



Natural Resources Conservation Service CONSERVATION PRACTICE STANDARD COMBUSTION SYSTEM IMPROVEMENT

CODE 372
(no)

DEFINITION

Replace, repower, or retrofit ~~fuel-consuming~~ an agricultural ~~equipment combustion system~~ and related components or devices.

PURPOSE

This practice is to accomplish one or more of the following purposes:

- ~~Reduce~~ Improve air quality by ~~reducing~~ emissions, ~~including~~ of oxides of nitrogen (NO_x).
- ~~Improve~~ air quality by reducing emissions of particulate matter (PM), ~~or other combustion byproducts.~~
- ~~Improve~~ Reduce energy use by ~~increasing the efficiency of the combustion system.~~

CONDITIONS WHERE PRACTICE APPLIES

This practice is applicable on all agriculture-related land uses ~~for~~ applies to existing fully-operational, in-use non-road agricultural combustion systems, including stationary, ~~portable, and self-propelled mobile, and portable~~ units.

This practice does not apply to:

- On-road and on-water vehicles and machinery for non-farm use or mainly used for transportation.
- Increasing agricultural or energy production as a primary objective.
- Replacing, For a combustion system associated with a pumping plant (e.g., pumping plant power unit), when the only change to the pumping plant is the replacement, repowering, or retrofitting existing diesel engines already certified to the current highest TIER rating with other diesel engines.
- Installation of a combustion system or non-combustion alternative that is not a replacement, repower, or retrofit of an existing agricultural combustion system.

For pumping plants that do not involve the replacement, repower, or retrofit of a power unit combustion system (including an integrated the power unit and pump) for an air quality or

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NRCS, NHCP
Month 2026 ~~May 2019~~

energy purpose, use NRCS this conservation practice standard (CPS). ~~For all other scenarios involving a pumping plant combustion system, use CPS~~ Pumping Plant (Code 533). ~~For a combustion system associated with enclosed controlled environment agriculture (e.g., greenhouses, indoor confined animal operations, etc.), use NRCS CPS Energy Efficient Agricultural Operation (Code 374).~~

Pre-Decisional/Deliberative

CRITERIA

General Criteria Applicable to All Purposes

The replacement, repower, or retrofit combustion system and related components or devices must serve roughly the same type of function and activity~~perform similar type of work~~ as the existing original equipment. ~~Additionally, the~~

The replacement, repower, or retrofit combustion system and related components or devices must have an appropriate power output~~be sized appropriately~~ to perform the intended task.

The replacement, repower, or retrofit combustion system~~an essentially equivalent amount of work as the original equipment~~ and related components or devices must meet or exceed currently applicable federal, state~~Federal, State~~, and local standards and guidelines.

Replacement and repower

After replacement or repower, destroy the existing units at a dismantling facility approved by NRCS. An approved dismantling facility is capable of scrapping and disposing of the units by shearing, crushing, or shredding. Destruction removes the existing high-emitting or low-efficiency units from service and prevents the replaced or repowered~~old~~ units from remaining in use~~use or movement into another locale~~.

If there are no local dismantling facilities, disable and properly dispose of the existing units by the following:

- To disable an engine, make a minimum of a 3-inch-diameter hole in the engine block including a portion of the oil pan rail (sealing surface).
- For mobile units, in addition to disabling the engine, completely sever the vehicle frame railings or destroy the bell-housing and transmission components if not equipped with a frame. Additional means may include compromising the drivetrain components by knocking holes in the transmission casing and cutting axles and axle housings for mobile units not equipped with a frame.
- For other units, disable the existing units using an approved NRCS method.
- Dispose of existing units and associated materials or contents in accordance with environmental laws and regulations. Ensure that any equipment remaining onsite does not create a nuisance or safety hazard~~habitat for vectors~~.

Destruction (or disabling, if applicable) and proper disposal must be documented. ~~This documentation must include—~~

- ~~• The, as described in existing unit types.~~
- ~~• The existing unit serial numbers or mobile unit vehicle identification numbers.~~
- ~~• The date the Plans and Specifications section below. Do not salvage, sell, or otherwise use any existing units were destroyed or disabled.~~
- ~~• How the existing units were destroyed or disabled.~~
- Specifying that no parts or components from an existing combustion system unless those were or will be parted out, used, or sold as parts or components can be re-used on the new unit. Obtain NRCS approval before salvaging, selling, or using parts or components from replaced or

~~repowered units, or used to rebuild an engine or equipment.~~

Prescriptive upgrades

Prescriptive upgrades are actions that have been demonstrated to reduce air emissions or improve energy efficiency and conform to relevant criteria in this practice standard. States are allowed to create state-approved prescriptive upgrade lists to identify replacement, repower, and retrofit actions that have previously been demonstrated to meet this practice standard. As such, design and implementation for items listed in a state-approved prescriptive upgrade list do not require additional specific analyses of air emission reductions or energy efficiency performance parameters.

- ~~Date-stamped photographs.~~

Additional Criteria Applicable to ~~Reducing~~ Improve Air Emissions ~~Quality~~

Any replacement, repower, or retrofit must demonstrate a reduction of air either PM or NO_x emissions, ~~or both~~.

For actions included on the state-approved prescriptive upgrades list, no further demonstration is necessary. For actions not included on the state-approved prescriptive upgrades list, provide a calculation of expected air emission reductions using an NRCS-approved method.

Emission control components must remain intact and functional for the life of the practice. Disabling emission control components violates this standard.

For a replacement or repowered combustion system and related components or devices, utilize a non-combustion ~~noncombustion~~ power source or a combustion power source that utilizes any combination of cleaner ~~burning~~ technologies, techniques, or fuels.

When installing a new ~~replacement or repower~~ diesel engine to replace or repower an existing ~~diesel-powered~~ engine, use the highest currently ~~newest~~ available U.S. Environmental Protection Agency engine TIER technology.

Additional Criteria Applicable to Improving ~~Reduce~~ Energy Efficiency ~~Use~~

Provide an analysis that demonstrates improved ~~Estimate reduced~~ energy efficiency by documenting the estimate ~~use that results directly from the application of probable this practice. Calculate the estimated annual difference in energy savings and the assessment~~ use on an after-practice minus-before practice basis. Use a documented methodology.

For energy efficiency upgrades included on the state-~~as~~-approved prescriptive upgrades list, no further demonstration, analysis, or calculation is necessary. For energy efficiency upgrades not included on the state-approved prescriptive upgrades list or for those that do not have additional criteria, academic, industry, manufacturer, or other energy efficiency performance parameters, select equipment and system improvements that meet the energy-related criteria in this practice standard.

Follow manufacturer's instructions and guidelines when designing, installing, initiating startup, and dismantling of equipment and systems. Use certified installers when required by the manufacturer.

Grain dryer replacement

The maximum allowable Specific Energy Consumption (SEC) of a stationary grain dryer is 2,000 British Thermal Units per pound of water removed, when calculated using a 10-percentage-point moisture reduction (wet basis) for corn (computation result is less than 2,000).

Grain dryers with combustion systems that supply supplemental heat (such as high-temperature batch, batch cross flow, and continuous cross flow dryers), may be replaced with a higher efficiency grain dryer such as a mixed flow, continuous flow, or tower dryer. Existing and replacement grain dryers are those where wet crop is loaded in the top of the dryer and dried crop is removed from the bottom of the dryer and heated air from the unit's burners pass from the burner plenum through the grain. An allowable replacement unit must be a new, stationary, high-efficiency dryer using a microcomputer-based control system to reduce over drying and total time of operation that meet or exceed the SEC criteria stated above.

When a grain dryer is replaced, the existing grain dryer must be decommissioned, destroyed, and removed from the farm. Destruction removes the existing combustion system from service and prevents the existing unit from reuse in another area.

- The burner on stand-alone stationary dryers such as cross flow horizontal or tower dryers must be destroyed by shearing, crushing, or shredding. The burner and all remaining dryer assemblies must be removed from the farm and taken to a recycling facility or disposed.
- The burner on high temperature bin dryers must be made inoperable; the bin may be converted to grain storage and handling functions without use of a supplemental heat source or disposed.
- No parts or components will be salvaged, used, or sold as parts, or used to rebuild a device, unless those parts or components can be re-used on the new unit. Obtain written NRCS approval before re-using parts or components from replaced units.

Follow the terms and conditions in the current version of ASABE S248, Construction and Rating of Equipment for Drying Farm Crops, as applicable.

Sap evaporator replacement

An allowable replacement evaporator must be a new, stationary, high-efficiency evaporator. The replacement evaporator will have an insulated firebox and an air-tight latching system. A wood fired unit will include air-injection, forced draft, or gasification mechanisms. The minimum manufacturer-rated efficiency of an oil, natural gas, or electric evaporator is 80%.

When an evaporator is replaced, the existing evaporator must be decommissioned, destroyed, and removed from the operation. Destruction removes the existing combustion system from service and prevents the existing unit from reuse in another area. No parts or components will be parted out, used, or sold as parts, or used to rebuild a device, unless those parts or components can be re-used on the new unit. Obtain written NRCS approval before re-using parts or components from replaced units.

CONSIDERATIONS

Installation of replacement or repower combustion systems with ~~non-combustion~~ ~~noncombustion~~ renewable energy sources (such as solar, wind, and water), are preferred means of reducing air emissions associated with agricultural combustion systems. ~~Non-combustion~~ ~~Noncombustion~~ renewable energy sources do not release air emissions directly and do not increase air emissions from offsite electricity generation. Consider the impacts of ~~non-combustion~~ ~~noncombustion~~ renewable energy sources on other resources to analyze their overall conservation benefit.

Retrofitting existing combustion systems can potentially reduce cost compared to replacement or repowering, while still having measurable benefits. Examples of individual retrofit actions include:—

- Adding one or more ~~emission~~emissions control devices.
 - Altering air/fuel mixtures to achieve more complete combustion and less emissions.
 - Adding a device that allows for reduced combustion of fuel to accomplish the same intended task.
 - Adding a device that allows for reduced operation of an existing combustion system, such as automated sensors, controls, and preheaters or reverse osmosis devices for sap processing and controls.
 - Accommodating the use of a cleaner burning fuel.
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- Other physical modifications or changes in combustion techniques that reduce emissions or improve energy efficiency~~formation or release.~~

~~Reduced emissions of volatile organic compounds (VOCs) are a secondary benefit of improving combustions system.~~

~~Utilizing noncombustion technology and nonfossil fuels can reduce greenhouse gas (GHG) emissions.~~

Considerations for grain dryer replacement

For those agricultural operations where the existing grain dryer measured SEC is 2,400 BTU/lb, or higher, consider replacement of the grain dryer. An SEC value above 2,400 Btu/lb indicates lower-than-average efficiency, suggesting that operational changes, maintenance improvements, or equipment upgrades could yield significant energy savings.

Continuous flow, mixed flow, or recirculating crossflow grain dryers usually perform with a SEC better than 2,400 BTU/lb and are considered energy efficient. These types of dryers are not replaceable unless their computed SEC is higher than 2,400 BTU/lb.

Combination high/low temperature, no heat, or low temperature bin dryers typically perform with a SEC of 2,000 BTU/lb or lower. Actual performance depends on operating conditions, ambient weather, grain type, moisture reduction, and maintenance practices. Improved energy efficiency is not expected if an agricultural operation is utilizing these types of dryers. Note that these types of dryers may not be capable of obtaining a moisture reduction of 10%, are not replaceable, and cannot be installed using this conservation practice standard.

PLANS AND SPECIFICATIONS

Prepare specifications for application of this practice for each site or planning unit according to the criteria, considerations, and operations and maintenance described in this standard. Record specifications for this practice using approved specification sheets, job sheets, implementation requirements, worksheets, and narrative statements from the conservation plan, or other documentation.

As a minimum, in the plans and specifications—

- Identify and describe the existing ~~units~~unit and related components or devices.
- Identify and describe the replacement or repower ~~units~~unit and related components or devices, if applicable.

- Identify and describe the retrofit units ~~retrofitted~~ and the type of modifications made to the existing system, if applicable.
- Document the destruction or disabling, if applicable, of the replaced or repowered units and related components or devices. This documentation must include:
 - Existing unit type(s).
 - Existing unit serial numbers or mobile unit vehicle identification numbers, if known.
 - Date the existing units were destroyed or disabled.
 - Method of destruction or disabling of the existing units.
 - Date-stamped photographs of the existing units before and after destruction from the dismantling facility, if applicable.
 - Location of stationary equipment and associated components and devices in relationship to other structures or natural features, where appropriate, in a plan view map. Include locations of existing, replacement, repower, and retrofit devices or equipment.
- For reduced air emissions ~~quality~~, document the methodology and analysis used to estimate air emissions ~~reductions~~ for actions not included on the state-approved prescriptive upgrades list.
- For improved energy efficiency and for actions not included on the state-approved prescriptive upgrades list, document the methodology and analysis used to estimate the anticipated energy use reduction or energy efficiency improvement.

OPERATION AND MAINTENANCE

Develop an operation and maintenance plan that is consistent with the purposes of this practice, its intended life, safety requirements, and the criteria used for its design.

This practice will require performance of periodic maintenance and operational items to maintain satisfactory performance. The plan must contain requirements including, but not limited to:—

- Operating and maintaining all components, including emission control components, in accordance with manufacturers' recommendations. In addition, observe all warnings, cautions, and safety protocols.
- Repairing or replacing all items, as needed to maintain the system in good working order.
- Retaining installation records, including certifications, and all manufacturers' installation, operation, maintenance, and user guides. Provide copies to NRCS upon request.
- Documenting maintenance or replacement conducted on any components.
- Maintaining records throughout the practice lifespan to document improvements in emissions or energy efficiency from the beginning of operation. Records may include actual operating hours, monthly utility bills (e.g., electricity, natural gas, propane, etc., electric), types and amounts of fuel used in the units, and energy production data. Provide copies to NRCS upon request.

REFERENCES

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No References

Pre-Decisional/Deliberative