

**NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE SPECIFICATION**

COMBUSTION SYSTEM IMPROVEMENT (NUMBER)

CODE 372

ENGINE REPLACEMENT – DIESEL ENGINES (NO_x, PM¹⁰ & PM^{2.5})

I. SCOPE

The work shall consist of replacing stationary or portable, non-self propelled, non-certified TIER I or TIER II agricultural diesel irrigation pump engines with newer diesel or electric engines in order to reduce emissions of particulate matter and ozone precursors such as oxides of nitrogen (NO_x). The replaced diesel engine must be TIER III or higher EPA emissions rated. Newer stationary replacement engines and motors must meet current local, state, tribal, and federal standards and guidelines for NO_x and particulate matter emissions. Additionally, non-diesel replacement engines must be tested, meet and comply with all state and federal emissions requirements.

II. GENERAL

Stationary agricultural diesel irrigation pump engines are considered a seasonal source of NO_x and particulate matter (PM) emissions because these engines operate mostly during the primary crop growing period (spring and summer months). These periods of high utilization coincide with the summer season, underscoring the need to reduce NO_x emissions. Replacing old diesel irrigation pump engines with newer lower emitting TIER certified diesel engines or with engines that utilize cleaner burning fuels (propane and natural gas) can substantially reduce NO_x and PM emissions. Replacement of the older diesel with an electric motor can eliminate these air emissions. The widespread use of these lower-emitting heavy-duty pump engines and motors will provide significant improvements for air quality in Montana and assist in the attainment of federal and state air quality standards.

III. CRITERA

All projects must produce no increase in particulate matter emission compared to the engine being replaced. Applicable standards and emission levels for that engine year and type of application will be utilized. All engine emission standard certification levels must have been approved through ARB certification testing, through U.S. Environmental Protection Agency (EPA) certification testing, or through emission testing at a laboratory approved by U.S. EPA or ARB.

Emission Factors Tables B-12 and B-13 and Load Factor 0.65 shall be used to estimate emission reductions in tons NO_x per year based on hours of engine operation per year.

Existing Diesel Engine – Annual NO_x baseline technology emissions:

(Table B-12 Emission Factor in g/bhp-hr * 0.65 * hrs. of operation) / (907,200 g/ton) = tons/yr. NO_x

Repower Diesel Engine – Annual NO_x reduced technology emissions:

(Table B-13 Emission Factor in g/bhp-hr * 0.65 * hrs. of operation) / (907,200 g/ton) = tons/yr. NO_x

IV. DISPOSAL OF REPLACED ENGINE

Replaced engines will not be allowed to be resold. These engines must be made inoperable by:

- A. Growers and their engine dealer must provide written certification in the form of a receipt for the engine disposal from a scrap metal recycling operation, or Growers and their engine dealer must permanently disable the engine by punching a hole through the engine block and certifying that this

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process has been completed. Existing, certified engines may be relocated on-farm to replace a non-certified or higher emissions engine.

V. REFERENCES

California EPA Air Resources Board. The Carl Moyer Memorial Air Quality Standards Attainment Program Guidelines. April 14, 2008.

TABLE B-12 ^{1/}
Uncontrolled Off-Road Diesel Engines
Emission factors (g/bhp-hr)
[EXISTING ENGINE - BASELINE TECHNOLOGY]

Horsepower	Model Year	NOx	ROG	PM10
25 – 49	Pre-1988	6.51	2.21	0.547
	1988 +	6.42	2.17	0.547
50 – 119	Pre-1988	12.09	1.73	0.605
	1988 +	8.14	1.19	0.497
120 +	Pre-1970	13.02	1.59	0.554
	1970 – 1979	11.16	1.20	0.396
	1980 – 1987	10.23	1.06	0.396
	1988 +	7.60	0.82	0.274

TABLE B-13 ^{1/}
Controlled Off-Road Diesel Engines
Emission factors (g/bhp-hr)
[REPOWER ENGINE - REDUCED TECHNOLOGY]

Tier	Horsepower	NOx	ROG	PM10
1	25 – 49	5.26	1.74	0.480
	50 – 119	6.54	1.19	0.552
	120 – 174	6.54	0.82	0.274
	175 +	5.93	0.38	0.108
2	25 – 49	4.63	0.29	0.280
	50 – 119	4.75	0.23	0.192
	120 – 174	4.17	0.19	0.128
	175 – 250	4.15	0.12	0.088
	251 +	3.79	0.12	0.088
3	50 – 120	2.74	0.12	0.160
	121 – 750	2.32	0.12	0.112
4 Interim	25 – 49	4.55	0.12	0.128
	50 – 120	2.40	0.11	0.056
	121 – 174	2.15	0.11	0.008
	175 – 750	1.29	0.08	0.008
	>750	2.24	0.12	0.048
4 Final	25 – 49	2.75	0.12	0.008
	50 – 120	1.33	0.08	0.008
	121 – 750	0.26	0.06	0.008
	>750	2.24	0.06	0.016

^{1/} From Page B-8, Appendix B, Part IV, The Carl Moyer Program Guidelines, April 14, 2008
 Note: g/bhp/hr = grams/brake horsepower/hour