



CONSERVATION ENHANCEMENT ACTIVITY

E533B

CONSERVATION STEWARDSHIP PROGRAM

Complete pumping plant evaluation for energy savings

Conservation Practice 533: Pump Plant

APPLICABLE LAND USE: Crop (Annual & Mixed); Crop (Perennial); Pasture; Associated Ag Land; Farmstead

RESOURCE CONCERN: Energy

ENHANCEMENT LIFE SPAN: 1 year

Enhancement Description

Evaluation of all pumping plants to determine the potential to rehabilitate/replace/reconfigure pump performance to improve water delivery efficiency 10% or more. Evaluate to determine if a Variable Frequency Drive motor controller(s) is recommended and the simple payback in terms of energy savings is less than 10 years.

Criteria

- Pump test evaluation will include all irrigation pumps on the on fields where the activity is implemented. There could be multiple pumps that are used on single or multiple fields. Minimum data necessary to complete the pumping evaluation:
 - Flow rate, instantaneous and for the season
 - Pressure at different flow rates based on partial or complete irrigations
 - Power usage to compute efficiency of the drive unit.
 - Area and fields irrigated
 - Estimate of friction loss in pipelines based on pressure drop in lines during test

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Documentation and Implementation Requirements

Participant will:

Prior to implementation

- Provide NRCS with a map showing the location of all fields and pumps connected to the irrigation system.
- Arrange for pump test evaluations of all irrigation pumps on fields where activity is implemented.

During implementation

- Have a pump test evaluation performed on all irrigation pumps that service the fields where activity is implemented.

After implementation

- Make the following items available for review by NRCS to verify implementation of the enhancement:
 - Pump test evaluation report
 - Provide a list of any adjustments to improve system efficiency made as a result of the evaluation. Calculate the reduction of energy use based on before and after conditions. Energy savings can be reported as the average annual or seasonal energy reduction compared to previous operating conditions.

NRCS will:

Prior to implementation

- Review Pumping Plant (Code533) with Participant as it relates to implementing this enhancement
- As needed, provide additional technical assistance to the participant as requested.



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After implementation

- Verify pump test evaluation, by reviewing evaluation report.
- Verify energy savings based on system efficiency before and after implementation of the enhancement.

NRCS Documentation Review:

I have reviewed all required participant documentation and have determined the participant has implemented the enhancement and met all criteria and requirements.

Participant Name _____ Contract Number _____

Total Amount Applied _____ Fiscal Year Completed _____

NRCS Technical Adequacy Signature

Date

North Dakota Sideboards:

1. Use of this enhancement is restricted to systems where the installation of a Variable Frequency Drive (VFD) has a reasonable potential for water savings. Either of two situations are considered to have potential:
 - The irrigation system consists of multiple irrigation delivery points operating from a single pump. This includes systems where multiple pumps supply multiple irrigation systems.
 - The irrigation system has Variable Rate Irrigation (VRI) currently installed.

These situations do not have potential for energy savings through a VFD:

- Single pump to a single system.
 - Multiple pumps to a single system that does not have VRI installed on it.
2. ND NRCS will develop target flow rate/TOH performance requirements for the pump, in order for the system to deliver peak consumptive use requirements of the crops in the rotation. In addition, ND NRCS will prepare an IWM Plan (Basic or Intermediate) utilizing the ND IWM Template. No record keeping or follow up is required for IWM under this enhancement. ND NRCS will communicate flow/TOH performance requirements to the service provider hired by the producer, as well as ensuring the service provider is clear on requirements of the evaluation.
 3. The producer is required to hire a qualified service provider, with appropriate testing equipment, to complete an evaluation of the pumping plant performance and efficiency using the Nebraska Irrigation Pumping Plant Performance Criteria and as described in NEH Part 623, Chapter 8, Appendix A. As of 2018, NDSU Extension is no longer staffed to provide this service. A full and complete report must be completed by the service provider, including the ND-ENG-533E Pumping Plant Evaluation Form and should include:
 - Age and condition of the components of the irrigation system and pumping plant
 - Water levels during pumping
 - A field developed pump curve
 - Pump and engine speed (rpm)
 - Actual Pump Plant Performance versus the Nebraska Performance Criteria
 - Actual pump efficiency versus the Manufacturer Published efficiency
 - Recommendation for improvements to the overall system efficiency
 - Estimate of energy savings if improvements are implemented
 4. The VFD evaluation may be done by the service provider, or by a NRCS engineer utilizing the CNTC Variable Speed Drive Economic Calculator worksheet.

Note that this enhancement does not *cover* implementation of Advanced IWM – utilize enhancements E449114Z8 and E449114Z7 for that separately.

'Development of /WM plan, pump requirements, and review/approval of pump test and VFD evaluation appropriate JAA {449, 442, 443, 533}.

5. ND NRCS will develop a site specific Irrigation Water Management Plan prior to implementation, utilizing the ND IWM Template, which includes guidance to the producer on sensor placement, weather station placement, and record keeping. Alternatively, the producer may provide an IWM Plan developed by a ND P.E., subject to a functional review and approval by NRCS.
 6. Flow meters are required to be installed as necessary to accurately account for the quantity of water applied to each individual field. If meters are not tied into the pivot panel for automatic recording, the producer will be required to keep side records for each individual application.
 7. Sensors must include a data logger that records daily soil moisture levels, at multiple depths, and transmits information electronically to the operator in real time. Acceptable sensor types include, Time Domain Transmissivity, Capacitance Sensors, Tensiometers, or Granular Matrix Sensors.
 8. A weather station is required unless an active NDAWN station is located within 5 miles of the irrigated field.
 9. At the completion of first irrigation season, prior to the end of the calendar year, NRCS and the producer will complete a technical evaluation of IWM utilizing the ND IWM Certification Tool. If a subscription service can provide comparable data (daily record of irrigation, rainfall, soil moisture), in an alternate format, that will be considered an acceptable substitute.
- *All planning, review, and/or end of the season evaluations require 449 JAA*