

What OnFarm Energy Assessments Can Do for Your Dairy Operation

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■ Introduction

Energy costs have increased significantly over the past years, with agricultural producers paying more for electricity, natural gas, diesel and gasoline. In addition, changes in farming practices have also increased demand for energy services. In order to cut costs and improve production, agricultural producers are looking at energy efficiency measures.

To address the unmet need, C3, in conjunction with Alberta Advanced Education and Technology (AET) and Alberta Agriculture and Food (AAF), have implemented a pilot program to conduct energy assessments for confined feeding operations in southern Alberta.

The OnFarm: Energy Solutions for Producers program is one of a kind in focusing on improving energy conservation and efficiency in the agricultural sector in Alberta and Canada. The program promotes increased adoption of energy efficiency (EE) measures and builds on AAF's current energy efficiency initiatives to identify and reduce barriers to greater adoption of efficiency measures. Components of the program include conducting 100 energy efficiency audits on farming operations in the southern region, helping to establish sector energy profiles, demonstration project(s) to showcase opportunities, establishing an EE network to promote financing and service infrastructure facilitating energy efficiency on farms, and ground proofing the applicability of technologies and practices on Alberta farms.

■ Program Goals and Objectives

The motivation and objectives for the program are:

- ▶ Reduce greenhouse gas emissions
- ▶ Reduce energy consumption in the agricultural sector

- Provide an opportunity for agricultural operators to save money

Deliverables

The program is expected to result in a number of deliverables, specific to the agricultural sector in Alberta:

- Average energy demand/consumption for a cross section of farm types
- Checklist of energy efficiency and conservation practices and technologies
- Demonstrations of appropriate practices and technologies
- Recommendations for practices and technologies for farm types and policy development
- Tools for implementation: trained auditors, efficiency and GHG calculator, a “Getting Started” resource guide, etc.

■ Program Process

The OnFarm program has been developed to allow for private companies to participate as delivery agents of the On Farm energy assessments. Program administration is handled jointly between Climate Change Central and the AAF’s Agriculture Technology Center. This section provides a short description of how a producer would participate in the program and what they could expect from participating.

Eligibility

The prospective participant will go through an initial screening process to determine general eligibility in the program. Should the prospective participant meet the eligibility criteria, an application form will be made available either on the website or alternatively may be mailed or faxed by request. Visit www.onfarmenergy.ca to download the registration form or contact AAF Agriculture Technology Centre (403) 329-1212 to request a registration form by mail.

Application

The application form must be completed, signed and sent in with a cheque for \$200. In addition, 12 consecutive months of both electricity and natural gas bills and a site map or site diagram must be included. The site diagram must have, at minimum, all buildings clearly identified along with building dimensions. A biosecurity form must be signed and submitted with the

application to ensure that any specific biosecurity measures are identified for the prospective assessor.

Approval

The application will be reviewed by the program administration and upon approval an assessor will be assigned to contact the participant. The assessor will confirm the information provided in the application form, and schedule an on-site inspection date.

On-Site Inspection

An on-site inspection is expected to take approximately 4 hours, however, participants should be prepared for one full day. The audit process requires staff and operators to be interviewed, so it is critical that time is given to the auditors while on site. This may entail some time on the operator's part to walk through the operations with the assessor. An inventory of all equipment that uses both natural gas and electricity will be taken, along with estimates of timing for equipment usage.

Analysis

The main effort within the OnFarm program is the analysis that the assessor undergoes to determine where the energy demand is within the farm operations. Based upon the data taken during the on-site visit, information is fed into the OnFarm analysis software to model energy consumption. The output from the software is then correlated with the billing information provided by the participant. Once energy consumption by operational component has been identified, the assessor is then able to determine where operational efficiencies can be realized.

Report

The assessor will complete the OnFarm report and submit to the program administration. Once the report has been successfully verified by OnFarm staff (quality control), the participant will receive a final report outlining where electricity and natural gas is being consumed on your operation and recommendations on how to curb this energy use. Specific operational information will be kept strictly confidential; however general data will be aggregated and published.

Post Audit Survey

A survey will be conducted one year after the audit has been performed to determine whether the program was beneficial to the participant and whether

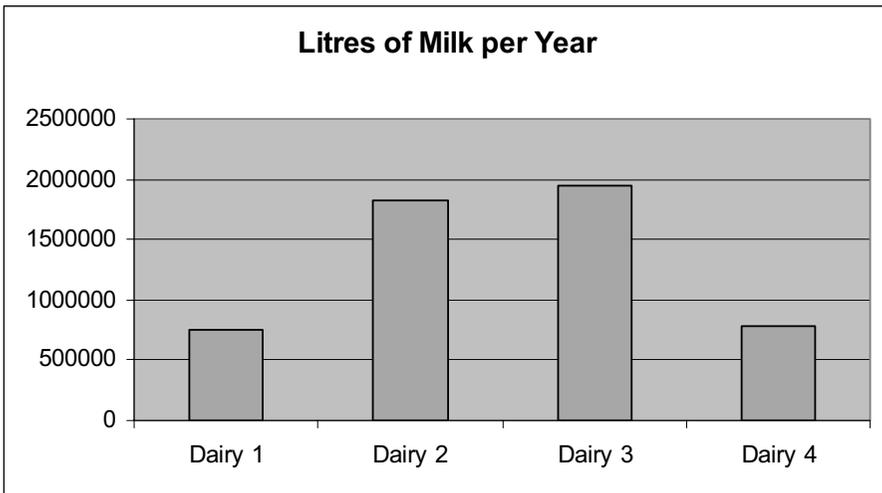
the participant has acted upon any of the recommendations.

■ Preliminary Results

Findings from the program to date are still in the preliminary stages, so data for this paper is limited. The results presented in this section are restricted to the development assessments that were conducted in preparation of the OnFarm program. In the development stage, four dairy operations were assessed to aid in the programming of the analysis spreadsheets. This section outlines the findings of those assessments.

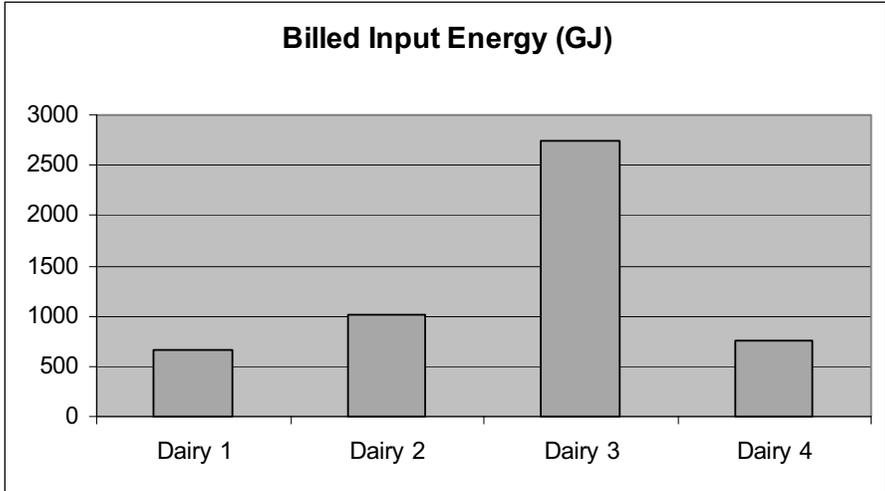
Dairy Operations

The dairy operations assessed in the development stage ranged in size from 67 milking cows up to 190 milking cows with milk production ranging from 750,000 litres per year up to 1,900,000 litres per year.



Taken from: OnFarm initial pilot audits, 2007

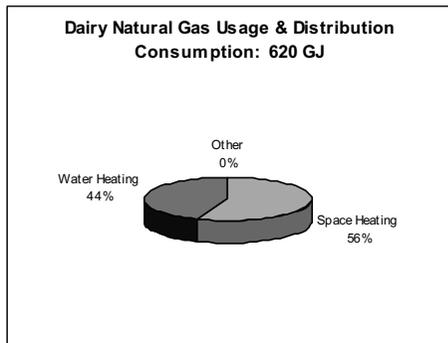
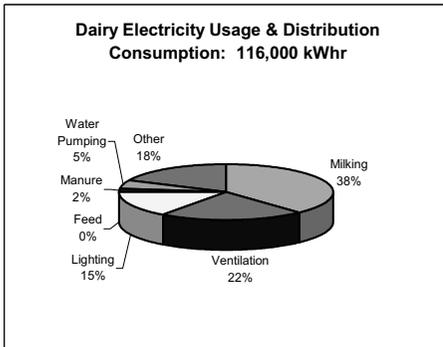
Milking parlour configurations varied from double-six arrangements to triple-5 to rotary. Each operation milked twice daily. The following chart indicates the overall energy input for the operations converted to a gigajoule equivalent.



Taken from: OnFarm initial pilot audits, 2007

From the analysis, Dairy #3 was identified as using a disproportionate amount of energy considering the output of milk on an annual basis. Discounting this somewhat anomalous result, average energy usage on a per liter output basis ranged from 0.55 Megajoules per liter up to 0.95 Megajoules per liter.

From the data taken, the following charts were developed to identify the typical energy usage on a dairy operation identifying categorical end-use.



Taken from: OnFarm initial pilot audits, 2007

■ Typical Energy Consumption and Distribution on a 100 Cow Dairy Farm

As can be seen from the electricity consumption chart, the primary source of consumption was in the milking stage (38%), with other major uses being

ventilation (22%) and lighting (15%). Other electrical loads included water pumping (5%), manure handling (2%) and other miscellaneous loads such as air compressors, pressure washers, and drinker heaters. The dairy operations used natural gas primarily for space heating (55%) and water heating (44%). Other natural gas loads were not significant, but included natural gas fired appliances.

■ Findings and Recommendations

The general findings from the initial dairy operation assessments identified a few common opportunities to improve efficiency and save energy. The first opportunity is lighting. Lighting is often identified as a first measure for energy efficiency retrofits due to the general ease of installation and the relatively quick payback on capital expenditure. Switching from T-12 fluorescent lighting to more efficient T-8 fluorescent lighting can save 10% on electricity consumption, depending upon the operation.

Another opportunity is in the use of variable speed drives. Vacuum pumps for milking operations are sized to handle estimated high volume use. This may only represent a fraction of the time that the pump is in operation. With a single speed motor, the vacuum pump runs at this highest level all the time, consuming a lot of extra energy. By using a variable speed drive, when the maximum volume is not needed, the pump can be slowed down thus conserving energy. This can amount to an electricity savings of 20%.

The third opportunity is in recovering milk-cooling heat through a plate cooler coupled with a variable speed milk pump. By using a heat transfer technology such as a plate cooler, an operation can employ the practice of pre-cooling its milk. This heat transfer can be optimized by slowing down the transfer rate of the milk to increase the cooling time in the plate cooler. This results in reducing the energy load on the bulk tank compressors. This heat transfer and heat recovery system can amount to 15% savings on electricity usage.

Other efficiency recommendations included items such as:

- ▶ Keeping fans clean and well lubricated
- ▶ Thermostats should be cleaned and calibrated twice a year
- ▶ Insulating blankets around water heaters

This list is by no means exhaustive, and the efficiencies gained will vary from operation to operation.

■ Conclusions

The On Farm: Energy Solutions for Producers program is a great opportunity for dairy operators to better define their energy consumption and identify ways in which they can reduce their energy consumption. Participation in the program is available through 2008. To date, energy profiles on the dairy operations have generally shown the majority of energy used in space heating, water heating, milking and lighting. Based upon this, there is significant opportunity to reduce energy by employing variable speed drives for vacuum pumps, plate coolers, and energy efficient lighting. Operators who wish to learn more about their specific operation can contact the OnFarm administration at (403) 329-1212 or go to the website at www.onfarmenergy.ca.



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