

## ENGINEERING RESEARCH CENTER 'PROF. URBANO ERNESTO STUMPF'



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Business partner: PSA Group

<http://cpebio.com.br>

*Conceptual study of an  
advanced ethanol-fueled  
engine*

FAPESP Process 2013/50238-3  
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The Engineering Research Center 'Prof. Urbano Ernesto Stumpf' is dedicated to develop researches in biofuel engines under the sponsorship of the FAPESP – PSA Agreement.

The ERC was born from a call for proposals launched in December of 2012 by FAPESP, from a cooperation agreement with the Peugeot-Citroën (PSA) which has the objective do create a Center dedicated to study biofuel applications in engines. FAPESP and PSA undertake to finance the CPE for up to ten years. This initiative by FAPESP and PSA was motivated by the need to create a "locus" where state-of-the-art and multidisciplinary research in the area of biofuels could put Brazil at the forefront of technological knowledge in the area.

The researches in vehicle powertrains adopting biofuels require a comprehensive approach. The topics addressed range from basic research on the phenomenology of the formation and evolution of sprays of ethanol and its combustion, to architectures linking powertrain and vehicle. Tribology, fluid mechanics, thermodynamics, heat transfer, mechanical design of parts and components, noise and vibration analysis, sensors, actuators and control are also themes to be dealt with. These themes are so diverse and simultaneously so interconnected that only an articulated pool of research groups with different skills can carry out the intended goals and face these challenges.

To attain its objectives, the ERC 'Prof. Urbano Ernesto Stumpf' must seek for new projects, incorporate other companies, other research groups and other sources of funding besides the FAPESP/PCBA budget since the beginning of its activities. The Center will also establish contacts and collaborations with other Brazilian and international institutions working in the area of internal combustion engines.

This proposal uses a concept named "backbone research project" – a research project capable to give coherence and common goals for diverse research groups while the Center is in its initial construction phase. Thus, the research plan for the first four years of the ERC is aimed to study the concept of an advanced ethanol-fueled engine, which explores the specificities and positive characteristics of ethanol as fuel. The expected result is a conceptual proposal to present an ethanol engine with better performance and simultaneously better efficiency than that of flex-fuel engines.

## AREAS AND RESEARCH THEMES

### **EXPLORATORY EXPERIMENTAL TESTS FOR AN ETHANOL ENGINE**

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Principal Researcher: Prof. Dr. Francisco Emilio Baccaro Nigro  
Division of Engines and Vehicles (DMV) – Mauá Institute of Technology (IMT)

### **FUNDAMENTAL STUDIES ON MIXTURE PREPARATION AND TURBULENT COMBUSTION OF ETHANOL IN ENGINES**

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Principal Researcher: Prof. Dr. Guenther Carlos Krieger Filho  
Laboratory of Environmental and Thermal Engineering - (LETE/EPUSP) – University of São Paulo (USP)

### **SPRAY COMBUSTION OF HYDRATED ETHANOL FOR MPFI ENGINES**

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Principal Researcher: Prof. Dr. Pedro Teixeira Lacava  
Laboratory of Combustion, Propulsion and Energy – ITA

### **THERMODYNAMIC SIMULATION OF INDICATED PERFORMANCE FOR ETHANOL ENGINES**

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Main researcher: Prof. Dr. Waldyr Luiz Ribeiro Gallo – DE/FEM/UNICAMP  
Biofuel Engine Laboratory – LMB/UNICAMP

### **INNOVATIVE MECHANICAL SOLUTIONS FOR ETHANOL ENGINES**

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Main researcher: Prof. Dr. Janito Vaqueiro Ferreira – DMC/FEM/UNICAMP  
Biofuel Engine Laboratory – LMB/UNICAMP

### **DYNAMIC SIMULATION, STRESS ANALYSIS, LOW WEIGHT COMPONENTS DESIGN AND ESSAYS**

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Principal researcher: Prof. Dr. Marco Lucio Bittencourt – DPM/FEM/UNICAMP  
Biofuel Engine Laboratory – LMB/UNICAMP