energy management for Canadian food and beverage industries

Agriculture Canada

Marketing and Economics Branch

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Canada

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Market Development Directorate

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in cooperation with the

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Energy Management Task Force

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CANADA/ALBERTA ENERGY PRICE AGREEMENT

On September 1, 1981, the Governments of Canada and Alberta agreed that the overall average field price of conventional 'old oil' will increase from the present price of $18.75 per barrel, with the first increase effective on October 1, 1981, the second on January 1, 1982, and thereafter every 6 months, in accordance with Table 1. These increases, however, are subject to the condition that the overall average field price of conventional 'old oil', plus transportation costs to Montreal, adjusted for quality, will not exceed 75% of the actual international price of oil.

TABLE 1

FIELD PRICES OF CONVENTIONAL OLD OIL ($/bbl)

	Increase	Level
Oct. 1, 1981	$ 2.50	$ 21.25
Jan. 1, 1982	2.25	23.50
July 1, 1982	2.25	25.75
Jan. 1, 1983	4.00	29.75
July 1, 1983	4.00	33.75
Jan. 1, 1984	4.00	37.75
July 1, 1984	4.00	41.75
Jan. 1, 1985	4.00	45.75
July 1, 1985	4.00	49.75
Jan. 1, 1986	4.00	53.75
July 1, 1986	4.00	57.75

For the purposes of this Agreement, 'old oil' means oil recovered from a pool initially discovered prior to January 1, 1981.

Natural gas prices will be favorable in relation to oil, rising at a steady 25 cents per Mcf every 6 months. In effect, natural gas will be priced at less than two thirds of the price of heating oil.

This new agreement supercedes the schedule of oil prices contained on page 6 of this manual.

ENERGY MANAGEMENT IDEAS

Increased energy costs are a reality to which the entire Agri-Food industry must adjust. We can ensure our continued competitiveness both at home and abroad by responding to this challenge.

The Energy Conservation Task Force, which is comprised of representatives of both industry and government, was set up to assist the Food and Beverage Industry adjust to higher energy prices. This practical guide to energy conservation is a direct result of their efforts. It offers suggestions on how to start an Energy Conservation Program and gives new blood to programs already under way.

I strongly support your individual efforts for energy conservation as well as the involvement of the Energy Conservation Task Force and my Department in attempting to reduce energy use in food processing, distribution and retailing. I would appreciate your comments on this publication and on energy issues in general.

Eugene Whelan
Minister
Agriculture Canada

PREFACE

This guide is a catalogue of ideas, information, services and material available to those interested in energy conservation. It is intended to stimulate food and beverage processor's interest in energy conservation and give information on how to get an energy management program started. More specific information is available and advice should be sought from qualified engineering staff before making any alterations to your plant or production processes.

The guide is a cooperative effort of Agriculture Canada, and the Food and Beverage Sector Energy Conservation Task Force. The material contained within has been contributed entirely by the Task Force, while the translation, editing and printing have been done by Agriculture Canada. The Government of Canada and its employees make no warranty, express or implied, and assumes no legal liability for contents or procedures outlined in this document. Inclusion of material in this guide is not intended to represent federal government endorsement.

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INTRODUCTION

"Beginning January 1, 1981, the wellhead price for a barrel of conventional Canadian oil will rise $1 every six months until the end of 1982. Thereafter, until the end of 1983, price increases will take place at the rate of $2.25 every six months. Commencing in 1986, the price will be raised at the rate of $3.50 every six months, until it reaches its appropriate quality-determined level relative to the oil sands "reference price". If by 1990 the conventional oil price is still below that for reference price oil, consideration should be given to a more rapid rate of escalation."[1]. The price of Natural Gas and electricity will also rise accordingly.

The aim of this publication is to assist food processors adjust to rising energy prices and to the reality of world energy supply. The publication contains suggestions for energy conservation, provides information on other publications and on available sources of assistance. The application of the information contained in this publication will enable the reader to develop an effective Energy Management Program. It will also help in reviewing current operation, maintenance and energy use policies, and assist in establishing a set of energy related "Standard Operating Procedures". Even though your company has probably already instituted several of these suggestions, it is hoped that this booklet will not only provide more Energy Conservation ideas, but will be of assistance in the development of a broad based Energy Conservation Program, and Plan of Action for your plant.

The booklet is divided into two parts. The first part gives suggestions on how to form an *Energy Management Committee* and includes a catalogue of *Energy Conservation Opportunities*. These provide guidelines on conserving energy at the plant. Opportunities cited are in areas such as boiler and power plant operations; heating, ventilating and air conditioning systems; processing equipment operations; and weekend shutdowns. The second part of the booklet details sources of information and services available to small, medium and large scale food and beverage processors. Included are: fifteen publications which should be obtained by your Energy Management Committee; information on the Industry/Government Energy Conservation Task Force; advice on how to contact the Energy Bus in your province; and Tax Incentives. The information they can provide will be extremely useful in developing an Energy Conservation Plan of Action.

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[1] *The National Energy Program* Energy Mines and Resources Canada, Report EP 80 - 4E, pg 27.

ENERGY MANAGEMENT PROGRAM

In recent years energy has become an extremely important and significant cost item in food production. The escalating cost of energy and the possibility of uncertain supply make it imperative that every food and beverage manufacturer make a conscientious effort to conserve energy. Every gallon of oil saved through conservation will make it available to future generations. Therefore, efforts to adapt our facilities to use alternate fuels should commence and contingency plans should be prepared to cope with interruptions in traditional sources of supply.

An Energy Management (EM) Program is an organized approach aimed at eliminating energy waste and improving the effective utilization of energy in our food and beverage facilities. To be successful, the EM Program must not only have complete management support, but allow each plant to initiate and lead its own conservation efforts.

Your energy conservation program can be successful only if it arouses and maintains the "participative" interest of your employees. Employees who understand the importance of energy conservation, who participate in the program, and who feel that they are partners in the planning and implementation of the details of the program, will have pride in the program.

The use of a company newsletter, bulletin boards, or posters for pictorializing energy conservation objectives and accomplishments will help impress employees with the importance of such matters.

An incentive plan should be set up to instill the desire within the management team and factory supervisors to promote energy conservation.

The Plant Manager and/or a full-time Energy Coordinator at each operating location should be responsible for organizing and directing the Energy Management Program. Each plant should organize a permanent and a complete Energy Management Committee. Since energy conservation is everyone's business, the Committee should include representatives from all departments in the plant to work as a team. Energy Monitors should be appointed for each shift and the Committee must obtain the Plant Manager's approval on all programs.

The functions of the EM Committee and the energy monitors are as follows:

(1) Schedule a complete energy conservation and utility audit at the plant before any energy conservation program is worked out. Energy logging must correspond to both common time elements and production factors. At larger manufacturing installations the manual approach to energy monitoring is very expensive. An alternative is the investigation of an automated energy management system that could perform a great deal of the work.

(2) Prepare piping schematics for steam, condensate, water (cold and hot) and refrigeration systems in order to check for energy balance, and to improve overall plant efficiency.

(3) The EM Committee and the energy monitors should observe and check the operations, the condition of facilities, the equipment and the processes for energy conservation, and should suggest modifications to conserve energy to the Engineering Department.

(4) The monitors should patrol the plants to observe utility waste due to improper process operations, lack of maintenance, or failure to shut down equipment at the termination of process or activity. They are to report their findings to the EM Committee.

(5) The EM Committee should immediately try to adopt corrective measures to stop utility wastage. The EM Committee should produce and issue weekly reports showing the cost of utilities being misused and wasted, and should initiate and follow up on corrective measures until problems are solved.

(6) The Committee should meet regularly to update and initiate Energy Conservation Opportunities, follow-up on recommendations, promote the ethic of conservation among employees, keep and analyze records, prepare reports and KEEP UP THE MOMENTUM OF THE PROGRAM.

(7) A utility cost and use data report must be submitted to the Plant Manager and/or Energy Conservation Coordinator from each operating location at the end of each monthly accounting period.

(8) Review all current and proposed projects to ensure that energy conservation schemes have been applied as an integral part of the original design. Retrofitting for energy conservation after project completion is often costly or impractical.

(9) Prepare an energy guide for future installations. Keep records of past experiences and write a specification to be followed by builder or contractor prior to putting a project down on paper.

ENERGY CONSERVATION ACTION PLAN

This *Action Plan* describes potential short and long term Energy Conservation Opportunities (ECO's) which can be implemented at your plant. All ECO's should be evaluated as to cost and time taken for implementation. All "no cost" projects should be started first.

An effective energy conservation program must begin with an historical energy audit. Normally, no technical expertise is required for this, and the results can be extremely valuable since they point to individual elements within the plant that should be more closely examined. The historical audit procedure makes use of the already existing accounting and production figures. Under the guidance of the factory manager, a careful look should be taken at the total energy consumed per unit of factory output over the last several years, and a record displaying these figures should then be created.

The audit should include the following on an historical basis:

a. Energy usage by activity and its cost
b. Fuel and electric supply purchases.
c. Heat, Ventilation, Air-Conditioning (HVAC) and power plant costs of operation.
d. Maintenance procedure and equipment upkeep.
e. Use of steam, water and refrigeration for processing and raw material handling.
f. Any other energy consuming process in the plant.

With this knowledge, the plant is now able to initiate and conduct more detailed diagnostic utility audits which look at the Cost/Benefit of specific projects.

In conjunction with the historical audit, the basic philosophy of your operation and maintenance policy should be examined. The EM committee should determine whether the policy is preventive, predictive or an emergency only repair policy, and make suggestions as to what it should be.

ENERGY CONSERVATION OPPORTUNITIES

These Energy Conservation Opportunities are suggestions that may help maximize the efficiency of energy use at your plant. Each ECO, however, must be evaluated on a cost/benefit basis. These guidelines may be used by the EM committee as a place to start their Conservation Program and to generate additional concepts for energy conservation.

Boiler and Power Plant Operations

Fuel for boilers is a major and costly energy input within a plant operation. Thus it is important to keep boiler operations functioning at peak efficiency. Boiler efficiency should be checked for each operating boiler. The causes of lower efficiency must be determined, and if possible, corrected immediately. A daily operating log of each boiler should be kept. A sample of a boiler log is shown in Table II.

Given that your steam demand is relatively constant, operate only a minimum number of boilers. Boiler operation below a 50% capacity is more often than not inefficient, depending on type of boiler. Minimize use of stand-by boilers or boilers operating at low load.

The EM committee may also want to evaluate the following boiler related ECO's for use in the plant:

(1) Shut down boilers, where possible, during holidays and weekends.

(2) Maintain minimum required boiler pressure. Reduce steam pressure during operating and non-operating periods. This is easily done with the installation of a "microprocessor".

(3) Provide automated boiler blowdown system at each boiler.

(4) Minimize boiler blowdown. Use adequate feedwater treatment to reduce blowdown. This may require large capital investment for certain waters.

(5) Install flashtank and heat exchanger to recover heat from hot boiler blowdown.

(6) Install low excess air combustion controls, and reduce combustion airflow to optimum.

(7) Examine waste oil and other solvents for possible boiler fuel use.

(8) Install fuel oil viscosity controls for residual fuel.

(9) Install fuel (natural gas or oil) meters for each boiler, a steam flow meter or boiler feedwater meter and a condensate flow meter. Use these meters to evaluate steam use in all steam use areas.

(10) Install equipment to preheat boiler feedwater and air preheaters to preheat combustion air.

(11) Establish burner maintenance schedule and adjust burners for efficient operation. Replace inefficient burners. Regular cleaning of a burner's air and fuel passages will also increase efficiency. Establish tube cleaning and soot blowing procedures.

(12) Maintain oil atomization at boiler burner. Check daily.

(13) Maintain proper fuel oil viscosity at boiler.

(14) Clean all boiler heat transfer surfaces frequently. Cleaning should include internal and external surfaces of drums, furnace walls and tubes. The water side should be kept clean with feedwater conditioners; and the fire side with soot blowing.

(15) Repair cracked or loose refractories, especially around burners and fuel passages.

(16) Check manually (on a weekly basis) for lag in boiler controls leading to high oxygen in flue gas. Continuous analysis through flue gas analyzers is the most cost effective method.

(17) Keep boilers tight to eliminate loss of efficiency due to infiltration. Have a yearly smoke test.

(18) Insure the continuous training of boiler operators and be sure that boiler log sheets are maintained daily.

(19) Feedwater system deaerator pumps and a suitable feedwater monitoring program should be set up.

Note: As controls and specifications for food and beverage processing equipment are generally given in British or American measuring units, the SI (metric) units have not been included.

Building Design and Construction

The building design and construction should be tight to minimize heat loss in winter and heat gain in summer. Use *ASHRAE Standard 90-75** (latest edition) for *Energy Conservation In New Building Design*. The guidelines in the Standard may also be used to retrofit or upgrade existing buildings. Other ideas to improve a building's use of energy include:

(1) Close holes and openings in your building — e.g., broken windows, unnecessary louvres and dampers, and cracks around doors and windows.

(2) Eliminate all unused roof openings and abandoned stacks.

(3) Reduce or eliminate single pane glass windows. Use storm windows or triple glazed windows where possible.

(4) Make sure that all outside doors are either self-closing, revolving or have vestibules. Establish a door use frequency study.

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*Available from: American Society of Heating, Refrigeration and Air Conditioning Engineers,
345 East 47th Street,
New York, New York. 10017

(5) Use weather shields of all outside truck unloading doors and keep doors to dock areas closed.

(6) Close off all unused areas of the building. Insure systems in these areas are checked for freezing.

(7) Study building design methods and materials for improved resistance to heat flow.

(8) Consider adding insulation to inadequately insulated and uninsulated building areas.

Compressed Air

(1) Operate compressed air systems at the lowest air pressure required.

(2) A compressor operating at 100 psig requires approximately 1 horsepower for every 5 cubic feet per minute of air. Make sure all leaks are repaired promptly. A compressed air leak of 1/4 inch diameter at 100 psig wastes 35,500,000 cubic feet of air per year. With power cost of $0.04/KWH, this amounts to an annual loss of approximately $4,000.

(3) Adjust cooling water discharge temperature to maximum permissible level and investigate the feasibility of installing a temperature regulating valve. Also consider conserving water by adding a water regulating valve.

(4) Use heat from the aftercooler to supplement water heating or for preheating boiler feedwater.

(5) Never use compressed air for cooling equipment or personal comfort.

(6) Shut off compressor(s) whenever it is practical.

(7) Survey pneumatic equipment for upgrading and reduced usage of compressed air. Determine if some equipment might be eliminated or replaced. Are multiple compressors scattered, or headered together? Does present piping lend itself to pressure segregation?

(8) Compressed air should not be used to dry filled cans. A blower can be used for drying cans after they leave the sterilizer. Minimize or eliminate pushing or directing of cans using compressed air force.

(9) Locate compressor intakes in a cool place, preferably outside of the building.

(10) Use smaller compressors for periods of nonproduction and weekend operation to avoid running large compressors.

(11) What type of air dryer is installed and what are its energy utilization characteristics?

(12) Separate plant air and instrument air.

Computers for Energy Management

The feasibility of applying computers and/or microprocessors for energy accounting, controlling energy use in mechanical and electrical equipment, and for scheduling product mix to achieve optimum energy use, should be investigated.

This investigation should start by determining whether major energy consuming devices within the factory have inadequate instrumentation and/or monitoring equipment.

Electric Power

(1) Size electric motors for peak operating efficiency. Overloaded motors waste power and shorten motor life. Underloaded motors also waste power. Are motors running at full capacity and can this be changed?

(2) Shut down electric motors not in use. At $0.04/KWH, a 5 horsepower motor running unnecessarily will incur a cost of approximately $1,300 in one year.

(3) Operate standby equipment only during an emergency and when it is absolutely needed. Do not use when primary equipment cannot handle the load.

(4) Consider using *ENERGY EFFICIENT ELECTRIC MOTORS* where a motor is in use more than 4,000 hours per year. Energy savings could offset the increased cost.

(5) Power factor improvement will save energy by reducing line losses. Power factor correcting capacitors should be installed with all motors of 100 horsepower and up. Power factor correction devices are also available. Synchronous motors are also worth considering above 100 horsepower.

(6) Consider replacing electric motors with back pressure turbines. Evaluate low pressure steam usage and steam balance in summer and winter.

(7) Provide proper maintenance and lubrication of motor-driven equipment. As loose belt drives waste power, insure proper tension. Use belt dressing if necessary. Consider cog-belts for better power transfer.

(8) Consider the use of existing idle generators or the installation of new equipment for low cost in-house power "co-generation".

Load Management

Electric bills for industrial consumers are usually divided into two parts. The first part is a charge for total electricity consumption. The second is a surcharge for the user's peak energy demand. Load management is any action taken to shift electricity use from periods of high demand to periods of low demand, so as to minimize the second charge for peak demand. Three means of achieving load management are:

(1) Load shifting: by shifting energy consuming activities from periods of high demand to off peak periods. The greatest potential for load shifting is in those processes which:

  (a) require little supervision.

  (b) are done independently of other processes.

  (c) have sufficient short term storage capability to hold your product until the next stage of processing.

(2) Load Cycling: by cycling energy consuming activities whose operation is normally random.

(3) Load Control: nonessential or discretionary loads are shut off automatically or manually to avoid exceeding a pre-set peak demand level.

Total electricity consumption charges can be reduced by attention to equipment start-up and vigilance in shutting off idle machines. Are there any block loads which lend themselves to load shedding or load deferral?

Fuel and Electric Management

(1) Oil-fired boilers should have maximum fuel flexibility and be able to burn all grades of fuel oil. This permits the purchase of various grades of oil depending on price and availability. This requires automatic control/analysis of flue gas to regulate air fuel ratio.

(2) Prior to the expiration of a natural gas contract, investigate whether a more favourable rate schedule is available. Investigate combining several natural gas meters to a single meter to attain savings as a result of greater usage at a lower unit cost level. This also eliminates the minimum charge during non-use in the summer. Companies should install a demand meter for maximum cost benefits if your current natural gas contract is both "Demand" and "Interruptable."

(3) Flue gas analyses should be performed daily to maintain proper CO_2 and O_2 levels. Gas and oil burners must be kept in correct adjustment to provide proper combustion.

(4) Electrical contracts should be reviewed for better rates and feasibility of combining multi-meters to a single meter.

(5) Cogeneration using gas turbines or diesel generators, and using their exhaust heat should be investigated.

Heating, Ventilating and Air Conditioning

(1) Install key operated thermostats to prevent individual adjustment by unauthorized personnel, or use a remote sensing device.

(2) Install clock thermostats or timers to control heating and cooling equipment.

(3) Check and calibrate thermostats periodically.

(4) Reduce temperature in highly ventilated areas during heating season.

(5) Consider locking or sealing windows and doors on one side.

(6) Consider use of carpeting in offices to reduce floor heat loss.

(7) Consider installation of humidifiers in offices to improve employee comfort in winter.

(8) Close drapes in offices at sundown to reduce heat loss. Make maximum use of sunlight for both heating and lighting during winter days.

(9) Rearrange office furniture so that desks and chairs are close to heating systems and/or natural sunlight.

(10) Reduce fan speed to eliminate drafts or redirect air from ducts.

(11) Maintain warehouses and storerooms to the lowest temperature consistent with stored product requirements. Intermittently-used warehouses should be heated to no more than 5°C (40°F) during heating season. Finished product warehouses may be maintained at 10°C (50°F) during the heating season.

(12) Evaluate if exhaust and make-up air quantities could be lowered. Check number of air changes per hour.

(13) Use return air instead of outside air when possible; eliminate make-up air as much as possible during unoccupied periods. Be careful that air does not become stale or too saturated with moisture and CO_2.

(14) Avoid introducing high moisture air into air-conditioned areas in summer.

(15) In winter, make sure that no heat is provided to areas where high internal heat gains provide sufficient heat.

(16) Keep outside air supply close to exhaust hoods where possible. Consider air purifiers instead of exhausting to outside.

(17) Keep doors shut between conditioned and unconditioned spaces.

(18) Be sure to shut off both heat and power to unit heaters not in use.

(19) Where possible, discontinue the use of additional building entrances to reduce air infiltration.

(20) Segregate and use separate HVAC systems for special operations such as computer rooms, which require more heating or cooling than surrounding areas.

(21) Consider changing zone control reheat system to variable air volume system.

(22) Shade or use reflective film on windows to reduce conditioning load.

(23) Clean or replace air filters regularly. Cleaning frequency should be determined by experimentation with filter changes in each area of the plant.

(24) Repair faulty louvres and dampers, check and correct outside air dampers for leakage.

(25) To avoid large vertical temperature gradients, use destratification fans in areas with large ceiling heights.

(26) Consider the application of evaporative cooling, especially in dry climates.

(27) Clean heat exchange surfaces and fans regularly. Clean water distribution devices on cooling towers and evaporative condensers regularly.

(28) Interlock heating and air-conditioning equipment to prevent simultaneous operation.

(29) Consider local spot heating using infrared heaters, instead of heating a large area.

(30) When outside temperature is low, use outside air for cooling.

(31) Evaluate heat pumps for space conditioning.

(32) Investigate the use of well water for cooling in the summer.

(33) Install temperature control on cooling tower to shut off fans when temperature of cold water drops to below design level. Can cooling tower coolant temperature be raised for energy efficiency?

Heat Recovery

(1) Determine whether the heat in waste water from cookers, retorts, scalders, and other processing equipment can be reclaimed to preheat boiler feedwater, domestic water or cleaning water. Use plate-type heat exchangers which can be cleaned daily by conventional cleaning methods.

(2) Evaluate the feasibility of recovering heat presently rejected at cooling towers.

(3) Evaluate reuse of heat recovery from machinery cooling water.

(4) Reclaim heat from large exhaust areas (such as offices) to preheat make-up air. This can be accomplished by heat wheels, heat pipes, or plate-type counterflow heat exchangers.

(5) For new chiller installations, consider the use of double bundle condensers, which provide approximately 38°C (100°F) water.

(6) Consider the use of heat pumps to raise the temperature of low-grade heat sources.

(7) Investigate heat recovery from bakery ovens and fryers for space heating, water heating or for preheating cooking oil.

(8) Whenever new equipment is installed, consider heat recovery as an integral part of the design. Retrofitting with heat exchangers, economizers and air preheaters is often difficult and costly.

Insulation

Adequate insulation conserves energy. The cost to insulate increases with insulation thickness but the heat loss decreases. Optimum insulation thickness usually minimizes total annual heating cost. Therefore it is important to keep insulation in good repair.

(1) Insulate all bare steam, condensate, hot and chilled water piping. ASME recommends that uninsulated piping components in existing systems should *not* be insulated without first consulting the original engineering design. (*Plant Engineering*, July 24, 1980, Page 5)

(2) Insulate float, orifice and impulse type steam traps. All other types of steam traps require some sub-cooling and should therefore not be insulated.

(3) Insulate hot water and condensate tanks.

(4) Insulate piping and duct work passing through unheated areas.

(5) Insulate bare above ground fuel storage tanks.

(6) Insulate all low temperature refrigeration piping and controls.

(7) Upgrade insulation and linings in furnaces, ovens and boilers.

(8) On existing buildings, install or upgrade insulation in walls and ceilings.

Lighting

Lighting should generally conform with the "Minimum Recommended Lighting Levels by Task" listed in the Table IV. These levels are given in foot candles by task. The minimum level for inactive areas surrounding the task should be 20 foot candles or one-third of the lighting task level, whichever is greater.

The lamp types and the lumens per watt of electricity are:

Type of Fixture	Lamp Wattage	Efficacy* (lumens/watt)
L.P. Sodium. P. Sodium	18 watts	45 lumens/watt
L.P. Sodium	180 watts	160 lumens/watt
H.P. Sodium	50 watts	50
H.P. Sodium	1000 watts	115
Metal Halide	175 watts	50
Metal Halide	1500 watts	88
Fluorescent (2x34 watt)	85	71
Fluorescent (2x40 watt)	97	65
Fluorescent (2x215 watts/1500ma)	480	63
Mercury Vapour	100 watts	28
Mercury Vapour	1000 watts	45
Incandescent	40 watts	11
Incadescent	1000 watts	21

*This figure includes ballast where applicable and are based on "initial" lumen output.

Select lamps for maximum efficiency. Mercury and 1500 milliamp fluorescent lamps are inefficient and should be avoided in new installations.

(1) Lighting adds to the air conditioning load. In summer, the presence of unnecessary lighting is even more wasteful and expensive since the air conditioning equipment must overcome heat generated by lamps.

(2) Eliminate unnecessary lighting in office, corridor, cafeteria, ingredient receiving and warehouse areas.

(3) Turn off all lights when not in use, except for security and safety lighting. Identify switches that should be left in the "on" position.

(4) Install "Lights Out" stickers on room light switches.

(5) Use desk lamps only if overhead lamps are discontinued.

(6) Limit higher lighting levels to task areas only.

(7) Reduce general illumination to minimum necessary for safety. Reduce exterior building and ground illumination to minimum safe level.

(8) Use separate switches for perimeter lighting which can be turned off when sufficient natural light is available. Reduce or eliminate general lighting where natural light provides sufficient illumination.

(9) Avoid turning fluorescent lights on and off for short periods since it reduces lamp life. If flourescent lamps are removed to reduce lighting level, be sure to remove both tubes and ballast. The best method is to remove the entire fixture.

(10) Mark panels and switches so that plant guards can monitor lighting.

(11) Restrict parking to specific lots so that lights can be turned off in unused lots.

(12) Use photo-cell controls on outdoor lights.

(13) Where practical, lower light fixtures in high ceiling areas.

(14) Replace age-yellowed prismatic panels and louvres. Up to 15 percent improvement in lighting efficiency may be realized.

(15) Keep lamps, fixtures and reflecting surfaces clean. Post instructions for operating, cleaning and maintenance of light fixtures and audit for custodial compliance.

(16) Wash walls and ceilings periodically and repaint as necessary to obtain maximum light reflection.

(17) Consider group bulb replacement instead of single bulb replacement since lamp output drops up to 15 percent after two years. This will also save labour costs.

(18) Consider thermal light switches that sense body temperature. This will deactivate lights if no one is in an area.

Maintenance

Maintenance should not be limited to emergency breakdown. An aggressive effort should be made to effect energy conservation through proper maintenance.

Electrical, mechanical, process equipment and controls should be operating at peak efficiency to conserve energy. All such equipment must be properly maintained to benefit from energy conservation programs. Preventive maintenance should be scheduled to take place during routine cleaning and repairs. Furthermore, when equipment performance shows signs of deterioration, the probable cause(s) should be investigated and corrected to avoid use of excess energy.

The cost of boiler fuels and electricity is substantial in all operations. It is, therefore, important to maintain boilers and the refrigeration system so that they are operated at peak efficiency. Equipment such as air filters, liquid strainers, heat transfer surfaces, fans, ducts, registers, etc. should be checked regularly for cleanliness. All instruments and controls such as thermostats, recording instruments, flow meters, pressure gauges, control valves, actuators, motor drives, dampers, and linkages should be kept in proper adjustment and calibration.

Leaks in steam, condensate, water and air lines should be repaired whenever they occur. Losses through leaks are continuous and persist for each of the entire year's 8,760 hours. The following table shows losses through small holes:

Diameter of Hole	Steam – lb/Hour 100 PSIG	Steam – lb/Hour 300 PSIG	Water – Gals/Hour 20 PSIG	Water – Gals/Hour 100 PSIG	Air S.C.F.M. 80 PSIG
1/16"	14	33	20	45	4
1/8"	56	132	80	180	16
3/16"	126	297	180	405	36
1/4"	224	528	320	720	64

Paints and Coatings

Select paints and finishes for either absorbing or reflecting heat from storage tanks, buildings and equipment. Excellent reflectors are poor absorbers of heat and vice versa.

The following table lists qualities as reflectors or absorbers of heat:

Excellent Reflectors:	White, bare aluminum, and light pastels
Good Reflectors:	Yellow, orange, bright red, aluminum color, light grey
Poor Reflectors:	Deep red, dark grey, blue green
Very Poor Reflectors:	Black

Other paint related ECO's which the EM Committee should also consider are:

(1) Paint storage tanks with appropriate colours as required to:

  (a) keep interior temperatures lower and reduce loss through evaporation.

  (b) keep interior temperatures higher thus making viscous fluids easier to pump and handle.

(2) Tests have proven that temperature differences as much as 20 to 30 degrees can be achieved through the proper selection of the best finish-coat colour. This same principle can be used to reduce temperature inside buildings by using appropriate colours for roofs and walls.

(3) Interior paints and coatings for good plants must be of a type approved by one of several federal agencies. See your local Agriculture Canada representative for the name of the agency or agencies administering the paint standards for your operation.

Processing Equipment and Operations

Adequate venting of air from thermal processing equipment, hydrostatic cookers, rotary cookers and retorts, and the free flow of steam from bleeders is essential for safe food processing. DO NOT ATTEMPT STEAM CONSERVATION BY CLOSING OFF OR DECREASING THIS FLOW. CONSIDERATION SHOULD BE GIVEN TO THE RECOVERY OF THIS HEAT AND STEAM. Ways to conserve energy in the equipment used for processing are:

(1) Steam, condensate water and compressed air leaks should be promptly repaired.

(2) Venting to the floor for rapid heatups should be stopped.

(3) Eliminate bypass on steam traps where possible.

(4) Steam traps should be checked periodically and repaired or replaced when needed.

(5) Steam should be turned off immediately at the end of a production run.

(6) Insulation should be kept in good repair.

(7) Preheating and venting of thermal processing equipment before the time indicated as necessary for each production procedure should be avoided.

(8) Conserve hot water. Collect and recycle heated water or vented steam for regeneration, plant heating, preheating and other uses.

(9) Investigate mechanical pumps for vacuum production. Mechanical pumps have a high initial cost but are more economical to operate than steam-jet ejectors.

(10) Initiate a steam optimization study to determine steam required for each product. This information should be used to arrange daily production schedules so that a low steam demand product can be matched with a high steam demand product to achieve more stable steam demand levels. This will reduce steam generation peaks at boilers and can result in the use of fewer boilers to meet production needs.

(11) Eliminate or reduce use of live steam for thawing of fats and other products.

(12) Use multi-effect evaporators where possible.

Raw Product Handling and Cleaning

Review product receiving, cold storage, handling and cleaning methods to determine whether engineering changes are feasible for energy or water conservation.

(1) Utilize gravity flow wherever possible.

(2) Schedule full and continuous production loads whenever possible.

(3) Minimize water use consistent with proper cleaning and investigate dry cleaning possibilities. Re-use water by counterflow where possible.

(4) Determine whether reduction of wash water temperature is possible.

(5) Shut off conveyors and other material handling equipment when not in use.

Refrigeration

Refrigeration systems must be properly maintained and kept in peak operating condition to conserve electricity. Prepare a schematic piping diagram for the total refrigeration system and maintain a daily operating log of compressors, motors, coolers, freezers and other auxiliary equipment. Deviations from normal operations should be immediately corrected. Other ECO's are:

(1) Keep a historical record of compressors and other major equipment with regard to overhauls, breakdowns plus emergency and routine repairs.

(2) Operate compressors at highest possible suction pressure. Raise suction pressure during third shift and on holidays and weekends.

(3) Operate compressors at the lowest possible condenser pressure all year.

(4) Eliminate operating multiple compressors at low loads when fewer compressors can be used at maximum loading. Recombine and shift loads to stop operation of unloaded compressors.

(5) Where possible, use jacket cooling water as make-up water for evaporative condensers. Check feasibility of installing a cooling tower for compressor jacket cooling water.

(6) Check compressor and pump seals and repair or replace as required.

(7) Repair or replace valve packings and flange gaskets to eliminate leakage.

(8) Operate purge unit at the lowest possible temperature to remove air from the system. This will reduce condenser pressure and reduce refrigerant loss.

(9) Provide seal caps on all seal cap valves and controls.

(10) Consider steam turbine drives for large centrifugal compressors.

(11) Check air handling units in coolers and freezers daily to ascertain the condition of fan motors and refrigeration controls. Provide easy access to the air units.

(12) Keep refrigeration heat transfer coils free of frost and snow. Frosted coils reduce or provide no refrigeration.

(13) Adjust defrost cycle to assure complete defrosting of coils.

(14) Keep freezer and cooler insulation in good condition. Repair damaged insulation immediately, to prevent further deterioration and water logging.

(15) All pipe insulation should be periodically inspected, immediately repaired when damaged, and mechanically supported to stay in place.

(16) Caulk or seal all electrical, control, piping and other penetrations to the freezers.

(17) Maintain the effectiveness of blast freezer and cold storage doors. Check for warped or deformed doors. Maintain door gaskets and adjust door hardware to assure tight seal at all times. Maintain seals under doors. Make every effort to eliminate air infiltration and leakage.

(18) Provide strategically located door guards to prevent lift truck damage to the doors. Check location of pull cords on automatic doors to allow adequate time for passage of lift trucks.

(19) Check seals on all loading dock doors. Be sure the doors operate, close and seal properly.

(20) Drain oil from ammonia systems at least once per week.

(21) Check calibration and accuracy of recorders, gauges and other instruments and controls to assure proper operation. Periodically check and calibrate ammeters on large electric motors used for centrifugal compressors.

(22) Keep refrigerator doors closed.

(23) Turn off lights in freezers when not needed.

(24) Apply and maintain freezer and cooler "air curtains".

(25) Consider an ice storage system to offset peak electrical load.

Steam and Condensate

(1) Turn off steam tracing during mild weather. Eliminate steam bleeders where possible.

(2) Consider replacing steam jets on vacuum systems with electric motor driven vacuum pumps.

(3) Optimize performance of steam jets and maintain steam jets for vacuum systems.

(4) Minimize steam venting to atmosphere.

(5) Disconnect steam lines not in use.

(6) Periodically check all equipment that requires steam such as blanchers, cookers, retorts and kettles for operation at the design temperature.

(7) Evaluate use of steam turbine drive versus electric motor drive whenever exhaust steam can be used. Evaluation should include low pressure steam usage and steam balance both in summer and in winter. A careful steam balance analysis is necessary to assure that exhaust steam can be utilized and not wasted at full load and/or at part load.

(8) Use low pressure exhaust steam for absorption water chillers.

(9) Replace barometric condensers with surface condensers.

(10) Maximize condensate return to the boiler.

(11) Install steam traps where needed.

(12) Establish a steam trap maintenance program and, where necessary, repair or replace steam traps.

(13) Keep all boiler heat transfer surfaces clean.

(14) Keep safety and relief valves at proper setting to avoid unnecessary opening.

(15) Repair leaks in steam, condensate and water lines.

(16) Repair valve seats and packing promptly to eliminate leaks.

(17) Eliminate bypasses on steam traps where possible.

(18) Investigate steam and condensate piping for excessive pressure drops, leaks, damaged or lack of insulation and take corrective steps.

(19) Flash high pressure steam condensate to lower pressure in successive steps to produce steam at each step and save use of live steam.

Transportation

(1) Set up a record system to check gasoline economy (L/100 km) for each vehicle. When mileage performance falls below a predetermined point, correct by a tune-up or other appropriate action.

(2) Evaluate advantages of diesel versus gasoline.

(3) Encourage backhauls to reduce travel by empty trucks.

(4) Extend use of rail and piggy-back services where economically possible.

(5) Emphasize speed limit of 100 km/hr and use of proper shifting speeds. Consider programs for driver evaluation. Investigate use of governors or tachographs to limit speed to below 100 km.

(6) Review and update maintenance programs regularly.

(7) Keep abreast of industry related fuel saving ideas and methods developed by truck and engine manufacturers.

(8) Encourage car pool or van pool use by employees. An incentive would be preferential parking spaces. Use computer facility to assist employees in forming car pools or van pools. Some Provincial Governments offer assistance to programs to establish van pools. Check with your provincial Ministry of Transportation.

(9) Consider a small bus or station wagon to carry employees to public transportation center and to Company facilities beyond walking distance.

(10) Investigate devices to reduce air resistance on trucks. Wind deflectors or vortex stabilizers can reduce air resistance on a typical tractor trailer by about 20 percent.

(11) Consider installing temperature modulated cooling fans on your vehicles. Typical cooling fans use about 5 percent of rated engine power.

(12) Add turbocharging kits to improve performance, reduce exhaust smoke, lower engine noise and reduce fuel consumption.

(13) Avoid making special deliveries and pickups. Schedule deliveries and receipts to avoid waiting time. Do not let engine idle for long periods of time. Shut off engine if idling period exceeds 1 minute (unless stopped for a traffic signal or similar regulated stop).

(14) Fill trucks to volume or weight capacity.

(15) Avoid unneeded or long warm-up periods for engines.

(16) Maintain proper tire inflation pressure and true wheel alignment. Use radial tires where feasible.

(17) Electric fork lifts should not be charged during peak electrical demand periods.

Water

(1) Correct all leaky water lines and faucets.

(2) Shut off water lines left running unnecessarily or use faucets which turn off automatically.

(3) Shut off water to equipment when equipment is not running during lunch and coffee breaks and at the end of shift. Make this task easy by keeping valves within reach so that shutting off does not require climbing or some other deterrent.

(4) Make sure water coolers are functioning. Consider the use of water coolers which require cups. These use less water than the free-running types.

(5) Install water and steam conserving high pressure, low volume cleaning systems.

(6) Make sure hot water temperature for personal use is not too high. Consider installation of a separate water heater for personal use so that temperature does not exceed 40°C (104°F).

(7) Install hot water heaters as close to the points of use as possible.

(8) Evaluate feasibility of installing a cooling tower to conserve water.

(9) High water pressure results in high water usage which is reflected in high energy usage. Each plant should determine the lowest water (hot and cold) pressure required for production.

(10) Check reuse of once through cooling water. Investigate reusing this water for clean up and preliminary product wash.

(11) Change locker room showers to low flow shower heads. Install shower head timers to limit shower duration.

Weekend Shutdown

Shutting off as much energy as possible on weekends can provide considerable savings in steam, water and electricity. For employees who work over the weekend, a separate water heater can be installed for their personal hot water requirements.

Make a weekend shutdown schedule so that nothing is overlooked. The schedule should include all valves, switches and controls to be turned off together with their location and function, plus a list of personnel who are to turn them off.

Plants that have hydrostatic cookers to maintain must keep some steam available in cold weather so that water lines in the cookers will not freeze. The boiler operator must watch outside air temperature and provide steam for the cooker as required. The installation of electric tracers to prevent these freeze-ups is a possibility.

Product incubation rooms may be kept at proper temperature with electric space heaters. Because of the close tolerance on temperature in these rooms, an automatic control of the heaters is required.

ANNEX A

Economic Justification Procedures

The Energy Management Committee must justify every proposed investment in energy conservation equipment in terms of its economic merit.

Methods of evaluating investment alternatives include the Present Value Method, the Return on Investment Method, Discounted Cash Flow Method, Benefit/Cost Analysis and the Payback Period Method, the latter of which is described below. For further information on these methods consult your accountant or a good accounting textbook.

One simple approach to justify a capital expenditure is to estimate the *PAYBACK PERIOD* for the piece of equipment in question. Assuming that the annual savings resulting from the expenditure are used to pay for the equipment, the purchase can be deemed profitable if the investment is recouped in a period less than the estimated life of the equipment. Interest charges over the life of the project must also be taken into account.

The general formula for such a calculation is:

$$\text{payback period in Years} = \frac{\text{Total project investment including interest charges} - \text{Tax Credits}}{\text{Net Savings}}$$

If this Payback Period is less than the life of the new system, the investment would be profitable. This particular method does not however take into account considerations such as opportunity costs, inflation, taxation schedules, or cash flow.

Table I PROJECT UTILITY DEMAND FORM

PROJECT NO. ____________________ PLANT ____________________

PAGE __________ OF __________

ENGINEER ____________________ DATE ____________________

EQUIPMENT	NO. ITEMS	UTILITY	PRESS. PSIG	DEMAND RATE	DEMAND FACTOR %	TOTAL
		STEAM		#/HR		#/HR
		FILTERED COLD WATER		GPM		GPM
		UNFILTERED COLD WATER		GPM		GPM
		HOT WATER		GPM		GPM
		COMPRESSED AIR		CFM		CFM
		VENTILATION		CFM		CFM
		GAS		CFH		CFH
		POWER AND LIGHTING		KVA		KVA
		REFRIG-ERATION		TONS		TONS

NOTE: Use additional sheets as necessary to list all equipment on project.

Table II BOILER LOG

PLANT DATE

TIME	STEAM FLOW			BOILERS																			
					TEMP °F		PRESS PSIG			OIL MTR	ATM AIR COMP	BTM BLOW DOWN	AUTO BLOWDOWN SETTING	DUST COLL	WATER TEST RESIDUAL					FLUEGAS PERCENT			
	INTEGRATOR	CONSTANT	POUNDS	BOILER NO.	OIL • BURNER	STACK	OIL • BURNER	STEAM	ATOM AIR/STEAM	GALLONS	OIL LEVEL	EXECUTED	SOLIDS MM HOS	SHAKE DOWN	CAUSTIC (ML)	SULFITE (PPM)	PHOSPHATE (PPM)	AMINE	SOLIDS (PPM)	CO_2	O_2	CO	EFFICIENCY (%)
8 A.M.																							
12 NOON																							
4 P.M.																							
8 P.M.																							
12 MID.																							
4 A.M.																							

	OIL GALLONS	GAS MCF	WATER GALLONS
CURRENT READING			
PREVIOUS READING			
TOTAL USED			

OIL ON HAND ________ GALLONS

OUTSIDE AIR TEMP °F ________ HIGH ______ LOW ______

CHEMICALS ADDED (LBS)

TIME	CAUSTIC SODA	FP 89	FP BURO	BRINE BUTTONS		

DEAERATOR			HOT WELL	FUEL OIL PUMP				FUEL OIL HEATER					FUEL OIL STORAGE TANK				WATER SOFTENER						
						PRESS PSIG IN. HG.			TEMP °F		PRESS PSIG												
UNIT NUMBER	F.W. TEMP (°F)	F.W. PRESS (PSIG)	TEMP °F	PUMP NO.	SUCTION TEMP (°F)	SUCTION	DISCHARGE	HEATER NUMBER	INLET	DISCHARGE	INLET	DISCHARGE	TANK NUMBER	OIL TEMP (°F)	OIL LEVELS (INCHES)	GALLONS	SOFTENER NO.	WATER TEMP (°F)	WATER PRESS (PSIG)	INTEGRATOR	CONSTANT	GALLONS	HARDNESS (PPM)

ENGINEERS

1st SHIFT ____________________

2nd SHIFT ____________________

3rd SHIFT ____________________

CHIEF ____________________

REMARKS: ____________________

Table III FUEL AND ELECTRIC HEATING VALUES

	Unit	BTU/Unit	Units/Million BTU
Anthracite Coal	Ton	26,000,000	0.0385
Bituminous Coal	Ton	25,000,000	0.0400
Sub-Bituminous Coal	Ton	16,600,000	0.0602
Lignite	Ton	14,400,000	0.0694
No. 2 Fuel Oil	U.S. Gal.*	135,000	7.4074
No. 4 Fuel Oil	U.S. Gal.	142,000	7.0423
No. 5 Fuel Oil	U.S. Gal.	148,000	6.7568
No. 6 Fuel Oil	U.S. Gal.	150,000	6.6667
Used Oil	U.S. Gal.	146,000	6.8493
Diesel Fuel	U.S. Gal.	135,000	7.4074
Gasoline	U.S. Gal.	123,800	8.0775
Kerosene	U.S. Gal.	130,130	7.6846
Natural Gas	MCF	1,020,000	0.9804
Natural Gas	THERM	100,000	10.0000
Propane	U.S. Gal.	91,500	10.9290
Butane	U.S. Gal.	102,760	9.7314
Electricity	KWH	3,413	292.9974

*To convert to Canadian gallons multiply by 1.2

Table IV MINIMUM RECOMMENDED LIGHTING LEVELS BY TASK

AREA	FOOT CANDLES
PLANT	
General Production Area	65
Inspection, rough	75
Inspection, final	150
Spice Room	100
Washrooms	65
Boiler and Engine Room	30
Can Storage	30
Freezer and Coolers	20
Warehouse	20
Loading Docks	20
Storerooms	30
Machine Shop	100
Maintenance Shop	80
Substation Room	20
Fan Rooms	10
OFFICE	
Cafeterias	30
Conference Rooms	70
Corridors	20
Drafting	150
Elevators	20
IBM Room	100
Inspection Kitchen	As per Government Regulations
Interviewing Rooms	30
Kitchens	70
Laboratory	100
Locker Rooms	30
Office Areas	100
Stairs	20
Storage	10
Washrooms	30

Sources of Information and Assistance

PART A Publications of Interest to an Energy Management Committee

Name of Publication	Purpose of Publication	Where to obtain it
Canadian Industry's Energy Performance Manual Level 1	To assist plant personnel whose job it is to collect energy data and report on energy performance.	Canadian Manufacturers Assoc., One Yonge Street, Toronto, Ontario. M5J 1J9 (416) 363-7261
"Energy Conservation Communications Kit"	To assist management in encouraging employees to participate in your energy conservation program. Also, gives a list of films, booklets, and brochures directed to energy conservation, and where to obtain them.	National Association of Manufacturers, Resources Technology Department, 1776 F. Street N.W., Washington, D.C. 20006 (202) 331-3700
Assistance to Business by the Ministry of State for Economic Development	A guide to programs and services which are available to the business community from the Federal Government. The publication is particularly oriented to the small and medium sized firm.	Business Center, Department of Industry, Trade & Commerce, 1st floor Center Block, 235 Queen Street, Ottawa, Ontario. Zenith 0-3200
Technical Information Service	To provide secondary or processing industries with up to date technical information on the properties and processing of material, the efficient operation of manufacturing facilities, new industrial developments, and results of scientific research.	National Research Council of Canada, Building M55, Montreal Road, Ottawa, Ontario. K1A 0S3
Conservation and Renewable Energy: Guide to Sources of Information Report E1 80-1	To identify government organizations and departments that are involved with some aspect of energy and/or conservation.	Information EMR, Department of Energy Mines & Resources, 580 Booth Street, Ottawa, Ontario. K1A 0E4 (613) 995-3065
Index of Selected Energy Mines and Resources Canada Publications — 1979	A title and subject index of general publications on energy, minerals and earth sciences, and a broad selection of scientific and technical reports of public interest published by the Department of Energy Mines and Resources between 1976 and 1979.	Information EMR, Department of Energy Mines & Resources 580 Booth Street, Ottawa, Ontario. K1A 0E4 (613) 995-3065

Name of Publication	Purpose of Publication	Where to obtain it
The National Energy Program 1980 Report EP 80-4E	A set of national energy policy decisions made by the Government of Canada to set out an energy program for the people of Canada. The aim is to address Canada's energy problems, ensure that Canadians share in the benefits of Canada's energy strengths and provide Canadians with energy security.	Information EMR, Department of Energy Mines & Resources, 580 Booth Street, Ottawa, Ontario K1A 0E4 (613) 995-3065
Tree Power An Assessment of the Energy Potential of Forest Biomass in Canada Report E2 78-1	The present estimate of the potential contribution of forestry biomass to Canada's energy requirements to the year 2025, with discussions of the economic, technical, social, environmental, and institutional uses of wood as a fuel.	Information EMR, Department of Energy Mines & Resources, 580 Booth Street, Ottawa, Ontario. K1A 0E4
Canadian Truck Fleet Performance Manual	This manual describes for truck fleet owners and operators, a method to determine fuel performance of their truck fleets. A measure of performance allows a manager to gage the effectiveness of his actions toward reducing the fuel use of his fleet.	Bakery Council of Canada, P.O. Box 61, Toronto Dominion Center, Toronto, Ontario. M5K 1G5 (416) 364-2696
Truckers Guide to Energy Conservation	To briefly cover several topics of interest to fleet owners involved in energy conservation.	Canadian Trucking Association Suite 300, 130 Albert St., Ottawa, Ontario. K1P 5G4 (613) 236-9426
Saving Fuel with Truck Drag Reduction Devices	To inform the fleet operator on what fuel savings and benefits can be reasonably expected by use of drag-reduction devices.	Canadian Trucking Association, Suite 300, 130 Albert St., Ottawa, Ontario. K1P 5G4 (613) 236-9426
Renewable Energy Resources A guide to the literature Report E1 77-5	A brief introduction and guide to the literature describing renewable energy sources, the technologies that harness them and their potential.	Energy Mines & Resources, Conservation & Renewable Energy Branch, Energy Communications Division 580 Booth Street, Ottawa, Ontario. K1A 0E4 1-800-267-9563 (toll free) OR (613) 995-1801

Name of Publication	Purpose of Publication	Where to obtain it
Renewable Energy Resources A guide to the Bureaucracy Report E1 77-18	A guide for individuals wishing to seek federal financial help in projects related to renewable energy technologies.	Energy Mines & Resources, Conservation & Renewable Energy Branch, Energy Communications Division 580 Booth Street, Ottawa, Ontario. K1A 0E4 1-800-267-9563 (toll free) OR (613) 995-1801
New Energy — New Opportunities; Programs to Develop Renewable Energy and Conservation Report E1 79-1	Contains information on government research and development programs for products or services related to renewable energy.	Energy Mines & Resources, Conservation & Renewable Energy Branch, Energy Communications Division 580 Booth Street, Ottawa, Ontario. K1A 0E4 1-800-267-9563 (toll free) OR (613) 995-1801
Energy Management in the Food and Beverage Industry	This publication is comprised of text and visual material from seminars on Energy Management in the Food and Beverage Sector, presented by Ontario Hydro.	Energy Conservation Division, Ontario Hydro, 620 University Ave., Toronto, Ontario. M5G 1X6 (416) 592-3815

PART B Industry/Government Energy Conservation Task Forces

Organized in 1975, the task forces work in close conjunction with industry association's to:

(a) exchange information and increase awareness on opportunities for and means of achieving more efficient energy use.

(b) set and report on targets for energy conservation.

(c) serve as a focal point for government/industry discussions on the energy situation and barriers to energy conservation.

To find out more, contact one of the member associations listed below, or Energy Mines and Resources Canada.

1. Grocery Products Manufacturers of Canada
2. Canadian Food Processors Association
3. Canadian Meat Council
4. National Dairy Council
5. Bakery Council of Canada
6. Fisheries Council of Canada
7. Canadian Wine Institute
8. Brewers Association of Canada
9. Association of Canadian Distillers
10. The Canadian Starch Industry
11. Canadian National Millers Association
12. Canadian Soft Drink Association
13. Association of Canadian Biscuit Manufacturers
14. Pet Food Manufacturers Association

PART C Enersave for Industry and Commerce

This is a set of ten industrial conservation manuals published by Energy, Mines and Resources Canada. Titles of the ten manuals are:

MANUAL NUMBER	TITLE
1	Guidebook/Index
2	Saving Money in Heating, Cooling and Lighting
3	Saving Money Through Process Design and Heat Recovery
4	Saving Money Through Product Optimization
5	Saving Money Through Combustion Control
6	Saving Money Through Steam and Compressed Air Management
7	Saving Money in Transportation and Delivery
8	Efficient People Moving
9	Saving Money in Office Practices
10	Saving Money Through Employee Motivation and Participation

These manuals provide an excellent source of detailed information on specific parts of your energy conservation program. They are available from:

Publication Distribution Centre
Information EMR
Energy, Mines and Resources Canada
580 Booth Street
Ottawa, Ontario
K1A 0E4

PART D The Energy Bus

The Federal Government, in cooperation with participating provinces, has provided industry with a number of computer equiped vehicles that perform on site energy audits. The purpose is to assist industry identify potential energy savings and to help initiate an energy conservation and management program. For more information on this service contact the office closest to you.

NEWFOUNDLAND
Department of Mines and Energy
Government of Newfoundland and Labrador
95 Bonaventure Ave.,
St. John's, Newfoundland.
A1C 5T7

PRINCE EDWARD ISLAND
Enersave for Industry and Commerce
P.O. Box 937,
Charlottetown, P.E.I.
C1A 8M4

NOVA SCOTIA
Nova Scotia Energy Council
P.O. Box 1087,
Halifax, N.S.
B3J 2X1

QUEBEC
Government du Quebec
Direction Generale de l'Energie,
360 Ouest St. Jacques,
Montreal, P.Q.
H2Y 1P5

ONTARIO
Government of Ontario
Ministry of Industry and Tourism,
900 Bay Street,
Hearst Block,
Toronto, Ontario.

SASKATCHEWAN
Office of Energy Conservation
1935 Scarth St.,
Regina, Sask.
S4P 2H1

ALBERTA
Department of Energy and
National Resources
Energy Conservation Branch
Industrial Energy Conservation
Program
Petroleum Plaza, North Tower
11th Floor
9915-108th Street
Edmonton, Alberta
T5K 2C9

BRITISH COLUMBIA
British Columbia Energy Commission
21st floor,
1177 West Hastings St.,
Vancouver, B.C.
V6E 2L7

PART E Tax Incentives

Various tax incentives exist to stimulate energy conservation. For example, federal sales tax has been removed on items such as heat pumps, some forms of insulation, heat recovery units, etc. .

More information on all such tax incentives can be obtained from your Local Revenue Canada Excise Field office or:

Revenue Canada
Excise Tax Administration,
191 Laurier Ave. W,
Ottawa, Ontario.
K1A 0L5

CONVERSION FACTORS FOR METRIC SYSTEM

Imperial units	Approximate conversion factor	Results in:	
LINEAR			
inch	x 25	**millimetre**	**(mm)**
foot	x 30	**centimetre**	**(cm)**
yard	x 0.9	**metre**	**(m)**
mile	x 1.6	**kilometre**	**(km)**
AREA			
square inch	x 6.5	**square centimetre**	**(cm^2)**
square foot	x 0.09	**square metre**	**(m^2)**
acre	x 0.40	**hectare**	**(ha)**
VOLUME			
cubic inch	x 16	**cubic centimetre**	**(cm^3)**
cubic foot	x 28	**cubic decimetre**	**(dm^3)**
cubic yard	x 0.8	**cubic metre**	**(m^3)**
fluid ounce	x 28	**millilitre**	**(mL)**
pint	x 0.57	**litre**	**(L)**
quart	x 1.1	**litre**	**(L)**
gallon	x 4.5	**litre**	**(L)**
WEIGHT			
ounce	x 28	**gram**	**(g)**
pound	x 0.45	**kilogram**	**(kg)**
short ton (2000 lb)	x 0.9	**tonne**	**(t)**
TEMPERATURE			
degrees Fahrenheit	(°F-32) x 0.56 or (°F-32) x 5/9	**degrees Celsius**	**(°C)**
PRESSURE			
pounds per square inch	x 6.9	**kilopascal**	**(kPa)**
POWER			
horsepower	x 746	**watt**	**(W)**
	x 0.75	**kilowatt**	**(kW)**
SPEED			
feet per second	x 0.30	**metres per second**	**(m/s)**
miles per hour	x 1.6	**kilometres per hour**	**(km/h)**
AGRICULTURE			
gallons per acre	x 11.23	**litres per hectare**	**(L/ha)**
quarts per acre	x 2.8	**litres per hectare**	**(L/ha)**
pints per acre	x 1.4	**litres per hectare**	**(L/ha)**
fluid ounces per acre	x 70	**millilitres per hectare**	**(mL/ha)**
tons per acre	x 2.24	**tonnes per hectare**	**(t/ha)**
pounds per acre	x 1.12	**kilograms per hectare**	**(kg/ha)**
ounces per acre	x 70	**grams per hectare**	**(g/ha)**
plants per acre	x 2.47	**plants per hectare**	**(plants/ha)**

Energy management for Canadian food and beverage industries