SHORT COURSE
ON
NEAR NET SHAPE COLD, WARM AND HOT FORGING WITHOUT 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/ Forging Processes
   • Introduction
   • Types of Forging Processes

2. Forging Process as a System
   • Process & Equipment Variables in Forging

3. Properties of the Billet Materials
   • Forgeability
   • Plastic Deformation
   • Flow Stress
     • Appendix A – Determination of Flow Stress at Room Temperature
     • Appendix B – Determination of the Damage Factor
     • Appendix C – Tensile Test

4. Friction and Lubrication
   • 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
     • Appendix B – Double Cup Extrusion Test
5. Precision Cold and Warm Forging
- Precision Cold Forging
- Precision Warm Forging
- Competing Processes
- Auxiliary Equipment in Forging
- Multiple Action Tooling
- Precision Forming Applications
- Example Simulations
  - Appendix A – Upset Forging of Cylinders
  - Appendix B – Cold Extrusion: Part I – Forward Extrusion
  - Appendix C – Cold Extrusion: Part II – Backward Extrusion

7. Design Guidelines for Cold and Warm Extrusion
- Applications for Cold Forging
- Forming Sequence Design
- Advantages & Limitations of Cold Forging
- Materials used in Cold Forging
- Defects in Cold Forging
- Case Studies

8. Examples of Cold/ Warm Forging Sequences

9. Die Failure
- Modes of Die Failure
- Die Failure in Hot & Cold Forging
- Predictive Models for Die Wear Prediction
- Surface Engineering Techniques

10. Forging Equipment
- Principles of Forging Machines
- Classification & Characteristics of Forging Machines
- Presses & Hammers for Cold & Hot Forging
  - Appendix A – Forging Equipment

11. Process Monitoring and Equipment
- Introduction
- Process Monitoring & Control of Forging Presses
- Machine Process Monitoring & Control

12. Forging of Aluminum Alloys

13. 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
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