Dairy and Milk Processing Case Study

The Maryland dairy industry numbers 463 farms and ranks fourth in state agricultural sales. As energy intensive operations, dairy and milk processing facilities are excellent targets for efficiency improvements. Through the 2014 Kathleen A.P. Mathias Agriculture Energy Efficiency Program, three Maryland dairies and milk processing facilities increased the economic and environmental sustainability of their operations. Participating facilities achieved about a 20 percent reduction in their energy consumption by installing the following measures:

- LED lighting
- Ventilation
- Milk cooling
- Refrigeration
- Compressor heat recovery
- Ventilation recovery

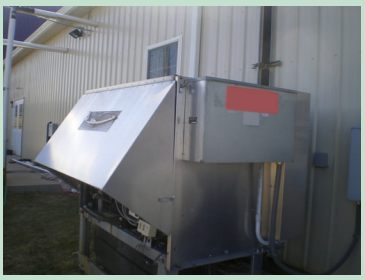
LED Lighting is the most efficient and one of the longest lasting forms of lighting available. LEDs are highly sought after in the dairy industry for these qualities. Particularly when lighting a free stall that requires a lift to change fixtures or bulbs, the long rated life of LEDs can significantly reduce the maintenance time and cost associated with this task.

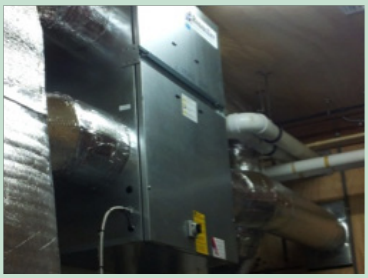
Ventilation is extremely important for the health of the cows. A cow begins to suffer heat stress at about 72 degrees Fahrenheit, which negatively affects milk production and can lead to other health issues as well. High efficiency ventilation helps provide proper cow cooling while reducing energy consumption and demand in the warmer months.

Milk cooling is typically a large energy-consuming process at dairy farms. Milk processing facilities also require efficient methods for cooling milk after pasteurization. Energy efficiency solutions such as plate coolers that pre-cool the milk using well water, scroll compressors that offer 15 to 20 percent greater efficiency than standard reciprocating compressors, and high efficiency chillers are all good examples of ways to reduce energy for milk cooling.

To implement these measures and the ones on the following page, three Maryland farms received grants totaling $208,824 toward total project costs of $495,613. The following table summarizes the savings and costs associated with the upgrades at these facilities. Costs and paybacks for similar measures on other farms will vary.

Projects were installed during the summer and fall of 2014. The dairy and milk processing upgrades delivered annual electricity savings of 594,095 kWh – enough energy to power 48 Maryland homes for a year.[2] Even more critical for the farmers, this energy savings resulted in a net decrease in operating costs of more than $23,000 annually per facility.





Refrigeration for milk processing facilities involves cooling the product and maintaining cool temperatures while awaiting shipping. Because new, warm or room temperature product is constantly being moved into the refrigerated spaces, these systems tend to have high run times, which increase the importance of energy efficient systems.

Compressor Heat Recovery is the capture of waste heat from the compressors to pre-heat water. Dairy operations can use hundreds of gallons of hot water daily to clean the milking system after every milking, among other uses. A compressor heat recovery unit can heat water to approximately 110 degrees Fahrenheit using just the waste heat from the compressors.

Energy Recovery Ventilation captures heat or coolness that is normally wasted in HVAC systems. This capture of conditioned air reduces the load on the system, thereby reducing energy use, while achieving the same heating and cooling of traditional HVAC systems.

Recommended Dairy and Milk Processing Measures	Propane Savings (gal)	Diesel Savings (gal)	Electric Savings (kWh)	Overall Energy Savings (MMBtu)	Estimated Annual Energy Cost Savings	Installed Cost	Estimated Payback in Years
LED Lighting			254,562	869	$27,618	$80,628	2.9
Ventilation			95,109	325	$10,338	$93,435	9.0
Milk Cooling			92,801	317	$9,990	$114,870	11.5
Refrigeration			137,667	470	$14,345	$155,089	10.8
Compressor Heat Recovery	1,661	359		202	$4,323	$36,161	8.4
Energy Ventilation Recovery	875		13,956	128	$3,454	$15,430	4.5
Totals	**2,536**	**359**	**594,095**	**2,311**	**$70,068**	**$495,613**	**7.1**

Other dairy operations can benefit from similar energy efficiency projects. The rapid payback—just over 7 years for the 2014 Mathias Ag Program grantees—makes the upgrades an attractive option for farmers even without the benefit of a grant. More efficient operations translate to a healthier bottom line.

[1] *United States Department of Agriculture (USDA) (2012). Census Publication – Ranking of Market Value of Ag Products Sold. Available online: http://www.agcensus.usda.gov/Publications/2012/Online_Resources/Rankings_of_Market_Value/Maryland/ Accessed: 3/17/15*

[2] *Based on the average Maryland residential annual electric use of 12,360 kWh. United States Energy Information Administration (2013). Average monthly residential electricity consumption, prices, and bills by state. Available online: http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3 Accessed: 3/17/15*