United States Department of Agriculture
Natural Resources Conservation Service

2016 – 1
2017 – 1 Renewal

Energy Enhancement Activity – ENR13 - Variable speed motor-drive systems

Enhancement Description
This enhancement activity is for upgrading of existing single speed motors through the addition of variable speed drives. A motor replacement may also be included in some cases. The primary use of this enhancement is for irrigation water pumping. This enhancement is not intended for farmstead or animal housing applications.

Land Use Applicability
Cropland, Pastureland

Benefits
Motor-drive systems are matched to the pump or other machinery which performs the work that needs to be done. Each motor-drive system must be sized to meet the maximum expected load even if that maximum load only occurs infrequently. This maximum output condition is rarely the most efficient operating point of the motor-drive system. A variable speed drive improves the system's energy efficiency under most operating conditions by matching the motor speed to the load. In contrast, the output of a single speed motor-drive system will rarely match the actual demand and is controlled in some way that often wastes a large part of the power it produces. For example, single speed electric motor-drive systems use more electricity during startup and have operating requirements which vary during the run cycle. A variable speed drive can start a motor slowly and ramp up to full speed reducing wear and tear on the motor.

Variable speed drives achieve higher energy savings in applications with long annual run-times and when the system operates outside its best efficiency point for long periods of time. Equipment which operates with frequent on/off cycles or uses some kind of mechanical throttling (dampers on air systems or valves in liquid systems) are typically good candidates for a variable speed drive.

Motor-drive systems which generally operate under steady load conditions are not good candidates for variable speed drives.

Conditions Where Enhancement Applies
This enhancement applies to only the number of single speed motors without variable speed drives within the selected land use. This enhancement does not apply to single speed motors for farmstead or animal housing applications.

Criteria

1. Determine current and anticipated requirements in terms of peak and typical load conditions (as the load varies daily and by season, crop, or other appropriate activity).
2. Retrofit single speed motors with a variable speed drive or replace single speed motors with an efficient motor and variable speed drive.

Adoption Requirements

This enhancement is considered adopted when the selected single speed motor has been retrofitted or replaced with a variable speed motor-drive system.

Documentation Requirements

Receipts and pictures of the installed variable frequency drive(s).

References

US-DOE. 2001. GREENING FEDERAL FACILITIES: An Energy, Environmental, and Economic Resource Guide for Federal Facility Managers and Designers. 2nd ed. Part V Energy Using Systems. 5.7.2 Variable-Frequency Drives. http://www1.eere.energy.gov/femp/pdfs/29267-0.pdf

Operations & Maintenance, Conservation Measures, and Client Acknowledgement

Operation and Maintenance

Operation:

Maintenance:

Conservation Measures

Actions that must be implemented by the landowner/manager during practice implementation:

Client's Acknowledgement Statement

The Client acknowledges that:
a. They have received a copy of the enhancement and understand the contents and requirements.
b. It shall be the responsibility of the client to obtain all necessary permits and/or rights, and to comply with all ordinances and laws pertaining to the application of this practice.

Cooperator: _____ **Date:** ____

Engineer: _____ **Date:**

Planner: _____ **Date:**