

Jonathan Morgan PSDE4003 HNC electrical and electronic engineering Project

by Jonathan Morgan

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INTRODUCTION

Princes Gate Water is a bottled water manufacturer supplying products in different countries throughout the world. All of the water produced by Princes Gate Water is bottled at source, located on site. This year 200 million bottles will be produced and distributed world wide.

The water extraction process.

1. Rain water naturally filtered for approximately 5 years.
2. Bore Hole pump pumps filtered water out of the spring, into a holding tank.
3. Water is distributed from the holding tank, through paper filters, to more tanks.
4. Water is fed to the filler machines and fills PET and Glass bottles.
5. Water is also distributed around the site for cleaning, rinsing and domestic use.

Problem

The factory has and continues to expand at a rapid rate, leaving some of the 'older' equipment behind. A holding tank which provides water for 2 bottling lines and supplies the whole site with its domestic water currently has an unreliable level detection system. The electronic supply for this system, is fed from a dated control panel that also provides automation for a set of 3 phase pumps.

Specification

This project will provide a suitable, reliable system for the level control of a holding tank and pump control, with capabilities to adapt to possible changes of the overall build and structure of equipment in the future. The current system requires updating to meet the industry standards and keeping within health and safety standards.

Aim

Research 2 methods for a solution to the problem which will demonstrate process automation. Cost, resource availability and time will need to be taken into consideration.

Objective

The objective is to design, test and install a chosen solution for the project that will meet the specification.



Overall Specification

Reliable – Produce a system that works correctly and is operator/ engineer friendly

Safe – Required to meet the industries safety standards

Adaptable – The system must have the capabilities to be modified and adapted in the future

Automation – The system must contain automation control

Cost – The system must be cost effective and finished within a time frame agreed with employer

Solutions

The electrical panel will be designed and built with space inside to accommodate the chosen automation solution.

Automation Solution 1.

Arduino – The benefits:

- Single board microcontroller
- Very little space taken in the panel
- Low voltage control
- Wide range of additional accessories
- 12 digital outputs
- Low cost
- Easy to test



Automation Solution 2.

Siemens PLC – The benefits:

- Industry standard
- Compatibility of a huge range of components
- A number of input and outputs
- Modules can be added for extra input/outputs
- Allows for changes within the program to be made easily
- Compatible with the current industry standard for level control equipment
- Preferred automation control for 3 phase pumps
- Connection to a siemens HMI with bespoke design for the project



The chosen solution

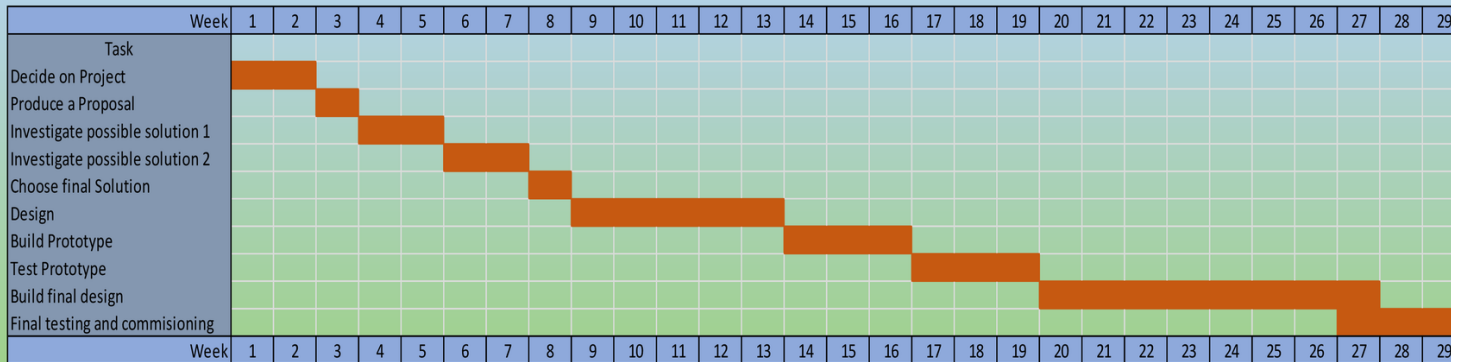
Solution 2 is the preferred option due to a number of factors.

- **Siemens PLC's are used throughout the factory**
- **Further developments and changes can easily be made to the automation programming**
- **Eco Max Level Controller is used on other vessels within the factory**
- **Quality online Siemens support to help with fault finding**
- **Preferred method for the control of 3 phase pumps**

Designing the Project

1. Research all components needed
2. Electrical wiring diagrams
3. Testing the Eco Max
4. PLC simulation
5. Prototype the design and test using testing equipment.

Gantt Chart



Contingencies

A number of suppliers have the availability of equipment required.

The project wont require any production line down time, but will require time during final installation and testing. This requires planning with the production schedule within the business.

With the ever changing strategies within the engineering and production departments, changes to the automation equipment can be made within the project build time frame.

Final Testing

Testing will be carried out before installing the equipment at an unused water vessel on site.

Thorough testing of the pump set, pneumatics, valves and plc program will be carried out during the commissioning phase after installation followed by a full project write up.

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

71 /100

Instructor

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GRADING FORM: CSG-RUBIC

JONATHAN MORGAN

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RESEARCH-INFORMED LITERATURE

 Project background investigation and research is evident. 6.5/10 Research has been carried out on the components and the solutions considered. 6.5/10 **13/20**

KNOWLEDGE AND UNDERSTANDING

 Problem definition is defined and understanding is evident. 4/5 Project constraints and codes of practice will comply with company protocols. This was explained in the presentation and in the questioning section. 3/5 Environmental and sustainability limitations were covered and are part of the company policy. This was explained very well. 3.5/5 Functional design was explained and response to questioning on this was given. 3/5 Response to questioning was very professional. 8.5/10 **22/30**

ANALYSIS

 Problem definition was clear and very well explained in presentation. 4/5 Functional design in the context of analysis was explained with good technical content and good response to questioning on this. 7.5/10 Justification of final solution was by comparison of solutions and to a good standard. Response to questioning on this showed a good understanding. 3.5/5 **15/20**

PRACTICAL APPLICATION AND DEP.

 Design specification was clear. 3.5/5 Critical choice and justification of final solution was carried out by comparison of solutions. The company policy also had a weighting that affected the result of this. 7.5/10 Project planning was explained well and a clear indication of the timeline was given with contingencies. However there should have been a more professional method used such as Gant Chart. 3/5

14/20

SKILLS FOR PROFESSIONAL PRAC.

 Quality of slides was good and the layout was logical and easy to follow. 3.5/5 Quality of delivery was good and in a professional manner. 3.5/5

7/10