Remote Monitoring of Industrial Parts Washers to Evaluate Performance at Customer Locations

PROJECT PLAN

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Contents

1 Introduction

1.1 PROJECT STATEMENT

Industrial parts washers manufactured by PMW use PLC's for control units that allow customers to control and modify wash cycle parameters such as water temperature, pressure, high and low reservoir fill levels, in addition to cycle times for the washing rinsing and drying of the parts. Washer PLC's are used to control the speed of transport belts or carousels that deliver the parts to the wash cycles. Washer PLC's often need to share cycle time data with robots designed to load and unload parts going through the washer enclosure. PLC's can monitor pressure drop through system filters to notify operators when filter media should be cleaned or changed. Access to operating data from customer sites would be very useful to PMW engineers when customers have equipment field inquiries and are not able to trouble shoot problems locally. It is not infrequent that the customers wire pump motors in a configuration that has them rotating backwards and still operating at a significantly reduced pressure and flow rate. This could be diagnosed by the PMW engineers using PLC data.

1.2 PURPOSE

PMW would analyze field data collected by this system to allow future designs to have improved performance and reliability. PMW engineers could provide a level of support for customers they have not experienced from other cleaning equipment manufacturers. This would provide a competitive advantage for PMW.

1.3 GOALS

Goals for this project include:

1. Recommendations for one or two approaches with a proof of concept for the recommended system that might include embedded software for collecting data from the washer PLCs.

2. Provide a communication protocol that results in the key data being collected in a PMW database that the engineers can access in real time.

4. Develop a user interface that would be usable by PMW engineers, service techs and sales representatives.

5. Develop specifications, vendor recommendations and cost estimates for a preferred system.

2 Deliverables

Documentation and proof of concept demonstration of one or more alternative systems communicating over a simulated distance to illustrate the feasibility of the recommended approach.

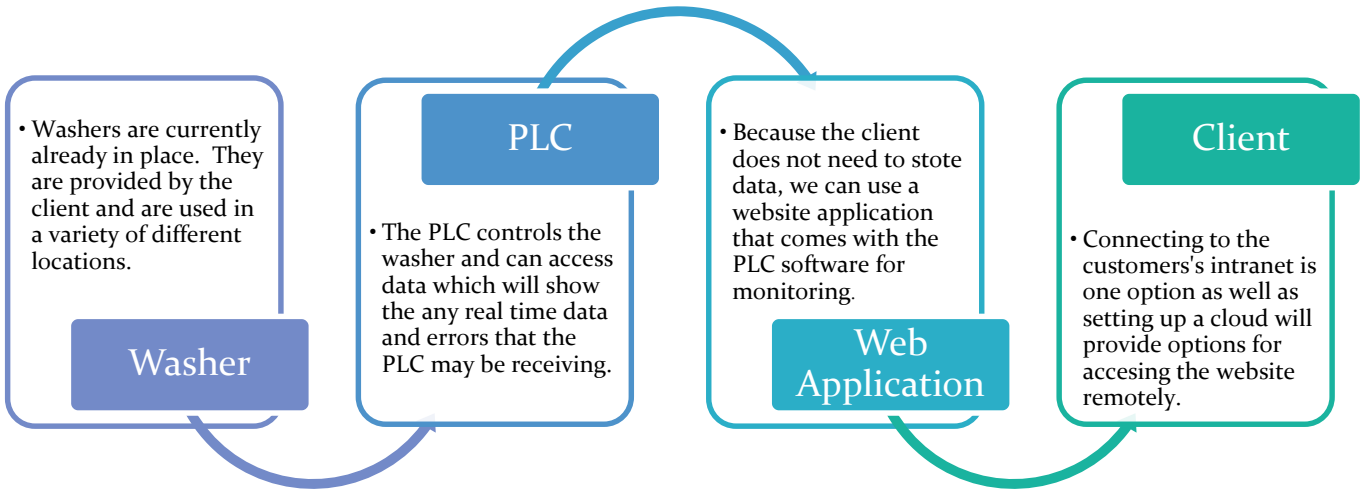
3 Design

The goal is to use the existing hardware as well as adding a few pieces that already exist.

3.1 PREVIOUS WORK/LITERATURE

There are products that are available through both Siemens and Rockwell that are set up to work with PLCs. No specific examples of this exact procedure have been placed. Similar jobs have been done but with different working conditions.

3.2 PROPOSED SYSTEM BLOCK DIAGRAM



3.3 ASSESSMENT OF PROPOSED METHODS

Since our last document, we have learned that there is not a need to store data or have a visual representation of the data on the washer which reduces the need for an HMI. Because of these we have been focusing our efforts on PLC's which have applications imbedded which will let a user connect to a cloud or intranet in order to monitor from onsite as well as other locations. Our proposed plan is to by the end of the semester give the client 2/3 PLC options to select from. These options will come from a variety of companies and product lines which will coincide with that is currently being used and what can be built upon in the future.

3.4 VALIDATION

If our solution works, we will be able to access data successfully through intranet or cloud for the client to access remotely. They will be able to troubleshoot using this data without needing to send a representative out to the site.

4 Project Requirements/Specifications

4.1 FUNCTIONAL

Technical Requirements:

- Setting up Intranet Access
- Compatible Programming between old and new PLC
- Having different hardware options for different customers that the original client has

4.2 NON-FUNCTIONAL

Non-Functional Requirements:

- Enclosures relating to heat/water
- Keeping all products clean and working

5 Challenges

PLC work is not something that is taught in either electrical, computer, or software engineering. Because of this, a main challenge will be working with the coding of the PLC and connecting all members to the project. Being able to test our solution may also be a challenge. Testing will have to be on a machine that the customer has available but not already connected to a PLC.

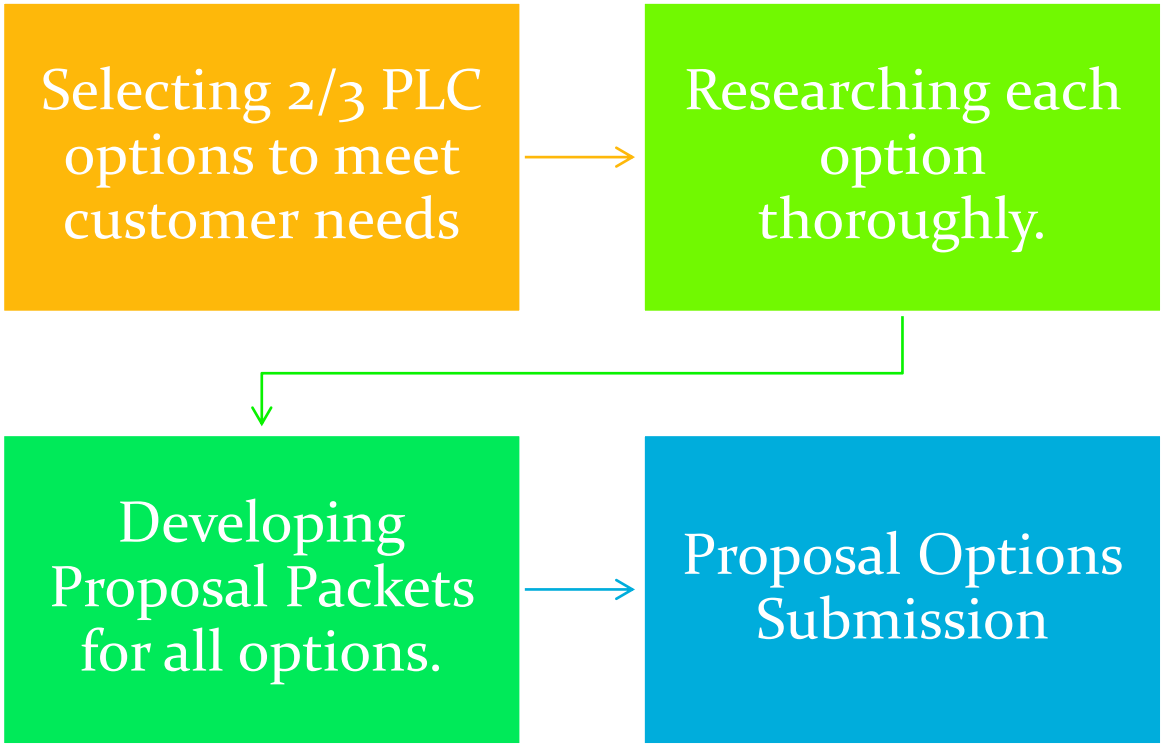
We have had several communication issues with our client, and we see this as continuing to be a challenge. Our contact does not seem to have a lot of information about the project, nor a vested interest in the work that we are doing. It has been very difficult to understand the pain that the client is having and the best way to solve it. This means that we are starting to have to make assumptions and hope that they meet the end needs of the client.

Many of the customers that our client works with require different product lines to be used. Because of this, we have to focus on a few types to start with and let the client decide which one will be most beneficial to them. Each product line has different features and different coding processes so completing all of the options is a goal, but it may not be obtainable based on time constraints.

6 Timeline

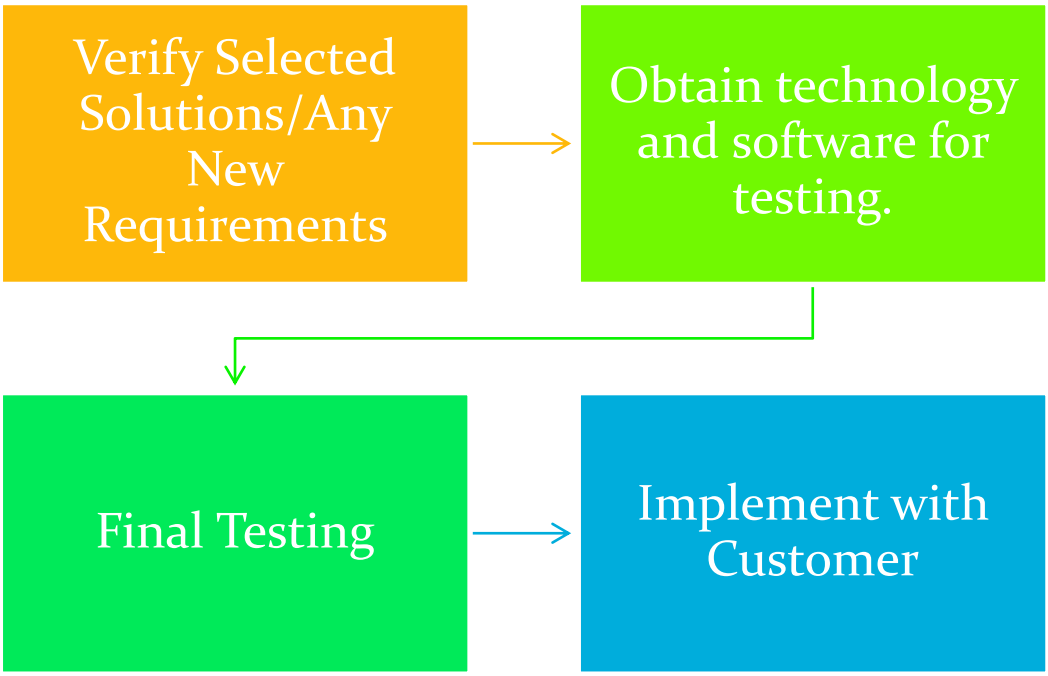
6.1 FIRST SEMESTER

With the first semester of our project coming to a close, we still have plenty of work that we want to get done in the next coming weeks. We have just recently received more data that will help with the functional requirements of the project. With what we have received we now have a set timeline that we would like to complete for the rest of the semester. Our first goal is to select 2/3 PLC options to move forward with. By narrowing down, we will be able to give much more detail on the options that we have selected based on what needs the customer has given us at this point. With the information for each PLC collected, we want to create a proposal for each of the options, including pros, cons, costs, and features to give to the client. From here, we will want them to select a primary and secondary option and we will move forward in to the next semester with testing.



6.2 SECOND SEMESTER

Once the customer has selected a primary and secondary option, we will want to reconfirm expectations and see any updates they may have had to their process over the summer months. At that point we will want to finally obtain the necessary technology (equipment is very expensive and ordering before necessary is irresponsible), and start doing our testing process. This should be a fairly easy step because so much of the research has already been done. We will finally want to implement the software options we have selected with the customer's washers.



7 Conclusions

Our plan is to implement a system that will allow our customer to successfully troubleshoot from a remote location by logging data and being able to see real time work that is happening on the washer. Using different platforms is an ideal solution for the client because it would allow them to be more diverse when marketing this service to their clients.

8 References

https://www.youtube.com/watch?v=NgZ5V3ruGAU

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