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EXPERIMENTAL ANALISYS OF ENGINE PERFORMANCE USING ETHANOL-BASED GASOLINE SURROGATES

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INTRODUCTION

Fuel Formulation and development for transportation is one of the most important topics in the development of efficient systems involving internal combustion engines. This work aims to experimentally test the in-engine performance of a quinary mixture of ethanol-based gasoline surrogates. That mixture was already tested in high pressure shock tubes, [1], and cooperative fuel research engine (CFR) [2], of this form, experimental data of ignition delay times and octane numbers are available, figures 1 and 2 shows the measurements.
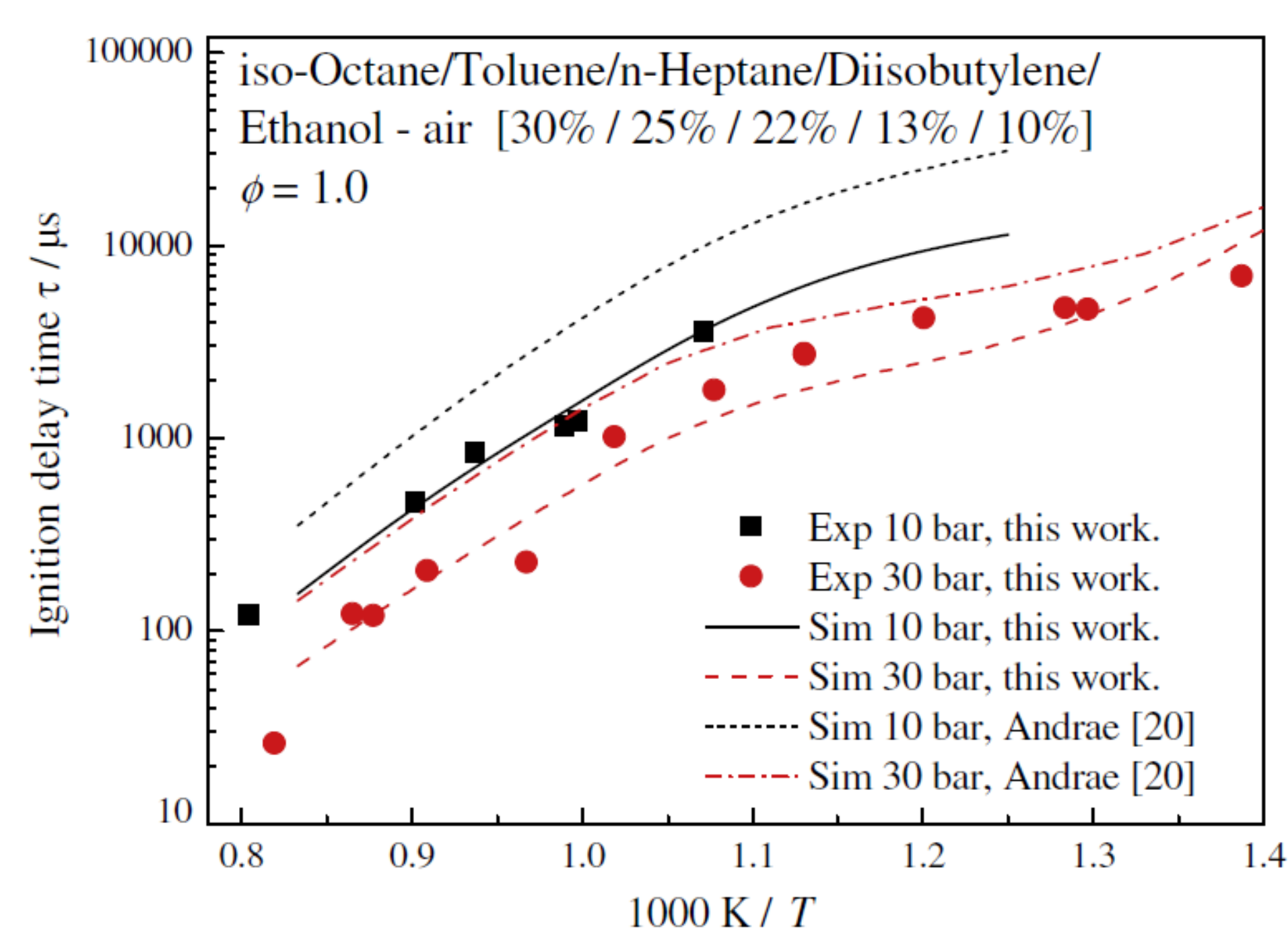

Figure 1. Experimental data of ignition delay times in high pressure shock tube. Data from [1]
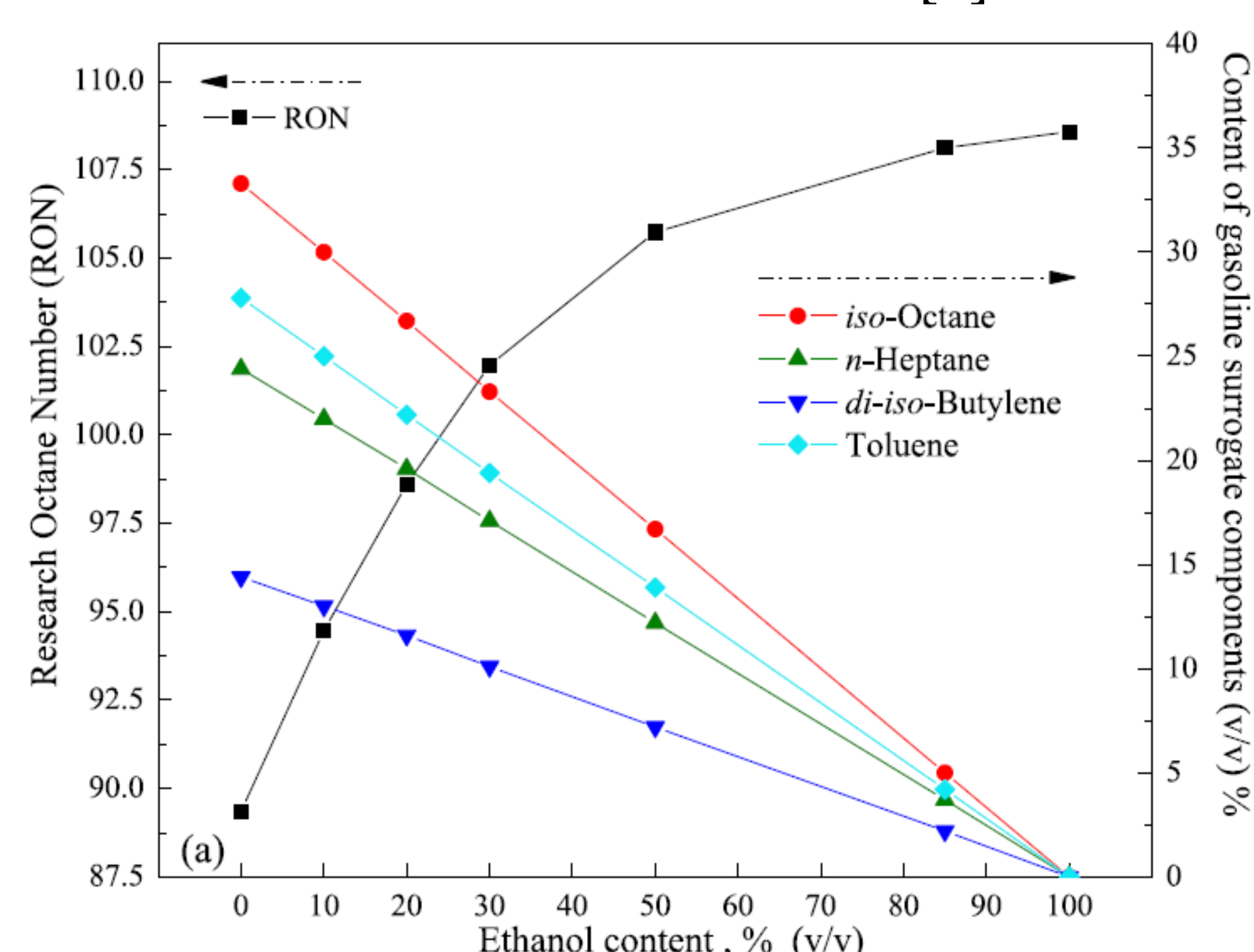

Figure 2. Experimental data of Research Octane Number in CFR engine. Data from [2]

OBJECTIVE

To make an assessment of the in-engine combustion performance of the quinary mixture proposed in [1], leaving into account the octane number limitation of [2], by using a dynamometric branch.

MATERIALS AND METHODOLOGY

A dynamometric branch using an 1800 cm^3, four-cylinder, spark ignition, multi-point fuel injection internal combustion engine will be instrumented for experimental determination of torque, power and fuel consumption. Mixtures will be prepared as described in [1] and data from [2] will me used in order to tune the composition as function of the compression ratio. Figure 3 shows the experimental set-up.
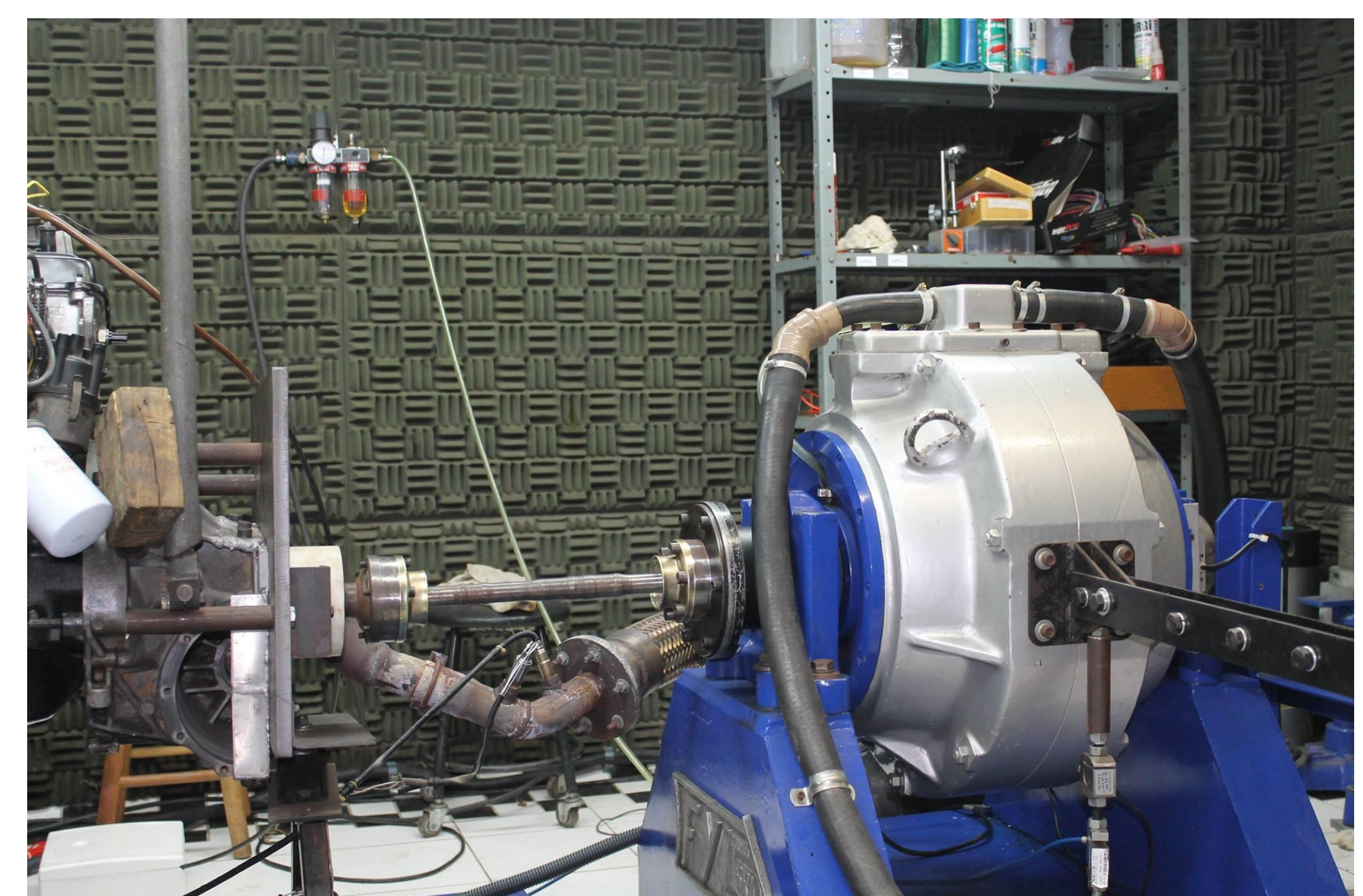

Figure 3. Experimental dynamometric branch at IFSC - Florianopolis

A piezo-transducer pressure sensor will be used to collect the in-cylinder pressure and of this form make the characterization of the combustion process. Engine characteristics curves of torque, power and fuel consumption will be obtained and compared to the ones obtained running the engine with common gasoline and blends of ethanol / common gasoline.

CONCLUSION

The experimental data obtained in this work will be used for the development of an experimental determination of the relationship between the Anti Knock Index (AKI) and Ignition Delay Times (IDT), useful for advanced engines developments as HCCI technology.

REFERENCES

[1] Cancino L, Fikri M, Oliveira A, Schulz C. Ignition delay times of ethanol-containing multi-component gasoline surrogates: shock-tube experiments and detailed modeling. Fuel 2011;90(3):1238–44. https://doi.org/10.1016/j.fuel.2010.11.003.

[2] A. da Silva Jr, J. Hauber, L.R. Cancino, K. Huber. The research octane numbers of ethanol-containing gasoline surrogates. Fuel 243 (2019) 306–313. https://doi.org/10.1016/j.fuel.2019.01.068.

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