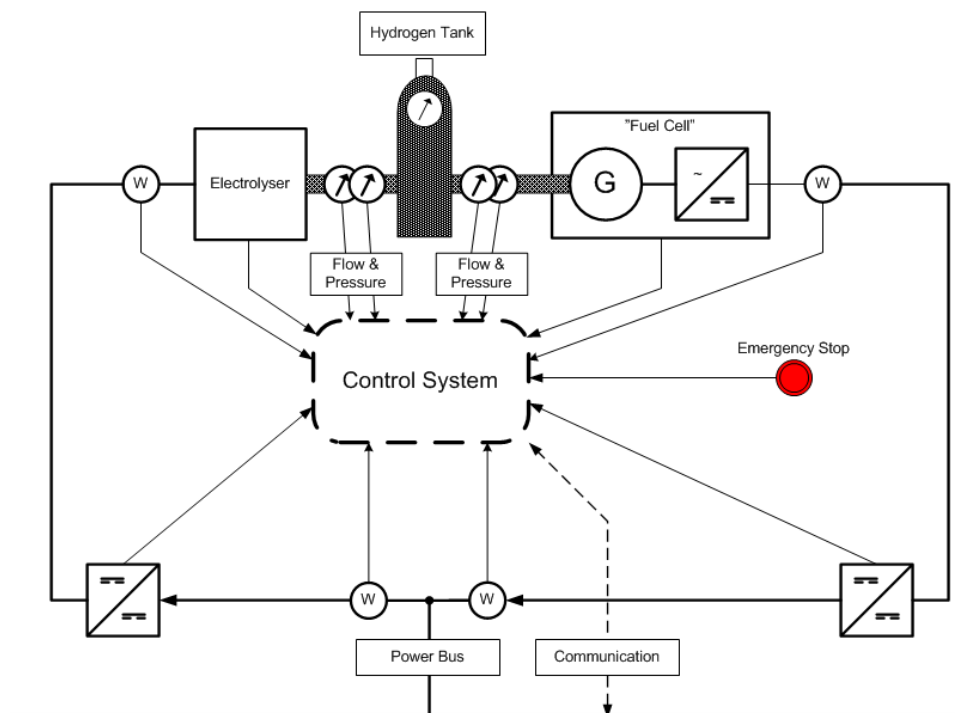


HYDROGEN SYSTEM

PRO4 - Realization



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INTRODUCTION

Preface

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This introductory document will briefly describe how the hydrogen project has been organized.

The hydrogen project has followed the EUDP development process (www.eudp.net), which define the four phases Pre-project, Launch, Realization and Post-project. Pre-project and Launch were done as part of PRO3 and the Realization and Post-project has been finalized here in PRO4.

The Realization phase uses the output from Launch as baseline where a set of requirements were defined for the hydrogen system. It is recommended to browse through the Launch documentation to gain some knowledge of the hydrogen system to be developed and to get some more background on the defined requirements. Both the Pre-project and Launch have been included for reference on the attached CD.

It has during Realization been necessary to postpone some requirements due to the fact that many new requirements were introduced during start-up of Realization and due to the fact that we in Team 4 were reduced from 4 members to 3. The requirements to down prioritize were agreed in the Product Accept Declaration for timebox 1-4 and included all the HW requirements related to the "Fuel Cell".

Timeboxes

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The Realization is split into a number of timebox deliveries where each delivery produces a product version that can be deployed and signed by the customer/customer representative.

Each timebox includes some strategy and planning, analysis, design, implementation, verification and deployment for a number of requirements.

Timebox 1 includes the overall planning for the complete Realization phase. In this timebox the complete list of requirements from Launch is divided into 5 timeboxes.

Timebox 1 also introduces the deployment plan with 5 product versions that allows a product version to be deployed in each of the 5 timeboxes. Each product version builds on top of the previous product version and is scoped to ensure that each version will add some value to the customer. The deployment plan is updated and adjusted each time a new timebox is initiated with many details on upcoming product versions and few details on the later product versions.

The contents of each timebox are summarized below and can be used to get a quick overview of what to expect in terms of documentation for each of the 5 timeboxes.

TIMEBOX 1 - START/STOP ELECTROLYZER AND IMPLEMENT DATABASE

- The Electrolyzer can be started and stopped from a software application running in user-space on a LPC2478 Development kit. The power bus is simulated by using the XPR 60-100 power supply.
- Database design for PHP website is settled and implemented on lene-lasse.dk
- Participatory session with low fidelity prototype for possible future user interface completed.

TIMEBOX 2 - MEASURE EFFICIENCY AND IMPLEMENT PHP WEB SITE

- It is possible to measure the efficiency of the electrolyzer by measuring the energy consumed versus energy produced by the electrolyzer. This requires the ability to measure voltage, current and flow. The measured data can be read-out from the H2 application SW.
- PHP web site can show measured data (data are simulated using scripts).
- Video presentation prepared to cover the participatory session with low fidelity prototype.

TIMEBOX 3 - GAIN CAN KNOWLEDGE AND FINALIZE PHP WEB SITE

- Establish CAN communication between 2 LPC2478 boards
- Login support for PHP web site (with java script validation)
- Mail notification support for PHP web site
- Improve SQL query for power calculation and improve graph presentation for PHP web site

TIMEBOX 4 - FINAL TESTING OF SENSOR HARDWARE AND GET STARTED WITH FPGA SUPPORT

- FPGA Module design including 8 channel ADC
- Final testing of sensor HW
- Preparation tasks for EMC test
- Update of sensor data to MySQL/web server
- Preparation of usability test
- Read-out of efficiency data via web
- Continuously update of sensor data and average filter

TIMEBOX 5 - CAN SUPPORT, EMC VERIFICATION, USABILITY TEST AND FINALIZE FPGA SUPPORT

- H2 Application support for CAN bus (handler functions)
- Driver for CAN Controller
- EMC verification in terms of Emission and Immunity test
- Usability test of PHP web site
- Extended test bench for FPGA based ADC
- Supporting HW in terms of R-2R ladder

The Product Delivered

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Below figure shows product version 5, which were the final Hydrogen Control System deployed to the customer/ Customer representative.

