

Carnegie Mellon

Materials Science and Engineering Seminar Series

Materials Research at Carnegie Mellon

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**“Numerical simulation of initial solidification in
continuous casting”**

Friday, September 15, 2006

11:00 A.M. Seminar in Baker Hall 136A

Refreshments precede seminar at 10:30 A.M. in 2325 Wean Hall

More than 90% of steel is currently cast through continuous casting technology. Even though the first continuous casters were designed more than 50 years ago, they still suffer from imperfections. Notably, the surface of cast products is flawed by grooves resulting from the oscillations of the mold, namely oscillation marks. They certainly originate from initial solidification, but exact mechanisms as well as a means to reduce them are unknown.

While essentially an experimental science at its beginning, the necessity for improved productivity and quality of continuously cast products has required more and more sophisticated means of understanding a multitude of phenomena. However, most of what happens in the mold is hidden from us by harsh conditions. About fifteen years ago, commercial software became powerful enough to simulate the inside of the mold: fluid flow, heat transfer, solidification. However, such software addresses only general needs and is limited in certain situations.

Initial solidification is such a situation. Turbulent fluid flow, free surface, heat transfer with solidification, radiative heat transfer are involved. If the modeling of each of them independently is sometimes challenging, coupling them adds greater difficulties.

This presentation illustrates continuous casting process, oscillation marks, fluid flow in the mold, modeling of heat transfer in the meniscus area, and modeling free surfaces. Results from this model will also be described.

Aymeric is currently a Ph.D. candidate under the guidance of Professor Alan Cramb.