

# Energy Savings in Meat Processing

## • Steam Efficiency • Refrigeration Efficiency • Cogeneration

### Highlights

- 20% reduction in natural gas consumption with potential savings of \$270,000/yr with overall payback of less than one year
- 15% reduction in electrical consumption with potential savings of \$400,000/yr with overall payback of 3 years
- On-site cogeneration with potential savings of \$1.4 million/yr
- Implementation of all energy saving measures would reduce GHG emissions by 8,900 tonnes/yr



Schneider Foods Kitchener, Ontario

### Sector Overview

Canada's red meat and meat products is the largest sector of the Canadian food manufacturing industry. Meat products are made from beef, veal, pork, lamb, venison and bison. Annual shipments were about \$11.3 billion in 2000. Meat processing companies make a wide variety of products including fresh, frozen, processed, smoked, canned, cooked meats and sausages and deli products.

In terms of the deli sector the main categories are luncheon meats, hot dogs, bacon and sausages. Ham is the largest selling deli item by volume followed by turkey, bologna and sliced beef such as pastrami. In Ontario, deli meat products are manufactured in about 25 federally licensed plants. These plants are

either integrated with primary processing plants (slaughterhouses) to ensure a supply of raw material, or are stand alone operations that purchase raw materials in the marketplace. Companies range in size from large multi-national corporations to small family-owned specialty operations.

In 2000, retail sales of deli meats were estimated to be \$1.1 billion across Canada. In Ontario, retail sales were just under \$500 million, or \$600 million if foodservice and ingredient sales are included. In comparison, the U.S. deli market was valued at \$7.6 billion (U.S.), which after currency exchange and population is similar to Canada on a per capita basis.

The deli meat sector is growing 4 per cent to 6 per cent per year in retail sales. Sales of many lighter and leaner products are growing over 10 per cent per year.

### Company Description

Schneider Foods of Kitchener, Ontario ([www.schneiders.ca](http://www.schneiders.ca)) is one of Canada's largest producers of premium quality food products. In Ontario, the company has operations in Kitchener, Ayr, St. Mary's, Guelph, Mississauga, Toronto and Port Perry. Additional operations are located in Winnipeg, Manitoba; Surrey, British Columbia; and St-Anselme, Quebec.

In total, there are 22 operating facilities and more than 5,000 employees across Canada manufacturing and selling Schneider's branded and private label products in the retail and foodservices markets throughout Canada and the United States. Schneider Foods produces more than 1,000 products, including ham, sausage, wieners, bacon, luncheon meats, specialty meats, and grocery products.

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## The Situation

Schneider's plant in Kitchener, Ontario manufactures various processed and cured meat products. As a competitively positioned company, Schneider Foods must meet changing consumer preferences and marketplace needs. This has resulted in production modifications at the plant in response to product mix changes involving addition of new product lines and discontinuation of others.

The meat manufacturing process at the Kitchener plant is energy intensive, using large amounts of both electricity and natural gas. The plant's total energy costs are about \$4 million, with the largest energy consumers being the ammonia refrigeration and steam systems. The power plant was designed for a larger steam and refrigeration load than what is required for current plant production. Refrigeration is supplied by a sophisticated multi-compressor system, composed of 10 compressors in a dry system with 3200 hp of capacity, and four

compressors in a flooded system with 2800 hp. The refrigeration load includes evaporators for space conditioning, coolers, snap-chillers, freezers, brine chilling of continuous wiener houses, ice making and process chilling. Steam is used in the manufacturing process and for space heating. The plant has three boilers with a steam demand load of up to 50,000 lbs per hour. The steam requirement for the process varies between 10,000 and 25,000 lbs per hour depending on production rate, while the steam requirement for heating varies between 8,000 and 10,000 lbs per hour, depending on the weather. The main process steam load includes smokehouses, continuous wiener houses (old and new), laundry, Clean In Place (CIP) and general cleaning, hot water tanks and captive-mold washing.

## Drivers for Change

- Large user of energy
- 20% potential increase in electrical peak power
- Corporate mandate to reduce energy consumption
- View energy efficiency as strategic competitiveness issue

As part of its corporate mandate to reduce energy costs, Schneider Foods is implementing plant-wide energy audits across Canada, prioritized based on energy usage. Brad Erhardt, Manager of Environmental Affairs, is spearheading this effort. The Kitchener plant was the first to conduct an energy audit. The audit was completed by Sandwell Inc. (an independent engineering consulting firm), with financial assistance from Natural Resources Canada.

## The audit focused on the following areas:

- **identifying energy efficiency opportunities in the steam and refrigeration systems; and**
- **investigating the technical and economic feasibility of on-site co-generation.**

## Audit Findings

The audit identified a total of 10 separate energy efficiency opportunities. On the steam side, five opportunities (see Table 1) to reduce natural gas usage could lead to total annual cost savings of \$156,000, with an overall payback of seven months. One was reducing deaerator exhaust to a minimum level by installing a fixed orifice in the exhaust pipe to restrict and maintain dissolved

oxygen below 10 ppb. This measure could result in natural gas savings of about 2.3 million cubic feet or \$16,000 annually, with no capital investment required.

**Table 1: Steam System Energy Savings**

Energy Saving Opportunities	Capital Cost (\$)	Cost Savings (\$/yr)	Simple Payback (years)
Reduce steam operating pressure	0	40,000	0
Improve turn down ratio on boilers	0	9,000	0
Eliminate warm stand-by boiler	4,000	78,000	0
Reduce deaerator exhaust	0	16,000	0
Reduce excess oxygen from 5% to 2%	100,000	13,000	7.7

## Other steam system efficiency improvements included:

- reducing the steam pressure from 125 psig to 100 psig;
- improving the turn down ratios on two boilers to enhance operation and efficiency, thereby eliminating the need for a third boiler;
- developing efficiencies in the pre-heating process of the back-up boiler; and
- reducing excess oxygen from 5 per cent to 2 per cent by installing a programmable logic controller (PLC) based boiler control system.

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## Audit Findings Cont...

On the refrigeration side, five measures (see Table 2) could lead to annual cost savings of over \$600,000, although some have long paybacks not meeting Schneiders hurdle rates.

One opportunity was increasing the suction pressure during the winter from 15 psig to 25 psig on the flooded and dry systems.

The pressure settings could be adjusted in stages to verify that the space temperature can be maintained. Implementation of this recommendation could result in electrical energy saving of 870,000 kWh or \$57,000 annually, requiring no capital investment.

**Table 2: Refrigeration System Energy Savings**

Energy Saving Opportunities	Capital Cost (\$)	Cost Savings (\$/yr)	Simple Payback (years)
Adjust suction pressure	0	57,000	0
Reduce ventilation rates	360,000	277,000	1.3
Install new screw compressors	890,000	225,000	4.0
Upgrade evaporative condenser system	342,000	35,600	9.6
Replace evaporative condenser	210,000	17,800	11.8

### Other refrigeration improvements included:

- reducing ventilation rates by turning off fans when not needed, installing 10 new fan motors with variable frequency drives (VFD) and controls, reducing speed of the fan belt drive, and reducing air exchanges to 4 per hour;
- installing two new 300 hp screw compressors with VFD motors and controls to allow efficient part load performance on the dry and the flooded systems;
- improving the efficiency of the evaporative condenser system with a

new control system, a new spray system, and replacing two condensers; and

- replacing an evaporative condenser with one that has a pump and indoor tank.

### Cogeneration

The audit determined that the plant has an ideal electrical and steam usage profile for on-site power generation (cogeneration). Sandwell has initially proposed a 5 MW natural gas fired turbine generator, complete with a heat recovery steam generator. Based on preliminary estimates, the capital cost would be \$6.5 million with annual energy cost savings of \$1.4 million, and a simple payback of 4.6 years.

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## Implementation Status

Schneider Foods is proceeding to implement the energy saving measures identified in the audit. All recommendations are being reviewed and prioritized by plant management. For instance, on the steam side, the plant has discontinued the use of the third boiler on a trial basis, as a result of implementing the turn-down program, and has reduced the deaerator exhaust. In refrigeration, the plant has successfully changed suction pressure in the flooded system from 15 psig to 18 psig, and on the dry system from 15 psig to 24 psig. Annual savings are in the \$30,000 range with no capital investment. Measures have also been taken to reduce the defrost cycle (frequency and duration) on refrigeration equipment in several departments, with plans to retrofit plant wide. In the process of reviewing the audit recommendations, plant staff have identified additional energy saving measures, which has created a continuous improvement philosophy.

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## Implications to the Food Sector

The process-focused approach used to identify and implement efficiency improvements at Schneider Foods' Kitchener plant is applicable to many food and beverage processors in Ontario. Studies of this nature typically identify total energy, water and sewage savings of 15 to 20 per cent. This approach is particularly relevant for companies with combined utility costs over \$200,000 per year. The recent changes to Ontario's electricity market and price pressures for natural gas create a new set of cost drivers and opportunities for industrial efficiency. In addition, prior to 2002, cogeneration had not been a viable economic option for many food plants. This is no longer the case. When combined with electricity load management, refrigeration and steam efficiency projects, co-generation represents a workable strategy for reducing costs and greenhouse gas emissions.

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“The process of conducting the energy audit has led to a mindset change in Schneider's plant personnel. They now view energy efficiency as a real cost-saving measure, and have identified additional energy reduction improvements”

Brad Erhardt  
Manager, Environmental Affairs

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## Support Services to Ontario's Food Industry

### Food Industry Cost Reduction Program

This case study was prepared as part of an Ontario program specially designed for the food industry to help companies reduce their energy, water and sewer costs. **OCETA (Ontario Centre for Environmental Technology Advancement)** manages this program in partnership with the Agricultural Adaptation Council and OMAF.

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### Ontario Ministry of Agriculture and Food (OMAF)

The Ontario Ministry of Agriculture and Food supports Ontario's food processing industry in several ways. The key strategies to support food business development include:

- attract new investment to grow the industry;
- retain the level of investment already in the industry;
- increase domestic and global market penetration of Ontario grown and processed foods; and
- minimize the risk to the public from food-borne illness.

OMAF has a network of sector officers to meet the everyday needs of food companies by:

- maintaining a proactive client account management system;
- researching and analysing sector challenges and opportunities;
- providing a “one-stop” access point to assist food companies in building their business and improving their competitive position; and
- providing information to influence investment and growth decisions.

### For more information on OMAF services contact:

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