



FINAL DECISION OF ISSUANCE NO. 0042

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I. GENERAL INFORMATION

- a. ERC Owner/Percent Ownership: ExxonMobil Production Company
- b. Primary Contact Name: Ms. Laura Johnson
Primary Contact Company: ExxonMobil Production Company, USA ("ExxonMobil")
- c. ERC Application Date: December 13, 2005
- d. ERC Application Completeness Date: January 12, 2006
- e. ERC Stationary Source Name: Exxon – Santa Ynez Unit
ERC Stationary Source Number: 1482
- f. ERC Facility Name: Las Flores Canyon, Platforms Hondo, Harmony, and Heritage
ERC Facility Number: 1482, 8009, 8018, and 8019
- g. ERC Source: ATC Permit Required. ATC Number: _____
ATC's 11912, 11984, 11985, and 11986
 PTO Canceled. PTO Number: _____
 PTO Modification Required. PTO Mod No: _____
 Exempt. Cite: _____
- h. ERC Zone: South Zone
- i. ERC Source Type: Mobile

II. BACKGROUND

This Emission Reduction Credit (ERC) application is for the creation of NO_x and PM/PM10 ERCs due to the replacement of the diesel main propulsion and auxiliary engines on the dedicated crew boat for the Exxon – SYU project, the *M/V Broadbill*. This "repowering" of the vessel involves the installation of two new Tier II Detroit Diesel Series 60 propulsion engines (each rated at 600 bhp), and two new Tier II Northern Lights Model M40C2 auxiliary engines (each rated at 60 bhp).

III. EMISSION REDUCTION CREDIT QUALIFICATION

a. Total DOI ERCs Approved:

NO_x = 1.843 tpq (7.374 tpy)
PM/PM10 = 0.072 tpq (0.287 tpy)

b. Number of Emission Elements: 2

c. Emission Element Data

c.1 Emission Element Name: Main Propulsion Engines

- EE/DOI Number: 01/0042

- Emission Element Description: Diesel-fired main propulsion engines on the *M/V Broadbill* crew boat. Includes two Detroit Diesel 12V-71 engines (each rated at 600 bhp).

- Undiscounted ERC Baseline (1): The three year emissions baseline is based on source test data maintained by the owner/operator, manufacturer data, and three years of fuel use

NO_x = 0.892 tpq (3.567 tpy)
PM/PM10 = 0.042 tpq (0.167 tpy)

- Technical Uncertainty Factor Used? Yes No

- Undiscounted ERC Baseline (2) - TUF Adjusted

NO_x = 0.892 tpq (3.567 tpy)
PM/PM10 = 0.042 tpq (0.167 tpy)

- ERC Due To: *Other:* Engine re-power with new Tier II diesel engines

- For Shutdowns/Reduction in Throughput : NA

BACT Discounted
 20 Percent Minimum Discount

- Amount of Shutdown/Reduction in Throughput Adjustment

NO_x = 0.00 tpq (0.00 tpy)
PM/PM10 = 0.00 tpq (0.00 tpy)

- RACT/SIP Discounted Yes No

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- RACT/SIP Applicable Rules: US EPA Emission Standards for Marine Diesel Engines. The Exxon – SYU project permits emissions from marine vessels associated with the source. As such, no specific boat/engines are directly regulated and ExxonMobil has a fleet of possible boats that may be used. While the engines that will be installed meet the US EPA standards for marine engines, the ERCs created due to this project are voluntary and not subject to the surplus provisions for new marine engines.

- Discounted Baseline (4) - RACT/SIP Adjusted

| | | | |
|-----------------|---|-----------|-------------|
| NO _x | = | 0.892 tpq | (3.567 tpy) |
| PM/PM10 | = | 0.042 tpq | (0.167 tpy) |

- Special ERC Restrictions? Yes No

- ERC Termination Date: none

- Are There Emission Element-Specific Conditions? Yes No

- (1) Compliance. For initial compliance, ExxonMobil shall source test the new Tier II engines to assess if the engines meet the NO_x emissions standards listed in ATC's 11912, 11984, 11985, and 11986. The issuance of the ERC Certificate will depend upon successful determination of compliance. ExxonMobil shall pay for all costs associated with testing, reporting and analyses.

For ongoing compliance determinations, ExxonMobil shall ensure that the main and auxiliary engines perform at or below the NO_x emission standards listed in ATC's 11912, 11984, 11985, and 11986 and that the vessel continues to operate within the designated area of Santa Barbara County waters.

On an annual basis, the APCD requires ExxonMobil to source test the emissions from the crew boats. The *M/V Broadbill* will be source tested on a rotating annual basis with the other crew boats dedicated to the Exxon – SYU project. ExxonMobil shall pay for all costs associated with testing, reporting and analyses. Source testing shall be performed according to the provisions of the APCD's current Source Test Manual or other methods approved by the APCD.

- (2) Validity of ERCs. The ERCs generated by this DOI are valid only for the *M/V Broadbill* crew boat and the associated new Tier II main propulsion and auxiliary engines installed. Any alteration to the engines installed in the *M/V Broadbill* or alteration to the actual crew boat operated by ExxonMobil shall require a modification to this DOI to re-analyze the validity of the ERCs. If the APCD determines that the ERCs are no longer valid, then ExxonMobil shall provide substitute ERCs.
- (3) Life of DOI. This Decision of Issuance #0042 remains active for the life of the ERCs. This is defined as (a) the ERCs are being used by a project as approved by the APCD, or (b) the ERCs remain unused in an active ERC Certificate.

- Attachments Yes No
 - Attachment 3 (*Manufacturer Specifications for the new Main Propulsion Engines*)

c.2 Emission Element Name: Auxiliary Engines

- EE/DOI Number: 02/0042
- Emission Element Description: Diesel-fired auxiliary engines on the *M/V Broadbill* crew boat. Includes two Detroit Diesel 3-71 engines (each rated at 131 bhp)
- Undiscounted ERC Baseline (1): The three year emissions baseline is based on data provided by the manufacturer and three years of fuel use.

| | | | |
|-----------------|---|-----------|-------------|
| NO _x | = | 0.952 tpq | (3.807tpy) |
| PM/PM10 | = | 0.030 tpq | (0.121 tpy) |

- Technical Uncertainty Factor Used? Yes No

- Undiscounted ERC Baseline (2) - TUF Adjusted

| | | | |
|-----------------|---|-----------|-------------|
| NO _x | = | 0.952 tpq | (3.807tpy) |
| PM/PM10 | = | 0.030 tpq | (0.121 tpy) |

- ERC Due To: *Other:* Engine re-power with new Tier II diesel engines

- For Shutdowns/Reduction in Throughput: NA

| | |
|--------------------------|-----------------------------|
| <input type="checkbox"/> | BACT Discounted |
| <input type="checkbox"/> | 20 Percent Minimum Discount |

- Amount of Shutdown/Reduction in Throughput Adjustment

| | | | |
|-----------------|---|----------|------------|
| NO _x | = | 0.00 tpq | (0.00 tpy) |
| PM10 | = | 0.00 tpq | (0.00 tpy) |

- RACT/SIP Discounted Yes No

- RACT/SIP Applicable Rules: US EPA Emission Standards for Marine Diesel Engines. The Exxon – SYU project permits emissions from marine vessels associated with the source. As such, no specific boat/engines are directly regulated and ExxonMobil has a fleet of possible boats that may be used. While the engines that will be installed meet the US EPA standards for marine engines, the ERCs created due to this project are voluntary and not subject to the surplus provisions for new marine engines.

- Discounted Baseline (4) - RACT/SIP Adjusted

NO_x = 0.952 tpq (3.807tpy)
PM/PM10 = 0.030 tpq (0.121 tpy)

- Special ERC Restrictions? Yes No

- ERC Termination Date: none

- Are There Emission Element-Specific Conditions? Yes No

- (1) Compliance. For initial compliance, ExxonMobil shall source test the new Tier II engines to assess if the engines meets the NO_x emissions standards listed in ATC's 11912, 11984, 11985, and 11986. The issuance of the ERC Certificate will depend upon successful determination of compliance. ExxonMobil shall pay for all costs associated with testing, reporting and analyses.

For ongoing compliance determinations, ExxonMobil shall ensure that the main and auxiliary engines perform at or below the NO_x emission standards listed in ATC's 11912, 11984, 11985, and 11986 and that the vessel continues to operate within the designated area of Santa Barbara County waters.

On an annual basis, the APCD requires ExxonMobil to source test the emissions from the crew boats. The *M/V Broadbill* will be source tested on a rotating annual basis with the other crew boats dedicated to the Exxon – SYU project. ExxonMobil shall pay for all costs associated with testing, reporting and analyses. Source testing shall be performed according to the provisions of the APCD's current Source Test Manual or other methods approved by the APCD.

- (2) Validity of ERCs. The ERCs generated by this DOI valid only for the *M/V Broadbill* crew boat and the associated new Tier II main propulsion and auxiliary engines installed. Any alteration to the engines installed in the *M/V Broadbill* or alteration to the actual crew boat operated by ExxonMobil shall require a modification to this DOI to re-analyze the validity of the ERCs. If the APCD determines that the ERCs are no longer valid, then ExxonMobil shall provide substitute ERCs.
- (3) Life of DOI. This Decision of Issuance #0042 remains active for the life of the ERCs. This is defined as (a) the ERCs are being used by a project as approved by the APCD, or (b) the ERCs remain unused in an active ERC Certificate.

- Attachments Yes No

- Attachment 4 (*Manufacturer Specifications for the new Auxiliary Engines*)

d. Evaluation Criteria Summary: This application was submitted pursuant to the criteria listed in Rule 806. The ERCs meet the basic qualification criteria of being surplus, quantifiable, permanent and enforceable.

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Surplus – In order for the ERCs to be valid, they must be surplus to the APCD’s Clean Air Plan. The CAP does not include the voluntary repowering of marine vessel engine emissions. Consistent with Rule 806, these ERCs will be evaluated against the rules in effect at the time of use.

Quantifiable – Attachment 1 provides the APCD approved ERC calculations. Attachment 2 provides the three year fuel use log use to determine the emission baseline. The proposed ERCs are considered quantifiable.

Permanent – In order to assure the permanence of the ERCs, ExxonMobil must operate the *M/V Broadbill* or an equal APCD-approved replacement crew boat for the life of the Exxon – Santa Ynez Project. Prior to replacing the *M/V Broadbill* or its engines, an application to modify this DOI must be submitted, to ensure that the assumptions of this DOI are maintained.

Enforceable – The Exxon – Santa Ynez Project stationary source permits have been revised (ATC’s 11912, 11984, 11985, and 11986) to include the new main and auxiliary engines for the *M/V Broadbill* as well as specifying the minimum percentage crew boat usage the *M/V Broadbill* must maintain each year. In addition, this DOI and its conditions remain in effect for the life of the ERCs. The APCD will periodically inspect the facility to ensure the equipment is being operated in the manner applied for in the DOI application.

- e. Recommendation: Based on the ERC application and attachment contained within the DOI, the approval of the ERCs is recommended.

Evaluator Date Reviewer Date

AIR POLLUTION CONTROL OFFICER

DATE

Attachments:

1. Emission Reduction Credit Calculations
2. Comparative Metered Fuel Usage for the *M/V Broadbill*
3. Manufacturer Specifications for the New Main Propulsion Engines
4. Manufacturer Specifications for the New Auxiliary Engines

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Attachments

Attachment 1 Emission Reduction Credit Calculations

Decision of Issuance No. 0042

Emission Reduction Calculations for Repowering the M/V Broadbill

| | |
|----------------------|--------------------|
| Stationary Source | Exxon - SYU |
| Stationary Source ID | 1482 |
| Facility: | |
| DOI # | DOI 0042 |
| Attachment # | 1 |

| Description | Device Specifications | | | Usage Data | | | | Emission Factors (lb/kgal) | |
|---|-----------------------|--------------------------|------|------------|---------|-----------|------------|----------------------------|---------------------|
| | Rating (bhp) | Capacity (gal/bhp-hr) | Load | gal/qtr | gal/yr | hours/qtr | hours/year | NOx | PM/PM ₁₀ |
| Existing Main (DD 12V-71) | 1,020 | 0.055 | 0.85 | 28,282 | 113,127 | 593 | 2,372 | 282.04 | 8.88 |
| New Main Engines (DD Series 60) | 1,200 | 0.055 | 0.85 | 28,282 | 113,127 | 504 | 2,017 | 217.87 | 5.93 |
| Existing Aux (DD 3-71) | 262 | 0.055 | 0.50 | 4,991 | 19,964 | 693 | 2,771 | 599.25 | 18.00 |
| New Auxiliary Engines (Northern Lights M40C2) | 120 | 0.055 | 0.50 | 4,991 | 19,964 | 1,512 | 6,050 | 217.87 | 5.93 |

| Baseline Usage Data (gal/year) | 2002 | 2003 | 2004 | 3-year Average |
|-----------------------------------|---------|---------|---------|-------------------|
| Existing Main (DD 12V-71) | 111,104 | 111,665 | 116,612 | 113,127 |
| Existing Aux (DD 3-71) | 19,607 | 19,706 | 20,579 | 19,964 |

| Engine Emissions | Emissions | |
|---------------------------|--------------|---------------------|
| | NOx | PM/PM ₁₀ |
| Existing Main (DD 12V-71) | | |
| Tons Per Quarter (TPQ) | 3.988 | 0.126 |
| Tons Per Year (TPY) | 15.953 | 0.502 |
| New Main (DD Series 60) | | |
| Tons Per Quarter (TPQ) | 3.081 | 0.084 |
| Tons Per Year (TPY) | 12.323 | 0.335 |
| ERC's (TPQ) | 0.908 | 0.042 |
| ERC's (TPY) | 3.630 | 0.167 |

| Engine Emissions | Emissions | |
|------------------------|--------------|---------------------|
| | NOx | PM/PM ₁₀ |
| Existing Aux (DD 3-71) | | |
| Tons Per Quarter (TPQ) | 1.495 | 0.045 |
| Tons Per Year (TPY) | 5.982 | 0.180 |
| New Aux (NL M40C2) | | |
| Tons Per Quarter (TPQ) | 0.544 | 0.015 |
| Tons Per Year (TPY) | 2.175 | 0.059 |
| ERC's (TPQ) | 0.952 | 0.030 |
| ERC's (TPY) | 3.807 | 0.121 |

| Total ERC's | NOx | PM |
|-------------|--------------|--------------|
| TPQ | 1.859 | 0.072 |
| TPY | 7.437 | 0.287 |

Notes:

- (a) Fuel use was averaged over three years (2002-2004). Baseline data taken from CVR and source tests.
- (b) Fuel use is 40% of the permitted limit, as requested by ExxonMobil.
- (c) NOx emission factors for the Detroit Diesel 12V-71 engine based on a source test completed in 2004
- (d) NOx emission factors for the Detroit Diesel 3-71 engine based on a source test completed in 2001 for the M/V Ocean Ranger
- (e) The NOx emission factors for the new Main (DD Series 60) and new Aux (NL M40C2) provided by the manufacturer
- (f) The PM emission factors for the new Main (DD Series 60) and new Aux (NL M40C2) per Marine Engine Tier 2, Category 1 standards.
- (g) The PM emission factor for the existing Main (DD 12V-71) and existing Aux (DD 3-71) provided by the manufacturer

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Attachment 2 Comparative Metered Fuel Usage for the M/V Broadbill

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Comparative Metered Fuel Usage for the M/V Broadbill

Stationary Source **Exxon - SYU**
Stationary Source ID 1482
Facility:
DOI # DOI 0042
Attachment # 2

| Baseline | Monthly Fuel Usage (gallons) | | | | | | | | |
|------------------------|------------------------------|----------------|---------------|----------------|----------------|---------------|----------------|----------------|---------------|
| | 2002 | | | 2003 | | | 2004 | | |
| | Total | Main | Aux | Total | Main | Aux | Total | Main | Aux |
| January | 8,114 | 6,897 | 1,217 | 8,535 | 7,255 | 1,280 | 8,729 | 7,420 | 1,309 |
| February | 6,093 | 5,179 | 914 | 11,446 | 9,729 | 1,717 | 10,282 | 8,740 | 1,542 |
| March | 9,542 | 8,111 | 1,431 | 13,535 | 11,505 | 2,030 | 11,692 | 9,938 | 1,754 |
| April | 10,373 | 8,817 | 1,556 | 13,142 | 11,171 | 1,971 | 10,525 | 8,946 | 1,579 |
| May | 11,160 | 9,486 | 1,674 | 12,219 | 10,386 | 1,833 | 11,873 | 10,092 | 1,781 |
| June | 10,967 | 9,322 | 1,645 | 13,552 | 11,519 | 2,033 | 12,401 | 10,541 | 1,860 |
| July | 11,942 | 10,151 | 1,791 | 12,687 | 10,784 | 1,903 | 13,473 | 11,452 | 2,021 |
| August | 12,953 | 11,010 | 1,943 | 14,552 | 12,369 | 2,183 | 13,311 | 11,314 | 1,997 |
| September | 13,029 | 11,075 | 1,954 | 12,524 | 10,645 | 1,879 | 11,106 | 9,440 | 1,666 |
| October | 12,242 | 10,406 | 1,836 | 0 | 0 | 0 | 11,976 | 10,180 | 1,796 |
| November | 11,761 | 9,997 | 1,764 | 7,811 | 6,639 | 1,172 | 11,545 | 9,813 | 1,732 |
| December | 12,534 | 10,654 | 1,880 | 11,368 | 9,663 | 1,705 | 10,277 | 8,735 | 1,542 |
| Total | 130,710 | 111,104 | 19,607 | 131,371 | 111,665 | 19,706 | 137,190 | 116,612 | 20,579 |
| Average - Total | 133,090 | | | | | | | | |
| Average - Main | 113,127 | | | | | | | | |
| Average - Aux | 19,964 | | | | | | | | |

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Attachment 3 Manufacturer Specifications for the New Main Propulsion Engines



DaimlerChrysler Off-Highway

Commercial Marine
Series 60 (14.0 L) - 6062HK34
600 bhp @ 2100 r/min

Performance Data
06N04M8084



This plot cannot be generated.

| Engine Speed, r/min | Engine Power, bhp | Propeller Power, bhp | Engine Fuel Consumption, gal/h (US) | Propeller Fuel Consumption, gal/h (US) |
|---------------------|-------------------|----------------------|-------------------------------------|--|
| 600 | 96 | 14 | - | - |
| 750 | 151 | 27 | - | - |
| 900 | 219 | 47 | 11.4 | 2.5 |
| 1050 | 324 | 75 | 15.9 | 3.8 |
| 1200 | 423 | 112 | 19.6 | 5.5 |
| 1350 | 476 | 159 | 21.6 | 7.8 |
| 1500 | 528 | 219 | 24.0 | 10.5 |
| 1650 | 581 | 291 | 27.3 | 13.7 |
| 1800 | 600 | 378 | 28.9 | 17.7 |
| 1950 | 600 | 480 | 29.0 | 22.7 |
| 2100 | 600 | 600 | 29.9 | 29.9 |

Tolerance for power values shown is +2/-0% at the conditions listed.
Tolerance for fuel values shown has not been specified.

| Condition | SAE J1228 |
|------------------------|----------------------------|
| Air Inlet Temp. | 77 °F |
| Relative Humidity | 30 % |
| Total Baro. Pressure | 30 in. Hg |
| Fuel Inlet Temp. | 100 °F |
| Spec. Fuel Gravity | 0.8376 |
| [ref. temp.] | 100 °F |
| Air Inlet Restriction | 10 in. H ₂ O |
| Exhaust Back Pressure | 15 in. H ₂ O |
| Raw Water Temp. | 77 °F |
| Min. Fuel Heat Content | 20,500 Btu/lb _m |
| [ref. test spec] | - |
| Air Density | 0.1 lb/ft ³ |
| Fuel Density | 6.99 lb/gal (US) |
| Oil Density | 7.50 lb/gal (US) |



DaimlerChrysler Off-Highway

Commercial Marine
Series 60 (14.0 L) - 6062HK34

Engine Configuration
Data Summary

| Description | |
|-----------------------------|--|
| Model Number | 6062HK34 |
| Hull Position | Starboard |
| Counterpart Model Number | 6062HK35 |
| Number of Cylinders | 6 |
| Bore | 5.24 in. |
| Stroke | 6.61 in. |
| Displacement - per cylinder | 142 in. ³ |
| Displacement - total | 855 in. ³ |
| After-treatment | No After-treatment Device |
| Aspiration | Turbocharged |
| Application Cooling System | Heat Exchanger Cooled |
| Combustion System | Direct Injection |
| Charge Air Cooling System | Separate Circuit Charge Cooling (SCCC) |
| Electronic System | DDEC IV Electronics |
| Engine Type | Inline Engine |
| Marine Gear | MG-5114 SC |
| Ventilation | Closed Engine Crankcase |
| Status | Available |
| Availability Date | 01 JAN 2004 |
| Discontinued Date | - |

| Size | |
|---|-----------|
| Overall Length - excluding the Marine Gear | 72.54 in. |
| Overall Width - excluding the Marine Gear | 40.74 in. |
| Overall Height - excluding the Marine Gear | 45.65 in. |
| Overall Length - including the Marine Gear | - in. |
| Overall Width - including the Marine Gear | - in. |
| Overall Height - including the Marine Gear | 46.06 in. |
| Distance from Front of Engine to the Output Flange of the Marine Gear | 80.16 in. |
| Distance from Front of Engine to the Marine Gear Mounting Surface on the Flywheel Housing | 61.14 in. |
| Distance from Rear Face of Block to the Mounting Surface on the Flywheel Housing | 5.43 in. |

This model is approved for numerous marine maximum-continuous applications.



| Weight | |
|--|----------------------|
| Approximate Dry Weight - excluding the Marine Gear | 2545 lb _m |
| Approximate Wet Weight - excluding the Marine Gear | 3600 lb _m |
| Approximate Dry Weight - including the Marine Gear | 2993 lb _m |
| Approximate Wet Weight - including the Marine Gear | 4072 lb _m |

| Center of Gravity for a Dry Engine & Gear | |
|---|-----------|
| Distance from Rear Face of Block - excluding the Marine Gear: x-axis | 22.10 in. |
| Distance above Crankshaft - excluding the Marine Gear: y-axis | 6.80 in. |
| Distance to the Right of the Crankshaft - excluding the Marine Gear: z-axis | 0.70 in. |
| Distance from Rear Face of Block - including the Marine Gear: x-axis | 16.71 in. |
| Distance above Crankshaft - including the Marine Gear: y-axis | 5.33 in. |
| Distance to the Right of the Crankshaft - including the Marine Gear: z-axis | 0.33 in. |

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Attachment 4 Manufacturer Specifications for the New Auxiliary Engines

C2-Series

General Specifications and Dimensions

| AC Output¹ | M40C2 | M55C2 | M65C2 | M99C2 | M175C2 |
|--|---|-------------------|-------------------|--------------------|--------------------|
| 60 Hz, 1800 RPM¹ kW | 40 kW | 55 kW | 65 kW | 99 kW | 175 kW |
| Voltage regulation | 1.5% | 1.5% | 1.5% | 1.5% | 1.5% |
| Frequency droop control | ±5% | ±5% | Isosynchronous 0% | Isosynchronous 0% | Isosynchronous 0% |
| Phase and power factor | All Models: Three phase -0.8 power factor std. Opt.: Single phase -1.0 power factor except M99C2 | | | | |
| Generator full load temperature rise | All Models: 95°C temperature rise at 50°C ambient | | | | |
| Lugger Diesel Engine Data | | | | | |
| Inline cylinders/aspiration/operating cycle | I-4 / Natural / 4 | I-4 / Turbo / 4 | I-4 / Turbo / 4 | I-6 / Turbo / 4 | I-6 / Turbo AC / 4 |
| Displacement - cid (liter) | 276 (4.5) | 276 (4.5) | 276 (4.5) | 414 (6.8) | 496 (8.1) |
| Bore/stroke - inches (mm) | 4.19/5 (106/127) | 4.19/5 (106/127) | 4.19/5 (106/127) | 4.19/5 (106/127) | 4.6/5.1 (116/129) |
| Oil capacity with filter - quarts (ltr) | 14.3 (13.5) | 14.3 (13.5) | 14.3 (13.5) | 20 (19) | 30.1 (28.5) |
| HP @ 1800 RPM ² / Max front PTO HP @ 1800 rpm | 62 / 60 | 99 / 90 | 102 / 102 | 150 / 149 | 261 / 118 |
| Cooling System (KC standard, HE optional) | | | | | |
| Heat rejection to jacket water - 1800 rpm BTU/min | 1537 | 2334 | 2959 | 3812 | 9619 |
| Freshwater pump capacity - 1800 rpm/gpm (lpm) | 38 (144) | 38 (144) | 38 (144) | 60 (227) | 57 (216) |
| KC turbo tube length @ 85°F seawater dockside - ft | 24 | 24 | 28 | 56 | 40 |
| KC steel skin cooler @ 85°F seawater dockside - sq ft | 31 | 50 | 52 | 75 | 130 |
| KC keel cooler head diameter - in NPT | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| KC keel cooler hose ID discharge/suction - in (mm) | 2.25 (57) | 2.25 (57) | 2.25 (57) | 2.25 (57) | 2.5 (64) |
| HE heat exchanger approx cooling capacity - gal (ltr) | 5.5 (21) | 5.5 (21) | 5.5 (21) | 6.5 (24.7) | 9.5 (36) |
| HE seawater pump capacity - 1800 rpm/gpm (lpm) | 24 (91) | 24 (91) | 24 (91) | 24 (91) | 43 (163) |
| HE max seawater pump suction head lift - in (m) | 39 (1) | 39 (1) | 39 (1) | 39 (1) | 120 (3) |
| HE sea water pump inlet hose ID - in (mm) | 1.25 (32) | 1.25 (32) | 1.25 (32) | 1.25 (32) | 2 (50) |
| HE min. seawater inlet/discharge thru-hull - in (mm) | 1.25 (32) | 1.25 (32) | 1.25 (32) | 1.25 (32) | 2 (50) |
| DC Electrical (24V standard, 24V optional) | | | | | |
| DC starting voltage - standard (optional) | 12 (24) | 12 (24) | 12 (24) | 12 (24) | 12 (24) |
| Min battery capacity - amp hr/12V CCA (24V CCA) | 200 / 640 (570) | 200 / 640 (570) | 200 / 640 (570) | 225 / 800 (570) | 250 / 800 (570) |
| Starter rolling amps @ 0°C - 12VDC (24VDC) | 780 (600) | 780 (600) | 780 (600) | 920 (600) | 950 (600) |
| 12 Volt battery cable size up to 10 ft (3m) | "00" | "00" | "00" | "00" | "000" |
| Air | | | | | |
| Generator cooling air flow 1&3Ø - 1800 rpm cfm | 595 | 595 | 955 | 1308 | 1308 |
| Air consumption - 1800 rpm/cfm (m³/m) | 127 (3.6) | 201 (5.7) | 226 (6.4) | 352 (9.2) | 554 (15.7) |
| Exhaust gas volume - 1800 rpm/cfm (m³/m) | 357 (10.1) | 512 (14.5) | 618 (17.5) | 851 (24.1) | 1314 (37.2) |
| Exhaust gas temp - 1800 rpm/F° (C°) | 1089° (587°) | 959° (515°) | 1040° (560°) | 984° (529°) | 817° (436°) |
| Approx. heat radiated to air - 1800 rpm/BTU/min | 328 | 451 | 533 | 812 | 1446 |
| Max. exhaust back Pressure - inch H ₂ O (mm H ₂ O) | 48 (1220) | 30 (762) | 30 (762) | 30 (762) | 30 (762) |
| Wet exhaust elbow OD- in (mm) | 4 (100) | 4 (100) | 4 (100) | CF | 5 (125) |
| Dry exhaust elbow in (mm) | 3 (75) | 4 (100) | 4 (100) | 4 (100) | 4 (100) |
| Fuel | | | | | |
| Fuel injection pump type and control | Rotary Mechanical | Rotary Mechanical | Rotary Electronic | Rotary Electronic | HPCR Electronic |
| Min suction & return line - in (mm) | 3/8 (9.5) | 3/8 (9.5) | 3/8 (9.5) | 3/8 (9.5) | 3/8 (10) |
| Max fuel transfer pump suction lift - in (mm) | 36 (914) | 36 (914) | 36 (914) | 36 (914) | 120 (3.0) |
| Max fuel flow to transfer pump at 1800 rpm - gph | 29.9 | 29.9 | 21.5 | 23.5 | 85 |
| Full load fuel returned to tank at 1800 rpm -gph | 26.6 | 24.7 | 15.5 | 15.6 | 73 |
| Specific fuel consumption max load 1800 rpm - lbs.hp.hr | 0.389 | 0.369 | 0.378 | 0.377 | 0.361 |
| Approx. fuel rate ³ at 1800 RPM full load - gph (lph) ³ | 3.29 (12.45) | 5.14 (19.45) | 6.01 (22.74) | 7.92 (30) | 13.3 (50.3) |
| Max Engine Operating Angle | | | | | |
| Continuous (with separate expansion tank) | All Models: Front Down: 0-5°, (0-10°). Rear Down: 0-12°. Left/Right Down: 0-5°, (0-23°) | | | | |
| Intermittent (2 minutes) | All Models: Front/Rear Down: 0-30°. Left/Right Down: 0-30° | | | | |
| Dimensions and Weight (do not use for installation, contact factory for installation drawings and info) | | | | | |
| Length - inches (mm) | 64.0 in (1625 mm) | 64.0 in (1625 mm) | 70.9 in (1801 mm) | 85.0 in (2159 mm) | Consult factory |
| Width - inches (mm) | 27.5 in (699 mm) | 30.2 in (766 mm) | 27.5 in (699 mm) | 27.5 in (699 mm) | Consult factory |
| Height - inches (mm) | 36.0 in (914 mm) | 37.6 in (955 mm) | 38.6 in (981 mm) | 40.0 in (1016 mm) | Consult factory |
| Weight - pounds (kilograms) | 1545 lbs (701 kg) | 1932 lbs (876 kg) | 1941 lbs (882 kg) | 2805 lbs (1274 kg) | Consult factory |

NOTES:

1. Prime kW ratings for 3Ø at 0.8 power factor. Consult factory for deration factors.
3. Based on prime kW rating at 1800. Fuel rate may vary depending on operating conditions.

2. Net flywheel hp rating for fully equipped engine at rated speed under SAE J816b.
4. Contact factory representative or www.northern-lights.com for current information.

Dealer

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