TECHNICAL MANUAL

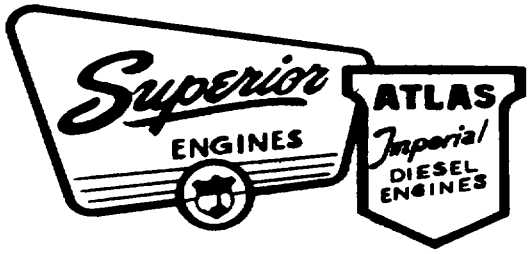
INSTRUCTION MANUAL

CARE AND OPERATION OF THE MAIN PROPULSION ENGINE THE NATIONAL SUPPLY COMPANY, MODEL 45-M5X-8

HEADQUARTERS, DEPARTMENT OF THE ARMY

JULY 1953

PARTS CATALOG



APPLIES ONLY TO THE FOLLOWING ATLAS ENGINES

50058 TO 50089 INCL.
50093 TO 50095 INCL.
50120 TO 50122 INCL.

BORE 9 STROKE 10 1/2

NO. CYL. 8 TYPE Marine

MODEL 45-M5X-8

WARNING

THE PARTS CATALOG SECTION OF THIS BOOK MAY CONTAIN EXTRA DATA (GROUP LISTS & SUB-ASSEMBLIES) WHICH DOES NOT APPLY TO THE ENGINES LISTED ABOVE.

USE ONLY THOSE GROUPS LISTED ON INDEX SHEET.

BEFORE USING THE PARTS CATALOG — READ CAREFULLY THE TWO INSTRUCTION PAGES IMMEDIATELY PRECEDING THE INDEX.

THE NATIONAL SUPPLY COMPANY
ENGINE DIVISION
SPRINGFIELD OHIO U.S.A.

MAIN PROPULSION ENGINE

MAIN PROPULSION ENGINE - MODEL 45-MSX-8-PO #ST3004/41

THE NATIONAL SUPPLY COMPANY - SPRINGFIELD 99 - OHIO

65’ HARBOR TUG - DESIGN 3004

HULLS ST 1978 to ST 2015

SPECIFICATIONS MIL-T-10920(TC) OF 8 FEB. 1951

1952

TABLE OF CONTENTS

The material in the Instructions has been arranged in sections each dealing with a specific subject or subdivision of the engine. The sections are arranged alphabetically and the titles and main contents are listed below.

GENERAL ENGINE DATA

The Atlas Imperial Diesel Engine described herein is of the heavy duty, solid injection, full Diesel type, designed especially for reliability and a long life of trouble-free operation. Compact, rugged construction allows a wide range of applications and accessibility of all wearing parts means simplified maintenance and dependable service. The engine incorporates the latest proven refinements of the four stroke cycle and operates as follows:

1st Stroke. On the downward or suction stroke of the piston, the inlet valve is open and pure air is drawn into the cylinder through the air inlet manifold. On supercharged engines the inlet manifold is supplied with air under slight pressure by the turbosupercharger.

2nd Stroke. On the second or compression stroke, this air is compressed which raises the air temperature to a point above the ignition temperature of the atomized fuel. Just before the piston reaches top center fuel injection starts and is completed shortly after the piston has passed the top dead center.

3rd Stroke. On the power stroke the injected fuel oil burns, increasing the pressure within the cylinder, which drives the piston down through its working stroke. Shortly before bottom center position is reached, the exhaust valve opens.

4th Stroke. As the piston returns toward the head, the burned gases are forced out through the exhaust valve port, and when the piston reaches top center, or shortly thereafter, the exhaust valve closes. Slightly before the piston reaches top center the inlet valve is opened so that at top center the engine is ready for the suction stroke and the cycle is then repeated.

The horsepower rating and the rated speed of the engines are stamped on the engine nameplate and these ratings should never be exceeded.

On the nameplate will also be found the engine serial number which should always be stated when ordering parts and in any correspondence with the factory or, Sales agencies.

The firing order, valve timing and the model designation will also be found on the engine nameplate. When corresponding or ordering parts it is desirable that the model number be stated also. The engine serial number is, however, more important and if the model number is not known, the number of cylinders and the bore and stroke of the engine may be stated.

Section A

SPECIFICATIONS:

BORE AND STROKE	9" x 10-1/2’
Total Displacement	6 Cyl. - 4007.8 Cu. Inches 8 Cyl. - 5343.8 Cu. Inches
Firing Order	See engine nameplate.
Maximum Speed	See engine nameplate - Do not exceed.

OPERATING PRESSURES:

Lubricating Oil Pressure	25 to 40 lbs./sq. in.
Fuel Oil	15 to 20 lbs./sq. in.
Starting Air Pressure	150 to 250 lbs./sq. in.

OPERATING TEMPERATURES:

Cooling Water	Normal Out - - - 1400 to 1600 F. Maximum Out- - 1700 F.
Lubricating Oil	Normal Out - - - 1500 to 1700 F.
Maximum Out	1850 F.

Best operation is obtained if water and oil temperatures are maintained within their normal range. Maximum temperatures should never be exceeded. Lubricating oil temperature should preferably be measured at sump pump discharge, but it can also be measured before entering oil cooler, in which case the temperatures should be about 50 lower than those stated above.

FUEL AND LUBRICATING OILS

1. RECOMMENDED FUEL OIL SPECIFICATION

Viscosity	35 to 70 S.U. Seconds at 1000 F.
Gravity(A.P.I.)	Minimum 240
Conradson Carbon(A.S.T.M. -D 189	Maximum 0.5%
Ash	Maximum 0.05%
B.S.&W	Maximum 0.1%
Sulphur (A.S.T.M.-D129)	Maximum 1.0%
Ignition Quality	45 to 55 Cetane Number or equivalent in other ignition index.

2. EFFECT OF FUEL PROPERTIES ON PERFORMANCE

The engine will operate satisfactorily on fuels with viscosities per above specification. It is possible to use thinner fuels but the operation is apt to be 'snappy" and it may be difficult to maintain even cylinder load balance at varying loads. To insure good operation it is recommended that the viscosity be held to the specification.

The gravity is of secondary importance. A minimum of 240 A.P.I. is merely given since heavier fuels generally require special treatment, such as heating and centrifuging, before they can be burned successfully.

The “Conradson Carbon" or "Carbon Residue" in the oil is an index to the amount of carbon which will form in the combustion chamber. Fuels with high 'Conradson Carbon" may cause carbon to build up on the spray tips to such an extent that the fuel sprays are deflected causing poor operation and smoky exhaust. The higher the Conradson Carbon the more frequently will it be necessary to clean the spray tips. Experience also indicates that maintenance costs will be higher when fuels with high 'Carbon Residues" are used.

The Ash content of a fuel is a measure of the amount of mineral material it contains. After burning the mineral residues are abrasive and it is, consequently, important that the Ash content be limited to 0.05%. If the content is higher rapid wear of cylinder liners, pistons and rings will result.

The item B.S.&W. (Bottom Sediment and Water) is an index to the fuel's cleanliness. It is good economy to use clean fuel and store it in clean tanks. Cleanliness in handling the fuel is also important (See paragraph entitled "Importance of Cleanliness in Fuel Handling" in Section N).

When the fuel oil is consumed in the engine Sulphur burns to Sulphur-dioxide. Under normal operating conditions most of this gas is ejected with the exhaust gases. If, however, temperature conditions are low' enough, that is, if the engine is idling at low speed and under cold conditions, the sulphur-dioxide gas-combines with condensed water vapors to form a corrosive acid which will attack metals used in the engine and exhaust system. It is consequently particularly important to hold the sulphur content low in fuels used for engines subject to variable loads with long periods of idling and also for engines subject to frequent starting and stopping.

The Cetane number of a fuel is an index of the ignition quality. Low Cetane values produce excessive knocking. Excessively high Cetane fuels cause high exhaust temperatures and smokiness of the exhaust.

Although the Flash Point does not affect the suitability of a diesel fuel it is well to specify a minimum of 1-500 F. since state laws and Classification Societies generally require this minimum. The Pour Point of the fuel should be at least 150 F. below the lowest temperature to which the fuel storage tank is subjected.

3. LUBRICATING OIL

We recommend that-a good grade of compounded mineral oil of a detergent type be used in these engines. The oil should be stable under the temperature conditions encountered in the engine and should be resistant to oxidation, foaming and sludging. The best assurance of obtaining a suitable oil is to use only products of well-known merit, produced by responsible concerns, and used in accordance with their recommendations. Do not permit your engine to be used as an experimental unit for trying out new or questionable lubricants.

There are on the market today many good compounded oils with different degrees of detergency. As a general rule the detergency should be what the engine needs and no more as lubricating quality usually, decreases with increase In detergency. A good index of detergency in a lubricating oil is the 'Ash' in the oil specification and as a general rule this item should not be over 1.0%. Best results are obtained with oils having an ash content of 0.5 to 0.7%.

In normally aspirated engines when the duty is not too severe a pure or 'straight" mineral oil may be used. When such an oil is used some carbon or other deposits will generally be found in the crankcase and sump tank. The amount of these deposits depend greatly on the quality of the oil which has been used and for good grades of oil the deposits are not excessive and in any way harmful to the engine. If, on the other hand, detergent type oil is used the chemicals contained in this type of oil enable it to carry the carbon or other constituents of the usual crankcase deposits in suspension. The detergent type oils also have a strong tendency to break loose and carry away any existing crankcase deposits and since there is a limit to the amount that can be carried in suspension clogging of filters and oil lines may result. It is consequently of utmost importance to thoroughly clean out the crankcase, oil lines and sump tank before changing from a straight mineral oil to a compounded oil. As an added precaution we suggest that the first batch of compounded oil be used only for about 100 hours and then drained off. These precautions apply also when changing 4 from one compounded oil to another compounded oil of different make or brand.

If a compounded oil is used the non-corrosiveness of this oil must be looked into very carefully. In this connection the Engineering Department of the Engine Division of The National Supply Company is available for consultation and they will be glad to advise whether or not a specific oil is suitable for use in this engine.

Regarding the viscosity of the lubricating, oil to be used, an oil of SAEX 30 grade is recommended for normal operating temperature. If the engine is to be operated under extremely hot temperature conditions, say 1100 F. or over, SAE 40 6il should. be used. If the ambient temperatures are below freezing, an oil of SAE 20 rating should be used.

For low temperature operation, the pour point of the oil at the minimum starting temperature to be expected should be carefully considered, as it is most essential that the oil be sufficiently fluid so that it will flow to the pump under all conditions.

The oil day tank (standard tank) holds the proper amount of lubricating oil, and the level should be maintained between the "Half" and "Full" marks on the oil gauge when the engine is running. In regard to drainage periods we suggest that the first batch of oil be drained after about 300 hours of service. Thereafter the filter cartridges should be changed and the drainage period can be increased to approximately 1000 hours providing the filter cartridges are kept in good shape and the oil remains reasonably clean. Experience will determine when to change filter elements and oil and in this connection it should be pointed out that it is more economical to maintain the filter in good shape. However, if the oil is badly discolored and loaded with insolubles, it should be drained off before new filter elements are put in.

INSTALLATION INSTRUCTIONS

1. PREPARING THE ENGINE BED

The success of a Marine engine installation depends greatly upon the construction of the foundation and upon the care exercised in lining up the engine to the propeller shafting. Poor installations will result in excessive vibration and continual change in engine alignment. The result is poor performance and failure of vital parts. For this reason The National Supply Company cannot guarantee an engine unless the engine foundation (engine bed) is strong andsrigid enough to prevent vibration and changes in alignment.

The importance of rigidity in the engine foundation cannot be over-emphasized and it must be securely fastened to the hull of the vessel so as to be virtually a part of the hull construction. For' installations in old hulls, where the rigidity of the hull is questionable, the foundation should be extended fore and aft as far as possible; twice the length of the engine is suggested. Stiffeners should be fitted to prevent the foundation from twisting and weaving. In twin screw installations it is advisable that both foundations be stiffly connected and braced to each other and to the hull. Steel foundations should be welded or riveted. Avoid bolts or screws which may work loose.

When preparing the engine foundation always obtain certified outline prints. Do not use figures or cuts in bulletins or sales literature. The top faces of the foundation must be straight and should be lined up so that they are parallel to the propeller shafting. Athwartships the two top faces should be level. The foundation should be constructed so as to allow 1" to 1½" thick shims or chocks between the engine supporting flanges and the top faces.

2. INSTALLING THE ENGINE

The engine should be lowered onto the foundation and allowed to rest on the leveling screws. For wooden foundations provide steel plates of sufficient area and thickness for the leveling screws to rest on. (Min. 4" x 4" x ½" to 3/4" thick) Shift the engine sideways until the centerline of the crankshaft lines up with the centerline of the propeller shafting. Then by means of the leveling screws adjust the height until the centerline of the crankshaft exactly lines up with the centerline of the propeller shafting. Also level the base athwartships. When alignment in all planes is at hand the following check should be made.

a. Turning over shaft there should be no binding between the centering spigot and recess of the two coupling halves.

b. The faces of the coupling halves should be parallel regardless of the angle through which either or both shafts are turned. With the propeller coupling half held against the engine coupling half, but not bolted, it should not be possible to insert a 0. in. feeler at any point between them. Check at top and bottom and the two sides before bolting flanges together.

If engine has been installed before launching it is advisable to temporarily bolt it to the foundation at this time. It is not advisable to proceed any further before launching unless the hull is extremely rigid. When the vessel is afloat the alignment should again be checked and if found satisfactory a chock should be carefully fitted at each holding down bolt. This applies to steel foundations. In wooden foundations careful