Fuel System and Emissions Control for Spark Ignition Engines Powered Micro-Cogeneration Systems

Goal of the project:
The main idea of the project is to adapt a fuel delivery control system and reducing emissions for micro-cogeneration installations powered by spark ignition engines. In addition to the benefit of reducing pollutants regulated by law, specifically carbon monoxide, nitrogen oxides and unburned hydrocarbons, the use of biogas ensures a significant reduction of carbon dioxide emissions, a gas that even if its not considered to be toxic, contributes to the green house effect. A common problem for small size biogas installations is the inability to ensure a constant flow of gas and the same methane concentration.

Short description of the project:
The problem of emissions control is an important issue only for cogeneration systems over a certain power level. For natural gas or biogas fueled engines that power electric generators and feature exhaust gas heat recovery in micro-cogeneration installations, the quantity of pollutants expelled into the atmosphere is considered to be insignificant.
Nevertheless, a tendency to reduce emissions for small power installations is noticed. Also, given the advantages of distributed power generation compared to centralized systems, small size applications will increase in numbers. Another important issue in the near future is fuel availability, and fuel systems will be required to be capable of proper operation with a variety of fuel types.
For this reason, the lack of fuel must be compensated by employing a dual fuel system that ensures delivery of a liquid fuel such as gasoline, when biogas flow is too low. One of the objectives of the present project is to cover this aspect of dual fueling, with a multidisciplinary approach involving control systems engineering.

Project implemented by:
The Faculty of Mechanics

Implementation period: 2010-2013

Main activities:
•Informative study of scientific literature;
•Strategy development for a dual-fuel system;
•Control software development;
•Validation for control module operation and exhaust gas treatment system;
•Control strategy adaptation

Results: 15 Research Papers in national and international journals

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Aplicability and transferability of the results:
Co-generation whit biofuels, small scale cogeneration, isolated domestic housing.

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