

**SHORT COURSE
ON
CLOSED DIE HOT FORGING WITH FLASH
FUNDAMENTALS AND APPLICATIONS**

August 2002

The attendees will receive 1) a Workshop booklet that contains all the slides used in the class, and 2) a CD that contains figures, text and animations that will be used in the class.

COURSE CONTENT

1. Introduction/Content

2. Forging Processes

- Types of Forging Processes

3. Forging Process as a System

- Process & Equipment Variables in Forging

4. Properties of the Billet Materials

- Forgeability
- Plastic Deformation
- Flow Stress
 - Appendix A – Flow Stress at Room Temperature
 - Appendix B – Damage Factor
 - Appendix C – Flow Stress at Forging Temperatures

5. Friction, Lubrication and Wear

- Forging as a System
- Friction & Lubrication
- Parameters that Influence Friction
- Surface Finish
- Lubrication
- Characteristics of Lubricants/ Coefficient of Friction
- Die Wear
 - Appendix A – Ring Compression Test

6. Temperature and Heat Transfer

- Heat Generation & Heat Transfer in Metal Forming Processes

7. Forging Equipment

- Principles of Forging Machines
- Classification & Characteristics of Forging Machines
- Presses & Hammers for Cold & Hot Forging

Engineering Research Center for Net Shape Manufacturing
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8. Special Forging Processes

- Upsetting
- Reducer Rolling
- Ring Rolling
- Radial Rolling

9. Forging Load and Stresses

- Load & Energy Requirements in Bulk Forming
- Plane Strain & Axisymmetric Deformation
- Upsetting of a Cylinder
- Closed Die Forging with Flash
- Empirical Methods for Prediction of Forging Pressures
- Variables Affecting Forging Load & Energy
 - Appendix A – Upset Forging of Cylinders

10. Metal Flow and Die Design

- Introduction to Preform Design
- Shape Complexity in Forging
- Guidelines for Preform Design
- Flash Design in Closed Die Forging
 - Appendix A – Preform Design in Closed Die Forging
 - Appendix B – Flash Design in Closed Die Forging
 - Appendix C – FORGEPAL – A computer program to calculate forces in hot forging.

11. Process Monitoring and Control

- Introduction
- Process Monitoring & Control of Forging Presses
- Machine Process Monitoring & Control

12. Summary & Outlook

Scroll Down for Course Fees and a List of Past Events organized by ERC/NSM

COURSE FEES

A. When the course is given at a hotel or university, or in cooperation with a conference:

Per person: \$ 495.00 – includes a booklet that contains black & white copies of the slides used.
Optional: \$ 50.00 – per copy of a CD (that contains the power point slides, animations and other forging modules).

B. When the course is given at a company location:

Per person: \$ 450.00 – includes a booklet that contains black & white copies of the slides used and one copy of a CD (that contains the power point slides, animations and other forging modules). Minimum of 8 people (or \$3600) plus travel expenses for the instructor.

C. The course is provided on a CD only:

It is possible to purchase this course, together with appropriate modules, on CD (that contains the power point slides, animations and other forging modules). The cost will be \$450 per CD + \$15 shipping and handling.

For further information please contact ERC/NSM Office:

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PAST EVENTS

36th International Cold Forging Group Plenary Meeting, August 31-September 2, 2003, Columbus, Ohio

International Cold Forging Conference & Short Course, September 2-4, 2003, Columbus, Ohio

Forging Technology Solutions Conference and Short Course on Precision Hot and Cold Forging, Sponsored by SME and ERC/NSM October 1-3, 2001, Columbus, Ohio

The 6th International Precision Forging Technology Conference / Short Course on Warm and Cold Forging, Sponsored by: SME and ERC/NSM November 9, 2000, Columbus, Ohio

The 5th International Precision Forging Technology Conference and Exhibits, Sponsored by: ERC/NSM and SME October 4-6, 1999, Detroit, Michigan

The 4th International Precision Forging Technology Conference and Exhibits, Sponsored by: ERC/NSM and SME October 12-14, 1998, Columbus, Ohio

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Engineering Research Center for Net Shape Manufacturing The Ohio State University

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The 3rd International Cold & Warm Forging Technology Conference, Sponsored by ERC/NSM and SME October 7-9, 1996, Columbus, Ohio

The 2nd International Cold & Warm Forging Technology Conference and Exhibits, Sponsored by: ERC/NSM and SME September 27-29, 1994, Columbus, Ohio

The 1st International Cold & Warm Forging Technology Conference, Sponsored by ERC/NSM and SME October 26-28, 1992, Columbus, Ohio

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