PROJECT DATA

DynaMotors, Inc. - 02GO12065

Development of Variable Speed (VS), High Efficiency, Integrated Electronic Motor for use in Residential HVAC Systems

Recipient:	DynaMotors, Inc.	Instrument Number:	DE-FG36-02GO12065
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Subcontractor(s):		B&R Number(s):	ED190602
		PES Number(s):	02-2140, 03-11015
EERE Program:	Building Technologies	State Congressional District	OH - 1 1

PROJECT SCOPE: The objective of this project is to develop and commercialize an efficient VS motor for residential HVAC fans (then compressors and pumps) that will be inexpensive enough to replace today's low efficiency single-speed motors. This will greatly reduce national electric energy consumption and related air pollution. The new motor is based on new, proprietary technology. If variable speed motors replaced all 76 million PSC motors running in central HVAC systems in the U.S., a reduction in energy consumption of 46 billion kWh (483 x 1012 Btu) annually would occur resulting in savings of $3.8 billion as well as an emissions reduction of 23 million metric tons of $C0_2$. (Potential savings of 48 billion kWh's per year based on 8 cents/kWh).

FINANCIAL ASSISTANCE

Approved DOE Budget	$200,000	Approved DOE Share	$200,000
Obligated DOE Funds	$200,000	Cost Share	$166,474
Remaining Obligation	$0		
Unpaid Balance	$0	**TOTAL PROJECT**	**$366,474**

Project Period: 10/1/02-3/30/04

TECHNICAL PERFORMANCE

DE-FG36-02GO12065

DynaMotors, Inc.

Development of Variable Speed, High Efficiency, Integrated Electronic Motor for use in Residential HVAC Systems

PROJECT SYNOPSIS

The goal is to develop and begin commercialization of an efficient VS motor for residential HVAC fans (and later compressors and pumps) that will be inexpensive enough to replace today's low efficiency single-speed motors. This will greatly reduce national electric energy consumption and related air pollution. The new motor is based on new, proprietary technology that can be sold at a profit in large volume to HVAC OEM's for $60 for a ½ hp model. Industry and DOE experts deem this an attractive level.

If variable speed motors replaced all 76 million PSC motors running in central HVAC systems in the U.S., a reduction in energy consumption of 46 billion kWh (483×10^{12} Btu) annually would occur resulting in savings of $3.8 billion as well as emissions reduction of 23 million metric tons of $C0_2$. (Potential savings of 48 billion kWh per year based on 8 cents/kWh).

SUMMARY OF TECHNICAL PROGRESS

A significant breakthrough occurred when DynaMotors discovered finite element analysis software which is able to model the discontinuous characteristics of their motor. This software has been in use since March of 2004 and has accelerated development.

In 2003 a second generation prototype motor was built. This motor uses the "Triac Control" scheme and performs quite well. This motor was shown to numerous potential customers and manufacturing partners at the ASHRAE HVAC trade show in early 2004. Response was universally positive. There continues to be no question that the industry very much desires a low cost variable speed motor for use in residential HVAC.

A major breakthrough in reducing torque ripple to acceptable levels has occurred. The previously reported "pole shaping" scheme was only marginally effective. A new scheme called "asymmetric stator" has been extremely effective reducing torque ripple by a factor of five. The motor's starting torque has also been increased by a factor of five.

Also in 2003, Dynamotors was invited to present a technical paper at the SMMA's (Small Motors Manufacturers Association) fall conference, and had articles published in Appliance Manufacturer, Machine Design, Design News, and Mechanical Engineering.

SUMMARY OF PLANNED WORK

As a result of this publicity, DynaMotors established contact with at least 20 potential customers and a small number of potential manufacturing partners. Interest in the technology has been very high, so DynaMotors is currently building 20 third generation prototypes for beta testing with these potential customers and partners. The prototypes are scheduled to be completed at the end of August 2004.

The near-term plan is to get prototypes in customer's hands for evaluation. This will better enable DynaMotors to establish (and satisfy) the markets wants and needs. This will also create demand for our motor which will help immensely in the second focus area which is to establish a relationship with an established motor manufacturer.

PROJECT ANALYSIS

DynaMotors spent all of the DOE funds and more than their cost share by early 2004. They continue to refine the motor technology with their own funds. Progress has been slow and barriers have been frequent but addressed appropriately. Industry interest appears high, but the project requires another year of effort to refine the motor to the standards of DynaMotors as well as test the prototype and engage motor manufacturers. It is recommended that DOE grant a no-cost time extension so they can follow the progress and receive a final report that covers the entire history of the motor development and success.

ACTION REQUIRED BY DOE HEADQUARTERS

No action is required from DOE Headquarters at this time.

STATEMENT OF WORK

DE-FG36-02GO12065

DynaMotors, Inc.

Development of Variable Speed, High Efficiency, Integrated Electronic Motor for use in Residential HVAC Systems

Detailed Task Description

Task 1 - Acquire motor design tools

Task 1.1 – Purchase Software

Task 2.1 – Hire Consultant

Task 2 – Acquire capital goods

Task 3 – Mechanical design

Task 3.1 - Stator/armature geometry

Task 3.2 – Winding pattern

Task 4 – Electrical design

Task 4.1 - Design non-transistor control

Task 4.2 – Evaluate speed control

Task 4.3 – Design speed feedback

Task 4.4 - Implement protective circuits

Task 5 - Select HVAC partner

Task 6 – Build lab prototypes

Task 6.1 – Procure parts

Task 6.2 – Assemble motors

Task 7 - Test and evaluate prototype

Task 8 - Select manufacturing partner

Task 9 - Reiterate design/test process

Task 10 - Investigate UL, CE standards

Task 11 - Build pre-production prototypes

Task 11.1 - Procure parts

Task 11.2 – Assemble motors

Task 11.3 - Install motor in partner HVAC

Task 11.4 - Alpha test

Task 12 – Project management and reporting

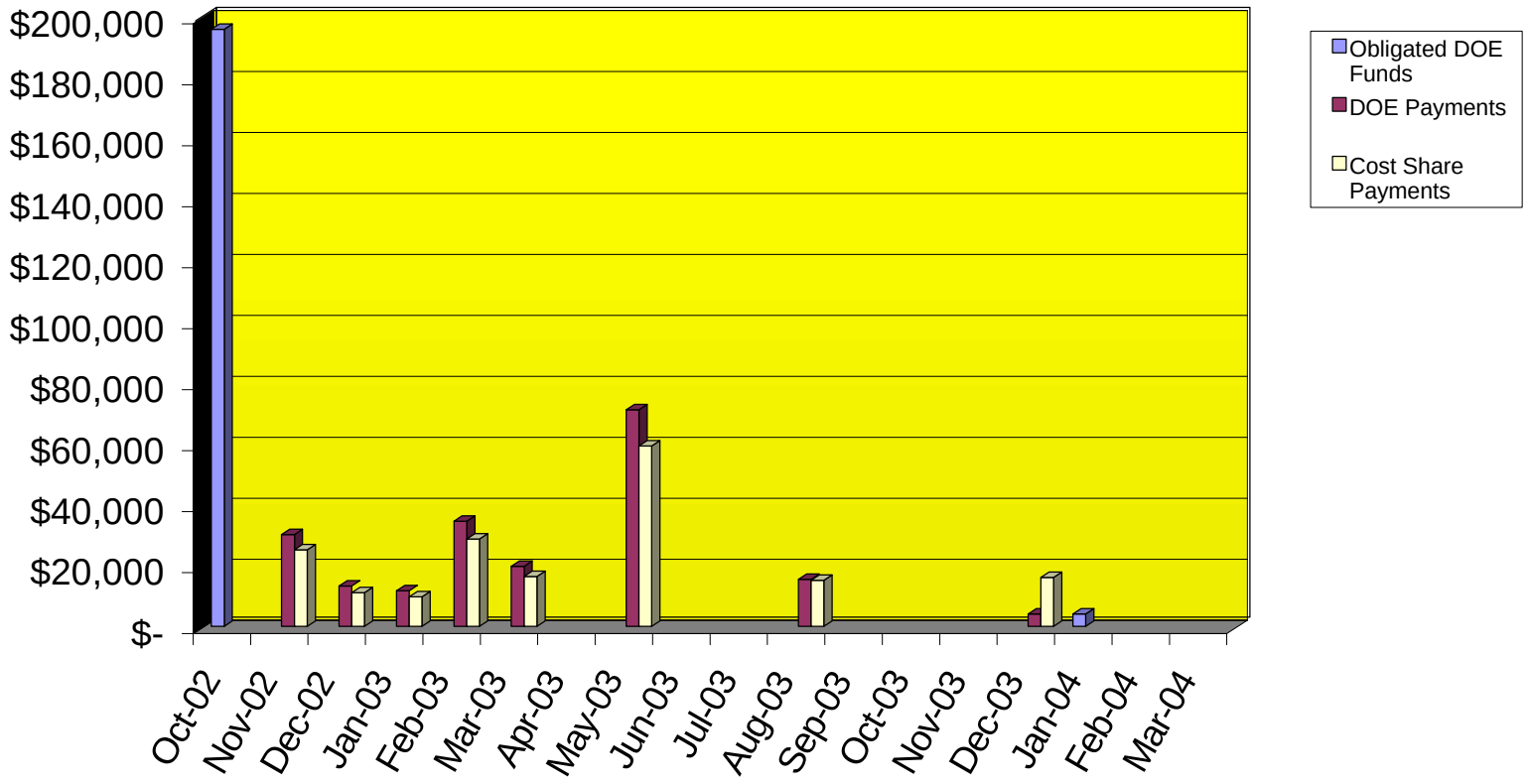
Task 12.1 - Weekly progress meetings

Task 12.2 - DOE required reports

Project Cost Performance in DOE Dollars for Fiscal Year 2003

DE-FG36-02GO12065 **DynaMotors, Inc.**

Development of Variable Speed, High Efficiency, Integrated Electronic Motor for Use in Residential HVAC Systems



	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03
Obligated DOE Funds	$195,881	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
DOE Payment	$0	$30,153	$13,291	$11,697	$34,484	$19,706	$0	$71,074	$0	$0	$15,475	$0
Cost Share Payment	$0	$25,103	$11,065	$9,738	$28,708	$16,405	$0	$59,170	$0	$0	$15,092	$0

	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	PFY*	Cumulative
Obligated DOE Funds	$0	$0	$0	$4,119	$0	$0	$0	$200,000
DOE Payment	$0	$0	$4,119	$0	$0	$0	$0	$200,000
Cost Share Payment	$0	$0	$16,070	$0	$0	$0	$0	$181,351

Approved DOE Budget:	$200,000
Approved Cost Share Budget:	$166,474
Total Project Budget:	$366,474

* Prior Fiscal Years

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