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# Progress Report FY04 Quarter 1

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## **Development of a Rolling Process Design Tool for Use in Improving Hot Roll Slab Recovery**

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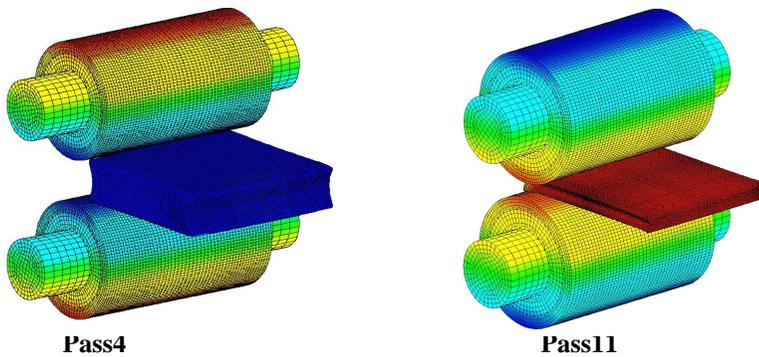
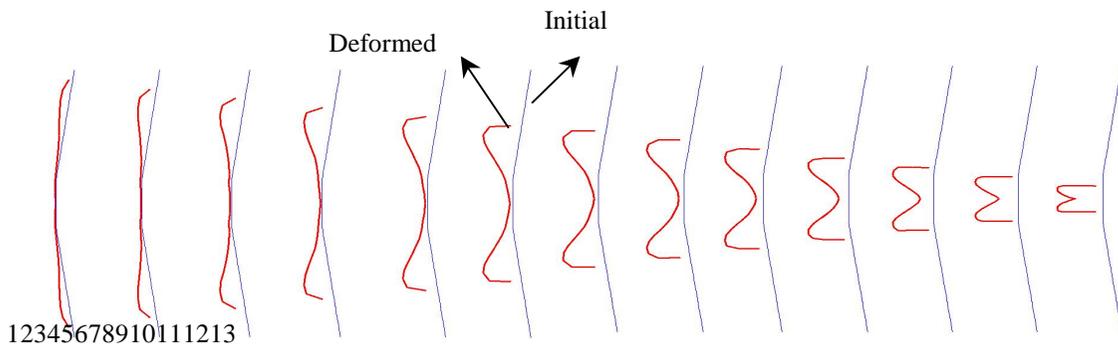
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## **Quarterly Report: Q1FY04**

### **LLNL Input**

In this quarter, a simulation has been carried out to validate the FEM model for a production facility mill configuration, focusing on the shape change evolution of the slab. Results of ingot shape evolution for a 13 pass rolling simulation are given in Figure 1. It was observed that the rollover of the slab is strongly dependent on friction. More studies on friction laws may be necessary for more accurate prediction. Another important feature is the mesh dependence of the result. More frequent remeshing may be necessary to be able to capture the deformation behavior more accurately. These issues are recurrently being investigated.

Also, we expect that ATC will provide the refined fracture model to LLNL shortly. Once available, appropriate modifications will be made in the FEM subroutines, and the validation process for slab fracture will continue.



**FIGURE 1.** Simulation result of slab side profile evolution upto 13<sup>th</sup> pass .

## Alcoa Input

Protected CRADA Information

Quarterly Report – Alcoa Contract 74518, Development of A Rolling Process Design Tool  
From October 1, 2003 to December 31, 2003

- An advanced fracture limit diagram which incorporates both tension and torsion fracture data at high/medium/low strain rates has been formulated and implemented in a 2D FEM model for testing the validity of fracture predictions – Alcoa proprietary information
- Slab edge profiles obtained from lab mill experiments were sent to LLNL team for the validation of 3D rolling simulations – Alcoa proprietary information.
- A typical ingot profile obtained from Alcoa plants was sent to LLNL team as an input to ALE 3D for the prediction of edge profile evolution – Alcoa proprietary information

Note:

1. Alcoa proprietary data means the data was developed by Alcoa before this CRADA activity started
2. Protected CRADA information means Alcoa data was produced in performance of this CRADA project. This data cannot be released for 5 years

3. All data generated by LLNL under this CRADA project is restricted under the rules governed by "Protected CRADA Data"

Work performed under the auspices of the U.S. Department of Energy by University of California Livermore National Laboratory under contract number W-7405-ENG-48 Lawrence

**U.S. Department of Energy**  
**Milestone Log**

**Development of a Rolling Process Design Tool for Use in Improving Hot Roll Slab Recovery**

Identification Number	Description	Planned Completion Date	Actual Completion Date
1.	Constitutive model defined: PQ3	3/02	3/02
2.	Fracture model defined: PQ5	9/02	9/02
3.	Friction model defined: PQ3	3/02	3/02
4.	Finite element model constructed: PQ4	6/02	6/02
5.	Rolling data produced: PQ6	12/02	12/02
6.	Initial code validation studies completed: PQ8	6/03	6/03
7.	Validate models in a production configuration: PQ10	12/03	12/03
8.	Complete parameter study: PQ12	6/04	

**U.S. DEPARTMENT OF ENERGY  
 FEDERAL ASSISTANCE PROGRAM/PROJECT STATUS REPORT**

**OMB Burden Disclosure Statement**

Public reporting burden for this collection of information is estimated to average 47.5 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Office of Information Resources Management Policy, Plans, and Oversight, Records Management Division, HR -422 -GTN, Paperwork Reduction Project (1910 -0400), U.S. Department of Energy, 1000 Independence Avenue, S.W., Washington, DC 20585; and to the Office of Management and Budget (OMB), Paperwork Reduction Project (1910 -0400), Washington, DC 20503.

1. Program/Project Identification No.	2. Program/Project Title <b>Development of a Rolling Process Design Tool for Use in Improving Hot Roll Slab Recovery</b>	3. Reporting Period 10/01/03 through 12/31/03
4. Name and Address PI: Richard Couch; Lawrence Livermore National Laboratory; Livermore, CA 94550-99; P.O. Box 808; Livermore, CA 94550		5. Program/Project Start Date 06/01/01
		6. Completion Date 05/31/04

7. Approach Changes

None

8. Performance Variances, Accomplishments, or Problems

None

9. Open Items

None

10. Status Assessment and Forecast

No Deviation from Plan is Expected

11. Description of Attachments

None

12. Signature of Recipient and Date

13. Signature of U.S. Department of Energy (DOE) Reviewing Representative and Date