# Southwest Clean Air Agency

| ENGINEERING DIVISION | Page 1 of 4 |
|---|---|
| STATIONARY/MOBILE COMBUSTION ENGINES | Application No:_____ |
| AIR DISCHARGE PERMIT APPLICATION DATA SHEET | Date Received:_____ |

## APPLICANT INFORMATION:

Applicant Name: _____

Station Identification: _____

Contact Name / Title: _____

Mailing Address: _____ Phone: _____
Street City State Zip

Equipment Address: _____ Phone: _____
Street City Stat Zip

## EQUIPMENT TYPE AND USE: (Check all that apply)

- ☐ Gasoline
- ☐ Diesel
- ☐ Natural Gas
- ☐ Reciprocating
- ☐ Turbine
- ☐ Normal Power Supply Source
- ☐ Standby Power Source
- ☐ Emergency Power Source
- ☐ Turbocharged
- ☐ Supercharged
- ☐ Aftercooled

## OPERATION DATA:

Hours of Operation Maximum: _____ hr/day, _____ days/wk, _____ weeks/yr
Hours of Operation Actual: _____ hr/day, _____ days/wk, _____ weeks/yr
Distance to: Property Boundary: _____ feet or miles; Closest Residential Dwelling: _____ feet or miles
Noise Level: maximum _____decibels; normal _____decibels

## ENGINE DATA:

Manufacturer: _____ Model No: _____
Serial No: _____ Date Produced: _____
Number of Cylinders: _____ Engine Brake Horsepower: _____ BHP
Exhaust Flowrate: _____ acfm (dscfm) Fuel Type: gasoline diesel natural gas (Circle one)
Exhaust / stack diameter: _____ inches Fuel Consumption Rate: _____ gal/hour ($ft^3$/min) at rated capacity

## FUEL DATA:

Use No. 2 Diesel Fuel, if application is diesel powered. Sulfur Content: 0.0015 percent (15 ppm) maximum allowed for diesel.
Density : 7.076 lb/gal (diesel) 6.15 lb/gal (gasoline)
Heating Values: diesel = 19300 Btu/lb (136,567 Btu/gal)
gasoline = 20300 Btu/lb (124,845 Btu/gal)
natural gas = 1000 $Btu/ft^3$

## GENERATOR/COMPRESSOR DATA:

Manufacturer: _____ Model No: _____
Serial No: _____ Date Produced: _____
Operating Speed: _____ RPM at engine speed _____ RPM
Rated Output: _____ KW or pressure (psi) Normal Output: _____ KW or pressure (psi)

## **EMISSION FACTORS:** (for information and reference only)

**Diesel Fuel**: (grade #2) from AP-42, Table 3.3-1

| | |
|---|---|
| Oxides of Nitrogen (NOx) | : 4.41 lb/MMBtu |
| Carbon Monoxide (CO) | : 0.95 lb/MMBtu |
| Volatile Organic Compounds (VOC) | : 0.36 lb/MMBtu (sum of hydrocarbons) |
| Oxides of Sulfur (SOx) | : 0.29 lb/MMBtu |
| Particulate Matter (PM) | : 0.31 lb/MMBtu |
| Particulate Matter ($PM_{10}$) | : 96% of PM lb/MMBtu |
| Carbon Dioxide ($CO_2$) | : 165 lb/MMBtu |
| Aldehydes | : 0.07 lb/MMBtu |

Above values assume 100 percent conversion of carbon in fuel to $CO_2$ with 87 weight percent carbon in diesel, average brake specific fuel consumption of 7000 Btu/hp-hr, diesel heating value of 19300 Btu/lb.

**Gasoline**: from AP-42, Table 3.3-1

| | |
|---|---|
| Oxides of Nitrogen (NOx) | : 1.63 lb/MMBtu |
| Carbon Monoxide (CO) | : 62.7 lb/MMBtu |
| Volatile Organic Compounds (VOC) | : 2.93 lb/MMBtu (sum of hydrocarbons) |
| Oxides of Sulfur (SOx) | : 0.084 lb/MMBtu |
| Particulate Matter (PM) | : 0.19 lb/MMBtu |
| Particulate Matter ($PM_{10}$) | : 96% of PM lb/MMBtu |
| Carbon Dioxide ($CO_2$) | : 155.0 lb/MMBtu |
| Aldehydes | : 0.07 lb/MMBtu |

Above values assume 100 percent conversion of carbon in fuel to CO2 with 86 weight percent carbon in gasoline, average brake specific fuel consumption of 7000 Btu/hp-hr, and gasoline heating value of 20300 Btu/lb.

**Natural Gas**: from AP-42, Table 3.2-1

| | Gas Turbine | 2-Cycle Lean Burn | 4-Cycle Lean Burn | 4-Cycle Rich Burn |
|---|---|---|---|---|
| Oxides of Nitrogen (NOx) | : 0.34 lb/MMBtu | : 2.70 lb/MMBtu | : 3.2 lb/MMBtu | : 2.3 lb/MMBtu |
| Carbon Monoxide (CO) | : 0.17 lb/MMBtu | : 0.38 lb/MMBtu | : 0.42 ln/MMBtu | : 1.6 lb/MMBtu |
| Total Organic Compounds (TOC) | : 0.053 lb/MMBtu | : 1.50 lb/MMBtu | : 1.2 lb/MMBtu | : 0.27 lb/MMBtu |
| Total Non-Methane Organic Compounds | : 0.002 lb/MMBtu | : 0.11 lb/MMBtu | : 0.18 lb/MMBtu | : 0.03 lb/MMBtu |
| Methane ($CH_4$) | : 0.051 lb/MMBtu | : 1.4 lb/MMBtu | : 1.1 lb/MMBtu | : 0.24 lb/MMBtu |
| Particulate Matter ($PM_{10}$) | : 0.0007 lb/MMBtu | : 0.0007 lb/MMBtu | : 0.0007 lb/MMBtu | : 0.0007 lb/MMBtu |
| Carbon Dioxide ($CO_2$) | : 110.0 lb/MMBtu | : 110.0 lb/MMBtu | : 110.0 lb/MMBtu | : 110.0 lb/MMBtu |

Speciated Organic Compounds and Air Toxic Emission Factors for Diesel Engines (#2 Diesel) without pollution control devices (from AP-42, Table 3.3-3)

| | | |
|---|---|---|
| Benzene | 0.000933 | lb/MMBtu |
| Toluene | 0.000409 | lb/MMBtu |
| Xylenes | 0.000285 | lb/MMBtu |
| Propylene | 0.00258 | lb/MMBtu |
| 1,3 Butadiene | <0.0000391 | lb/MMBtu |
| Formaldehyde | 0.00118 | lb/MMBtu |
| Acetaldehyde | 0.000767 | lb/MMBtu |
| Acrolein | <0.0000925 | lb/MMBtu |
| Polycyclic Aromatic Hydrocarbons (PAH): | 0.000168 | lb/MMBtu |
| includes: | | |
| Naphthalene | 0.0000848 | lb/MMBtu |
| Acenaphthylene | <0.00000506 | lb/MMBtu |
| Acenaphthene | <0.00000142 | lb/MMBtu |
| Fluorene | 0.0000292 | lb/MMBtu |
| Phenanthrene | 0.0000294 | lb/MMBtu |
| Anthracene | 0.00000187 | lb/MMBtu |
| Fluoranthene | 0.00000761 | lb/MMBtu |
| Pyrene | 0.00000478 | lb/MMBtu |
| Benzo(b)fluoranthene | <0.000000099 | 1lb/MMBtu |
| Benzo(k)fluoranthene | <0.000000155 | lb/MMBtu |
| Benzo(a)pyrene | <0.000000188 | lb/MMBtu |
| Indeno(1,2,3-cd)pyrene | <0.000000375 | lb/MMBtu |
| Dibenz(a,h)anthracene | <0.000000583 | lb/MMBtu |
| Benzo(g,h,l)perylene | <0.000000489 | lb/MMBtu |
| Total PAH | 0.000168 | lb/MMBtu |

# Southwest Clean Air Agency

| ENGINEERING DIVISION<br>STATIONARY/MOBILE COMBUSTION ENGINES<br>AIR DISCHARGE PERMIT APPLICATION DATA SHEET | Page 3 of 4<br>Application No:_____ |
|---|---|

## EMISSIONS CALCULATIONS

Emissions = Emission Factor X Fuel Consumption Rate X Specific Weight of Fuel X Fuel Heating Value X Usage Time X Ton Conversion

E = (lb/1,000,000 Btu) X (gal/hr) X (lb/gal) X (Btu/lb) X (hr/year) X (ton/2000 lb)

Example: $E_{NOX}$ for diesel = (4.41 lb/1,000,000 Btu) X (.5 gal/hr) X (7.076 lb/gal) X (19300 Btu/lb) X (24 hr/day) X (7 days/wk) X (52 wk/yr) X (1 ton/2000 lb)

= 1.32 tons/yr

Note - If using other than No. 2 diesel for diesel applications, the emission factor may vary; see AP-42 for emisison factors for other fuel types.

**Calculate emissions for each criteria pollutant below as it applies to the proposed installation and summarize below.**

$E_{NOX}$ = _____ = _____ tons/yr

$E_{CO}$ = _____ = _____ tons/yr

$E_{VOC}$ = _____ = _____ tons/yr

$E_{SOX}$ = _____ = _____ tons/yr

$E_{PM}$ = _____ = _____ tons/yr

= = = = = = = = = = =

$E_{TOTAL}$ = ($E_{NOX}$ + $E_{CO}$ + $E_{VOC}$ + $E_{SOX}$ + $E_{PM}$ ) **REGULATED EMISSIONS TOTAL = _____ tons/yr**

Additional emission considerations:

$E_{PM10}$ = .96 (PM) = _____ tons/yr

$E_{CO2}$ = _____ = _____ tons/yr

| ENGINEERING DIVISION<br>STATIONARY/MOBILE COMBUSTION ENGINES<br>AIR DISCHARGE PERMIT APPLICATION DATA SHEET | Page 4 of 4<br>Application No:_____ |
|---|---|

## EXHAUST GAS FLOWRATE CALCULATION
(Conversion from acfm to dscfm)

The following equation converts a flowrate for a given condition noted as actual cubic feet per minute (acfm) to a flowrate in cubic feet per minute at dry standard temperature and pressure conditions (dscfm). The applicant should provide the actual flowrate in acfm, pressure in inches of mercury, moisture in percentage, and temperature in degrees Rankine to the following equation to make the conversion.

$$F_{dscfm} = F_{acfm} \times \frac{T_{dscfm} \times P_{acfm}}{T_{acfm} \times P_{dscfm}} \times \frac{1 - M}{100}$$

where:

$F_{dscfm}$ = Exhaust flowrate at standard temperature and pressure in dry standard cubic feet per minute
$F_{acfm}$ = Exhaust flowrate at measured temperature and pressure in actual cubic feet per minute
$T_{dscfm}$ = Temperature at standard conditions in degrees Rankine (460 + 68 °F)
$T_{acfm}$ = Temperature of actual exhaust discharge in degrees Rankine (460 + T °F)
$P_{dscfm}$ = Pressure at standard conditions in inches of mercury (29.92 in Hg)
$P_{acfm}$ = Pressure of actual exhaust discharge in inches of mercury ( $P_{acfm}$ in Hg)
M = Exhaust gas percent moisture as measured (decimal equivalent)

$$F_{dscfm} = \_\_\_\_ \times \frac{530 \times \_\_\_\_}{\_\_\_\_ \times 29.92} \times \frac{1 - \_\_\_\_}{100}$$

Flowrate = _____ dscfm

## EXHAUST GAS PARTICULATE CONCENTRATION (PC)

The following equation is used to calculate the particulate concentration (PC) in the exhaust gas stream. The applicant should provide the missing data for maximum pounds of particulate per hour in the exhaust gas stream and the flowrate of the exhaust stream in cubic feet per minute.

$$PC = \frac{R_1 \text{ lbPM/hr (max)} \times 7000 \text{ grains/lb}}{F_1 \text{ ft}^3 \times 60 \text{ min/hr}}$$

where:

PC = particulate concentration (grains/dscf)
$R_1$ = particulate mass emission rate (lb/hr)
$F_1$ = flowrate in dry standard cubic feet per minute (dscfm)

$$PC = \frac{\_\_\_\_ \text{ lb PM/hr (max)} \times 7000 \text{ grains/lb}}{\_\_\_\_ \text{ ft}^3 \times 60 \text{ min/hr}}$$

Particulate Concentration = _____ grains/dscf