

Practice: 372 - Combustion System Improvement

Scenario: #3 - Electric Motor/Centrifugal Pump Combination Unit in-lieu of IC Engine, < 100 hp

Scenario Description:

Replace an existing IC engine operating an irrigation well with a new electric motor/centrifugal pump combination unit. An existing IC engine is stationary or portable (does not propel a vehicle and is not an auxiliary IC engine on a vehicle). This replacement provides the greatest emission reductions by eliminating NOx, VOC, and PM emissions from the source.

Resource Concerns: Air Quality Impacts - Emissions of Ozone Precursors; Air Quality Impacts - Emissions of Particulate Matter (PM) and PM Precursors; Inefficient Energy Use - Equipment and Facilities; Inefficient Energy Use - Farming/Ranching Practices and Field Operations. Associated Practices include: 374 - Farmstead Energy Improvement; 533 - Pumping Plant; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 442 - Irrigation System, Sprinkler; 447 - Irrigation System, Tailwater Recovery; 449 - Irrigation Water Management; 516 - Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; 614 - Watering Facility; 642 - Water Well, CAP 126 Comprehensive Air Quality Management Plan, CAP 122 Agricultural Energy Management Plan - Headquarters, and CAP 124 Agricultural Energy Management Plan - Landscape.

Before Situation:

Irrigation pump with diesel engine withdraws water from a surface water body and provides water through a center pivot irrigation system. The emissions of oxides of nitrogen and/or particulate matter from the engine are identified to contribute to an air quality resource concern OR based on an evaluation of the engine, the pump, the well, and the center pivot irrigation system, the engine is less than 50 percent efficient in delivering water to the system.

Air Quality Impacts: The existing internal combustion engine emissions are identified to contribute to an air quality resource concern.

Inefficient Energy Use: The existing internal combustion engine uses excess fuel to operate an existing irrigation pump.

Plant Condition Impact: Poor plant condition and vigor is evident due to a lack of water during critical times in the growing season.

Water Quality Impacts: Fuel tank and fuel line have potential to cause environmental damage with leaks. The existing internal combustion engine is inefficient in delivering water to the system; subsequently, the lack of plant growth and uptake of nutrients, nitrogen and phosphorus are not being fully utilized and are available to be lost to surface and ground waters.

After Situation:

The electric motor/centrifugal pump combination unit replaces the existing older engine and pump; the engine being replaced will be disabled and a certificate of inoperability submitted prior to certification of practice completion. The existing engine is supported by a concrete pad; no cost have been included for a new pad. Additional costs may be incurred, if a concrete pad is not present.

For Air Quality: The electric motor does not produce any on-farm emissions of oxides of nitrogen or particulate matter, resulting in a substantial emissions reduction on the farm.

For Energy: Energy efficiency will be improved by at least 20%.

For Plant Condition: Plant condition and vigor will be improved.

For Water Quality: The potential for environmental damage due to leaks from the tanks and fuel lines has been eliminated. Plant uptake of available nutrients will be increased and less nutrients will be lost to surface and ground waters.

Scenario Feature Measure: Number of Combustion Units Replaced

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$9,885.22

Scenario Cost/Unit: \$9,885.22

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$25.61	30	\$768.30
Materials						
Motor, electric, NEMA Premium, 30 Hp and Centrifugal Pump	2426	Premium NEMA approved Electric Motor and Centrifugal Pump. 30Hp. Includes materials and shipping only.	Each	\$9,116.92	1	\$9,116.92

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Scenario: #4 - Electric Motor in-lieu of IC Engine, less than 100 hp

Scenario Description:

Replace an existing IC engine operating an irrigation well with a new electric motor. An existing IC engine is stationary or portable (does not propel a vehicle and is not an auxiliary IC engine on a vehicle). This replacement provides the greatest emission reductions by eliminating NOx, VOC, and PM emissions from the source.

Resource Concerns: Air Quality Impacts - Emissions of Ozone Precursors; Air Quality Impacts - Emissions of Particulate Matter (PM) and PM Precursors; Inefficient Energy Use - Equipment and Facilities; Inefficient Energy Use - Farming/Ranching Practices and Field Operations. Associated Practices include: 374 - Farmstead Energy Improvement; 533 - Pumping Plant; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 442 - Irrigation System, Sprinkler; 447 - Irrigation System, Tailwater Recovery; 449 - Irrigation Water Management; 516 - Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; 614 - Watering Facility; 642 - Water Well, CAP 126 Comprehensive Air Quality Management Plan, CAP 122 Agricultural Energy Management Plan - Headquarters, and CAP 124 Agricultural Energy Management Plan - Landscape.

Before Situation:

Irrigation pump with diesel engine withdraws water from a well and provides water through a center pivot irrigation system. The emissions of oxides of nitrogen and/or particulate matter from the engine are identified to contribute to an air quality resource concern OR based on an evaluation of the engine, the pump, the well, and the center pivot irrigation system, the engine is less than 50 percent efficient in delivering water to the system.

Air Quality Impacts: The existing internal combustion engine emissions are identified to contribute to an air quality resource concern.

Inefficient Energy Use: The existing internal combustion engine uses excess fuel to operate an existing irrigation pump.

Plant Condition Impact: Poor plant condition and vigor is evident due to a lack of water during critical times in the growing season.

Water Quality Impacts: Fuel tank and fuel line have potential to cause environmental damage with leaks. The existing internal combustion engine is inefficient in delivering water to the system; subsequently, the lack of plant growth and uptake of nutrients, nitrogen and phosphorus are not being fully utilized and are available to be lost to surface and ground waters.

After Situation:

The electric motor replaces the existing older engine; the engine being replaced will be disabled and a certificate of inoperability submitted prior to certification of practice completion. The existing engine is supported by a concrete pad; no cost have been included for a new pad. Additional costs may be incurred, if a concrete pad is not present.

For Air Quality: The electric motor does not produce any on-farm emissions of oxides of nitrogen or particulate matter, resulting in a substantial emissions reduction on the farm.

For Energy: Energy efficiency will be improved by at least 20%.

For Plant Condition: Plant condition and vigor will be improved.

For Water Quality: The potential for environmental damage due to leaks from the tanks and fuel lines has been eliminated. Plant uptake of available nutrients will be increased and less nutrients will be lost to surface and ground waters.

Scenario Feature Measure: Number of Combustion Units Replaced

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$6,673.65

Scenario Cost/Unit: \$6,673.65

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$25.61	30	\$768.30
Materials						
Motor, electric, NEMA Premium, 50 HP	1173	Premium NEMA approved electric motor, 50 Horsepower and all required appurtenances. Includes materials and shipping only.	Each	\$5,905.35	1	\$5,905.35

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Scenario: #5 - Electric Motor in-lieu of IC Engine, greater than or equal to 100 hp

Scenario Description:

Replace an existing IC engine operating an irrigation well with a new electric motor. An existing IC engine is stationary or portable (does not propel a vehicle and is not an auxiliary IC engine on a vehicle). This replacement provides the greatest emission reductions by eliminating NOx, VOC, and PM emissions from the source.

Resource Concerns: Air Quality Impacts - Emissions of Ozone Precursors; Air Quality Impacts - Emissions of Particulate Matter (PM) and PM Precursors; Inefficient Energy Use - Equipment and Facilities; Inefficient Energy Use - Farming/Ranching Practices and Field Operations. Associated Practices include: 374 - Farmstead Energy Improvement; 533 - Pumping Plant; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 442 - Irrigation System, Sprinkler; 447 - Irrigation System, Tailwater Recovery; 449 - Irrigation Water Management; 516 - Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; 614 - Watering Facility; 642 - Water Well, CAP 126 Comprehensive Air Quality Management Plan, CAP 122 Agricultural Energy Management Plan - Headquarters, and CAP 124 Agricultural Energy Management Plan - Landscape.

Before Situation:

Irrigation pump with diesel engine withdraws water from a well and provides water through a center pivot irrigation system. The emissions of oxides of nitrogen and/or particulate matter from the engine are identified to contribute to an air quality resource concern OR based on an evaluation of the engine, the pump, the well, and the center pivot irrigation system, the engine is less than 50 percent efficient in delivering water to the system.

Air Quality Impacts: The existing internal combustion engine emissions are identified to contribute to an air quality resource concern.

Inefficient Energy Use: The existing internal combustion engine uses excess fuel to operate an existing irrigation pump.

Plant Condition Impact: Poor plant condition and vigor is evident due to a lack of water during critical times in the growing season.

Water Quality Impacts: Fuel tank and fuel line have potential to cause environmental damage with leaks. The existing internal combustion engine is inefficient in delivering water to the system; subsequently, the lack of plant growth and uptake of nutrients, nitrogen and phosphorus are not being fully utilized and are available to be lost to surface and ground waters.

After Situation:

The electric motor replaces the existing older engine; the engine being replaced will be disabled and a certificate of inoperability submitted prior to certification of practice completion. The existing engine is supported by a concrete pad; no cost have been included for a new pad. Additional costs may be incurred, if a concrete pad is not present.

For Air Quality: The electric motor does not produce any on-farm emissions of oxides of nitrogen or particulate matter, resulting in a substantial emissions reduction on the farm.

For Energy: Energy efficiency will be improved by at least 20%.

For Plant Condition: Plant condition and vigor will be improved.

For Water Quality: The potential for environmental damage due to leaks from the tanks and fuel lines has been eliminated. Plant uptake of available nutrients will be increased and less nutrients will be lost to surface and ground waters.

Scenario Feature Measure: Size of Replacement Motor

Scenario Unit: Horsepower

Scenario Typical Size: 200

Scenario Cost: \$17,470.40

Scenario Cost/Unit: \$87.35

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$25.61	40	\$1,024.40
Materials						
Motor, electric, NEMA Premium, 200 to 299 hp	1437	Premium NEMA approved Electric Motor and required appurtenances. 200 to 299 hp (148 - 221 kW). Includes materials and shipping only.	Horsepower	\$82.23	200	\$16,446.00