



Dairy Processor Carbon Reduction through Energy Efficiency (D-CREE)

The current situation

Fluid milk processing is a significant source of carbon dioxide equivalent (CO₂e) emissions within the total lifecycle of milk. According to preliminary results of the milk processing facilities life cycle assessment (LCA), 75 percent of processing-related emissions come from electricity use, 23 percent from fuel use and 2 percent from refrigerant leakage.¹ Natural gas (or, in some cases, fuel oil, diesel or propane) is used to generate steam for thermal processes such as pasteurization and cleaning, while electricity is primarily used for refrigeration, lighting, compressed air and motors.

Energy efficiency best practices reduce energy use, greenhouse gas (GHG) emissions and operating costs. Along with going straight to the bottom line, they can improve system reliability, avoid maintenance and shut-down costs, increase productivity and add new revenue streams. In addition to energy efficiency, today's best practices to reduce GHG emissions include cogeneration and the use of alternative energy sources, such as solar and wind.

Several factors have led to limited implementation of energy efficiency best practices in the past. There has been a lack of information, such as measured and proven energy savings data, as well as a lack of cost-effective turnkey solutions. Resources, including management and engineering time and attention, are scarce. And energy efficiency projects have to compete with core operations for financial support.

A strategy for sustainability

The Dairy Processor Carbon Reduction through Energy Efficiency (D-CREE) project will increase milk processor awareness of and confidence in the economic feasibility of energy efficiency projects and lead to their adoption. Building on the LCA information baseline, the project will develop plant-specific benchmarking tool to assess energy use, energy costs GHG emissions, as well as modeling tools to simulate "next practice" energy reduction measures. It will create and publish case studies demonstrating economic feasibility and resource requirements for efficiency improvements, and put them directly in the hands of processors.

Tactics for change

Participating processors and their plants will have access to several resources expected to help significantly reduce GHG emissions by improving plant energy efficiency and provide attractive return on investment. The D-CREE project plan will pursue four tactics, the first three immediately and the fourth in the longer term.

1. Gather and disseminate best practices and case studies with associated economic feasibility. The project plan will provide plants with technical data and examples of energy efficiency upgrades that have been successful for other fluid milk processing plants. Like the Hazard Analysis and Critical Control Points (HACCP) model for food safety, the project will identify critical control points for energy efficiency and develop corresponding validated case studies. Participating processors will be asked to share examples of their proven best practice projects.
2. Develop a validated plant process simulation model. This model will provide the fluid milk industry with high temperature short time (HTST) processing and ultra high temperature (UHT) plant performance indices, benchmarks and industry statistics. An applied research project will develop the model, which will then be used to help identify fluid milk plants with the greatest potential for significant energy and GHG reductions.
3. Encourage processors to set individual company-level targets and adopt relevant best practices. Companies can use the case studies and benchmarking tools to set appropriate energy efficiency and GHG reduction targets, and create a customized road map for implementing energy efficiency projects in their plants.
4. Develop a customizable fluid milk processing simulation tool to allow processors to assess their next practice opportunities. This longer-term effort will focus on the identification of potential next practices for the fluid milk processing industry. Possible examples include thermal and non-thermal alternative pasteurization methods, intervention processes that improve the performance of HTST processing, renewable energy sources, alternative refrigeration systems and advanced packaging systems. A simulation software tool will be customized to any plant to evaluate a given next practice and provide energy, GHG and economic analysis.

Economic and environmental impact

Based on an analysis of four proven case studies that implemented best practices in lighting, refrigeration, compressed air and boilers, and assuming 80 percent industrywide adoption of these practices by 2020, the D-CREE project estimates *at least* 8 percent industrywide CO₂e reductions — more than 400,000 metric tons — and energy cost savings of \$45 million to \$50 million, based on national average prices for electricity and natural gas.

¹ University of Arkansas. Processor Survey, 2008. (Preliminary results). Survey data was collected from a total of 50 fluid milk processing plants, which collectively represent 12 percent of all U.S. milk plants. Processing sites surveyed consumed a combined total of 530 million kWh and 1.75 million MMBTUs to process fluid milk.
