



Assessment Date:  
June 06, 2006

#### Benefits:

- Implemented seven recommendations to minimize energy consumption and optimize efficiency.
- Recommended measures result in a reduction of energy usage of 14.7% per year.
- Implemented measures have paybacks ranging from immediate to 2 years with an overall payback period of just 7 months.

#### Applications:

The IAC team identified opportunities to increase productivity and reduce energy usage by increasing boiler efficiency and using the optimum storage operation. The high percentage implementation of recommendations at this plant will encourage the IAC team to help other similar facilities in the future.

## Multi-wall Packaging: Recommendations Saves by Increasing Storage Efficiency

### Summary

Through the Department of Energy's *Industrial Assessment Center* located at **North Carolina State University**, Multi-wall Packaging, a corrugated packaging material manufacturer, was able to save a significant amount of money through reductions in energy and productivity improvements. Through recommended actions for the steam system, boiler efficiency was increased by 3%, compressed air use was reduced with the use of shut off valves on the machines, and productivity improvements were made by on-going reductions in in-process inventory.

### Company Background

Multi-wall Packaging is a custom manufacturer of corrugated packaging material. Their product is used as packaging material for furniture and appliances, making the product fit snugly in the box and preventing damage during shipment. Kraft paper is corrugated, cut to width, and rolled into small rolls. The rolls of corrugated board are stacked and glued together creating a thick block that is cut to length. Notches and other holes may be cut, so that the block will bend to form a corner. The finished product is packaged and sent to the customer.

### Assessment Approach

A team of faculty, staff, and students from the North Carolina State University Industrial Assessment Center performed an Industrial Assessment in June of 2006. The assessment was led by Center Director, Dr. James W. Leach and Extension Specialist Dr. Stephen Terry, both faculty members in the Department of Mechanical and Aerospace Engineering at NC State University.

### Notable Observations

The facility had recently purchased a small firetube boiler to provide steam for the small corrugating machine. The boiler was in good shape, but the stack temperature was noted to be quite high, reaching 500°F at high fire. Excess air levels were also a bit high, but not excessive. Plant personnel indicated that the boiler had some scale issues from the previous owner. Our observations confirmed this fact.

Upon recommendation of the IAC team, the plant shut the boiler down for the weekend and performed a chemical treatment of the water side heat transfer surfaces. The boiler was also tuned by a reputable boiler serviceman. The measured efficiency of the unit after the boiler was serviced showed a **3% increase**, in line with the IAC's estimate of 2.5% improvement and **\$1,720/yr. cost savings**.



In addition, the assessment team recommended that only the minimum number of steam nozzles on the corrugator be turned on during machine setup between batches. This recommendation was done, “as soon as the assessment team left the plant.” *The estimated savings were over \$13,000/yr. with no implementation cost.*

### Compressed Air

One of the notching machines used compressed air to push cut-away pieces away from the work area and into a bin for recycling. The nozzle was quite large and was not turned off when the machine was idle. The assessment report recommended either installing a manual shut off valve to be used by the employees, or an automated control, tied into the machine’s operation. This recommendation saved an estimated \$200 per year with \$500 implementation cost.

### Productivity

The plant stores a large amount of in-process inventory, because their customers often demand shipments with little notice. Using principles discussed in the IAC report, the plant is developing a plan to reduce in-process inventory – and thus reduce carrying costs.

### Results

Table 1 shows the annual cost savings achieved at the Multi-wall Packaging facility from implementing the conservation opportunities identified during the assessment by the North Carolina State University Industrial Assessment Center team. Based on these recommendations, the facility can reduce its electrical consumption by 39,670 kWh and natural gas usage by 1,928 MMBTU/yr. The overall cost savings resulting from energy savings recommended and increased productivity is \$28,985/yr.

### Projects Identified

Implemented opportunities are described in the following table:

Table 1. Opportunities at Aluminum Foundry				
Recommended Action	Annual Resource Savings	Annual Cost Savings	Implementation Cost	Payback (months)
Tune Boiler and Clean Surfaces	124 MMBtu	\$1,720	\$2,300	16
Repair Steam Traps	339 MMBtu	\$4,704	\$1,500	4
Recover Compressed Waste Heat	505 MMBtu	\$6,998	\$4,635	8
Turn Off Compressed Air to the Auto-Notcher When Not in Use	11,670 kWh	\$272	\$500	22
Close Excess Steam Nozzles of Corrugator	960 MMBtu	\$13,322	\$0	Immediate
Replace 400 Watt Metal Halide Lamps with 360 Watt Lamps	28,000 kWh	\$1,390	\$50	1
Reduce Storage of In-process Work	0	\$20,000	\$20,000	12
<b>Total</b>	<b>1,928 MMBtu 39,760 kWh</b>	<b>\$48,406</b>	<b>\$28,985</b>	<b>7</b>

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