

**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION**

May 30, 2006

PERMIT TO INSTALL

346-05



ISSUED TO
QUICKSILVER RESOURCES, INC

LOCATED AT
Section 34, T30N, R4W
Hayes Tower Road
North Hayes Township, Michigan



IN THE COUNTY OF
Otsego

STATE REGISTRATION NUMBER

N7465

The Air Quality Division has approved this Permit to Install, pursuant to the delegation of authority from the Michigan Department of Environmental Quality. This permit is hereby issued in accordance with and subject to Section 5505(1) of Article II, Chapter I, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Pursuant to Air Pollution Control Rule 336.1201(1), this permit constitutes the permittee's authority to install the identified emission unit(s) in accordance with all administrative rules of the Department and the attached conditions. Operation of the emission unit(s) identified in this Permit to Install is allowed pursuant to Rule 336.1201(6).

DATE OF RECEIPT OF ALL INFORMATION REQUIRED BY RULE 203: December 15, 2006	
DATE PERMIT TO INSTALL APPROVED: May 30, 2006	SIGNATURE: G. Vinson Hellwig
DATE PERMIT VOIDED:	SIGNATURE:
DATE PERMIT REVOKED:	SIGNATURE:

**PERMIT TO INSTALL
 Common Abbreviations / Acronyms**

Common Acronyms		Pollutant/Measurement Abbreviations	
AQD	Air Quality Division	Btu	British Thermal Unit
BACT	Best Available Control Technology	°C	Degrees Celsius
CAA	Clean Air Act	CO	Carbon Monoxide
CEM	Continuous Emission Monitoring	dscf	Dry standard cubic foot
CFR	Code of Federal Regulations	dscm	Dry standard cubic meter
COM	Continuous Opacity Monitoring	°F	Degrees Fahrenheit
EPA	Environmental Protection Agency	gr	Grains
EU	Emission Unit	Hg	Mercury
FG	Flexible Group	hr	Hour
GACS	Gallon of Applied Coating Solids	H ₂ S	Hydrogen Sulfide
GC	General Condition	hp	Horsepower
HAP	Hazardous Air Pollutant	lb	Pound
HVLP	High Volume Low Pressure *	m	Meter
ID	Identification	mg	Milligram
LAER	Lowest Achievable Emission Rate	mm	Millimeter
MACT	Maximum Achievable Control Technology	MM	Million
MAERS	Michigan Air Emissions Reporting System	MW	Megawatts
MAP	Malfunction Abatement Plan	ng	Nanogram
MDEQ	Michigan Department of Environmental Quality	NO _x	Oxides of Nitrogen
MSDS	Material Safety Data Sheet	PM	Particulate Matter
NESHAP	National Emission Standard for Hazardous Air Pollutants	PM-10	Particulate Matter less than 10 microns diameter
NSPS	New Source Performance Standards	pph	Pounds per hour
NSR	New Source Review	ppm	Parts per million
PS	Performance Specification	ppmv	Parts per million by volume
PSD	Prevention of Significant Deterioration	ppmw	Parts per million by weight
PTE	Permanent Total Enclosure	psia	Pounds per square inch absolute
PTI	Permit to Install	psig	Pounds per square inch gauge
RACT	Reasonably Available Control Technology	scf	Standard cubic feet
ROP	Renewable Operating Permit	sec	Seconds
SC	Special Condition Number	SO ₂	Sulfur Dioxide
SCR	Selective Catalytic Reduction	THC	Total Hydrocarbons
SRN	State Registration Number	tpy	Tons per year
TAC	Toxic Air Contaminant	µg	Microgram
TEQ	Toxicity Equivalence Quotient	VOC	Volatile Organic Compound
VE	Visible Emissions	yr	Year

* For High Volume Low Pressure (HVLP) applicators, the pressure measured at the HVLP gun air cap shall not exceed ten (10) pounds per square inch gauge (psig).

GENERAL CONDITIONS

1. The process or process equipment covered by this permit shall not be reconstructed, relocated, or modified, unless a Permit to Install authorizing such action is issued by the Department, except to the extent such action is exempt from the Permit to Install requirements by any applicable rule. **[R336.1201(1)]**
2. If the installation, construction, reconstruction, relocation, or modification of the equipment for which this permit has been approved has not commenced within 18 months, or has been interrupted for 18 months, this permit shall become void unless otherwise authorized by the Department. Furthermore, the permittee or the designated authorized agent shall notify the Department via the Supervisor, Permit Section, Air Quality Division, Michigan Department of Environmental Quality, P.O. Box 30260, Lansing, Michigan 48909, if it is decided not to pursue the installation, construction, reconstruction, relocation, or modification of the equipment allowed by this Permit to Install. **[R336.1201(4)]**
3. If this Permit to Install is issued for a process or process equipment located at a stationary source that is not subject to the Renewable Operating Permit program requirements pursuant to R336.1210, operation of the process or process equipment is allowed by this permit if the equipment performs in accordance with the terms and conditions of this Permit to Install. **[R336.1201(6)(b)]**
4. The Department may, after notice and opportunity for a hearing, revoke this Permit to Install if evidence indicates the process or process equipment is not performing in accordance with the terms and conditions of this permit or is violating the Department's rules or the Clean Air Act. **[R336.1201(8), Section 5510 of Act 451, PA 1994]**
5. The AQD District Supervisor shall be notified, in writing, of a change in ownership or operational control of the stationary source or emission unit(s) authorized by this Permit to Install pursuant to R336.1219. The notification shall include all of the information required by R336.1219(1)(a) and (b). In addition, a new owner or operator must submit a written statement pursuant to R336.1219(1)(c), agreeing to and accepting the terms and conditions of this Permit to Install, and shall notify the AQD District Supervisor of any change in the contact person for this Permit to Install. **[R336.1219]**
6. Operation of this equipment shall not result in the emission of an air contaminant which causes injurious effects to human health or safety, animal life, plant life of significant economic value, or property, or which causes unreasonable interference with the comfortable enjoyment of life and property. **[R336.1901]**
7. The permittee shall provide notice of an abnormal condition, start-up, shutdown, or malfunction that results in emissions of a hazardous or toxic air pollutant which continue for more than one hour in excess of any applicable standard or limitation, or emissions of any air contaminant continuing for more than two hours in excess of an applicable standard or limitation, as required in Rule 912, to the Department. The notice shall be provided not later than two business days after start-up, shutdown, or discovery of the abnormal condition or malfunction. Written reports, if required, must be filed with the Department within 10 days after the start-up or shutdown occurred, within 10 days after the abnormal conditions or malfunction has been corrected, or within 30 days of discovery of the abnormal condition or malfunction, whichever is first. The written reports shall include all of the information required in Rule 912(5). **[R336.1912]**
8. Approval of this permit does not exempt the permittee from complying with any future applicable requirements which may be promulgated under Part 55 of 1994 PA 451, as amended or the Federal Clean Air Act.

9. Approval of this permit does not obviate the necessity of obtaining such permits or approvals from other units of government as required by law nor does it affect any liability for past violations under the Natural Resources and Environmental Protection Act, 1994 PA 451.
10. Operation of this equipment may be subject to other requirements of Part 55 of 1994 PA 451, as amended and the rules promulgated thereunder.
11. Except as provided in subrules (2) and (3) or unless the special conditions of the Permit to Install include an alternate opacity limit established pursuant to subrule (4) of R336.1301, the permittee shall not cause or permit to be discharged into the outer air from a process or process equipment a visible emission of density greater than the most stringent of the following. The grading of visible emissions shall be determined in accordance with R336.1303. **[R336.1301]**
 - a) A six-minute average of 20 percent opacity, except for one six-minute average per hour of not more than 27 percent opacity.
 - b) A visible emission limit specified by an applicable federal new source performance standard.
 - c) A visible emission limit specified as a condition of this permit to install.
12. Collected air contaminants shall be removed as necessary to maintain the equipment at the required operating efficiency. The collection and disposal of air contaminants shall be performed in a manner so as to minimize the introduction of contaminants to the outer air. Transport of collected air contaminants in Priority I and II areas requires the use of material handling methods specified in R336.1370(2). **[R336.1370]**
13. The Department may require the permittee to conduct acceptable performance tests, at the permittee's expense, in accordance with R336.2001 and R336.2003, under any of the conditions listed in R336.2001. **[R336.2001]**

SPECIAL CONDITIONS

Emission Unit Identification

Emission Unit ID	Emission Unit Description	Stack Identification
EUDEHY	Glycol dehydration system processing gas from the Antrim zone.	NA
EUENGINE1	Natural gas fired reciprocating engine.	SVENGINE1
EUENGINE2	Natural gas fired reciprocating engine.	SVENGINE2
EUENGINE3	Natural gas fired reciprocating engine.	SVENGINE3
EUENGINE4	Natural gas fired reciprocating engine.	SVENGINE4
Changes to the equipment described in this table are subject to the requirements of R336.1201, except as allowed by R336.1278 to R336.1290.		

Flexible Group Identification

Flexible Group ID	Emission Units Included in Flexible Group	Stack Identification
FGENGINES	EUENGINE1, EUENGINE2, EUENGINE3, EUENGINE4	SVENGINE1, SVENGINE2, SVENGINE3, SVENGINE4
FGMETHANOL	Methanol storage equipment totaling less than 5,000 gallons for all equipment	N/A
FGFACILITY	All process equipment at the facility including equipment covered by other permits, grand-fathered equipment and exempt equipment.	N/A

The following conditions apply to: FGENGINES

Emission Limits

	Pollutant	Equipment	Limit	Time Period	Testing/ Monitoring Method	Applicable Requirements
1.1a	NOx	EUENGINE1	23.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1), 40 CFR 52.21 (c) & (d)
1.1b	CO	EUENGINE1	21.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1)
1.1c	NOx	EUENGINE2	23.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1), 40 CFR 52.21 (c) & (d)
1.1d	CO	EUENGINE2	21.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1)
1.1e	NOx	EUENGINE3	23.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1), 40 CFR 52.21 (c) & (d)
1.1f	CO	EUENGINE3	21.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1)
1.1g	NOx	EUENGINE4	38.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1), 40 CFR 52.21 (c) & (d)
1.1h	CO	EUENGINE4	22.4 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 1.11 and Appendix A	R336.1205(1)

Process/Operational Limits

- 1.2 No later than 60 days after issuance of this permit, the permittee shall submit to the AQD District Supervisor, for review and approval, a malfunction abatement/preventative maintenance plan for FGENGINES. After approval of the malfunction abatement/preventative maintenance plan by the AQD District Supervisor, the permittee shall not operate FGENGINES unless the malfunction abatement/preventative maintenance plan, or an alternate plan approved by the AQD District Supervisor, is implemented and maintained. The plan shall incorporate procedures recommended by the equipment manufacturer as well as incorporating standard industry practices. At a minimum the plan shall include:
- a. Identification of the equipment and, if applicable, air-cleaning device and the supervisory personnel responsible for overseeing the inspection, maintenance, and repair
 - b. Description of the items or conditions to be inspected and frequency of the inspections or repairs

- c. Identification of the equipment and, if applicable, air-cleaning device, operating parameters that shall be monitored to detect a malfunction or failure, the normal operating range of these parameters and a description of the method of monitoring or surveillance procedures
- d. Identification of the major replacement parts that shall be maintained in inventory for quick replacement
- e. A description of the corrective procedures or operational changes that shall be taken in the event of a malfunction or failure to achieve compliance with the applicable emission limits

If the malfunction abatement plan fails to address or inadequately addresses an event that meets the characteristics of a malfunction at the time the plan is initially developed, the owner or operator shall revise the malfunction abatement plan within 45 days after such an event occurs and submit the revised plan for approval to the AQD District Supervisor. Should the AQD determine the malfunction abatement/preventative maintenance plan to be inadequate, the AQD District Supervisor may request modification of the plan to address those inadequacies. [R336.1205(1), R336.1910, R336.1911, R336.1912]

- 1.3 The permittee shall not operate any engine equipped with an add-on control device for more than 200 hours per engine per year without that control device consistent with the malfunction abatement/preventative maintenance plan (pursuant to SC 1.2). The 200 hours shall include times after an engine change-out occurs and general maintenance performed as allowed by the malfunction abatement/preventative maintenance plan. The hours per year limit is based on a 12-month rolling time period as determined at the end of each calendar month. [R336.1205(1)]

Equipment

- 1.4 The permittee shall not operate any engine that contains an add-on control device unless that device is installed, maintained, and operated in a satisfactory manner, except as specified in SC 1.3. Satisfactory operation includes performing the manufacturer's recommended maintenance on the control device and operating in conjunction with the malfunction abatement/preventative maintenance plan specified in SC 1.2. [R336.1205(1), R336.1910]

Testing

- 1.5 Upon request by the AQD District Supervisor, the permittee shall verify NO_x and CO emission factors used to calculate emissions from one or more engine(s) in EUENGINE, by testing at owner's expense, in accordance with Department requirements. If a test has been conducted, any resulting increase in an emission factor shall be implemented to calculate NO_x and CO. No less than 60 days prior to testing, the permittee shall submit a complete test plan to the AQD. The AQD must approve the final plan prior to testing. Verification of emission rates includes the submittal of a complete report of the test results to the AQD within 60 days following the last date of the test. [R336.1205(1), R336.2001, R336.2003, R336.2004]

Monitoring

- 1.6 No later than 100 days after issuance of this permit, the permittee shall install, calibrate, maintain and operate, in a satisfactory manner, a device to monitor and record the natural gas usage from each engine included in FGENGINES on a continuous basis. [R336.1205(1)]

Recordkeeping/Reporting/Notification

- 1.7 The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor and make them available by the last day of the calendar month, for the previous calendar month, unless otherwise specified in any recordkeeping, reporting or notification special condition. **[R336.1205(1)]**
- 1.8 The permittee shall maintain a log of all maintenance activities conducted according to the malfunction abatement/preventative maintenance plan (pursuant to SC 1.2). The permittee shall keep this log on file at a location approved by the AQD District Supervisor for a period of at least five years and make it available to the Department upon request. Except as provided in R336.1285(a)(vi), if any engine included in FGEngines is replaced with an equivalent-emitting or lower-emitting engine, the permittee shall notify the AQD District Supervisor of such change-out and submit acceptable emissions data to show that the alternate engine is equivalent-emitting or lower-emitting. **[R336.1205(1), R336.1911]**
- 1.9 The permittee shall keep, in a satisfactory manner, for any engine equipped with an add-on control device, monthly and 12-month rolling time period records of the hours each engine included in FGEngines is operated without the control device. The permittee shall keep all records on file at a location approved by the AQD District Supervisor for a period of at least five years and make them available to the Department upon request. **[R336.1205(1)]**
- 1.10 The permittee shall keep, in a satisfactory manner, monthly fuel use records for each engine included in FGEngines, as required by SC 1.6. The permittee shall keep all records on file at a location approved by the AQD District Supervisor for a period of at least five years and make them available to the Department upon request. **[R336.1205(1)]**
- 1.11 The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period NOx and CO emission calculation records for each engine included in FGEngines, as required by SC 1.1a through 1.1h and Appendix A. The permittee shall keep all records on file at a location approved by the AQD District Supervisor for a period of at least five years and make them available to the Department upon request. **[R336.1205(1)]**

Stack/Vent Restrictions

	Stack & Vent ID	Maximum Diameter (inches)	Minimum Height Above Ground Level (feet)	Applicable Requirement
1.12a	SVENGINE1	16*	37.5*	R336.1225, 40 CFR 52.21 (c) and (d)
1.12b	SVENGINE2	16*	37.5*	R336.1225, 40 CFR 52.21 (c) and (d)
1.12c	SVENGINE3	16*	37.5*	R336.1225, 40 CFR 52.21 (c) and (d)
1.12d	SVENGINE4	16*	37.5*	R336.1225, 40 CFR 52.21 (c) and (d)
* Restrictions on stack diameter and height above ground level apply beginning no later than 180 days after issuance of this permit. Beginning 180 days after issuance of this permit, the exhaust gases shall be discharged unobstructed vertically upwards to the ambient air.				

The following conditions apply to: FGFACILITY

Emission Limits

	Pollutant	Equipment	Limit	Time Period	Testing/ Monitoring Method	Applicable Requirements
2.1a	NOx	FGFACILITY	97.1 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 2.5 and Appendix A	R336.1205(1), 40 CFR 52.21 (c) & (d)
2.1b	CO	FGFACILITY	89 tpy	12-month rolling time period as determined at the end of each calendar month.	SC 2.5 and Appendix A	R336.1205(1), 40 CFR 52.21 (c) & (d)

Material Limits

2.2 The permittee shall only burn sweet natural gas in FGFACILITY. [R336.1205(1)]

Testing

2.3 Verification of H2S and/or sulfur content of the natural gas burned in FGFACILITY may be required upon request by the AQD District Supervisor. This condition is necessary to ensure compliance with SC 2.2. [R336.1205(1)]

Recordkeeping / Reporting / Notification

2.4 The permittee shall complete all required calculations in a format acceptable to the AQD District Supervisor and make them available by the last day of the calendar month, for the previous calendar month, unless otherwise specified in any recordkeeping, reporting or notification special condition. [R336.1205(1), 40 CFR 52.21 (c) & (d)]

2.5 The permittee shall keep, in a satisfactory manner, monthly and 12-month rolling time period NOx and CO emission calculation records for FGFACILITY, as required by SC 2.1a, 2.1b and Appendix A. The permittee shall keep all records on file at a location approved by the AQD District Supervisor for a period of at least five years and make them available to the Department upon request. [R336.1205(1), 40 CFR 52.21 (c) & (d)]

APPENDIX A
Procedures for Calculating NOx and CO Emissions

The permittee shall demonstrate compliance with the NOx and CO emission limits by keeping track of all fuel usage for all equipment using such fuel at this facility and multiplying that fuel usage by an equipment-specific emission factor. The emission factors are typically expressed as a mass weight of pollutant per unit of fuel.

Each engine included in FGENGINES:

The permittee shall use emission factors from vendor data or from source specific testing (stack testing), as available for each engine included in FGENGINES. This also applies to engine(s) from engine change-out(s). If emission factors from other sources are used, the permittee shall obtain the approval of the AQD District Supervisor before using the emission factors to calculate emissions.

Fuel burning equipment at the facility:

The permittee shall use emission factors contained in the most recent AP-42 (Compilation of Air Pollutant Emission Factors) or the most recent FIRE (Factor Information Retrieval) database if vendor or stack testing data is not available. If emission factors from other sources are used, the permittee shall obtain the approval of the AQD District Supervisor before using the emission factors to calculate emissions.

The permittee shall document the source of each emission factor used in the calculations.