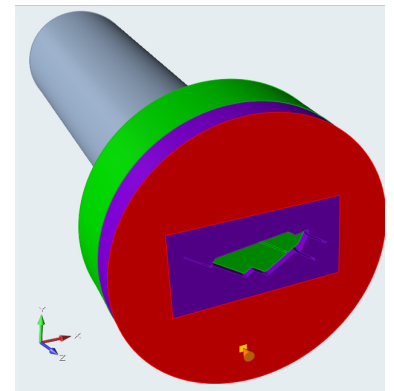


- Deflections are magnified by 30 times more than true values.
- QR results in less stress on the liner ID and then less liner deformation.
- In QR container liner ID expands about 0.1 mm less than the container with elements further away from liner. This value can be even higher in reality because the material model is assumed to be fully elastic.

TOOL DEFLECTION AND LONGITUDINAL WELDS

Boundary and Simulation conditions

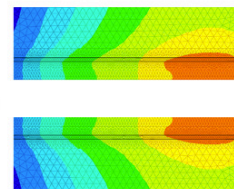
- The red area is assumed as rigid support.
- Die material (H13) is considered fully elastic.



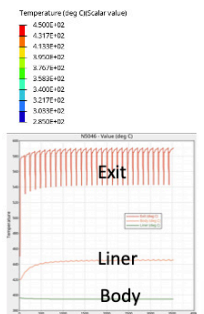
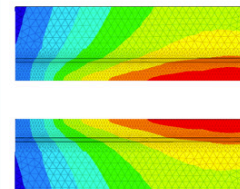
TEMPERATURE DISTRIBUTION

**Preheated and idle
(Before first billet)**

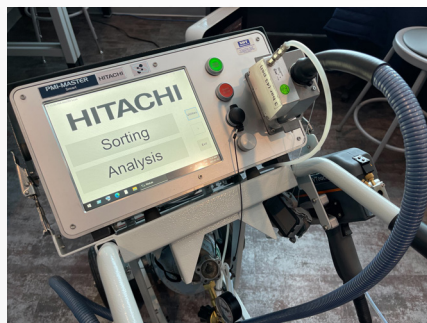
QR container



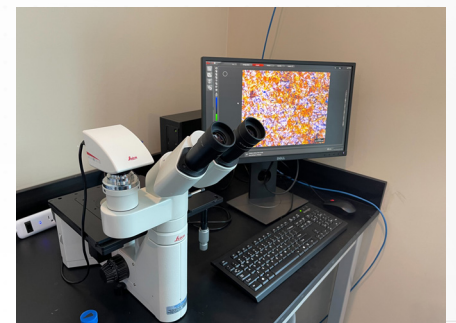
After 30 billets



MATERIAL CHARACTERIZATION



Optical Emission Spectrometer (OES)



Metallography Microscope



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