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FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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**Project Accomplishment Summary
for
Project Number 92-MULT-018-B2-4**

PARAMETRIC ELECTRIC MOTOR STUDY

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April 30, 1995

MASTER

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PROJECT ACCOMPLISHMENT SUMMARY

Title: PARAMETRIC ELECTRIC MOTOR STUDY
DOE TTI No.: 92-MULT-018-B2-4
Partner: GM - Delco Remy Division

BACKGROUND

Technology for the axial gap motor was developed by DOE with an investment of approximately \$15 million. This development effort is for motor technologies of high power density and high efficiency. Such motors that are also small and light-weight are not available on the commercial market because high-power motors have typically been used in large industrial applications where small size and light weight are not requirements. AC Delco has been developing motors since 1918 and is interested in leveraging its research and development dollars to produce an array of motor systems for vehicles and to develop a future line of propulsion products.

DESCRIPTION

The DOE focus of the study was applied to machining applications. The most attractive feature of this motor is the axial air gap, which may make possible the removal of the motor's stationary component from a total enclosure of the remainder of the machine if the power characteristics are adequate. The objectives of this project were to evaluate alternative electric drive systems for machine tools and automotive electric drive systems and to select a best machine type for each of those applications. A major challenge of this project was to produce a small, light-weight, highly efficient motor at a cost-effective price.

The project developed machine and machine drive systems and design criteria for the range of applications. The final results included the creation of a baseline for developing electric vehicle powertrain system designs, conventional vehicle engine support system designs, and advanced machine tool configurations. In addition, an axial gap permanent magnet motor was built and tested, and gave, said one engineer involved, "a sterling performance." This effort will commercialize advanced motor technology and extend knowledge and design capability in the most efficient electric machine design known today.

ECONOMIC IMPACT

In addition to improving machining processes, these new technologies could very well become enabling technologies for high-volume production, moderately priced, electric and electrically augmented automotive powertrains. The potential effects on the market are widespread, since AC Delco is a principal supplier of motors in the automotive, trucking, construction, agriculture, and locomotive industries as well as for general industry and airports.

Beyond economics, this technology offers an opportunity to positively influence the health and safety of workers and the environment by improving machining processes that will eliminate the exposure of humans in processing hazardous, toxic materials such as uranium, plutonium, and beryllium.

BENEFITS TO DOE

The technologies this project developed promise unique electric motor configurations that can enhance the machining processes at the Y-12 Plant and other Defense Programs production facilities, and they can benefit the machine tool and electric vehicle industry at large. This work will (1) improve worldwide competitiveness in U.S. industry, (2) help to meet DOE's National Energy Strategy goal of improved energy efficiency, and (3) help to maintain a strong U.S.-based machine tool industry that reduces future dependence on foreign manufacturing equipment.

Application of this technology to the proposed venture will be another significant step toward commercializing a DOE investment. This project also supports DOE goals by using equipment and knowledge paid for by tax dollars to address technical problems, by keeping engineers up to date on technology developments that may be required to solve problems, and by bringing new knowledge from the private sector into the government facilities that could lead to more efficient operations.

PROJECT STATUS

This project was completed in March 1995.

PROJECT EXAMPLES

The axial gap permanent magnet motor, designed by Lockheed Martin and built by AC Delco, was displayed at the Partnership for a New Generation of Vehicles (PNGV) celebration at the White House on October 18, 1994, which was videotaped by PNGV. A photograph is attached.

COMPANY SIZE

Delco Remy is a division of General Motors Corporation and is currently undergoing renaming and restructuring.

CONTACTS

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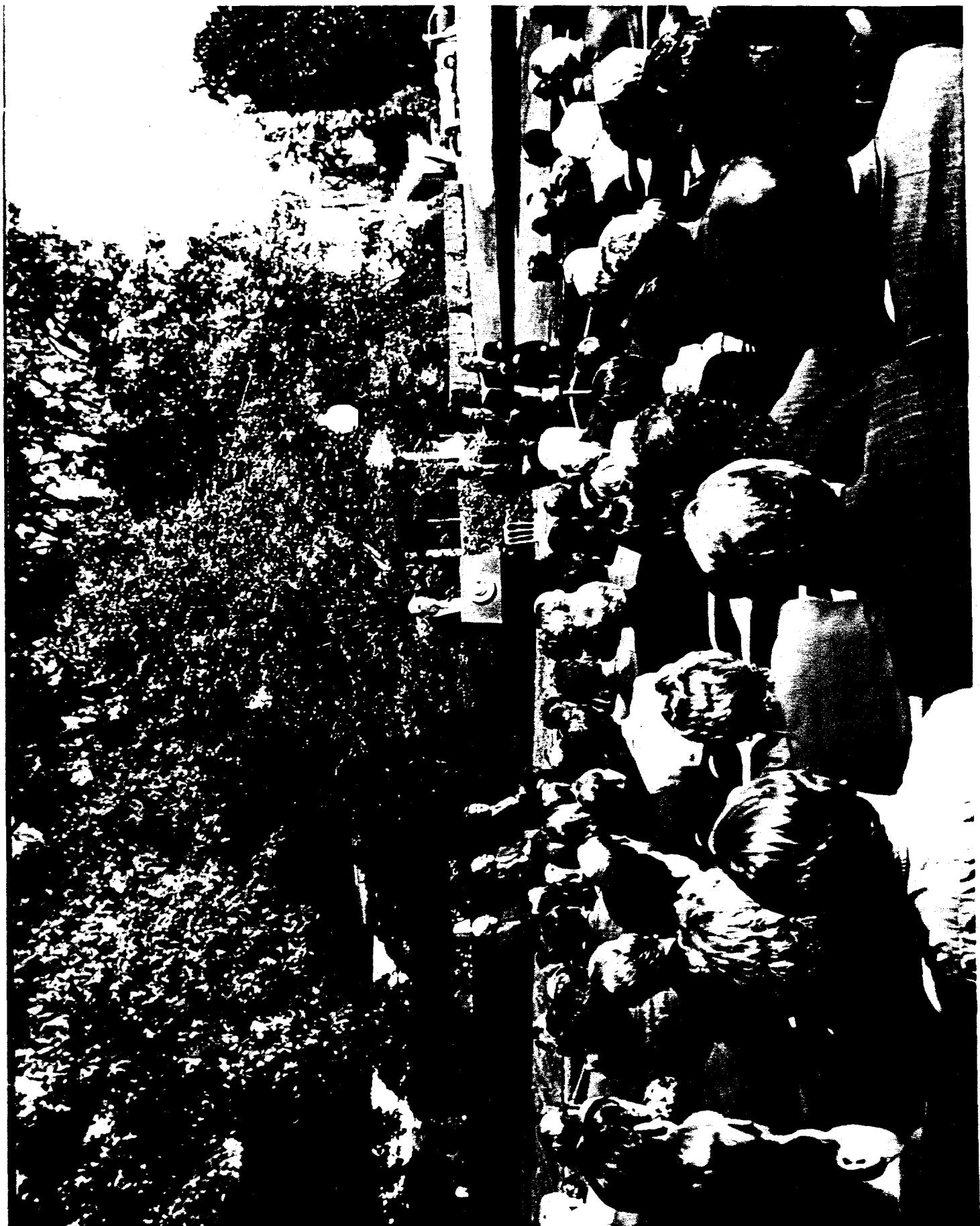
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