



Nordic Ware



Roopesh Pushpala

Industrial and Systems Engineering,
University of Minnesota Twin Cities

Company Background

Nordic Ware is a kitchenware manufacturer in St. Louis Park employing about 400 people. Starting in 1946, Nordic Ware is best known for its Bundt design cake pans. They also produce a large variety of cookware, bakeware and microwave accessories. Production operations include metal fabrication, parts washing, liquid and powder coating application, and plastic molding. Nordic Ware also operates an Industrial Coating Division, which provides custom surface coating.



“My internship at Nordic Ware has given me the exposure to industrial working standards and an opportunity to investigate numerous fields of engineering. My work as a process engineer broadened my ability to apply process efficiency and lean principles which will be a key aptitude all through my career.” ~RP

Project Background

Fabricated and cast parts are cleaned in one of two large belt conveyor washers to remove stamping oils and machining coolants prior to being painted and packed for shipping. These three-stage washers use natural gas, cleaning chemicals, softened and de-ionized water prior to a force air drying step.

Parts are painted on one of six lines which move parts on a chain-on-edge conveyor, past automated compliant paint spray guns, while parts spin on fixtures as they are painted. Parts are manually transferred to a belt-driven curing oven and the process is repeated for the opposite side of the part. Various forms of rectangular cookware, such as griddles, are increasing in popularity and could benefit from alternative processing methods. Nordic Ware wanted to optimize the performance of these cleaning and coating lines.



Incentives To Change

Nordic Ware takes sustainability very seriously and believes the term reaches far beyond what a product is made from and whether it can be recycled or not. Goals for this project involve reducing energy consumption, VOC emissions and production costs. Improvements in productivity, quality, machine uptime and energy efficiency aid Nordic Ware in efficiently utilizing resources and meeting customer expectations.

SOLUTIONS

Optimize Washer Operation

Several opportunities were investigated which optimize the water and energy use of Nordic Ware’s two industrial parts washers. Operators of the washers noticed increasing levels of foam in the first rinse stage which could be reduced by increasing the water flow. The intern worked to optimize and standardize the height settings of an air knife to direct the cleaner back into the first stage

without drying the cleaner on the parts. Rinse water spray pressure settings were also reduced and standardized based on part weight to minimize foam formation. Spray nozzle maintenance procedures were implemented at this time. Foaming was also reduced by converting the make-up water of the first rinse to city water instead of softened water. Overflow from the de-ionized (DI) water rinse stage was routed to the first rinse to reduce hardness and reuse the water. Elimination of the foam lead to adjustments to the water flow which reduced water usage for the washers.

After implementation of the suggestions to improve rinsing with city water, the intern focused his attention on the use of DI water consumption in the final rinse. The first step was recalibration of the DI water meters and sensors used to monitor the water quality in this rinse. New spray nozzles were then purchased and installed to provide a halo of water with very good rinsing properties with a much lower water flow-rate and achieve spot-free parts. These recommendations have been implemented and reduced the washer water consumption by 55%.

Implement Overhead Coatings Line with IR Oven

Paint transfer efficiencies were calculated for multiple products measuring coating usage during several shifts with various paint line leaders. Tests found significant improvements in paint transfer efficiency when rectangular products did not rotate and were fixed in place on the conveyor. Options considered include installation of an overhead line which would allow for increased part density by hanging up to six products per fixture and paint application of both sides in one pass. This suggestion includes passing the overhead conveyor through a new infra-red (IR) curing oven. Work is underway with Nordic Ware’s coating and equipment suppliers to facilitate electrostatic paint application, which would improve paint transfer efficiency even further. It is estimated that the new line would improve paint utilization by 28%, increase production throughput, and reduce the labor needed for transferring product.



Adopt Standard Operating Procedures

Lean manufacturing principles were used to evaluate, improve, standardize and document work methods on the washer and coating lines. Standard operating procedures on the wash line include checking the conductivity of the rinse tanks at regular intervals, setting appropriate line speed, and adjusting the height of the air knife. Implementing the standard procedures can reduce down time and product defects. Standard operating procedures on the paint line include checking the pattern of the spray guns, time of spray, atomizing air pressure, rotating speed, line speed and also the production efficiency to increase the productivity while reducing waste and downtime.



Recommendation	Annual Reduction	Annual Savings	Status
Optimize washer operation	9,093,000 gallons of water 28.5 tons of salt	\$86,400	Implemented
Implement overhead coatings line with IR oven	3,300 gallons of paint 6.80 tons of VOC and 75% labor	\$367,000	Recommended/ investigating further
Adopt standard operating procedures	Reduced process defects	N/A	In progress