# JIT Powder Coating Co.

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## Organization Background

JIT Powder Coating Company is a custom coater located in Farmington, MN. The company supplies high quality powder coats on a variety of formed and fabricated metal substrates for businesses in Minnesota, Wisconsin, and Iowa.

JIT
Powder Coating Company

*"I am thankful to have had this awesome opportunity through MnTAP! I was stretched in many different ways, from designing equipment to ordering parts, and I learned so much about the engineering and problem-solving processes. I am confident my recommendations to JIT are worthwhile and that my new skills will apply directly to future occupations." ~ CH*

## Project Background

Powder coating requires rigorous surface preparation of the parts by either spraying or dipping them in a series of different rinses. This process, known as pretreatment, enhances the corrosion resistance of parts and improves adherence for the powder coating. JIT uses an industry standard chemistry known as iron phosphate for its two pretreatment lines. However, a relatively new zirconium-based chemistry has emerged as an alternative that can provide equal or superior pretreatment quality while offering advantages in costs and phosphorus reduction. JIT saw the MnTAP intern program as an opportunity to drive improvement projects that would allow them to support a potential shift to zirconium, and also evaluate opportunities to save energy and labor.

## Incentives To Change

While JIT Powder Coating has always produced quality powder coats, the company continuously looks to improve the quality, consistency, and throughput of its operations. Being able to achieve these goals would help expand the company's business opportunities while saving them money. The company also has strong ties to its neighboring communities and regularly takes initiatives that allow them to be a leader in environmental stewardship and promote a safe workplace for their employees.

## SOLUTIONS

### Install Small Line Immersion Heater

JIT was struggling with significant down time in their smaller conveyor line due to the need for heat exchanger maintenance. The limited availability of this line meant the larger line was needed for smaller runs impacting scheduling and energy use. A new immersion-style burner was recommended that is anticipated to require less maintenance. Improving the reliability of the small line is anticipated to improve JIT's production capacity while helping to save natural gas. Additional savings are expected from decreased maintenance and replacement parts costs.

### Implement Large Line Modifications

There are a number of improvements that JIT can make on the equipment that supports the operation of their large wash line. These upgrades are important steps towards being able to achieve the next level in process and quality control. Four of the five pumps that operate each pretreatment stage can be replaced with newer, right sized models that will be more reliable.

*"It is hard to have someone be able to exclusively focus on a single project. But with Calvin, we now had someone dedicated to solving the washer challenges that were preventing us from making our 2nd conveyor line into a fully capable production area. Calvin did great work and we expect to have many of his recommended solutions implemented by the end of 2021."*

*~ Tim Milner, President, JIT Powder Coating*

# Solutions

Changing out the manifolds that deliver the chemistries to the nozzles from blackened iron to CPVC will offer advantages of decreased fouling and maintenance costs. Implementing a regular schedule for nozzle maintenance will also help to verify that they are spraying effectively, ensuring a consistent, high quality surface on the parts. Finally, automating chemical additions to the tanks was recommended, which would decrease labor spent on titrating and manual additions and ensure consistency in the tanks. These upgrades will help to boost the reliability and consistency of the large line's pretreatment quality while helping to save resources such as chemical, energy, time, and labor. If all of these changes were to be implemented, the savings from the reduction in costs due to reworks were estimated to be $11,000.

## Install VFD on Pumps

It is recommended that the new pumps are also equipped with variable frequency drives (VFDs). This will allow the flow rates through each of the stages to be easily adjusted according to production requirements while being more energy efficient than using a throttle valve.

## Use Zirconium Pretreatment

There is an opportunity to transition to a zirconium pretreatment chemistry on the large wash line. The chemistry has the advantages of being applied at ambient temperatures and producing low amounts of sludge. Because the process tanks do not need to be heated, JIT can save $17,700 from reduced natural gas usage. An additional advantage is that there is less phosphate released into the outgoing wastewater.

## Install VFD on Exhaust Fan

The current exhaust fan on the large line is oversized and cannot be operated because it removes too much of the spray in the first stage. Another challenge is the fan's tendency to freeze over during the winter due to the high humidity inside the building. Installing a VFD on the fan would allow JIT to decrease the speed of the fan to a level where it can be effective without interfering with the pretreatment process. They would also be able to run the fan with automatic shutdown settings that would prevent the fan from freezing in the winter. This will help to improve the climate and comfortability of workers within the building throughout all months of the year.

| Recommendation | Annual Reduction | Annual Savings | Status |
|---|---|---|---|
| Install Small Line Immersion Heater | 95,600 therms | $33,000 | Planned |
| Large Line Modifications (CPVC Manifests, New Pumps, Automation, Nozzle SOP) | Natural gas from paint burn off (fewer parts needing rework) | $11,000 | Planned |
| Install VFD on Pumps | 34,400 kWh | $4,000 | Planned |
| Use Zirconium Pretreatment Chemistry | 51,000 therms | $17,700 | Recommended |
| Install VFD on Exhaust Fan | NA | NA | Recommended |

**MnTAP Advisor:** Daniel Chang, Associate Engineer