State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 09-8

February 26, 2009

Agenda Item No.: 09-2-2

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 research proposal, number 2664-263, entitled “Measurement of Diesel Solid Nanoparticle Emissions Using a Catalytic Stripper for Comparison to Europe's PMP Protocol,” has been submitted by the University of California, Riverside,

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2664-263 entitled “Measurement of Diesel Solid Nanoparticle Emissions Using a Catalytic Stripper for Comparison to Europe's PMP Protocol,” submitted by the University of California, Riverside, for a total amount not to exceed $170,000.

NOW, THEREFORE BE IT RESOLVED that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 2664-263 entitled “Measurement of Diesel Solid Nanoparticle Emissions Using a Catalytic Stripper for Comparison to Europe's PMP Protocol,” submitted by the University of California, Riverside, for a total amount not to exceed $170,000.

BE IT FURTHER RESOLVED that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed $170,000.

I hereby certify that the above is a true and correct copy of Resolution 09-8, as adopted by the Air Resources Board.

/s/

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Monica Vejar, Clerk of the Board

ATTACHMENT A

"Measurement of Diesel Solid Nanoparticle Emissions Using a Catalytic Stripper for Comparison to Europe's PMP Protocol"

Background

The gravimetric methods currently used for regulatory determination of emissions will have difficulty accurately quantifying Particulate Matter (PM) mass emissions as standards continue to grow more stringent. The European Particle Measurement Program (PMP) is a particle measurement protocol that aims to measure solid particle number emissions and could complement regulatory mass measurements. The PMP protocol is included in Euro 5/6 proposed emission regulations. The Air Resources Board (ARB) sponsored a study to critically investigate the potential of the PMP protocol for emissions from heavy-duty vehicles and engines titled: "Evaluation of the Proposed New European Methodology for Determination of Particle Number Emissions and its Potential in California for In-use Screening." This study found that there are a significant number of apparently solid, sub-23 nanometer particles that can survive the PMP volatile particle remover. The nature of those sub-23 nanometer particles needs to be revisited and thoroughly investigated.

Objective

This project will investigate the penetration and formation of particles in Europe's current PMP protocol sampling system, and assess the impact of those processes on the PMP-compliant measurement of solid particle number emissions.

Methods

For this project, the contractor will assemble and evaluate a catalytic-stripper (CS) in the laboratory. The CS and a reference PMP system will be installed in the University of California, Riverside, College of Engineering – Center for Environmental Research and Technology (CE-CERT) mobile emission laboratory for a side-by-side comparison by measuring emissions from a diesel particle filter-equipped heavy-duty diesel vehicle under actual driving conditions. Tests will focus on differentiating solid nanoparticles from volatile nanoparticles exiting the sampling train prescribed in the PMP. Cycles and flow-of-traffic conditions from previous studies will be considered in this follow-up investigation.

Expected Results

A final report will address the differences found when counting particles using the CS-PMP and the reference PMP. The key contribution of the final report will be a clear description of the physical nature of the particles that are observed post PMP volatile particle remover. Findings from this project will be published in peer-reviewed journals and presented in national and international conferences.

Significance to the Board

The information obtained from this study will inform ARB concerning the development of PMP-based methods for in-use screening of emissions from heavy-duty diesel engines, which dominate the current California diesel fleet, as well as light-duty vehicles in the event that diesel technology begins to significantly penetrate that market.

Contractor:
University of California, Riverside (UCR)

Contract Period:
18 months

Principal Investigator (PI):
Drs. Heejung Jung (PI) and Thomas D. Durbin (co-PI)

Contract Amount:
$170,000

Basis for Indirect Cost Rate:
The State and the UC system have agreed to a ten percent indirect cost rate.

Past Experience with this Principal Investigator:
UCR CE-CERT is world-renowned for vehicular emissions research. Professor Heejung Jung and Dr. Thomas D. Durbin have worked extensively and successfully with ARB on various projects. The previous PMP study (#05-320) is an excellent example of the successful cooperation between the PIs and ARB staff.

Prior Research Division Funding to UCR:

Year	2008	2007	2006
Funding	$64,942	$215,898	$363,372

B U D G E T S U M M A R Y

Contractor: University of California, Riverside

Measurement of Diesel Solid Nanoparticle Emissions Using a Catalytic Stripper for Comparison to Europe's PMP Protocol

DIRECT COSTS AND BENEFITS			
1.	Labor and Employee Fringe Benefits	$ 27,142	
2.	Subcontractors	$ 7,424	
3.	Equipment	$ 0	
4.	Travel and Subsistence	$ 5,568	
5.	Electronic Data Processing	$ 0	
6.	Reproduction/Publication	$ 0	
7.	Mail and Phone	$ 0	
8.	Supplies	$ 4,696	
9.	Analyses	$ 82,035[1]	
10.	Miscellaneous	$ 30,448[2]	
	Total Direct Costs		$157,313
INDIRECT COSTS			
1.	Overhead	$ 12,687	
2.	General and Administrative Expenses	$ 0	
3.	Other Indirect Costs	$ 0	
4.	Fee or Profit	$ 0	
	Total Indirect Costs		$12,687
TOTAL PROJECT COSTS			**$170,000**

[1] Includes fuel surcharge for a support vehicle, trailer prep and test, engineering time for testing oversight and real time data compilation, PMP rental and fabrication of a catalytic stripper.
[2] Includes facilities rental of CE-CERT based on 24percent of Modified Total Direct Costs (MTDC).