

Bachelor's Thesis, Term Project

Conceptional Design of On-line Electro-Hydraulic Test Rig for pumps as an application for the Industry 4.0 - Hydraulic part (Sponsored by Ezz Steel)

(Industrial Project, With Collaboration with Ezz Steel)

Main Advisor(s): (Assoc. Prof. Dr. Eng. Amir Roushdy and Dr. Eng. Taher Salah eldeen)

Co-Advisor(s): (Eng. Malek Mahmoud)

The sudden trips of the Main Control Center (MCC) units controlling (driving) the main industrial hydraulic pumps (DR pressure controlled) of Rolling Mill Stands of a Flat steel plant (FSD) are related to improper setting of these pumps. The need to develop an online portable test rig is very essential for direct setting and adjustment of hydraulic pumps pressure control valve as well as for judgement of pumps conditions needed to overhauled (repaired) to save time and effort and take the right decision. **There is a Master's student from Mechatronics Engineering Department, Senior Researchers from ARATRONICS also available to help and advice and The Lab Engineer from ARATRONICS, guiding and directing the student with Assoc. Prof. Dr. Eng. Amir Roushdy.**



Fig.: Test Rig for pumps as an application for the Industry 4.0

For more details please contact:

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Project outlines and chapters:

1. Overview and Principles of hydraulic system at the Rolling Mill line.
2. Overview of hydraulic pumps operating at Rolling Mill line.
3. Overview and principles for the on-line hydraulic system design.
4. Conceptual design of the power unit including the followings consideration: -
 - o Hydraulic tank unit size
 - o Max. pressure
 - o Used pump
 - o Oil cooler/Heater
 - o Hydraulic block
 - o Internal hydraulic connections.
5. Hydraulic Power unit safety precautions.
6. Design of housing of the hydraulic system.
7. Define the needed measurements related to power unit control philosophy to deliver it to Electrical Team.
8. Define the needed data to be displayed and logged through the HMI.
9. Using Automation studio to verify hydraulic power unit design.

Research focus of this project:

- Literature review on the project should be studied properly.
- Not only, creating a software control system for the project but also the hardware.
- Experiments using the gadget and control system should be built properly.
- The outcomes must be documented.

Requirements:

- Passionate to learn more about, Soft Robotics, 3D Printing design, Robotics and control.
- Prior mechatronic design expertise is desired like "SolidWork and Arduino".
- Enthusiasm for completing actual practical work with 3D printing staff (design fabrication and construction).
- A method of working that is both structured and self-contained.

General tasks of the project:

- The complete methodology is already available in the ARATRONICS Lab, so we will discuss it from the first day to start the automation process for it
- Fabricate the machine/system using 3D printer/CNC machine (small parts).
- Assembly all parts of the Robot.
- Changing the working variables and see the effect on the locomotion of the robot.

Other notes:

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ARAtronics Research Center for
Opto-Mechatronics Engineering

ARAtronics Research Center,
Mechatronics Engineering Department,
Faculty of Engineering and Material Sciences (EMS),
The German University in Cairo (GUC)

- A weekly meeting with the advisors will be required for this project, as well as weekly progress updates (***The meeting could be more than once during the week based on your progress and based on your achievements***).
- You should to be in the Lab two days per week (***It could be more than two days based on your progress and based on your achievements***).
- All reports must be prepared in the style of a research paper.
- The outcome of this research will be published in one of the coming international Conferences and , or Journal

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