Water Conservation Improvements
CertainTeed Roofing

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Company Background

• Saint Gobain- Parent company for CertainTeed
  • World wide company with 185,364 employees
  • CertainTeed-more than 5,700 employees and more than 60 manufacturing facilities

• Shakopee facility
  • Produces roofing and roofing materials.
  • It features three lines
  • This project features the third line only which is their main production line
How Shingles are Made

- Dry end fiberglass and looper
- Asphalt and granules
- Cooling
- Finished looper
- Cutter
- Reapplication
- Packaging

http://www.inquiring-eye.com/anatomy/roof.htm
Motivations For Change

• Environmental impact savings
• Water reduction
• Corporate sustainability goal
• Lost production
Corporate Sustainability Goals

3 Year Goals 2017-2019
2016 Baseline

- Energy consumption: -5% (MWh/NSP)
- Total CO₂ emissions: -7% (MTCO₂/NSP)
- Water Withdrawal: -20% (M³/NSP)
- Water Discharge: -20% (M³/NSP)
- Non-recovered waste: -15% (Ton/NSP)

2025 Goals
2010 Baseline

- Energy consumption: -15% (MWh/NSP)
- Total CO₂ emissions: -20% (MTCO₂/NSP)
- Water discharge: -80% (M³/NSP)
- Long-term: Zero industrial water discharge in liquid form
- Non-recovered waste: -50% (Ton/NSP)
- Long-term: Zero non-recovered waste
Project Goals

Temperature goals
At the cutter it must be below 95 °C
Goal is 80 °C

Improving the Web Cooling/Drying
While Reducing Water and Energy Usage
Project Overview

- Reduce Water Use
  - Reduce waste
  - Reduce usage
  - Calculate current heat losses
  - Test and research new options

- Create Better Cooling
  - Make production faster
  - Reduce maintenance
  - Reduce operator error
  - Create better product
Approach

• Determine savings associated with final recommendations

• Review
  • Water consumption
  • Amount of wasted product
  • Energy consumption

• Create process flows and show options
Possible Improvements

- Cooling tower overflow
- Nozzle overspray
- Maintenance of cooling system
- Better air exchange

https://d3fjmcoibav.becloudfront.net/s3fs-public/colors/308747-LM-MaxDefWeatheredWood.JPG
Water Consumption

• The main resources that were dealt with in this waste reduction project is water

• Water costs $.0027 per gallon and is the highest priority of resource for CertainTeed

<table>
<thead>
<tr>
<th></th>
<th>Gallons</th>
<th>Dollars</th>
<th>Gallons</th>
<th>Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Yearly Use</td>
<td>27,026,000</td>
<td>$49,919</td>
<td>18,500,000</td>
<td>$15,984</td>
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<tr>
<td>Total Cost</td>
<td>$ per gallon .0027</td>
<td></td>
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</tbody>
</table>
Options

• Water reduction
  • Chiller
  • Extending rolled cooling
  • Larger tank
  • Reuse of warm wastewater for use in evaporative cooling

• Increased Cooling
  • Maintenance of parts
  • Creating an air plenum
  • Makeup air
  • Air flow Curtains
Recommendation: Chiller

- Best way that limits water use in cooling section
- Run cost $24,200
- Purchase cost $161,400
- Install cost $153,600
- Benefits:
  - Drops water usage 1.8 GPM or 21 degree temp drop
  - Gains back lost production up to $159,000
Chiller

- Sizing 205 tons of cooling will cover all of the cooling for line 3
- Water cooled condenser cooled off of current cooling tower.
- 60 degree average cool water temp, possibly lower
- Works best when combined with additional rolls
- Best location next to quality room
Additional heat loss

<table>
<thead>
<tr>
<th>Btu/hr current</th>
<th>Btu/hr chiller</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,098,566</td>
<td>2,962,947</td>
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</table>

<table>
<thead>
<tr>
<th>possible water saved</th>
<th>GPM</th>
<th>temp drop degrees F</th>
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</thead>
<tbody>
<tr>
<td>chiller</td>
<td>2</td>
<td>21</td>
</tr>
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</table>
Additional rolls

- Is the chiller enough?
- Additional cooling enables better product
- Higher cost vs saving water
- Lowers run cost of chiller
Additional rolls

- Add 18 rolls
- Further eliminates water use

<table>
<thead>
<tr>
<th></th>
<th>Btu/hr</th>
<th>Water saved GPM</th>
<th>Temp drop degrees F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat removed with chiller new rolls</td>
<td>195,000</td>
<td>.7</td>
<td>8</td>
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</table>
Tank Control

• **Overflow**
  • Water over flows pit at around 14 GPM constantly during production
  • Pump schedule

• **Air compressors**
  • Dump water from single pass
  • Doesn’t return all water

• **Solution**
  • Put a return water control system on the pit level and send all water back to the compressors to eliminate overflow and only refill pit sump pit as makeup as necessary
Larger Tank

• A second option - larger tank extension
• Addresses the pumping schedule problems
• Allows for the tank to deal with pumping schedules
• Doesn't address air compressor overflow.
• Still will overflow in cases
## Options table

<table>
<thead>
<tr>
<th>Waste Reduction Option</th>
<th>Waste Reduced (per year)</th>
<th>Implementation Cost</th>
<th>Cost Savings (per year)</th>
<th>Payback Period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Reduction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chiller for recirculating water to the cold rolls</td>
<td>946,000 gal water</td>
<td>$315,000</td>
<td>Water $2500 Production Gain Up to $159,000</td>
<td>2.3 Years</td>
<td>Recommended</td>
</tr>
</tbody>
</table>
| More rolls for cooling with chiller                          | (Amount dependent on chiller temp)  
367,920 gal water | $162,000 for rolls + 162,000 install | Water (dependent on chiller temp) $678 Production Gain Up to $159,000 | 4.3 years      | Further investigation needed |
| Larger holding Tank and reducing overflow                   | 7,400,000 + gal water    | $100,000            | $13,600                 | 7.3 Years      | Recommend               |
Personal gains

• How to meet with professionals
• How to scope bid and design projects
• Exposure to Industrial equipment
• Data collection
• Seeing real life calculations
• Communicating between multiple people