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H_2MS_Hydrogen production management system for prototype reactor

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Abstract

A hydrogen management system was design and implemented integrating a batch tubular reactor unit with a custom specific electronic monitoring and controlling system, making possible real time control, data acquisition and remote data collection of several process variables for Hydrogen generation and storage from chemical hydride, sodium borohydride. The objective is to achieve an automatic on-demand control of the batch reactor, to provide a "quasi-continuous" production and storage of hydrogen, to fulfill the energy requirements intended to feed a fuel cell for stationary applications. The custom hardware and firmware is easy expandable and adaptable to different reactor specifications and can be optimized and redesigned, allowing a final lower cost when compared to off-the-shelf acquisition and control systems. The development and optimization of the H2MS system's local control firmware is being carried out, namely the several software drivers for the different data acquisition and actuator modules to be used. The H_2MS system includes also a low cost single-board microcomputer running on Windows 10 environment, using a touch sensitive monitor for data display and user interaction. The high-level software application for reactor's control and user interaction is under development, giving the possibility of real time acquired data reactor status to be displayed in a synoptic dashboard, and allowing the user touch interaction to modify some of the system's parameters and actuators status. In the future, it will also be possible to access the system remotely.

Preliminary data using the developed H_2MS system, see figure 1, have already been collected in experimental conditions that allow production of 500 LH_2 per hour at different temperatures, based on in-house developed catalyst and full kinetic study.

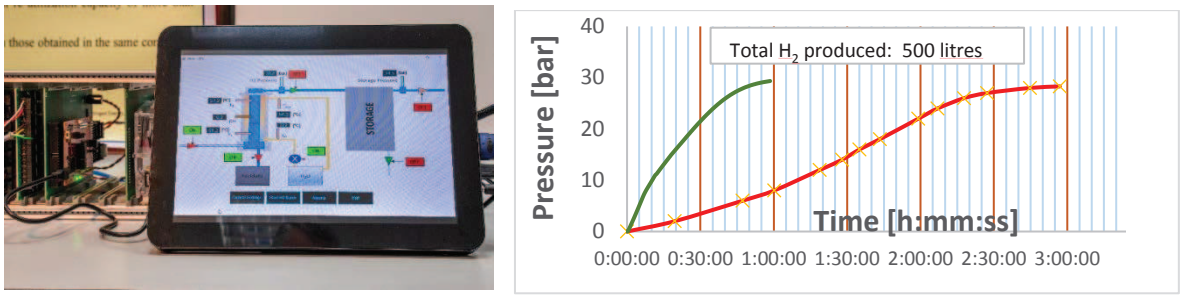

Fig. 1. Real time data acquisition for 500 LH_2 per hour at different temperatures, using developed prototype reactor and H_2MS system.

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References

[1] Sousa T., Rangel C.M., 2014. A Dynamic Two Phase Flow Model for a Pilot Scale Sodium Borohydride Generation Reactor", Intern. J. Hydrogen Energy 39, 5291-5300.