9943 Elimination or Minimization of Oscillation Marks - A Path to Improved Cast Surface Quality

Benefits

- Increased productivity by reducing defects.
- Improved product quality.

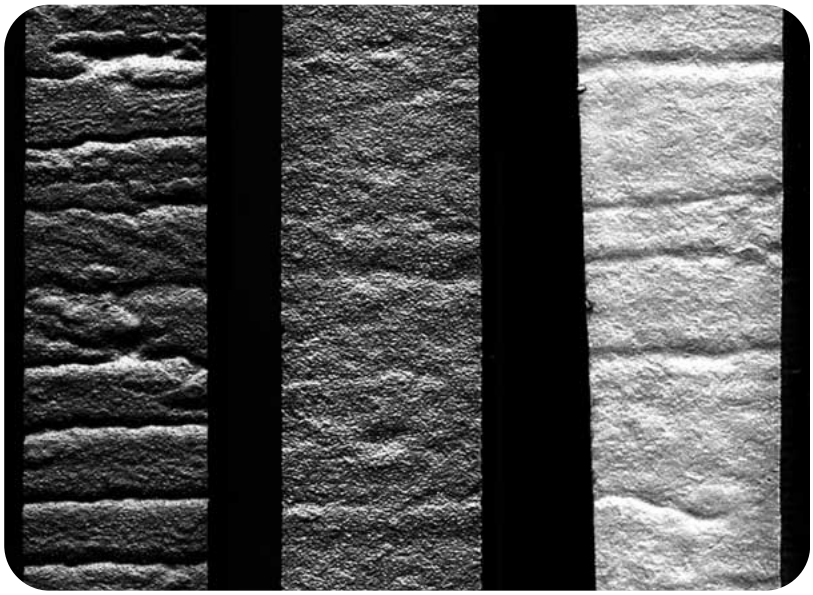
Applications

Continually cast steel products.

Oscillation marks are the most recognizable feature of continuous casting and can be related to subsurface defects that can be found on product rolled from continuous cast slabs. While the physical surface defect of the oscillation marks themselves do not necessarily pose a significant problem in many grades, at this time, many defects have been found to be associated with oscillation marks, especially when the mark can form a hook. Thus the presence of oscillation marks and the related defects found on the surfaces of product rolled from cast slabs leads to the necessity for excessive slab surface treatments, from spot scarfing to complete surface removal, before slabs can be hot rolled.

The successful development of these new practices to eliminate oscillation mark formation has the potential to significantly reduce defects in cast product and increase the productivity and yield of continually cast steels.

Oscillation Marks



Project Goal: To develop strategies that can be used on industrial continuous casters to reduce oscillation mark depth, and, in particular, to minimize the formation of hook type defects that are prevalent on ultra low carbon grades.

Recent work has shown that in low carbon steels, especially in ultra low carbon steels, that the formation mechanism of oscillation mark is to due to increased solidification rate in the meniscus area of the mold due to movement of the meniscus towards the mold wall during the negative strip time of the mold. The work indicates that it is possible to affect meniscus mark formation by either changing the heat transfer rate in the meniscus area of the caster or by changing the position of the liquid steel meniscus, or by affecting both issues. This leads to the potential for some completely novel approaches to either eliminating or minimizing the oscillation marks that are found on cast slab surfaces. Thus this project will focus upon further developing this new understanding of oscillation mark formation with the view to developing new approaches to the operation of a continuous caster that will lead to the elimination or minimization of the defects that are associated with oscillation marks.

Progress and Milestones

- ❖ Project start date: November 2004
- ❖ Complete literature review: June 2005
- ❖ Set up apparatus/study effect of mold surface condition: June 2005
- ❖ Mold material trials: December 2005
- ❖ Complete mold material design: August 2006
- ❖ Initial meniscus modeling: December 2006
- ❖ Develop techniques & guidelines for meniscus control: October 2007
- ❖ Project completion date: December 2007

Total Project Cost $380,500

Duration 36 Months

Research Organization
Carnegie Mellon University
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