AR No. 3

Insulate Cookers

**Recommended Action**

Insulate the two can cookers with two-inch fiberglass batted insulation covered with a foil jacket for protection.

<table>
<thead>
<tr>
<th>Assessment Recommendation Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy (10^6 Btu)</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>116</td>
</tr>
</tbody>
</table>

**Background**

Currently the two can cookers have no insulation and are releasing a large amount of heat into the plant. By adding insulation the majority of this heat will be contained and result in a reasonable savings.

**Anticipated Savings**

The existing energy loss \( (E_0) \) can be found from:

\[
E_0 = [U_0 \times ((A_{C1} + A_{C2}) \times (T_S - T_A))] \times H
\]

\[
= [2 \text{ Btu/hr}\cdot\text{oF}\cdot\text{ft}^2 \times ((245 +180) \text{ ft}^2 \times (180-10) \text{ oF})] \times 1,344 \text{ hr/yr}
\]

\[
= 125.7 \times 10^6 \text{ Btu/yr}
\]

where

\[
U_0 = \text{Existing Heat Transfer Coefficient: 2 Btu/hr}\cdot\text{oF}\cdot\text{ft}
\]

\[
A_{C1} = \text{Area of Larger Cooker: 245 ft}^2
\]

\[
A_{C2} = \text{Area of Smaller Cooker: 180 ft}^2
\]

\[
T_S = \text{Surface Temperature of the Tanks: 180 °F}
\]

\[
T_A = \text{Ambient Temperature: 70 °F}
\]

\[
H = \text{Annual Operating Hours: 1,344 hr/yr}
\]

The Energy loss after 2 inches of fiberglass batted insulation and a foil jacket \( (E_1) \) can be found from:
\[ E_1 = \left[ U_1 \times ((A_{C1} + A_{C2}) \times (T_S - T_A)) \right] \times H \]
\[ = \left[ 0.16 \text{ Btu/hr-\textdegree F-ft}^2 \times ((245 + 180) \text{ ft}^2 \times (180-70) \text{ \degree F}) \right] \times 1,344 \text{ hr/yr} \]
\[ = 10.1 \times 10^6 \text{ Btu/yr} \]

where

\[ U_1 = \text{Proposed Heat Transfer Coefficient} \]
\[ = \frac{1}{(1/U_0 + 1/R)} \]
\[ = \frac{1}{(1/2 + 1/0.17)} \]
\[ = 0.16 \text{ Btu/hr-\textdegree F-ft}^2 \]

\[ R = \text{Insulation R-Value} \]
\[ = \text{Thermal Conduction/Inches of Insulation} \]
\[ = \frac{(0.34 \text{ Btu-in/ft}^2\text{-hr-\textdegree F})/2\text{-in}}{} \]
\[ = 0.16 \text{ Btu/ft}^2\text{-hr-\textdegree F} \]

The energy savings (ES) can be found from:

\[ ES = (E_0 - E_1) \]
\[ = (125.7 - 10.1) \times 10^6 \text{ Btu/yr} \]
\[ = 115.6 \times 10^6 \text{ Btu/yr} \]

The cost savings (CS) can be found from:

\[ CS = ES \times \frac{4.6924}{10^6 \text{ Btu}} \]
\[ = 115.6 \times 10^6 \text{ Btu/yr} \times \frac{4.6924}{10^6 \text{ Btu}} \]
\[ = $540/yr \]

<table>
<thead>
<tr>
<th>Source</th>
<th>Quantity</th>
<th>Units</th>
<th>Energy 10^6 Btu</th>
<th>Cost $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>1,156</td>
<td>Therms</td>
<td>116</td>
<td>540</td>
</tr>
</tbody>
</table>

**Savings Summary**

**Implementation Cost**

In addition to the two inches of fiberglass batted insulation, a foil jacket will be necessary for protection. The cost of the insulation and the jacket used below include installation. The implementation cost (IC) can be found from:

\[ IC = (A_{C1} + A_{C2}) \times \left[ (\text{Insulation Cost}) + (\text{Cost of Jacket}) \right] \]
\[ = (245 + 180) \text{ ft}^2 \times \left[ ($0.50/\text{ft}^2) + ($0.05/\text{ft}^2) \right] \]
\[ = $345 \]

The savings will pay for the implementation cost in 0.6 years.