Green Material Survey
Salo Manufacturing

Intern: Paul Henriksen

MnTAP Advisor: Jeff Becker

Minnesota Technical Assistance Program

UNIVERSITY OF MINNESOTA

Driven to Discover℠

Company Overview

- Salo is an open mold fiberglass bath and shower manufacturer

“Open Mold”

Mold Prep

Lamination

Gel Coat

Motivations for Change

- Research green materials to implement into manufacturing
- Follow the building market trend of going green
- Realize possible cost savings

Reasons for MnTAP Assistance

Green materials may…

- Reduce emissions fees
- Save energy
- Eliminate hazardous materials
- Reduce raw materials needed

Approach

- What can go green?
- How can I reduce styrene emissions?
- How can I eliminate that material?

❖ Find materials and implement onto a small scale

Determining Inefficient Processes

- Locate bottlenecks: Foam bases and lamination
- Try different application techniques and different materials

Green Resin

- Resin & fiberglass sprayed onto a unit to provide strength
  - Emits styrene: a possible carcinogen
- Try low-styrene and styrene-free alternative resins
  - Problems: Filler content, spray patterns, workability

Foam Materials

- The bases of barrier-free shower units were reinforced with an infusion foam
  - ~90 min installation time per shower and toxic chemicals required
- Solution: Spray foam or foam inserts

Green Release Agents

- Release agents are mold sealers, waxes, and cleaners used to prepare the molds for production
  - High VOC content
- Solution: Find low VOC release agents

Eliminate Acetone

- Acetone is a popular, low flash point solvent
  - All material lost to evaporation
- Switch to water based solvent- Acrastrip®.

Recommended Process Changes

- Eliminate Acetone
- Styrene Free Resin
  - No styrene, no VOC's
- Recycled Content Resin
  - Salo products would be marketable to LEED projects
- Green Release Agents
  - VOC free release agent

Successful Process Changes

- Optimized Ventilation (Implementing)
  - Repair current equipment
  - Enhance air flow through facility
- Foam Inserts (Implementing)
  - Saves ~75 minutes per unit produced
  - Eliminates isocyanates in facility
  - $3 material savings per unit

Summary

Waste Reduction Option	Change Type	Waste reduced (annual)	Implementation Cost	Cost Savings, $/year (Loss, $/year)	Payback Period	Status
Optimize lamination technique	Procedure Change	1,200 lbs. styrene; 4,000 lbs. trim waste	NA	$75,032	Immediate	Not Recommended
Switch to recycled resin	Material Change	NA	$0.214/lb.	($78,000)	NA	Tentatively Recommended
Switch to styrene-free resin	Material Change	10,800 lbs. styrene HAP	$1.29/lb.	($385,200)	NA	Tentatively Recommended
Switch to VOC-free Release Agents	Material Change	100 lbs. VOCs	$549.31	Unknown	Unknown	Not Recommended
Optimize HVAC system	Equipment Refurbish	Unknown	$11,000	Unknown	Unknown	Implementing
Spray foam system	Procedure/Equipment Change	NA	$8,000	$1,015	7.9 years	Not Recommended
Foam slab material component	Material Change	470 lbs. polyurethane; 5.8g isocyanate	NA, saves $4.66/unit	$2,966	Immediate	Implementing
Replace acetone with Acrastrip®	Material Change	3570 lbs. VOCs; 900 lbs. hazardous waste	NA, saves $0.43/lb. solvent	$1,688	11 months	Recommended

Personal Benefits

- Networked with a lot of professionals in various industries
- I got really good at “cold calling”
- Practiced general engineering and problem solving skills

Questions?