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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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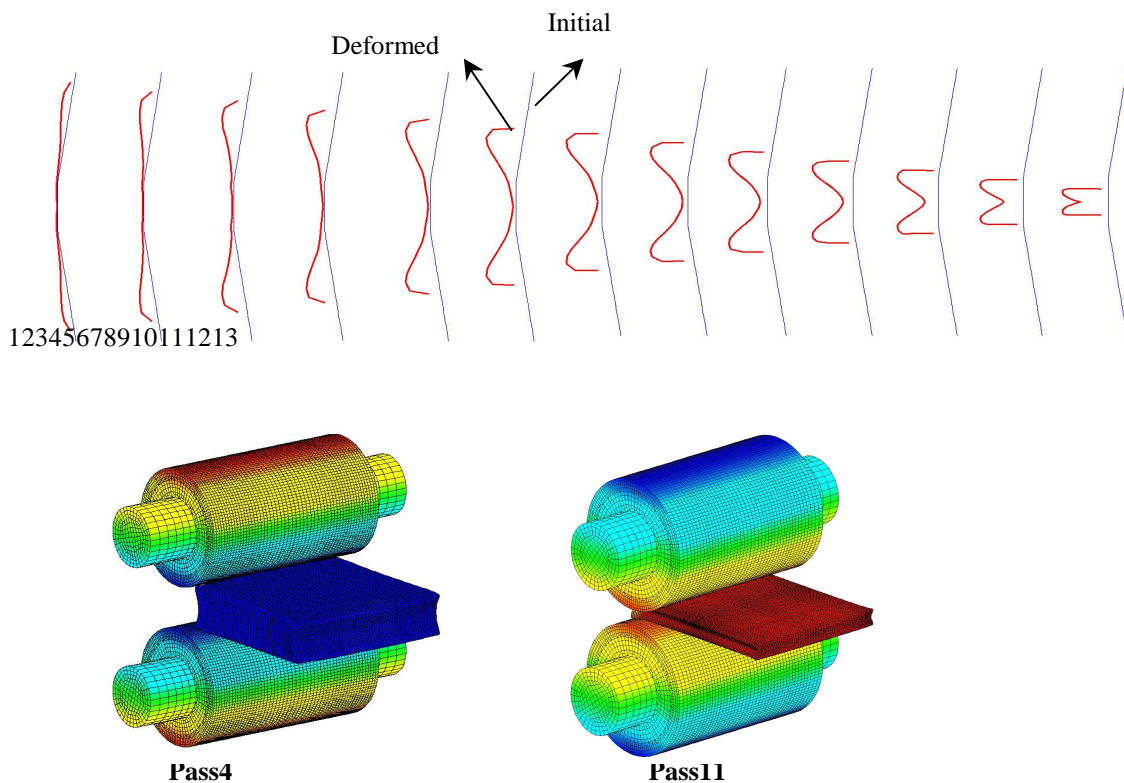
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## **Quarterly Report: Q1 FY04**

### **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 currently 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.



**FIGURE1.** Simulation result of slab side profile evolution upto 13<sup>th</sup> pass .

## AlcoaInput

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 ALE3D 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"

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**U.S.DepartmentofEnergy**  
**MilestoneLog**

**DevelopmentofaRollingProcessDesignToolforUseinImprovingHotRollSlabRecovery**

IdentificationNumber	Description	PlannedComple tion Date	ActualCompletionDate
1.	Constitutivemodeldefined: PQ3	3/02	3/02
2.	Fracturemodeldefined:PQ5	9/02	9/02
3.	Frictionmodeldefined:PQ3	3/02	3/02
4.	Finiteelementmodel constructed:PQ4	6/02	6/02
5.	Rollingdataproduced:PQ6	12/02	12/02
6.	Initialcodevalidationstudies completed:PQ8	6/03	6/03
7.	Validatemodelsina productionconfiguration: PQ10	12/03	12/03
8.	Completeparameterstudy: 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.

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4. Name and Address PI: Richard Couch; Lawrence Livermore National Laboratory; Livermore, CA 94550-99; P.O. Box 808; Livermore, CA 94550-99		5. Program/Project Start Date 06/01/01
		6. Completion Date 05/31/04
7. Approach Changes  <input checked="" type="checkbox"/> None		
8. Performance Variances, Accomplishments, or Problems  <input checked="" type="checkbox"/> None		
9. Open Items  <input checked="" type="checkbox"/> None		
10. Status Assessment and Forecast  <input checked="" type="checkbox"/> No Deviation from Plan is Expected		
11. Description of Attachments		

<div><input checked="" type="checkbox"/> None</div>	
12. Signature of Recipient and Date	13. Signature of U.S. Department of Energy (DOE) Reviewing Representative and Date