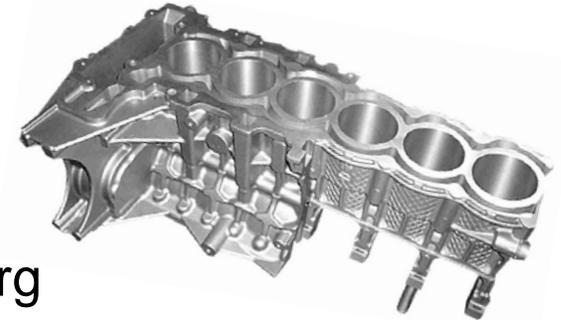


Magnesium Research and Technology Development

Project 48976

Peer Review Presentation
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“This presentation does not contain any proprietary or confidential information”

Magnesium Research and Technology Development - Outline

Purpose of Work

Previous Review Comments – N/A

Approach

Barriers

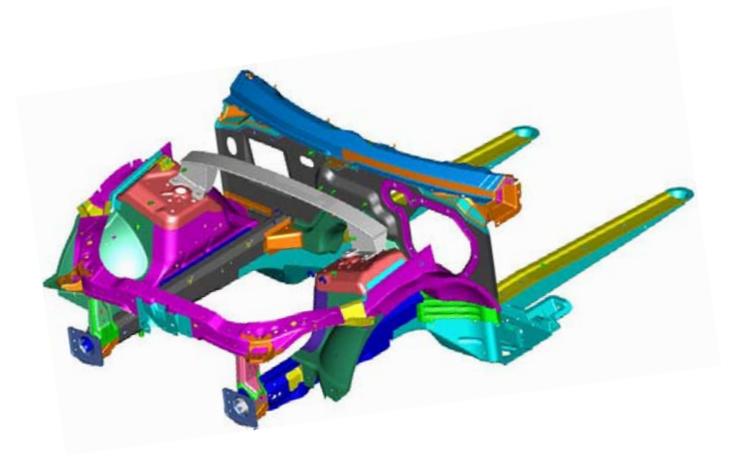
Performance Measures & Accomplishments

Technology Transfer

Publications /Patents

Plans for Next Fiscal Year

Summary



Purpose of Work

OVERALL: Increase the U.S. automotive industry's awareness of and familiarity with magnesium as a viable option for lightweight automotive applications.

1. On behalf of the D.O.E., coordinate the USAMP's Magnesium Front End Research & Development (MFERD) project in collaboration with China and Canada.
2. Compile, document and evaluate state-of-the-art R&D in magnesium (Mg) research around the world as a resource to best determine where U.S. government resources should be directed.
3. Advise DOE on critical/key funding areas for Mg

Approach

- ▶ Increase automotive industry awareness in the use of Mg
 - Develop and maintain the Magnesium R&D Bibliographic Database located at www.magnesium.pnl.gov
 - Vice-Chair the TMS Mg Light Metal Committee.
 - Co-chair and edit the 2008 TMS Mg Symposium and Proceedings.
- ▶ As the U.S. Project Technical Committee (PTC) Chairman for the MFERD project
 - Advise the U.S. Project Steering Committee member (Dr. Carpenter) of on-going activities by the PTC and project tasks.
 - Assist in the coordination of U.S. MFERD task results, project meetings and international three-country meetings.
 - Evaluate proposals and oversee the effectiveness of the nine tasks of the MFERD project.
- ▶ Conduct and report on the gaps in international research related to Mg R&D.

Specific Approach Related to the MFERD Project (AMD-604)

This first-of-its-kind international cooperative project combines the best minds in science and technology of magnesium from Canada, China and the U.S.



- ▶ The Project Steering Committee (PSC) is the highest level of the project where government funding decisions are made. The PSC is comprised of a representative from Canada's Natural Resources Canada, China's Ministry of Science and Technology, and the U.S. Department of Energy.
- ▶ The Project Technical Committee (PTC) is the management level and is comprised of a representative from Canada's CANMET Natl. Lab, China's Magnesium Center and the U.S. PNNL. The PTC also has a representative from USAMP. The PTC is responsible for overseeing and reporting overall progress to the PSC. The PTC is also responsible for overall coordination of annual meetings when held in their respective country.
- ▶ The 9 Tasks have a task leader from each country. The Task Leaders are responsible for ensuring the work committed to under their task is completed thoroughly, on scope and within budget.

Barriers

- ▶ Absence of U.S. automotive materials engineers familiar with magnesium as a structural material compared to materials like aluminum and steel. These knowledge-based limitations specifically impact the design and application in the MFERD project such as:
 - Crashworthiness of predominantly cast Mg structures
 - Durability of Mg structures in fatigue, overload and corrosion
 - Performance characteristics of Mg-intensive structures
 - (e.g. NVH, structural modes, stiffness)

- ▶ Absence of a substantial magnesium production and processing industry within the U.S. capable of supporting the envisioned design and manufacturing initiatives.

- ▶ Technology-based limitations:
 - Defect-free, high-strength, weldable castings
 - Limited formability of Mg sheet and extrusions (hcp metal)
 - Mg joining technologies not developed for automotive structures
 - Low-cost corrosion protection; environmentally-assisted fracture

- ▶ International language barriers cause delays in communications and can impact interpretation or meaning of technical results.

Performance Measures and Accomplishments

(MFERD)

E. Nyberg, the U.S. Project Technical Committee (PTC) Chairman for this three country project, performed the following activities:

- ▶ Organized and coordinated all aspects of the first annual MFERD PSC/PTC and Task Leaders' review meeting (Orlando, FL – March '07).
- ▶ Coordinated and reviewed progress by the 9 U.S. Task Leaders.
- ▶ Used quarterly international conference calls with the PTC members from China and Canada to status U.S. project results.
- ▶ Co-wrote the U.S. and International semi- and Annual Reports to DOE
- ▶ Co-authored a paper by the PTC members presented at the TMS annual meeting in (March '07).

E. Nyberg also contributed the following non-MFERD activities:

- ▶ Presented the opening plenary talk on Mg Research in N. America at the 2006 International Conference on Magnesium and Its Alloys in Dresden, Germany (Nov. '06).
- ▶ Developed a publicly available database/bibliography on Mg research.
- ▶ Co-authored a proposal for a North American Network of Mg Research.

Technology Transfer

- ▶ MFERD SharePoint™ website developed at PNNL was transferred to operations at Mississippi State University's Center for Advanced Vehicle Systems (CAVS).
 - Transfer necessary to non-DOE facility to enable Foreign Nationals to access applicable project specific information.
 - No Intellectual Property or Proprietary Information was involved with the transfer or located on the website.
- ▶ Knowledge Sharing and Transfer –
 - Annual Task Leaders Mtg., Orlando, FL (March 2007)
 - U.S. Annual Project Review Meeting, Dearborn, MI (Dec 07) including live and telecom participation by Canadian and Chinese project Task Leaders.
- ▶ Mg R&D Bibliographic Database developed and available for public access at www.magnesium.pnl.gov

Publications / Patents

1. A. Luo, E. Nyberg, K. Sadayappan and W. Shi, “*Magnesium Front End Research & Development - A Canada-China-USA Collaborative Project*”, TMS Annual Meeting, Orlando, FL, USA, February 25 – March 1, 2007.
2. Presented the opening plenary talk entitled, “*Automotive Mg Research and Development in N. America*,” at the 7th Intl. Conference on Magnesium Alloys and Their Applications in Dresden, Germany, November 2006
3. E. Nyberg, “*Magnesium Research and Technology Development (FY 2007 Annual Report)*”, PNNL-16597, Pacific Northwest National Laboratory, Richland, WA [Unpublished report submitted to DOE].
4. Magnesium R&D Bibliographic Database www.magnesium.pnl.gov

Plans for Next Fiscal Year (FY08)

- ▶ Lead the MFERD Project Technical Committee including organization and minutes of quarterly PTC meetings/conference calls, report to the US PSC representative on progress.
- ▶ MFERD international review mtg. in Hangzhou, PRC (April '08)
- ▶ Oversee the ongoing work of MFERD Project Tasks in accordance with work plans and objectives.
- ▶ Completion of MFERD Annual report (incl. coordination of English to Chinese translation of Task Leaders' reports).
- ▶ MFERD U.S. Team review (Oct. '08).
- ▶ Issue final report to DOE on Mg Technology Gap analysis.
- ▶ Vice-Chair TMS Lightweight Metals Committee on Magnesium ('07/08) and Chair Committee next year ('08/09).
- ▶ Lead 2009 TMS Annual Symposium on Magnesium Technology including editor of the Mg Technology Proceedings
- ▶ Maintain the Mg R&D Database at www.magnesium.pnl.gov

Summary

MFERD Related:

- ▶ There is a large opportunity for magnesium structural sub-assemblies to effect vehicle weight reduction and improve fuel economy at reasonable cost, provided a number of fundamental technical barriers are overcome.
- ▶ A strong international collaboration of Mg researchers and technologists has been organized and launched with technical objectives and targets agreed to by the participants.
- ▶ Country and Task area work began in CY 2007 and initial results of Task teams are beginning to emerge in FY08.

Other non-MFERD Related:

- ▶ Proposal to DOE on investment in future in a N. American Magnesium Research Network (together with ORNL and CANMET) and related magnesium projects.
- ▶ National activities centered on increasing awareness on the use of magnesium as a lightweight automotive structural material.