

## **ESA-195 Public Report**

### **Introduction:**

This J.R. Simplot facility produces French fries and other potato products in Moses Lake, Washington. The plant operates a primary boiler that burns a combination of natural gas and hydrogen. The hydrogen is piped to the boiler room from a neighboring facility. The plant uses saturated steam to peel, blanch, and cook the potato products.

### **Objective of ESA:**

The purpose of the steam energy saving assessment was to train this facility's and neighboring facilities' engineering groups to use the Department of Energy steam tools, to create a model of the plant steam system, and to identify projects that will save energy.

### **Focus of Assessment:**

The plant generates steam to be used in the production of French fries and other potato products. The J.R. Simplot Company operates three plants in the Moses Lake area and several plants in the neighboring state of Idaho. Neighboring plants participated in the ESA to gain knowledge regarding the use of the Department of Energy's steam tools. If ways can be identified to improve the plant steam system operation, the cost of energy use at the facilities can be reduced (i.e., primarily reduce the amount of natural gas consumed).

### **Approach for ESA:**

J.R. Simplot was serious about gaining as much as possible from the Department of Energy-sponsored ESA; eight people were involved in the training audit, including two corporate engineering representatives. The assessment began by reviewing the Department of Energy's Steam System Scoping Tool (SSST). Information obtained from the SSST and other specific

information from the evaluation team was used to begin the modeling process. Jeff Breiling, the plant lead for the assessment, was very well prepared with the data previously requested. A plant tour was conducted to collect flue gas samples from the boiler, to observe the operation of the blowdown heat recovery equipment, and the deaerator, feed water economizer, and the condensate recovery system.

3E Plus software was used to build a metric for determining the heat loss in portions of the plant distribution system that have bare or poorly insulated pipe.

By the end of the first day of work, Jeff Breiling was manipulating the Steam System Assessment Tool (SSAT) model to develop a comprehensive list of steam system improvement opportunities. On the second day, significant time was spent computing steam turbine isentropic efficiencies, demonstrating the use of the 3EPlus software, and adjusting the SSAT model to ensure that all of the training audit team members were satisfied that the SSAT model represented the current plant operation.

### **General Observations of Potential Opportunities:**

- The total Moses Lake Plant natural gas use for the boilers was 211,150 MMBtu for 2005. In addition 258,087 MMBtu of hydrogen was also used in the boiler. Additional natural gas is also direct fired in product dryers. The cost of boiler fuel for 2005 was \$2,511,000.00.
- The impact fuel was the blend of natural gas and hydrogen and the cost used in the SSAT program was price a price of \$5.35/MMBtu.
- The impact electrical cost used in the SSAT program was a budget price of 1.7 cents/kWh.

To enhance the accuracy of the SSAT model, the facility needs to record the steam generated from each boiler each day, the makeup water used in the boilers each day, and the amount of low pressure process steam used each day.

The following opportunities were evaluated using a fuel cost of \$5.35/MMBtu and electric cost of \$0.017/kWh. Some projects were modeled to determine the marginal cost of steam for the plant and the value of return condensate. The values are listed below.

- Steam has a marginal cost for the Moses Lake plant of \$7.03/klbs.
- If the plant steam load could be reduced by 1000 lbs/hr, an annual savings of \$50,000 would result.
- Condensate has a marginal cost for the Moses Lake plant of \$0.00817/gallon or \$0.98/1000 lbs. (The above costs include fuel, water, and chemical treatment)

1. Change boiler efficiency, increase combustion air temperature. The facility currently uses outside air for combustion air and the average outside air temperature for Moses Lake, Washington is 49oF. Use boiler room air for the combustion air supply and it is estimated that the average combustion air temperature will increase to 69oF. This technique allows the capture of some of the radiant heat loss from the boiler and the warmer air will improve the efficiency of the boiler. The SSAT model indicates an annual savings of \$15,000 per year.

2. Modify medium pressure and low pressure condensate flash system. The existing system does not use flash recovery. The high temperature condensate is returned directly to the boiler as feed water. Install a medium pressure flash tank and then direct the remaining medium press flash to the deaerator where it is flashed and used to displace the pegging steam for the deaerator. The SSAT model indicates a savings of \$187,000.00 per year, but that is overstated because the model does not value the condensate that is returned directly to the boiler at an elevated temperature. A separate heat balance was completed to compare the two systems, and the actual savings for two stages of flash recovery will be \$136,000 per year.

3. Change Boiler Efficiency and the Process Steam Requirements. Evaluate the installation of a full condensing stack economizer. A full condensing economizer will reduce boiler stack temperature thereby increasing boiler efficiency to 88.3%, and it will generate a large volumes of hot water that can be used in the plant for blanchers, wash water, and defrost water. The hot water reduces the amount of steam that must be used to heat water in the plant. The savings depends on the amount of hot water that can be used in the plant and additional engineering and metering will be required to verify this opportunity. The model indicates a potential savings of \$277,000. Accurate data must be collected on the volume of water that is currently being heated with steam in the plant to be certain that all of the potential heat in the boiler stack can be reclaimed.

4. 4. Other. - Evaluate changing from a demineralized makeup water pre-treatment system to a reverse osmosis pre-treatment system. The blowdown and boiler chemical treatment requirements will remain approximately the same but the need for the sulfuric acid and caustic soda used to regenerate the demineralizer will be eliminated. The facility is spending \$45,000 per year for acid and caustic. This will reduce the plant water cost from \$0.0041/gallon to \$0.0015/gallon.

Potential fuel savings from above improvements:

Near-Term

2,832 MMBtu

0.6% savings

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Medium-Term	25,402 MMBtu	5.4% savings
Long-Term	51,271 MMBtu	10.9% savings
Total	79,505 MMBtu	16.9%

### Management Support and Comments:

We did not meet with the plant manager but J.R. Simplot dedicated personnel from three plants to the training audit for three days, including corporate engineering representatives.

### DOE Contact at Plant/Company:

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