Polyurethane Foam Mock Engine Blocks

Federal Manufacturing & Technologies

G. R. Lenox

KCP-613-5965

Published May 1997

Final Report/Project Accomplishments Summary
CRADA Number 95-KCP-1020

Approved for public release; distribution is unlimited.

Prepared Under Contract Number DE-AC04-76-DP00613 for the United States Department of Energy

AlliedSignal AEROSPACE

MASTER
DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade names, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Printed in the United States of America.

This report has been reproduced from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, Tennessee 37831; prices available from (615) 576-8401, FTS 626-8401.


AlliedSignal Inc.
Federal Manufacturing & Technologies
P. O. Box 419159
Kansas City, Missouri 64141-6159
POLYURETHANE FOAM MOCK ENGINE BLOCKS

G. R. Lenox

Published May 1997

Final Report/Project Accomplishments Summary
CRADA Number 95-KCP-1020
DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.
Polyurethane Foam Mock Engine Blocks
Project Accomplishments Summary
CRADA Number 95-KCP-1020

Date: 5/7/97 Revision: 0

A. Parties
The project is a relationship between

AlliedSignal FM&T
2000 E 95th Street
PO Box 419159
Kansas City, MO 64141-6159

P-Ayr Products
19641 Santa Fe Trail
Leavenworth, KS 66048

B. Background
P-Ayr Products designs and manufactures polyurethane foam castings of automotive engines and hardware. P-Ayr Products identified a market need for lightweight “mock engines.” The “mock engines” can be used in automotive displays and fit checks where an actual engine would result in greater cost investment or safety risk from the weight. P-Ayr has successfully marketed “mock engines” for automotive displays, amusement rides, racing teams, automotive repair shops, and motion picture studios. The “mock engines” come complete with all of the threaded holes of an actual engine so that the “mock engines” can be accessorized as a real engine. P-Ayr Products was experiencing inconsistency in their ability to produce acceptable product. The company's lack of experience in polyurethane foam formulation and subsequent processing was keeping the product line from reaching its full potential.

AlliedSignal's expertise in polyurethane foam formulating and foam processing was teamed with P-Ayr Products' expertise in tooling design and manufacturing to create an optimum foam system formulation and processing which will enhance the consistency of P-Ayr Products' “mock engines.” AlliedSignal (the Department of Energy's Kansas City Plant - KCP) gained enhanced knowledge of commercial foam systems and enhanced ability to modify the foam systems for specific applications.

C. Description
The objective of this CRADA was to develop a foam system and foam processing which would consistently produce acceptable product. To this end, P-Ayr Products supplied KCP with samples of the foam system they were currently using. KCP performed chemical and physical testing of the foam system to baseline the material. Testing performed included water content, resin hydroxyl number, catalyst level, and stoichiometric relationship. Foam systems with low hydroxyl numbers yield tougher products at low densities. Next, KCP
and P-Ayr Products worked together to determine the shell volume of the mold, the density range of acceptable product, and packing factor for the foam material. Characterization of volume, density, and packing factors were important as polyurethane foam properties change with changes in part density. KCP and P-Ayr Products determined the requirements that the new foam system must meet. KCP determined low hydroxyl candidate materials. KCP determined strength properties of the candidate materials. P-Ayr and KCP chose three material blends, and KCP molded prototypes from each blend in molds supplied by P-Ayr Products. The KCP and P-Ayr Products analyzed the resulting products, and P-Ayr Products chose the formulation they thought was superior. The KCP wrote a material specification and delivered it to P-Ayr Products.

D. Expected Economic Impact
P-Ayr Products received a polyurethane foam formulation which should greatly enhance their ability to consistently produce “mock-engines.” Processing recommendations made by KCP personnel which were immediately employed by P-Ayr Products also increased production yields. Examples of those recommendations were a change in mold releases and in-mold cure time. The increased yields aided P-Ayr Products in meeting tight production schedules, which delighted their customers. The resulting increased product yields and efficiency should maintain P-Ayr Products as the market leader in the supply of ultra lightweight engine replicas. Since this is an international market, US competitiveness should also be increased.

E. Benefits to DOE
This CRADA provided KCP the opportunity to work with low hydroxyl number polyurethane foams that it would not otherwise have the impetus to work on. Products made from polyurethane systems with high hydroxyl numbers are characterized by their high strength and their resistance to high temperatures. Weapon system parts require the resistance to high temperatures. However, with the high strength, the high hydroxyl systems produce parts that are quite rigid and prone to being brittle. The low hydroxyl number systems produce products that are tougher and less brittle. Results obtained from working with these types of foams will be applied to future work in the areas of storage and transport containers made from low hydroxyl foam systems. Containers of this type will provide better protection to delicate weapons assemblies during transport and storage.

F. Industry Area
Industries benefiting from this project include the automotive aftermarket parts industries and the automotive repair industry.

G. Project Status
This project was completed in October 1996 with the delivery of the product specification to P-Ayr Products.
H. Point of Contact for Project Information
Ken Bauer
US Department of Energy
Kansas City Area Office
PO Box 410202
Kansas City, MO 64141-0202
Telephone: (816) 997-3418
Fax: (816) 997-5059

Guy R. Lenox
AlliedSignal FM&T
PO Box 419159
Kansas City, MO 64141-6159
Telephone: (816) 997-3418
Fax: (816) 997-7068

I. Company Size and Point of Contact
P-Ayr Products is a company employing approximately 7 persons and has an estimated annual sales of $200,000 dollars.
Dean Ayres - President
Phone: (913) 651-5543

J. Project Examples
AlliedSignal has no tangible items to be used in a demonstration.

K. Technology Commercialization
Besides the establishment of a new material into P-Ayr's product line, the process improvements developed during this CRADA will help P-Ayr to lower their manufacturing costs by reducing scrap and rework.
L. Release of Information
I have reviewed the attached Project Accomplishment Summary prepared by AlliedSignal FM&T and agree that the information about our CRADA may be released for external distribution.

Dean Ayres, President of P-Ayr Products, gave verbal approval for the release of this report on 5/29/97.