

1.1 General Introduction

Industrial automation is the use of control systems to control machines and processes, reducing the need for human intervention, this made the production rate constant and almost error free.

If we compare a job being done by humans and by automation, the physical part of the jobs replaced by use of a machine, whereas the mental capabilities of the human are replaced by automation. The human sensory organs are replaced with electrical, mechanical or electronic sensors to enable the automation system to perform the job.

Control engineering has evolved over time. In the past humans were the main method for controlling a system. Recently electricity has been used for control and early electrical control was based on relays. These relays allow power to be switched on and off without a mechanical switch. It is common to use relays to make simple logical control decisions. The development of low cost computer has brought the most recent revolution, the Programmable Logic Controller (PLC). The advent of the PLC began in the 1970s, and has become the most common choice for manufacturing controls [4].

PLCs have been gaining popularity on the factory floor and will probably remain predominant for some time. This is because of the advantages they offer:

- ✓ Cost effective for controlling complex systems.
- ✓ Flexible and can be reapplied to control other systems quickly and easily.
- ✓ Computational abilities allow more sophisticated control.
- ✓ Troubleshooting aids make programming easier and reduce downtime.

- ✓ Reliable components make these likely to operate for years before failure.
- ✓ With the invention of PLCs process controlling became easier, and productivity increased noticeably.

Control system implies direct interaction with the physical work. In order to ensure that our control system can help us manage our activities and environments in desired ways, Manual control system is implemented to control the system. Which defined as the overall actions related to control the processes are taken by operators.

When using manual control systems we usually confronted with some issues such as:

The production, safety and energy consumption are all subject to the correctness and accuracy of human action. Likely human errors affects quality of the final product.

1.2 Problem statement

Poly aluminum chloride (PACL) drums discharging system -which is used now in Almanara water treatment plant- is mainly used to discharge a (PACL) drums to fill a poly aluminum chloride (PACL) dosing buffer tanks which feeds a (PACL) dosing pumps. To refill the buffer tanks with the a (PCAL) three important elements must be considered (labors, forklift and the discharging pump), the challenge is to upgrade the filling manual system to automatic system that's will decrease the labor from three to one person and will eliminate the need for the forklift and the driver and will extend the pump life along with other benefits which will be covered in the thesis.

1.3 Project objectives

The main objective of this research is to design a poly aluminum chloride (PACL) Automatic Filling System by using a Programmable Logic Controller (PLC), what will result in:

- i. Reduction of man power.
- ii. Reduction of cost.
- iii. Eliminate the need for a forklift.

1.4 Methodology

- i. Collecting data, determine assumptions and constraints and eliciting requirements.
- ii. Analyzing the collected data to create different designs that can perform the same objective.
- iii. Evaluating the designs according to the criteria list (cost, quality, applicable and safety) that have determined before.
- iv. Choosing the suitable design according to the criteria list that mentioned above.
- v. Developing the selected design as well as possible.
- vi. Establishing small model similar to the selected design.
- vii. Reevaluating the selected design and fix the malfunctions.
- viii. Measuring outputs and observing results.

1.5 Research Outlines

This thesis consists of five chapters will be briefly discussed. In chapter one, the introduction of automatically filling system using the Programmable Logic Controller (PLC) will mainly discussed about

the project objectives and scope in order to achieve the desired goal. After that, chapter two is a literature review covered all explanation about the water treatment area as well as a current previous work that we stand on it. In Chapter three, design and modeling described about the overall project that has been testified and successfully operate. Come along with in this chapter is an explanation about material selection which is including controller, motor, sensor in order to design a project. As well as Chapter four that focus on the system model operation and control aspects. Finally Chapter five there will be conclusions and recommendations.