

<http://www.sce.com/showcasing-energy-efficiency>

VFDs Save Energy in Milking Vacuum Systems

To maintain the stable vacuum needed for milking cows, air must be removed from the system at the same rate at which it enters. Typically, air enters the system through pulsators, claws, leaks, and unit fall-off. Conventional vacuum control is accomplished by running, at full speed, a vacuum pump sized to the largest possible airflow and allowing air to bleed into the system through a pressure regulator.

With the help of Southern California Edison engineers, a new vacuum control system was demonstrated at two California dairies, where the speed and capacity of the vacuum pump are adjusted so air is removed at the same rate as it enters the milking system, without the need of a conventional controller or regulator.

The Cross Creek Dairy, located near Hanford, has two double 20 parlors, each milking about 1,600 cows twice daily. The original vacuum pumps were 30-hp water rings, one for each parlor. Following a regulator efficiency test, a new piping layout was implemented in the East parlor, which

resulted in the replacement and downsizing of the pump and relocation of the regulator. A new 20-hp lobe/blower pump was installed. With the new layout and pump, annual energy savings of 51,000 kWh or \$4,000 were obtained.



The next step was to install a variable frequency drive (VFD) with a direct vacuum feedback system. The conventional regulator remained in place and was set at one inch above milking vacuum (note that the regulator is not necessary). The vacuum stability with the new control system is equal to or better than the previous approach.

When all of Southern California Edison's recommendations (new piping, layout, a new smaller pump, and the VFD) were implemented, annual savings of 109,000 kWh were obtained. This represents a 63 percent

reduction in energy use, translating into \$9,000 of energy savings. The new control system has been in use since February of 1997 without any problems.

The second implementation of this new vacuum control system was at the Corona Dairy Ranch, located in the Chino area. On this farm 830 cows are milked three times a day in a double 16 parlor with two 15-hp vane (oil lubricated) vacuum pumps. Originally, this farm used both pumps for milking and pipeline washing. The vacuum pumps operate about 23 hours per day. Following a regulator efficiency test, a new piping layout was implemented, which resulted in the relocation of the regulator and the use of only one pump for milking and both pumps for washing.

A variable frequency drive was installed on a new 15-hp lobe pump. Based on measurements made, the new control system was capable of maintaining a vacuum stability equal to the original system for both milking and cleaning. The energy savings at Corona Dairy Ranch are significant with less than one-fifth of the vacuum pump's energy being used. This translates into an annual energy savings of 176,000 kWh or 81 percent, which is a \$14,000 reduction in energy costs. The new control system has been in operation since November of 1997 with no significant problems.