Continuous Casting Consortium
Annual Report

University of Illinois, August 14, 2013

USB -Drive - Table of Contents

1. B.G. Thomas: Overview of projects


   Videos:

3. M. Chivan Nailboard Measurements of Surface Flow at Severstal

4. Rui Liu Multiphase Mold Flow Model at Severstal

   Videos:
   04_LIU-R_jet_wobbling_single_phase
   04_LIU-R_DES_DPM

5. R. Singh Effect of Double-Ruler EMBr on Transient Mold Flow with LES
   B.G. Thomas Modeling and Scaling Laws

   Videos:
   05_SINGH-R__Severstal_FC_Mold_0-30_p85sec.wmv
   05_SINGH-R__Severstal_FC-Mold_YZ_surface_with_vectors_half_speed.wmv
   05_SINGH-R__Severstal_No_EMBr_37_5sec.wmv
   05_SINGH-R__Severstal_No_EMBr_Surface_27_37_5sec_no_vectors.wmv

6. S.M. Cho EMBr Effect on Mold Level Fluctuations at Posco
   B.G. Thomas

7. K. Jin Bubble entrapment with Multiphase Flow and EMBr: Model Validation with Measurements at Baosteel

8. ASM Jonayat Thermal-fluid model of Oscillation, Meniscus Heat Transfer and Flux Consumption
9. K. Swartz
   L. Hibbeler
   **Modeling Mold Flux Entrainment**
   
   videos:
   09-SWARTZ-K-Ak_10_Fine_Mesh.avi
   09-SWARTZ-K-Entrainment_Coarse.avi
   09-SWARTZ-K-Transient_Test_Problem_Animation.avi

10A. P. Duvvuri
10B. Spray Cooling Optimization

11. B. Petrus
   **Dynamic Thermal Behavior with CONOFFLINE**
   
   videos:
   11_PETRUS-B_Slice_temperature_moving_through_caster
   11_PETRUS-B_Speed_change_in_conventional_slab_caster

12A. L. Hibbeler
12B. L. Hibbeler
   **Modeling and On-Line Measurement of Narrow Face Mold Taper**
   **Stress Analysis of Dendritic Microstructure During Solidification**
   
   videos:
   12A_HIBBELEN_MoldFill
   12B_HIBBELEN_Eulerian_Dendrites

13. A. Murali
   **Improvements to Equilibrium Model of Precipitate Formation**

14. M. Zappulla
   **Equilibrium Precipitate Model Graphical User Interface – EQPrecip 1.1**

15. K. Xu
   **Heat Transfer, Bulging, and Machine Taper Modeling**

16. Y. Li
   **Modeling SEN Preheating with Fluent and GASEQ**

17. B.G. Thomas
   **CCC 2013 USB Table of Contents and List of Reports**
EQPrecip 1.1 (CCC Precipitation Model – Equilibrium)
(K. Xu and A. Murali program; M. Zappulla GUI)

Windows 32 and Windows 64 versions of:

1. Readme.txt
2. MCR Installer.exe
3. readme
4. SampleInput.txt
5. Xu Kun Equilibrium Precipitate Model Paper

2013 CCC Reports

Mold Flow with EMBr

**High Fidelity Numerical Investigations of Tailored Magnetic Fields for Defect Reduction in Continuous Casting of Steel**
Ramnik Singh

**Large Eddy Simulations of Effect of Double-Ruler Electro-magnetic Field on Transient Flow during Continuous Casting**
R. Singh, B.G. Thomas and S.P. Vanka
CCC Report 201302

**Transient Fluid Flow During Steady Continuous Casting of Steel Slabs Part I: Measurements and Modeling of Two-phase Flow**
Seong-Mook Cho, Seon-Hyo Kim, Brian G. Thomas, and Yong-Jin Kim
CCC Report 201303

**Transient Fluid Flow During Steady Continuous Casting of Steel Slabs Part II: Effect of Double-Ruler Electromagnetic Braking (EMBr)**
Seong-Mook Cho, Seon-Hyo Kim, Brian G. Thomas, and Yong-Jin Kim
CCC Report 201304

**Effects of a Magnetic Field on Turbulent Flow in the Mold Region of a Steel Caster**
Singh, R., B.G. Thomas, and P. Vanka
Effect of Electromagnetic Braking (EMBr) on Turbulent Flow in Continuous Casting (reprint)
Singh, R., B.G. Thomas, and S.P. Vanka

Flow Control with Ruler Electromagnetic Braking (EMBr) in Continuous Casting of Steel Slabs
Thomas, Brian G., Ramnik Singh, Rajneesh Chaudhary, and Pratap Vanka
Fifth Baosteel Biennial Academic Conference (BAC2013), Shanghai, PRC, June 4-6, 2013.

Mold Flow Phenomena (other)

Mold Slag Entrainment Mechanisms in Continuous Casting Molds (reprint)
Hibbeler, L.C., and Brian G. Thomas

Slidegate Dithering Effects on Transient Flow and Mold Level Fluctuations (reprint)
Liu, Rui, Brian G. Thomas, Love Kalra, Tathagata Bhattacharya, and Aloka Dasgupta,

Transport and Entrapment of Particles in Steel Continuous Casting (reprint)
Thomas, B.G., Q. Yuan, S. Mahmood, R. Liu, and R. Chaudhary
Metallurgical and Materials Transactions B, in press.

Mold Slag Properties

Computational Modeling of Temperature, Flow and Crystallization of Mold Slag during Double-Hot-Thermocouple-Technique Experiments
Zhou, L., W. Wang, R. Liu, and B. G. Thomas

Kinetic Study of the Devitrification of Mold Powder Slags (reprint)
Maldonado, Yadira G., F. Andrés Acosta, A. Humberto Castillejos and Brian G. Thomas
Fundamental Computational Modeling

Measuring Heat Transfer During Spray Cooling Using Controlled Induction Heating Experiments and Computational Models (Reprint)
Zhou, Xiaoxu, B. G. Thomas, C. Alberto Hernández B., A. Humberto Castillejos E. and F. Andrés Acosta G.

Calibration of Thermal Models of Steel Continuous Casting Molds (reprint)

Particle Transport in a Turbulent Square Duct Flow with an Imposed Magnetic Field
Liu, R., Surya P. Vanka, and Brian G. Thomas

Multiphysics Simulation of Metal Solidification Processes with Abaqus
Koric, Seid, Brian G. Thomas, and Lance Hibbeler