Compressed Air Energy and Water Reduction

Phillips Distilling Company

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University of Minnesota
Driven to Discover™
Phillips Distilling Company (Princeton, MN)

- Produce several top brands of alcoholic beverages
  - UV
  - Phillips
  - Prairie
  - Many more!

- Also import wine and spirits

- Ship ~7 million cases/year
Incentive for Change

“One Team: G.R.E.E.N.”

• Sustainability committee
• Environmental responsibility is economical

• Biggest reduction opportunities:
  • Compressed air
  • Water use/discharge

https://www.rit.edu/kgcoe/isese/sites/rit.edu/kgcoe.isese/files/images/Sustainable%20graphic.jpg
MnTAP Assistance

Compressed air opportunity

• Compressed air audit (rebate from Connexus)
• Compressed air maintenance plan
  • Detect, tag, record, and fix all leaks
• Identify compressed air costs
• Improve compressed air system efficiency
Approach (compressed air)

- Study the system
- Breakdown energy usage
- Identify opportunities
- Develop recommendations
Process overview (compressed air)

- Inlet air: 300hp compressor
- Treatment system: 300hp compressor
- Distribution: Bottling equipment, Tank agitation, Waste

- 635,000kWh/year ($62,000)
- ~400 to 700 CFM
Compressed air usage

Demand distribution:

Proper use 41%

Equipment 34%
Leaks 29%
Open valves 26%
Agitation 11%

Reduction opportunity 59%
Recommendations (compressed air)

1. Compressed air system maintenance

<table>
<thead>
<tr>
<th>Annual energy reduction</th>
<th>Implementation cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>158,000kWh</td>
<td>$750</td>
<td>$15,500</td>
<td>2 weeks</td>
<td>Implementing</td>
</tr>
</tbody>
</table>

- **Used leak detector to identify 35 leaks**
  - ~125CFM demand (158,000kWh/yr)
  - Fixed 54% of leaks, plans to fix remaining

- **Created compressed air maintenance program**
## Recommendations (compressed air)

2. Closing open equipment valves

<table>
<thead>
<tr>
<th>Annual energy reduction</th>
<th>Implementation cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>150,000kWh</td>
<td>&lt;$6,000</td>
<td>$14,600</td>
<td>&lt;5 months</td>
<td>Implementing</td>
</tr>
</tbody>
</table>

- Develop procedures for closing air valves
- Install solenoid valves where necessary
Recommendations (compressed air)

3. Pressure/flow controller

<table>
<thead>
<tr>
<th>Annual energy reduction</th>
<th>Implementation cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>38,000kWh</td>
<td>$4,000</td>
<td>$3,700</td>
<td>1.1 years</td>
<td>Recommended</td>
</tr>
</tbody>
</table>

- Control pressure in plant
- Reduce compressor pressure from 112psig to 100psig
### Recommendations (compressed air)

4. Regulating air use for tank agitation

<table>
<thead>
<tr>
<th>Annual energy reduction</th>
<th>Implementation cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>31,000kWh</td>
<td>none</td>
<td>$3,000</td>
<td>-</td>
<td>Recommended</td>
</tr>
</tbody>
</table>

- Raise awareness
- Standardize procedures
- Regulate and time air use
## Compressed air recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Annual reduction</th>
<th>Total cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leak prevention program</td>
<td>158,000kWh</td>
<td>$750</td>
<td>$15,500</td>
<td>2 weeks</td>
<td>Implementing</td>
</tr>
<tr>
<td>Closing equipment valves</td>
<td>150,000kWh</td>
<td>&lt;$6,000</td>
<td>$14,600</td>
<td>&lt;5 months</td>
<td>Implementing</td>
</tr>
<tr>
<td>Pressure/flow controller</td>
<td>38,000kWh</td>
<td>$4,000</td>
<td>$3,700</td>
<td>1.1 years</td>
<td>Recommended</td>
</tr>
<tr>
<td>Regulating agitation air</td>
<td>31,000kWh</td>
<td>-none-</td>
<td>$3,000</td>
<td>-none-</td>
<td>Implementing</td>
</tr>
<tr>
<td>Electric bag inflators</td>
<td>11,000kWh</td>
<td>$2,300</td>
<td>$1,000</td>
<td>2.3 years</td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>388,000kWh</strong></td>
<td><strong>$13,000</strong></td>
<td><strong>$38,000</strong></td>
<td><strong>4 months</strong></td>
<td></td>
</tr>
</tbody>
</table>
MnTAP Assistance

Water

• High water discharge (nature of process)
• Expensive to dispose
• Find ways to **reduce** and **recycle** water
Approach (water)

- Study the system
- Sample wastewater streams
- Develop strategies to reuse wastewater
Process overview (water discharge)

Production floor spills

Tank rinses

Flushing unused product from transfer pipes

Captured high-strength

Above ground production area

Collected and recycled

Floor grates / gutters

Underground wastewater sump

Pumped out as waste
Recommendations (water)

1. New rotating spray balls

<table>
<thead>
<tr>
<th>Annual wastewater reduction</th>
<th>Implementation cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>~150,000gal</td>
<td>$2,500</td>
<td>$9,000 to $16,000</td>
<td>&lt;4 months</td>
<td>Recommended</td>
</tr>
</tbody>
</table>

- ~50% less water per rinse
- Easy to implement
Recommendations (water)

2. Reusing low-strength wastewater

<table>
<thead>
<tr>
<th>Annual water reduction</th>
<th>Implementation cost</th>
<th>Annual savings</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>~160,000gal</td>
<td>Needs further analysis</td>
<td>$10,000 to $18,000</td>
<td>Needs further analysis</td>
</tr>
</tbody>
</table>

- Final tanks rinses are very clean
- Still investigating where this water can be reused
### Water reduction recommendations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Annual reduction</th>
<th>Total cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reusing rinse water</td>
<td>280,000gal water</td>
<td>Unknown</td>
<td>&gt;$10,000</td>
<td>Unknown</td>
<td>Investigating</td>
</tr>
<tr>
<td>New spray balls</td>
<td>150,000gal water</td>
<td>$2,500</td>
<td>&gt;$9,000</td>
<td>&lt;4 months</td>
<td>Recommended</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>430,000gal water</strong></td>
<td><strong>Unknown</strong></td>
<td><strong>&gt;$19,000</strong></td>
<td>Unknown</td>
<td>Investigating</td>
</tr>
</tbody>
</table>
## Company benefits

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Annual reduction</th>
<th>Total cost</th>
<th>Annual savings</th>
<th>Payback period</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressed air total</td>
<td>388,000kWh</td>
<td>$13,000</td>
<td>$38,000</td>
<td>4 months</td>
<td>Implementing</td>
</tr>
<tr>
<td>Water total</td>
<td>430,000gal water</td>
<td>Unknown</td>
<td>&gt;$19,000</td>
<td>Unknown</td>
<td>Investigating</td>
</tr>
<tr>
<td>Insulating boiler pipes</td>
<td>10,000therms</td>
<td>$2,200</td>
<td>$6,000</td>
<td>4 months</td>
<td>Implementing</td>
</tr>
</tbody>
</table>
My experience

- Industry-tailored sustainability solutions
- Production manufacturing practices
- Communication
- Accountability
Thank you!