



Canadian Gypsum Company (CGC) Inc.  
11105 Bridge Road,  
Surrey, BC  
V3V 3V2

April 10, 2023

Dr. John Shen, Director  
Mechatronic Systems Engineering  
Simon Fraser University  
Surrey, BC, V5A 1S6

Dear Dr. Shen,

The technical report enclosed with this letter, that is titled as "Columbia Okura Ai1800 Robotic Palletizer Installation at Canadian Gypsum Company (CGC) inc. "is required to be submitted as a mandatory part of my Co-op work term 2. This report explains the aspects of Project Management used to replace the 30+ years old Robotic Palletizer and Stretch Wrapper installed in the CGC Surrey Plant with a new Palletizer and Stretch Wrapper.

CGC inc. is owned by United States Gypsum (USG) Ltd., which is the lead manufacturer of Gypsum products throughout the North America and Mexico. The USG was bought off by Knauf Group in 2019. Knauf Group is the top manufacturer of insulation based in Germany.

My role here in Surrey Plant was Project Engineer. The responsibilities included Project Management of Capital Projects, Mechanical and Electrical design to provide solutions to problems of production workers and creating safety procedures along with Visual Work Instructions.

I would like to thank CGC inc. for providing the necessary Safety, Orientation, and Engineering training through Oracle. I want to thank Rebal Abaza, Manager (Production, Joint-treatment, and Engineering) for providing mentorship, training, and reviews throughout the term.

I acknowledge that I have not gained any help other than what is mentioned above in writing report. I also confirm this report has not been previously submitted for academic credits at this or any other institution.

Sincerely

Saranpreet Singh

301417143

# Columbia Okura Ai1800 Robotic Palletizer Installation at Canadian Gypsum Company (CGC) inc.

## **Co-op Technical Report #2**

April 10, 2023

Word Count: 1425

### **Prepared For:**

Simon Fraser University

School of Mechatronic Systems Engineering

Co-op Program

### **Prepared by:**

Saranpreet Singh – 301417143

## **Abstract**

This project is a Capital Project that is based on replacing the existing FMC Robotic Palletizer and Lantech Stretch Wrapper. The new Palletizer manufactured by Columbia Okura and a new stretch wrapper manufactured by Lantech have been chosen for the replacement. The project starts with finding the right equipment, getting manufacturer's quotes, getting installers' quotes, and the plant labor charges. The estimate is submitted to the corporation for approval. The plan for executing the whole project is set in place that also includes scheduling, down-time, surplus production, benefits, and risks. Several tests regarding the layout of conveyors, palletizers, and stretch wrappers were conducted that also include choosing suitable model of Print and Apply system. The project is awaiting corporate approval and will set its pace once approved.

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## **1.0. Introduction**

### **1.1. About CGC (Canadian Gypsum Company) inc.**

The Parent Company of CGC is USG (United States Gypsum) which has joined the Knauf group, the world's largest gypsum manufacturer, in 2019. CGC manufactures gypsum wallboard products, interior finishing materials and suspended acoustical ceilings in Canada. The main goals of the company are Innovation, Safety, and Sustainability. In the Surrey location of the CGC, the products manufactured include Ready-Mix, Concrete Mix, and Paint. The distribution center is in Port Kells from where all the finished goods are shipped to all the lower mainland in British Columbia. All over Canada, CGC Operates three mines, five plants, and several distribution and customer service centers.

### **1.2. Project Introduction and Objectives**

In the Spring 2023 Co-op, working as a Project Engineer at CGC inc. required working on Capital Projects. These Projects included Office Renovations, Manufacturing Building Restoration, Replacing Robotic Palletizer, Lunchrooms and Laboratory Renovation, Geodome Replacement, and Defective Box Detector. The workload was divided based on the lead times, quotes availability, contractors' timeline, and budget estimation. This technical report is for the Robotic Palletizer Installation project. The job responsibilities were to determine the suitable palletizer for industrial use by the plant while considering the available room, utility, and productivity of the manufacturing line. The Plant currently has an FMC Technologies mechanical palletizer and a Halton Stretch wrapper that are shown through Figure 2 and Figure 1 respectively, which are original to the plant and were installed in 1990 (30+ years). This equipment causes delays on the production line. The Palletizer and stretch wrapper cause on average 74.1 hours of downtime per year. Due to the age of the equipment, OEM (original equipment manufacturer) parts are hard to find and have a long lead time, some parts are unavailable and need to be fabricated by CGC's maintenance mechanic or a vendor. Due to this condition, the objective is to install a new Columbia Okura Ai1800 4 Axis Articulating Robotic Arm Palletizer [1], a Lantech wrapper with Top Sheet Placement [2], and new label printers. Installing the proposed equipment provides a more reliable machine that meets USG standards which will result in a delay decrease, contributing to an annual savings of \$9000.



Figure 1: Existing Halton Stretch Wrapper

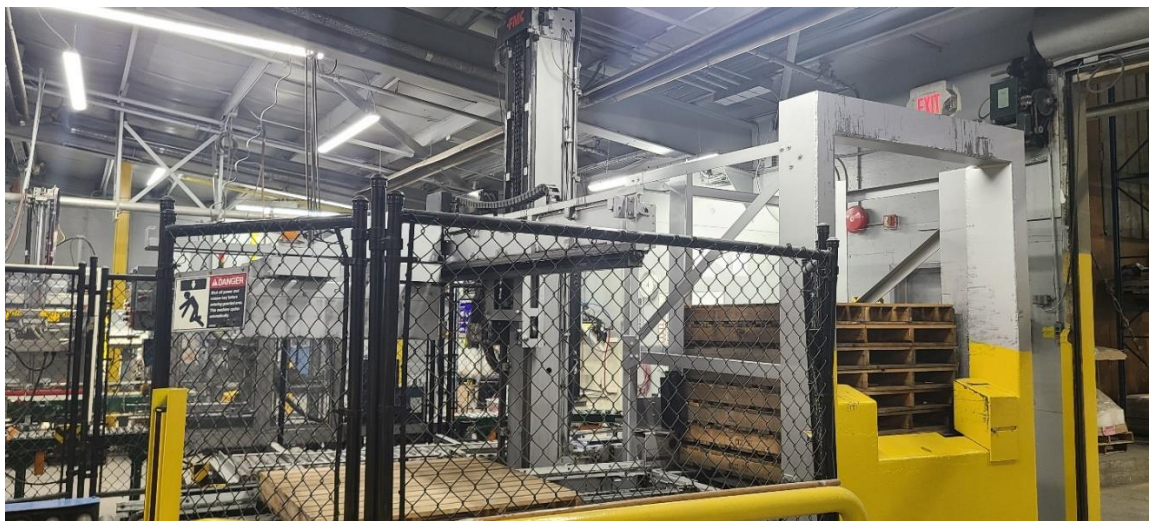


Figure 2: Existing FMC Robotic Palletizer

## 2.0. Detailed Analysis

### 2.1. Approach

To complete the objectives the approach is to install the new Columbia Okura Ai1800 Robotic Palletizer [1] and Lantech Stretch Wrapper with Top Sheet Placement [2]. Being a Capital Project, this may take time north of a year. There were multiple tasks delegated to me that include Budget Estimation, gathering quotes from manufacturers and contractors, confirming mechanical drawings fitting the plant layout, and finding alternative to the larger than room available equipment.

### 2.2. Equipment

The new Columbia Okura Ai1800 Robotic Palletizer [1] is now the standard in USG for Ready Mix Palletizers. The Current Palletizer and wrapper will be removed and

scraped. Electrical equipment such as transformers in that area will be relocated to provide sufficient working space for the new machines as Surrey location's Ready-mix packaging area is very compact as shown in Figure 1 and Figure 2. The new Ai1800 Robotic Palletizer and Lantech Q Wrapper will be installed by a third-party contractor and commissioned by Columbia Okura technicians. To mitigate any concerns with customer orders, the plant will build inventory, plus some additional contingency inventory ahead of time in preparation for the 10 day down time required for installation. Commissioning and Startup will be an additional 10 days; however, the product will be manufactured during this time. The print and apply system also need to be installed along with other equipment. The tags that are printed with crucial details like Pallet Number, batch number, Product number, and Quantity etc. These tags need to be printed by a production worker and create delay.

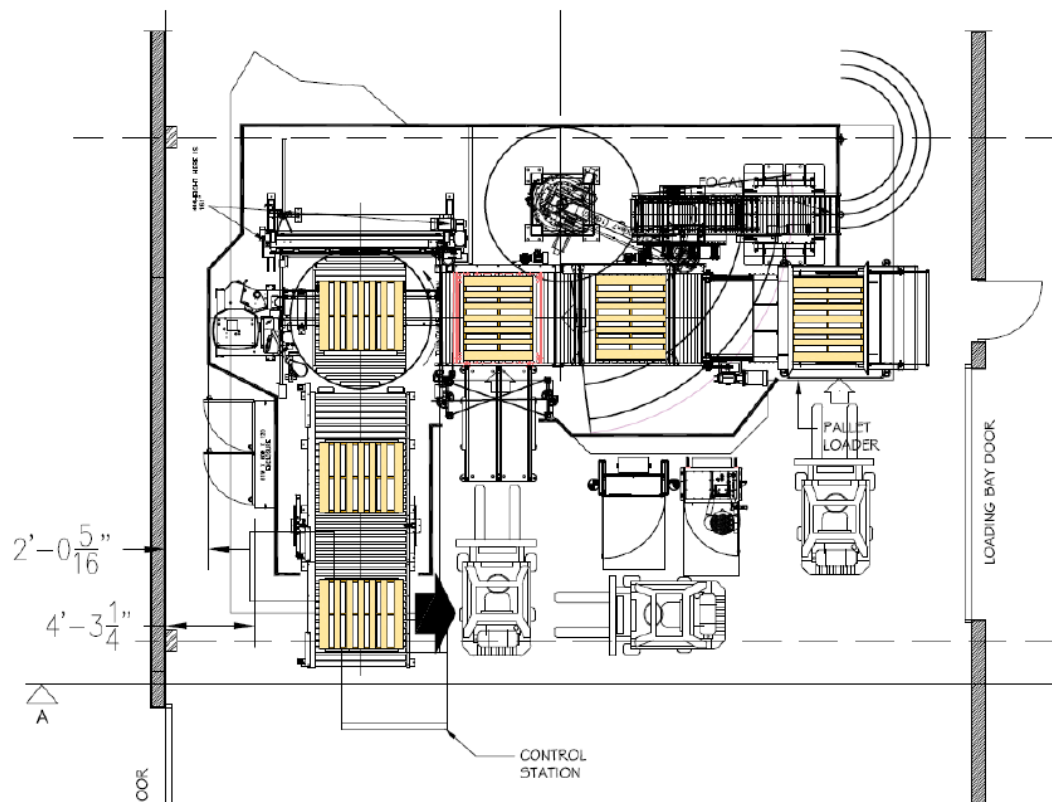


Figure 3: Columbia Okura Ai1800 Robotic Palletizer Layout [1]



## ***Q L Series Automatic***



Figure 4: New Lantech Stretch Wrapper [2]

### **2.3. Experiments**

Being a Capital Projects there were many experiments made throughout. One experiment that I was part of directly was to choose the Print and Apply system through discussion with the Joint Treatment Manager and Technical Manager. The standard is to use a fully automatic Print and Apply System, but through virtual experiment it has been found out that the Print & Apply will cover more space than we have. Also, it may require a set of separate rolling conveyors, that cannot be accommodated due to space constraints. The next option would be to choose a semi-automatic Print & Apply, that will only print labels automatically, and a production worker will apply them manually. This will cut the delay time for operators by at least half. This was the optimal choice, and the project would be budgeted for semi-automatic Print & Apply.

### **2.4 Analyses and Results**

The Brief analyses would be that the budget and estimate for the Robotic Palletizer has been submitted to the corporate for approval. The equipment that is budgeted for includes Columbia Okura Ai1800 Robotic Palletizer [1], Lantech Stretch Wrapper [2], and Barcode Printer with HMI Screen (Semi-automatic Print and Apply). The final decision will be made if they are satisfied with the equipment and if this will serve the purpose of increasing production and decreasing delays in the Ready-Mix Packaging area of the Plant. The resulting layout visible in Figure 3, including all the equipment has met the requirements of available space after disposing existing palletizer and the stretch wrapper along with relocation of the transformers and electrical panels from the wall beside the existing equipment.

### **2.5. Discussion**

The next steps after approval of the project will be Procurement Contract meaning distributing contracts to different contractors that may include the Manufacturer, Mechanical and Electrical Installers, and Programmers. After ordering, there is a lead time for the equipment of about a year. Once the equipment is delivered to the

plant, there will be Installation Outage of about 10 days. Once installed the Commissioning Startup will be performed by the manufacturer. The goal was to replace the old palletizer that is from the year 1990, with a new palletizer that is up to USG standard. The Halton Stretch wrapper is also from the same year as the Palletizer and it must also be replaced with a new Lantech Stretch Wrapper. These objectives are bound to be completed as the Scope of work, Estimate and Schedule is submitted to corporate for approval. I may not be able to foresee the next steps in the project as my co-op ends at the end of April. The project is planned using quotes, budgets, labor, taxes, and material costs. The schedule is created using Gantt Chart with estimated timeline. There is also a Project Plan established that involve the following items:

1. Key Project Accountabilities.  
Includes Project Manager, Construction Site Supervisor, and Plant Project Representative.
2. Engineering.  
Includes Equipment Layout, Equipment Specifications, Electrical Power, Electrical I/O and Devices, and PLC Programming.
3. Procurement.  
Includes Mechanical Requisitioning, Electrical Requisitioning, Purchase Orders, and Major Purchases.
4. Construction.  
Includes Civil Work, Structural Work, Equipment Installation, Piping Installation, and Electrical Installation.
5. Change Management.  
Includes Project Variance Requests (PVRs).
6. Commissioning & Startup.  
Includes Commissioning, Operator Training, Operating Procedures, and Maintenance Program.
7. Communication & Reporting.  
Includes Project Health Report and Plant Communication.

These are the key aspects of a project that must be completed throughout the project and are essential for project management. Each area of the Project is assigned to different or same stakeholder who sees through that aspect until the end of the project.

### **3.0. Conclusion and Recommendations**

The Capital Projects take a lot of Planning, Scheduling, Estimation, and Experiments before the start of the project. This is crucial as we can plan for contingency or in case the project fails. Due to the level of the project, there is big lead time, installation time, commissioning startup, and factory acceptance test time. However, none of the stages can be skipped and must be focused on in detail for the success of the project. There might be some roadblocks that can be hit throughout the project that include:

1. Delivery delay.
2. Mechanical or electrical failures.



3. Installation Delay or infractions.
4. Production time delay.

And many more. A plan to overcome these roadblocks must be in place and is highly recommended. During the Co-op term, working closely with the manufacturing machines has exposed me to engineering aspects of production. While working on Capital Projects the continuous management support, production worker co-operation, Estimation, and Scheduling are very important for the success of Projects.

## References

- [1] Columbia Okura, "Robotic-Palletizers," Columbia Okura, [Online]. Available: <https://columbiaokura.com/products/robotic-palletizers/>. [Accessed 10 04 2023].
- [2] Lantech , "q-series," Lantech, [Online]. Available: <https://www.lantech.com/explore-stretch-wrappers/semi-automatic/q-series/>. [Accessed 10 04 2023].