SUPPORTING INDUSTRIES

Project Fact Sheet

Innovative Die Material and Lubrication Strategies for Forging Technology

Benefits

- Increased die life eight (8) times
- Reduced energy (electricity and natural gas) input by 90%, and energy cost per piece by 50%
- Reduced particulate emissions from lubricants by 90%
- Increased die-related uptime to 90% and die-related downtime to 50%
- Creation of wear and failure data to determine preventive maintenance and repair schedules
- Targeted quality improvements of 25 parts per million rejection rates

Applications

The forging technology could be applied to the following industries to improve energy efficiency and provide environmental gains: the Aluminum Industry (forging, extrusion, other metal working); the Metal Casting Industry (interaction and lubrication between aluminum and H-13 die steel); and the Steel Industry (new tool steel grades).

Innovative die materials and ultra hard surface coatings that will increase die life and reduce energy input, die-related uptime and downtime and particulate emissions from lubricants

In forging operations, reduction of scrap, use of environmentally friendly lubricants and reduction of energy utilization (often related to equipment uptime) are the frequent goals of the forging plant engineers or plant managers. This project aims to develop and implement innovative die material and surface coating strategies, such as composite dies and self-lubricating coatings, that will meet these energy, environmental and cost reduction goals and, in addition, improve the quality of the forged parts to prevent their rejection. A fully equipped forging cell is being established at the Ohio State University (OSU). This cell will be the first of its kind in the U.S. which the project partners will use to carry out the research on industrial-sized equipment.

Innovative Die Material and Lubrication Strategies for Clean and Energy Conserving Forging Technologies

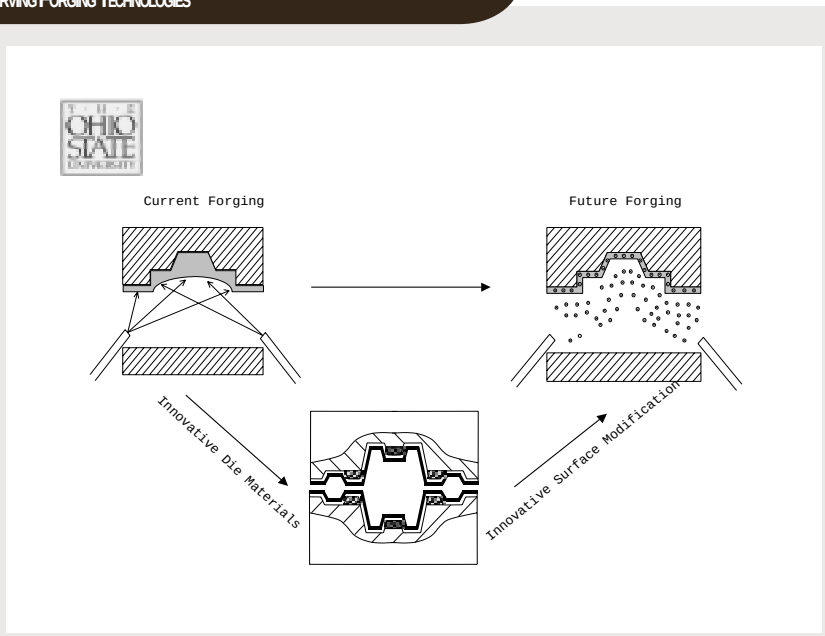

Illustration of the future of forging with innovative die materials.

Project Description

Goal: The objectives of this research are to develop and implement innovative die material and surface coating strategies that will help forging plants to reduce their scrap and energy utilization (often related to equipment uptime), and to develop environmentally friendly lubricants and processes to improve the quality of the forged parts produced.

This project is synergistic to the North American Die Casting Association program on coating and surface technology to eliminate soldering and reduce heat checking; the U.S. Department of Energy-Information Technolgoy (DOE-IT) and Small Business Innovation Research (SBIR) programs on coating-substrate systems; and the National Science Foundation-Engineering Research Center for Net Shape Manufacturing (NSF-ERC/NSM) program for redesigning the extrusion-forging process for automotive valves and investigating the innovative die material SiAION.

Progress and Milestones

- Project start date, July 2001
- Project end date, June 2005.
- Year 1: Design, fabrication and qualification testing of a fully instrumented forging press test cell. Researchers will develop an experimental plan for testing lubrication under different forging regimes.
- Year 2: Conducting benchmarking experiments (ring tests, spike forging tests, backward extrusion tests) on industry standard lubricants and die materials; and experiments on innovative die materials and lubricants to determine energy, environmental and economic envelop of these new materials. Incorporating experimental observations into a knowledge base for industrial use.

PROJECT PARTNERS

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