Case Study: Woodfold Mfg., Inc. 2007

Project date: *June through November 2007 / Updated August 2008*
Project conducted by: *Woodfold Mfg., Inc., the Oregon Manufacturing Extension Partnership, and the Pacific Northwest Pollution Prevention Resource Center (PPRC)*
Case study prepared by: *PPRC, Seattle, Washington (www.pprc.org)*

Introduction

Woodfold Mfg., Inc. (Woodfold) in Forest Grove, Oregon, manufactures a custom line of wood products, including specialty doors and shutters. The Pacific Northwest Pollution Prevention Resource Center (PPRC) and Oregon Manufacturing Extension Partnership (OMEP) partnered in a lean and environment pilot project with Woodfold in 2007. Funding for the project was provided by the EPA, with additional in-kind hours contributed by Woodfold, OMEP, and PPRC.

The primary objectives of this collaboration were to:

- Evaluate the benefits and synergies of integrating environmental considerations into lean practices, and,
- Improve product quality, production efficiency, and environmental performance at Woodfold.

Woodfold is well-versed in lean manufacturing. Numerous lean and environmental procedures were already in place prior to this effort. However, Woodfold had not previously combined lean and environmental considerations in one project. They found this to be a very useful tool and added a 9th environmental waste to their internal set of lean wastes.

The primary focus for this evaluation was the shutter painting line, which involves spray priming, sanding, and spray painting. More specifically, they apply a light primer coat, dry, sand, apply a heavier primer coat, dry, sand, apply a coat of paint (lacquer), sand where needed, and finally, a second and final coat of lacquer.

On June 12, 2007, OMEP provided lean guidance for value stream mapping (VSM) of this process line, while Woodfold staff and PPRC provided environmental input to the VSM process. The current state and future VSM preparation was expanded beyond conventional lean to incorporate material, energy, and water inputs and outputs at each "process box".

Collectively, the participants closely scrutinized the current process and identified potential lean and environmental improvements. From June to November 2007, numerous environmental improvements were implemented. The productivity improvements identified for the paint line are pending implementation.

Findings

The group spent one day evaluating the current paint line, and generating the current state and future state VSMs. To include and better identify environmental improvements, any relevant material, water, energy, and waste inputs and outputs were captured on the VSM. The group observed the paint line, and briefly toured the rest of the plant.

Opportunity areas were identified:

- Reduce production bottlenecks and increase throughput in the shutter paint line;
- Improve and standardize spray paint techniques and methods to optimize transfer efficiency and reduce overspray;
- Reduce energy consumption;
- Reduce water use for paint line flushing;
- Reduce solid waste; and,
- Reduce particulate emissions.

Activities and Outcomes

Over the course of several months, Woodfold and PPRC corresponded regarding the environmental opportunities identified above. In addition, PPRC returned and conducted STAR training (www.mass.gov/envir/ota/star/default.htm) to assist Woodfold paint operators in improving their spraying techniques to optimize paint transfer efficiency.

A list of actions and results are reflected in Table 1. Table 2 lists estimated annual cost savings associated with changes. The lean improvements identified during the VSM are complete as well, but are not reflected here.

Conclusions

Through this pilot project at Woodfold, the examination of environmental wastes in conjunction with lean activities helped the team identify opportunities that may not have been considered in a traditional lean project.

PPRC thanks Woodfold and OMEP for participating in this project and the U.S. EPA for funding for the project.

Table 1. Process Changes and Results

Action	Result
Conducted STAR training for improving painting techniques, and evaluated different painter techniques on video.	Increased paint transfer efficiency for lacquer from 15.9% to 19.7% and for primer from 39.6% to 42.4%. Created standard work to sustain this improved paint performance. Reduced overspray and volatile organic compound (VOC) emissions. Increased paint booth filter longevity due to reduced overspray (and therefore decreased solid waste).
Redesigned a paint container from a 12" to a 6" diameter bucket for custom color orders mixed in quantities less than two gallons. (5" paint depth is required so the pump does not intake air).	Reduced overproduction of custom color paints by 48 gallons/year.
Changed to a zipper-mounted filter system for paint booths. These filters are slightly more expensive than previous type.	Expect to eliminate particulate emissions and increase longevity of the filters. Reduced labor for filter changeout and added 156 hours of available paint booth time.
Revised methods and criteria for flush water for line purging.	Reduced water consumption by about 50% for this function – from 12 gallons/day to 6 gallons/day. Reduced energy associated with evaporating this wastewater stream.
Found a local recycler for flexible PVC scrap.	Diverted about 1,000 pounds per month of solid PVC waste from the landfill. Looking into alternative plastics to replace PVC.
Re-evaluated and conducted a cost-benefit analysis for a wood-fired boiler for sawdust waste, to supplement heat during non-summer months.	No further action at this time.
Investigated possibility of eliminating metal pigments in certain stain colorants.	Did not adopt any changes due to the need for UV stability in stain colors. Woodfold and their paint supplier will continue to look for alternatives in the future.

Table 2. Annual Cost, Time, Material, and Environmental Savings for Implemented Changes

Reductions	Source of Savings	Annual Cost Savings	Annual Time, Material, & Environmental Savings
Labor/Increased Capacity	New filter system	$3,800	Over 160 hours
Material	Avoided paint purchase (raw material) due to new paint container design	$1,440	48 gallons/year
	Improved transfer efficiency	$34,664	136.3 gallons primer 854.1 gallons of lacquer
Emissions	Improved transfer efficiency	Not quantified	968 pounds VOCs 82 pounds hazardous air pollutants (HAPS)
Disposal	Booth Filters (longer life)	$954	50% reduction in filter material used
	PVC scrap to recycler	$670	6 tons scrap PVC
Water	New flush /purge water methods	$4	2,600 gallons/year
Energy	Reduced use of evaporators due to improved water use	$3,300	120,000 kwh electricity
Total Cost Savings (Quantified as of 8/08)		**$44,832**	

This case study summary was prepared by the Pacific Northwest Pollution Prevention Resource Center. For more information, contact Charlie Martin at cmartin@omep.org, or Michelle Gaither at mgaither@pprc.org.