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# **Development of a Rolling Process Design Tool for use in Improving Hot Roll Slab Recovery Quarterly Report: Q1 FY03**

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

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### **Quarterly Report: Q1 FY03**

#### **LLNL Input**

In this quarter, further analysis was done to investigate the difficulty in predicting fracture at the slab ends. The stress concentration created by the notch geometry at the slab ends can accelerate damage and promote fracture at the relatively low strain rates that exist when the notch region is not directly in the roll bite. However, the phenomenological fracture model provided by Alcoa Technical Center (ATC) was calibrated for strain rates characteristic of the rolling process zone and hydrostatic stress states less severe than the leading edge notch. Additional experiments are being performed at ATC to extend the model's range to include the low strain rate, high triaxiality condition.

A bug in the parallel code that caused an inconsistent temperature distribution at the slab surface has been identified and corrected. Currently, more simulations are being performed to validate the model.

## **Alcoa Input**

### Protected CRADA Information

Quarterly Report – Alcoa Contract 74518, Development of A rolling Process Design Tool

From October 1, 2002 to December 31, 2002

- Lab rolling experiments of an Alcoa alloy going through distinct fracture conditions have been completed by Alcoa personnel IN 4q, 2002.

- Data collected from this set of rolling experiments, including in-situ thermal data, 3D shape profiles under various rolling passes, and fracture responses will be shared with LLNL personnel to verify 3D numerical results.

- 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 can not 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"

**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	
7.	Validate models in a production configuration: PQ10	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 10/01/02 through 12/31/02
4. Name and Address PI: Richard Couch; Lawrence Livermore National Laboratory; L-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  <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  <input checked="" type="checkbox"/> None		
12. Signature of Recipient and Date	13. Signature of U.S. Department of Energy (DOE) Reviewing Representative and Date	