



Sushruth Venkatesh
Chemical Engineering
University of Minnesota Twin Cities

Company Background

Started in 1895, Firmenich, Inc. is the world's largest privately owned company in the flavors and fragrances business. Firmenich has a strong presence in 64 different countries across the globe, and has 26 manufacturing sites and 56 operational facilities. At its facility in New Ulm, MN (FIRULM), Firmenich makes over 900 different types of spray-dried, dry-blended, paste, and liquid flavors.



“Sushruth brought excellent analytical skills to projects as well as a fresh perspective for new projects. He gained a lot of knowledge about manufacturing and the food industry. It was a win-win situation.”

~ Sandra Mohr, Process Technology Manager, Firmenich

“Lean manufacturing is all about value creation. I don't think there is any greater professional satisfaction than helping create products that many people consume, while doing so more efficiently and by using fewer resources. This internship has given me a chance to apply the most abstract of chemical engineering concepts to a practical setting. I will no doubt use the project management & communication skills I've picked up here in the rest of my professional career.” ~SV



Project Background

Approximately 40% of FIRULM's products are spray-dried products. This makes the spray drying operation a critical component of the company's operation. FIRULM would like to optimize this drying process to improve performance. Furthermore, FIRULM desires to increase capacity to meet increased customer demands.

The clean-in-place (CIP) cycle is a step that immediately follows spray drying. FIRULM's strict adherence to quality control ensures that no contamination occurs across different product batches. The company wishes to reduce (and perhaps even reuse) the water and chemicals used during this step (while maintaining quality levels) to utilize their resources in a responsible manner, keeping in line with sustainability goals.

Incentives To Change

FIRULM practices lean manufacturing principles, and strives to increase productivity and to eliminate the seven wastes associated with manufacturing. Doing this has helped reduce costs and increase profitability. FIRULM counted on a MnTAP intern to bring a fresh pair of eyes to observe the processes at the facility, as well as additional engineering expertise. FIRULM is also on the path of continuous improvement, not only in manufacturing, but also in safety and quality. Finally, FIRULM would like to lead Firmenich's global sustainability efforts by improving resource utilization.



initial water saving estimates of 80,000 gallons per year on one of the dryers, with an accompanied 14 hours of time that could go towards production, resulting in increased annual income of \$9,000.

Increase Feed Solids

The concentration of feed solids in the slurries fed to the spray dryer play a crucial role in the process. Since the primary function of a spray dryer is to evaporate water, reducing the amount of this water leads to a higher production rate. Since there is less water to evaporate, there is a decrease in energy consumption as well. The intern was able to implement a project for increasing the feed content, a move that has the potential to increase production capacity by over 75,000 lbs. per year.

Recover Product Solids

The current CIP process at FIRULM is designed to flush out any solids left in the spray dryers and associated components (screw conveyors) into the drain during washing. The intern suggested recovering this product to reduce total suspended solids (TSS) & biochemical oxygen demand (BOD) costs associated with these discharges. Multiple methods of product recovery were considered. The best option is the use of a pigging device which is expected to prevent over 47,200 lbs. of product a year from going down the drain, and save over \$15,300/year as a result.

Solutions

Add an Operator

One of the spray dryers at FIRULM currently has only one operator to prepare each batch, run the dryer, and run the CIP process. He has to shut down the equipment after every spray drying batch, run cleaning water and chemicals through the spray dryer, take down and manually clean equipment, and then reassemble the equipment. Adding another operator to this dryer would increase throughput. Working alongside the operator, the intern found that a total of 320 hours of production could be gained per year, which translates to a potential production increase of 53,000 lb. and annual income of \$100,000.

Add Sensory Controls

Currently, operators at FIRULM use either a visual inspection or a timer based system to control rinse cycles in the CIP process. To ensure more precision and enable the operators to concentrate on other important things, the intern recommended automation of these processes through the use of turbidity and/or conductivity meters. This way, the operator would be able to tell when to stop a particular rinse, saving precious water and chemicals in the process. Hand held conductivity meter readings provided



Recommendation	Production Gains	Annual Reduction	Annual Savings	Status
Add an Operator	320 hours 53,000 lb	---	\$100,000	Testing
Add Sensory Controls	14 hours	80,000 gallons	\$9,000	Recommended
Increase Feed Solids	>75,000 lb	2,200 therms 28,000 gallons	\$337,500	Testing
Recover Product Solids	---	47,200 lb solids	\$15,300	Recommended