

SPOTLIGHT

on the continuous casting of steel

by J.P. HOFFMAN*

The School on the Continuous Casting of Steel, the second school organized by the Technical Programme Committee—Metals Technology of The South African Institute of Mining and Metallurgy (SAIMM), was held at the CSIR Conference Centre from 16th to 20th May, 1988.

The principal lecturer at this very successful five-day School was Professor J.K. (Keith) Brimacombe, the Stelco Professor for Process Metallurgy in the Department of Metallurgical Engineering, University of British Columbia, Vancouver, Canada. Professor Brimacombe was ably assisted by speakers from the local steelmaking industry, who described case studies based on experience in their particular plants.

The School was well attended, with 70 delegates representing a broad spectrum of the steelmaking community, research and development personnel, and university staff.

The School was opened by Mr Ben Alberts, President of the SAIMM.

Lectures

Professor Brimacombe's lecturing style is refreshing and humorous, which brightened up the School. He led the delegates through the course, not rushing anything but explaining in detail all the concepts, theoretical as well as practical, of the peripherals of continuous casting, all of which can affect the final quality of the end-product—be it slab or billet. His first remark on the first day served as the theme of his series of lectures: 'If you are not here to improve the quality of your product, what are you doing here?' Since it is more difficult to continuously cast billets of good quality than slabs, somewhat more time was spent on the continuous casting of billets. Every day, an hour was put aside for panel discussions, and this procedure was well accepted by the delegates, and lively and informative discussions ensued spontaneously. Professor Brimacombe managed to get the delegates speaking to one another and exchanging experiences, which can be regarded as one of the highlights of the School.

Course Content

Professor Brimacombe started his lectures by discussing the fundamental reactions, such as chemical interactions in liquid steel, resulting from ladle injection or

other ladle-refining techniques, and the thermodynamics and reaction kinetics in ladle, tundish, and mould. His next topic, still under fundamentals, included fluid flow in ladle, tundish, and mould, and heat transfer during solidification.

Showing his expertise also in physical metallurgy, Professor Brimacombe described what happens during solidification, examining the structure, shell growth, segregation, crack formation, and off-squareness in the case of billets. An in-depth discussion followed covering the mechanical properties of steel at elevated temperatures and crack formation. The importance of proper mould design, heat-flux density in moulds, thermal fields, distortion of billet-mould tubes, mould materials (copper versus chromium and nickel-plated coppers), mould fluxes, mould cooling-water quality, and the factors influencing oscillation-mark formation were stressed and discussed at length.

Another topic brilliantly covered with the use of computer modelling was the cooling of slabs and billets using spray cooling and water cooling in the secondary cooling zone of the caster. Spray-related defects were pointed out, and spray design for the quality improvement of billets was described by means of a case study.

Enough time was spent on the effect of oscillation marks on the surface quality of continuously cast slabs to enable all the delegates to grasp this very important factor in full. Segregation phenomena and the improvements obtainable from the use of electromagnetic stirring were covered well by Professor Brimacombe.

Conclusion

The lectures were of an exceptionally high standard and were presented in a most professional manner. The notes are of an equally high standard, being an up-to-date state-of-the-art account, and could serve as a reference manual for many years to come.

The objectives set by the Technical Programme Committee—Metals Technology were achieved. In addition, a forum was created offering opportunities for open discussions of mutual problems and achievements between continuous-caster 'operators'.

Professor Riaan Dippenaar is to be congratulated on his excellent choice of principal lecturer. Bringing Professor Keith Brimacombe to South Africa was well worth the effort, and he should be congratulated on a fine presentation.

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