

State of California  
AIR RESOURCES BOARD

Resolution 08-31

June 26, 2008

Agenda Item No.: 08-6-2

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code Sections 39700 through 39705;

WHEREAS, a proposal, entitled "Demonstration of Particulate Matter Sensor in Post-DPF Environment," has been submitted by Honeywell Laboratories to the Innovative Clean Air Technologies (ICAT) Program solicitation;

WHEREAS, the proposal has been reviewed for technical and business merit by highly qualified individuals; and

WHEREAS, the Research Division staff, Executive Officer, and Deputy Executive Officers have reviewed and recommend for funding:

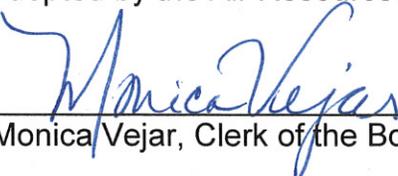
Proposal, entitled "Demonstration of Particulate Matter Sensor in Post-DPF Environment," submitted by Honeywell Laboratories, for a total amount not to exceed \$199,811.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code Section 39703, hereby approves the following:

Proposal, entitled "Demonstration of Particulate Matter Sensor in Post-DPF Environment," submitted by Honeywell Laboratories, for a total amount not to exceed \$199,811.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and agreements for the efforts proposed herein, and as described in Attachment A, in an amount not to exceed \$199,811.

I hereby certify that the above is a true and correct copy of Resolution 08-31, as adopted by the Air Resources Board.

  
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Monica Vejar, Clerk of the Board

## ATTACHMENT A

Innovative Clean Air Technologies (ICAT) Grant Proposal:  
"Demonstration of Particulate Matter Sensor in Post-DPF Environment"**Background**

The California Air Resources Board (ARB or the Board) seeks after-treatment and engine control systems for diesel engines to achieve low emissions and verify that these systems are functioning while the vehicle is operating. This is preferred to conducting system checks with the vehicle pulled off-road. ARB also requires certification that recommended on-board diagnostic (OBD) emission levels are not being exceeded. Moreover, there is a need for rapid determination of a failed diesel particulate filter (DPF) to indicate that maintenance or replacement is needed. Since DPF failure can produce emissions over the recommended OBD levels, which conventional measurement techniques are inadequate to detect, a new on-vehicle direct measurement method is needed for measuring the actual particulate mass downstream of the DPF.

Honeywell produces and markets sensors for engine and exhaust environments. Honeywell also desires to extend these sensors into the after-treatment area. To this end, Honeywell has been developing a particulate mass (PM) sensor for many applications including engine control, DPF loading, DPF efficiency, and OBD, and has worked to help develop PM sensors that can be used for exhaust gas recirculation control. From the work that has been conducted to date, Honeywell has begun to look at how the sensor might be used to detect malfunctioning DPF filters at the low levels specified by the heavy-duty OBD regulation.

**Objective**

Under the ARB-sponsored Innovative Clean Air Technologies (ICAT) Grant program, Honeywell would test and demonstrate this PM sensor to show how it can detect the low particle levels downstream of the DPF and is able to directly measure PM levels indicative of a DPF failure.

**Methods**

This program will conduct on-engine demonstration testing of Honeywell's PM sensor. The tests will examine the sensor's responsiveness and signal accuracy by comparing with calibrated particle measuring equipment and by confirmation with gravimetric measurements during a modified Supplemental Emissions Test (SET). The sensor response will be determined in a post-DPF environment using a functional DPF and also a faulty DPF to assess the capability of the sensor at emission levels corresponding with the adopted future OBD fault threshold of 0.03 g/bhp-hr. The data from these measurements will be analyzed to provide the correlation of the PM sensor output with both particle and charge distributions in addition to correlation with the gravimetric measurements. These results will be provided to ARB as the deliverables from this study.

will allow ARB to maintain stringent requirements for detection of malfunctioning DPFs on future model year heavy-duty engines.

**Significance to the Board**

The successful development and commercialization of the PM sensor enables direct measurement of the diesel particulate in the exhaust, and when coupled to the OBD system will alert the driver of a compliance failure, so that corrective action can be taken. In the absence of this level of precision, malfunctioning DPFs will be undetected until they reach much higher emissions levels, increasing the amount of diesel PM emitted before the need for repair is identified. This sensor will ensure that the emissions reduction targets of the regulations are achieved.

**Applicant:** Honeywell Laboratories

**Project Period:** July 2008 through June 2009

**Principal Investigator:** Brian Krafthefer

**ICAT Funding:** \$199,811

**Co-funding:** \$199,897

**Past Experience with This Principal Investigator:** None.

**Prior ICAT Funding to 2008**

Year	2007	2006	2005
Funding	\$0	\$0	\$0

**BUDGET SUMMARY****Honeywell Laboratories****"Demonstration of Particulate Matter Sensor in Post-DPF Environment"**

<b><u>Direct Costs and Benefits</u></b>	<b><u>ICAT</u></b>	<b><u>Total</u></b>
1. Labor	\$ 88,104	\$ 88,104
2. Employee Fringe Benefits	\$ 21,288	\$ 65,881
3. Subcontractors	\$ 84,131	\$ 124,693
4. Equipment	\$ 0	\$ 0
5. Travel and Subsistence	\$ 4,288	\$ 4,988
6. Materials and Supplies	\$ 2,000	\$ 2,000
7. Other Direct Costs	\$ 0	\$ 0
Total	\$ 199,811	\$ 285,666
 <b><u>Indirect Costs</u></b>		
1. Overhead	\$ 0	\$ 114,042
2. Other Indirect Costs	\$ 0	\$ 0
Total	\$ 0	\$ 114,042
 <b>Total Project Costs</b>	 <b><u>\$ 199,811</u></b>	 <b><u>\$ 399,708</u></b>