

Eco-efficiency opportunities fact sheet

Manufacturers and Processors: Increasing Boiler Efficiency

Introduction



The Eco-Efficiency Program for Manufacturers (E2PM) was created by Dalhousie University's Eco-Efficiency Centre to help small- to medium-sized manufacturers and processors, across Nova Scotia, identify eco-efficiency and pollution prevention opportunities. The program focused on

business initiatives to reduce costs by utilizing energy, water, and materials more efficiently. The program consisted of four components, two offered by Eco-Efficiency Centre staff and two by private consultants. Both Eco-Efficiency Centre staff and consultants conducted site visits of local manufacturers and prepared recommendations on opportunities available. Formal opportunity and implementation assessment reports were prepared by the consultants for participating companies.

Before the program ended in March 2009, data was collected from 70 Nova Scotian companies on various eco-efficiency and pollution prevention opportunities. A survey of a subset of these 70 companies, that recorded savings from implemented opportunities, identified \$2.8 million saved and over 8000 tonnes of greenhouse gas reductions annually over the life of the project. It should be noted that these numbers show only quantifiable results. Additional companies benefitted from the program but were unable to quantify their savings at the time of the survey.

To demonstrate common trends found in opportunity and implementation assessments, data was compiled and sorted to identify the top five most common recommendations with examples of specific recommendations from each category.

Recommendation

The increase of boiler efficiency through maintenance and retrofits.

Rank

This recommendation was suggested in 49% of cases, making it the fourth most popular retrofit (tied with minimizing water use in processes).

Details

Boilers use the combustion process to boil water and create steam, which in turn is used for heating or mechanical processes. Boiler efficiency is the ratio of input energy to usable output energy (generally speaking, the energy of the exiting steam). Due to high oil fuel prices, even small changes in boiler efficiency can have a dramatic effect on costs. In many cases, boilers are not maintained properly, which can cause a decrease in efficiency; this is easily remedied by having the boiler cleaned regularly.

Another common method used to increase boiler efficiency is the preheating of the return stream. If waste heat can be collected, it can be used to effectively augment the input energy of the water entering the boiler. This decreases the amount of fuel required to raise the energy level of the water to the final steam state.

Most of the wasted energy in a boiler system is released as heat through the boiler stack, which is then released into the atmosphere. This heat can be a great source of energy and can increase boiler



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efficiency by as much as 5-10%. The heat is frequently transferred directly back into the boiler return to optimize the heating efficiency.

Other opportunities that should be considered when examining boilers is to convert boilers to natural gas where present or replace them (when replacement is required) with pellet fuelled boilers. Natural gas has the lowest environmental impact of all fossil fuels and its costs are generally lower than fuel oil. Pellet systems are cheaper to run than fuel boilers and produce fewer emissions.

Payback Period

Payback periods for proper maintenance depend entirely on the state of the boiler prior to the cleaning, but payback periods of less than a year are common. Regular maintenance will ensure that the boiler remains at maximum efficiency.

Preheating the return stream and capturing the waste stack heat often go hand in hand. Payback periods for the installation of a control system and a heat exchanger to move the heat to the boiler return are generally 2-4 years. The short payback period often makes this a lucrative option due to the increased efficiency and reduction in fuel costs.

Modifying a boiler to use natural gas or purchasing a wood pellet boiler should be assessed on a case-by-case basis, as they can be quite complicated projects. Natural gas tends to be cheaper than fuel oil, and the emissions released during combustion are lower than traditional fuel oil. While availability is still limited in some areas natural gas should be considered as an alternative to bunker oil. Wood pellet boilers can be more efficient and more environmentally friendly if pellet source are the result of sustainable forestry methods. Fuel switching or changing out boilers can be large scale projects and are difficult to evaluate for standard payback periods. Opportunity assessments have gauged similar projects as having payback periods of approximately six years.

Company Examples

A food processing plant had their boilers inspected by Enerscan Consultants Limited during an opportunity assessment. The control system, insulation and tuning were identified for upgrades to increase the efficiency by 10%. The capital cost for this project was \$5000 which, when factored again a 10% fuel savings, gave a payback period of less than a year.

Stantec Consulting Ltd. completed an opportunity assessment for a food processing plant in 2009. The assessment determined that capturing the waste stack heat, which left the plant at 300° Fahrenheit, was a viable way of improving the boiler efficiency. The project called for the installation of a heat exchanger to capture the heat and use it to preheat the boiler return. This dramatically increased the efficiency of the unit, saving \$20,000 per year. The capital cost for the project was approximately \$50,000, resulting in a payback period of less than 3 years.

This eco-efficiency opportunities fact sheet was prepared by the *Eco-Efficiency Centre*, a non-profit, non-government educational and environmental management support centre for small- and medium-sized enterprises in Nova Scotia. The Eco-Efficiency Centre was established in 1998 as a partnership between Dalhousie University and Nova Scotia Power Inc., and is supported by private corporations, governments and foundations. The Centre assists companies to achieve better environmental and economic performance through resource conservation, pollution prevention, recycling, reuse, and general good environmental practices.