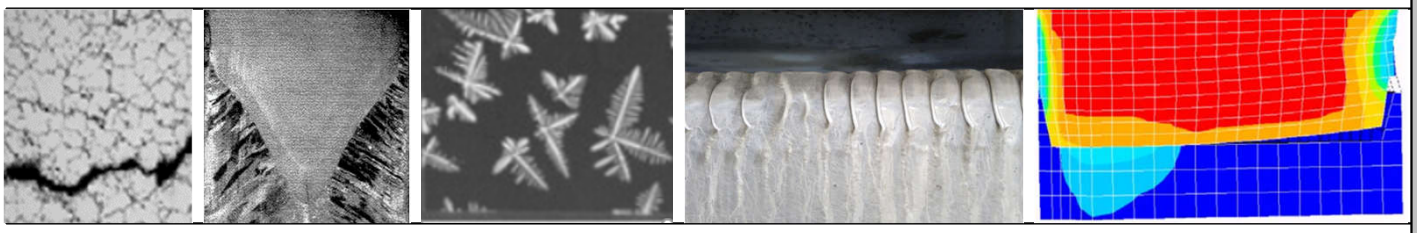
Direct Chill (DC) Casting: Science & Technology

Weekly Live Online Course

This online training course is presented over 10 weekly sessions. It covers the control of steady state ingot attributes, pull-in and shell zones, as well as the start-up requirements for reduced heat transfer. An introduction to solidification metallurgy is also provided.



A fresh approach

Many technical training courses start from basic principles, building towards a detailed analysis of the particular technology. This often leaves attendees floundering in a sea of concepts and equations, unsure how the physical basics relate to the actual workplace.

Our approach, based on extensive experience in delivering training courses to industry, overcomes these difficulties. We first provide an appreciation of what the various technologies are expected to deliver to their customers, and why it is important. Only then do we consider how everyday operations relate to the physical basics.

Most importantly, we use workshops extensively, where attendees investigate the relationships between actuators they control (*e.g.* metal level, water flow rate) and the performance of each manufacturing stage. All workshops are computer based for the live online course.

Such 'discovery-based learning' results in a deeper understanding, and better knowledge retention and usage in the workplace.

Course structure

The course focuses on:

- metal level control and shell zone formation
- low head casting and gas pressure assisted casting
- ingot pull-in and mould opening design
- heat management and water quality
- start up practices and curl control.

Each weekly session is centred on a seminar delivered live, allowing hand-raising and discussion.

Following the seminar, a related workshop is introduced, which attendees can tackle in their own time. This workshop is reviewed interactively at the start of the next live session.

Agenda

1. Introduction to DC Casting
2. Shell and surface control
3. Metal level control
4. Gas pressure assisted casting
5. Pull-in and butt bulge
6. Heat management
7. Heat transfer and water quality
8. Cast start-up
9. Introduction to solidification metallurgy
10. Designing a casting practice

"Thanks Paul and David. Excellent content, very well presented in a professional, pedagogical manner with a constant touch of funny! See you next time!"
Yves Larouche, Dynamic Concept

tsc Training Courses: *Direct Chill (DC) Casting: Science & Technology*

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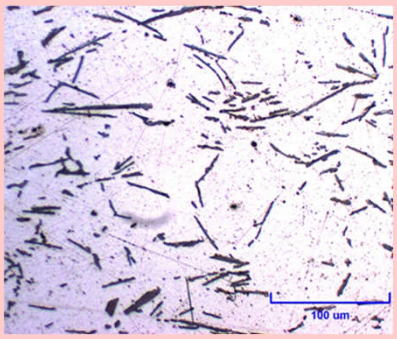
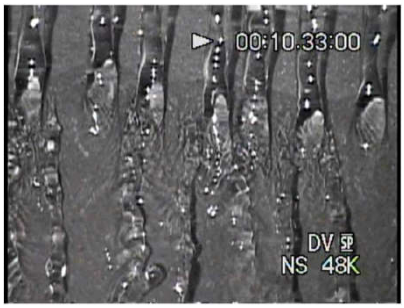
Course structure

"Amazing course once again! Paul and David have a great way to present complex problems in a simple way. And in between the sessions, they are always keen for a chat. I can highly recommend!! Well done guys!"
Katrin Mester, AMAG

Shell zone and surface control

We look at shell zones in DC casting: why it matters from a product and process perspective, and how it is controlled. The mechanism of shell formation, dictated by primary heat flow to the mould, terminated by the influence of water cooling is explained. The three common methods to control shell zones are investigated: low head casting, electro-magnetic casting, and hot top casting.



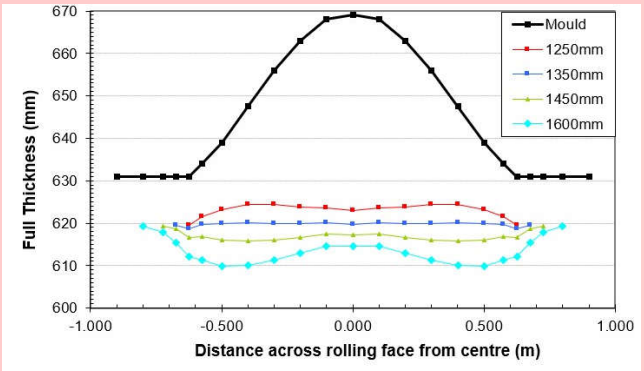


Heat transfer and water quality

Cooling with water sprays is crucially dependent on the surface temperature. Convective cooling, nucleate boiling and film boiling are examined. The Biot number is the key metric to compare the relative importance of sequential heat transfer processes. Film boiling is a desirable phenomenon at the start of a cast to reduce the cooling rate, but nucleate boiling is the mechanism operative in steady state.

Ingot Pull-in and Mould Opening Design

The "pull-in" deformation of rolling faces during casting is introduced and quantified with experimental observations on the effect of speed, thickness, and alloy. The absence of pull-in, and the consequent "butt bulge" or swell during the cast start-up is demonstrated. Strategies for mould design to achieve flat ingots are described. The use of variable width mould tooling, and the associated compromises for ingot flatness are analysed.



Presenters

Paul Evans and **Ricky Ricks** were formerly directors of research and innovation for Alcan. They set up *tsc* to help clients develop their technology strategy, including knowledge management and technical training.

David Humphreys has managed remelts and cast houses in Alcan and Alcoa and has extensive technical and practical expertise.

Registration

Register online on the course website:

www.training.tecstrat.com

Alternatively email us: **equiries@tecstrat.com**

"Been on almost all aluminium training courses from TSC. Content is current, relevant and expertly put together. Practical workshops at the end of each session bring theory and real world problems together. I can recommend the TSC courses for every specialist working in the aluminium industry."
Francois Vlok, Hulamin Rolled Products

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