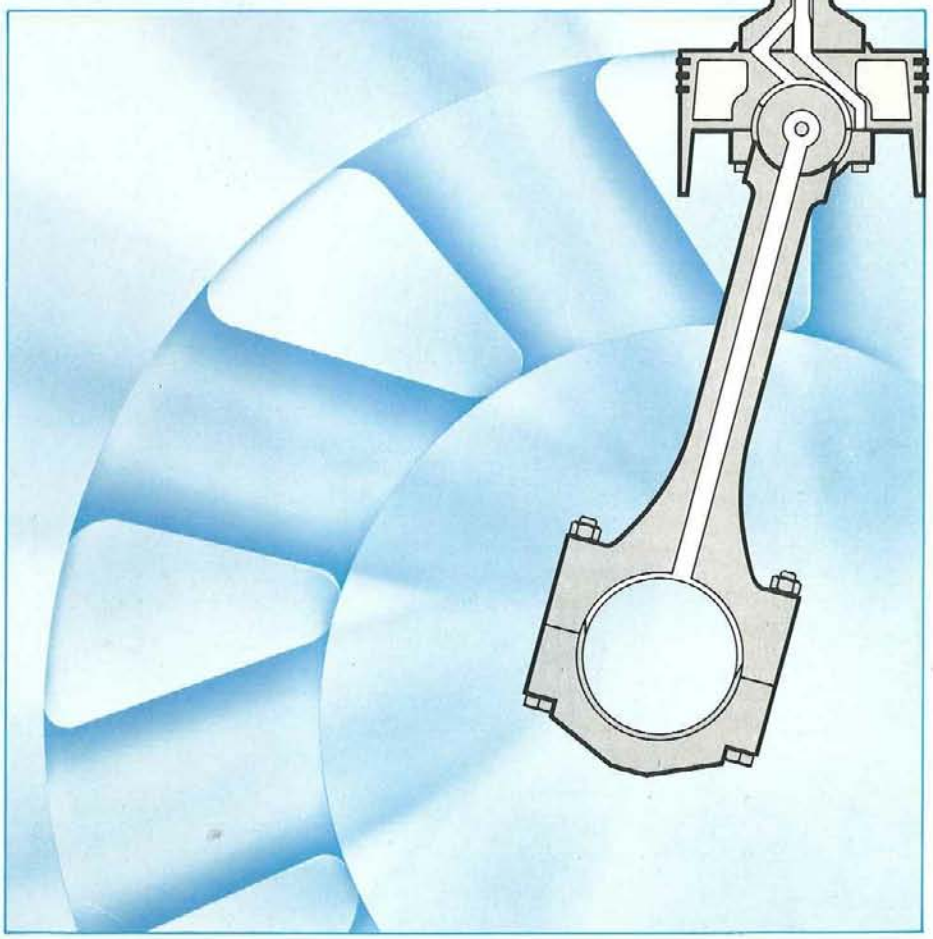
BOLNES power in steel

medium-speed crosshead dieselengine BOLNES 190/600



The medium-speed diesel engine with crosshead scavenger piston

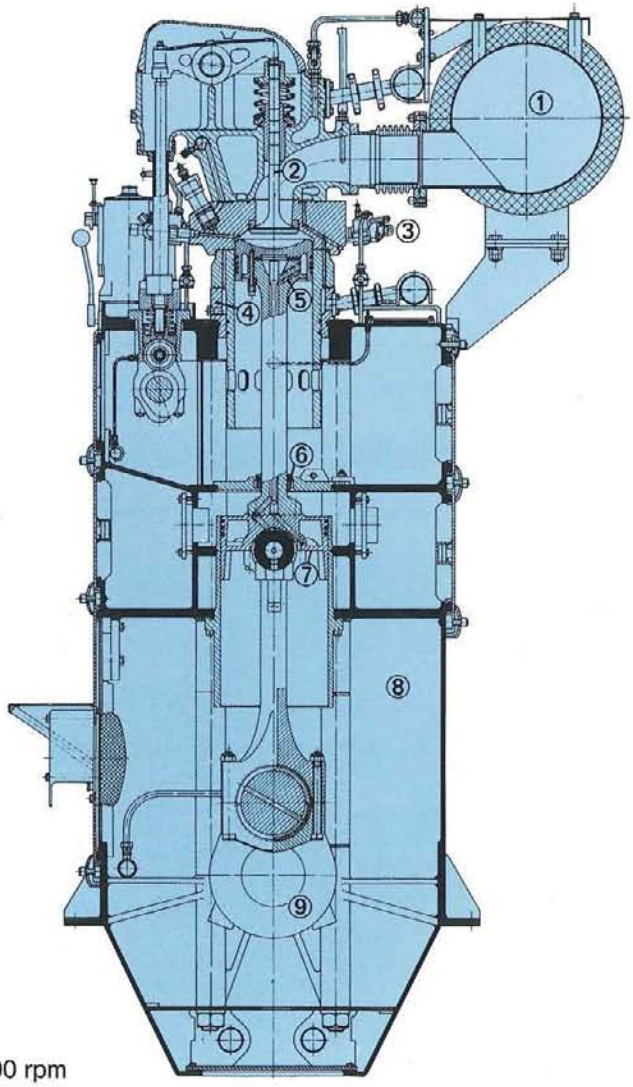
The Bolnes diesel engine is the world's smallest 2-stroke crosshead diesel engine.

This diesel engine features:
- exceptionally low lubricating oil consumption due to complete separation of combustion space and crankcase.
- unique air control due to the design of the crosshead scavenger piston which gives absolutely smokeless combustion under all conditions.
- high performance at low speed; even 110 % torque at 70 % rpm.
- extremely suitable for operation with heavy fuel oils due to separate lubrication systems.
- simplified maintenance through unique design characteristics.

TYPE 190/600
Type 190/600 is based on the well-tried type 170/600. By using a high-efficiency supercharger, lower fuel consumption and high power output have been achieved.

The diesel engine is built in both in-line and V-type constructions (types DNL 190/600 and V-DNL 190/600 respectively) for ships, industrial applications and electrical power stations.

BOLNES
DNL 190/600



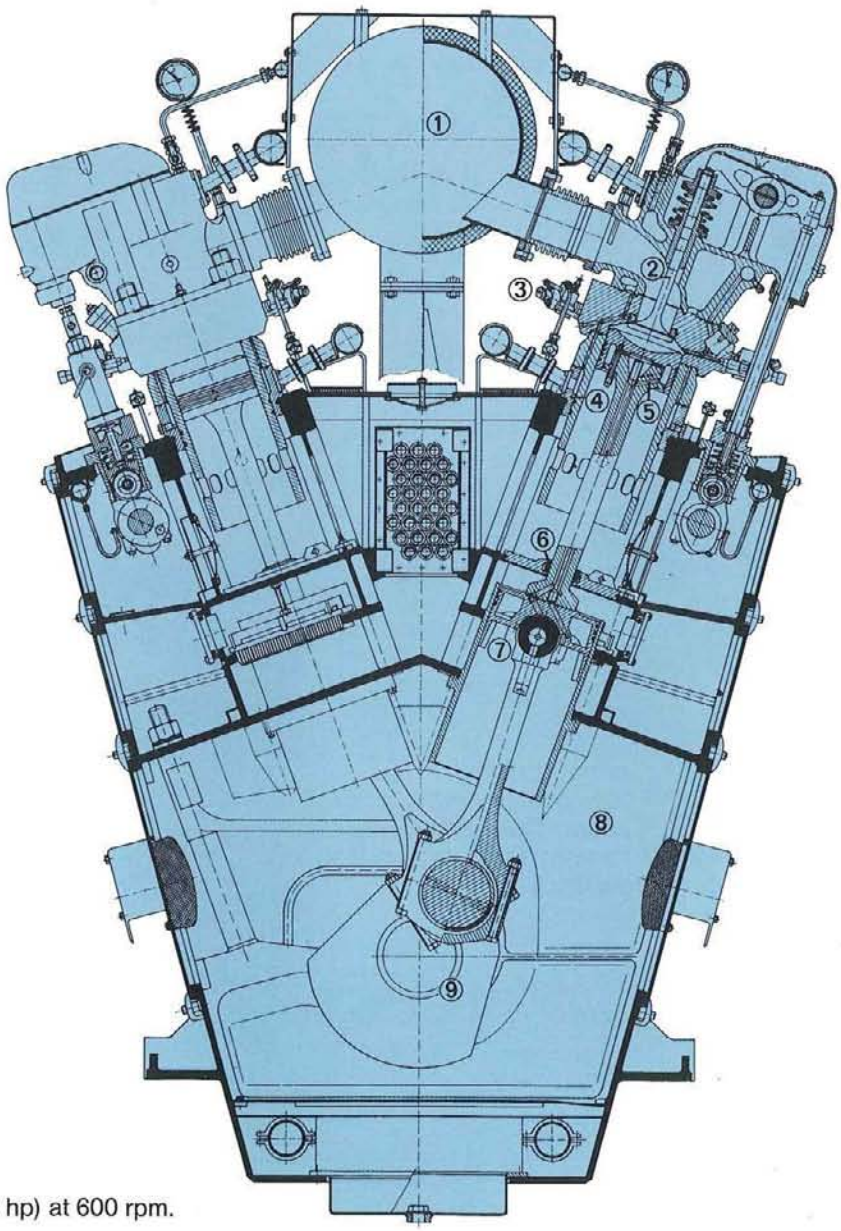
Output range
400 kW - 1400 kW (545 hp - 1900 hp) at 600 rpm

Legend

1 Exhaust-gas manifold fitted with expansion bellows.
2 Uniflow scavenging with one centrally placed exhaust valve of Nimonic 80 A material.
3 Two single-hole nozzles; abolutely smokeless combustion.
4 Separate exchangeable cooling jacket with chrome plated cylinder liner.
5 Oil-cooled piston.
6 Seal around piston rod - no contamination of crankcase oil.
7 Crosshead, also scavenger piston, no lateral pressure on working piston.
8 Welded steel plate frame.
9 Crankshaft, removable from the side.

BOLNES

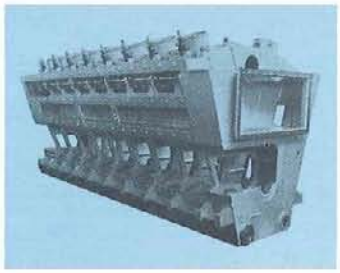
V-DNL 190/600

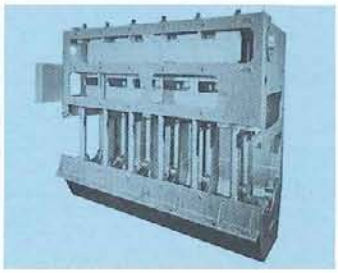


Output range

1400 kW - 2800 kW (1900 hp - 3800 hp) at 600 rpm.

Construction details

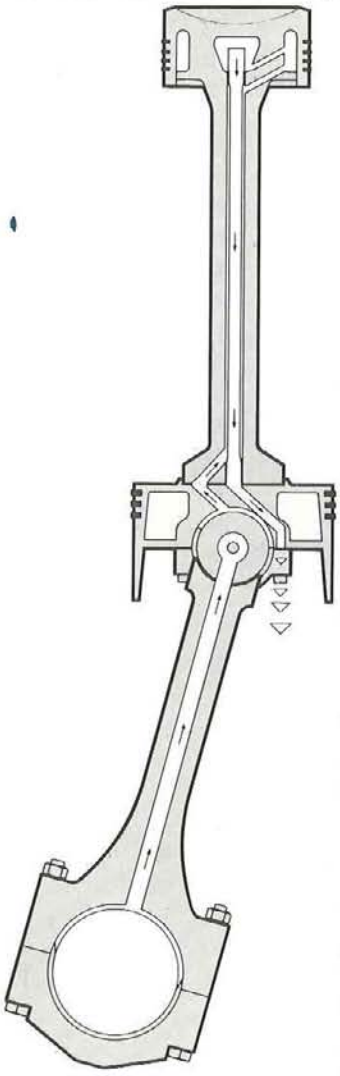




Frame

Crankcase, sump and cylinder beam form a single welded whole. Low weight output ratio combined with great rigidity.
Frame columns removable for fitting crankshaft.
Frame has ample inspection covers.
The entire frame is stress-relieved after welding but before machining.

Crosshead scavenger piston combination



Main piston
On the top of the forged steel main piston is a basin-shaped recess which, together with a similar cavity in the cylinder head, forms the "lenticular" combustion chamber. The piston is oil-cooled by the shaker principle.

Piston rod
Hollow-bored with central pipe for piston cooling-oil flow in both directions.

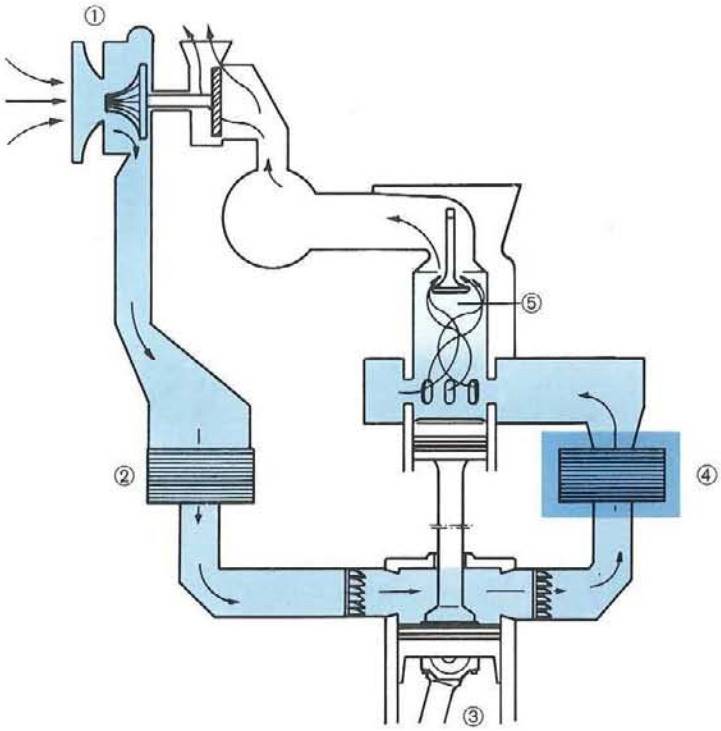
Crosshead scavenger piston
An integral casting of high-grade nodular cast iron. Cylindrical, constructed as a scavenger pump, working in series with the super-charger as a second stage of compression.
The entirely round, hard-ened and ground steel crosshead pin is supported in a thin-walled ternary type bearing bush with ample lubrication and cooling grooves.

Connecting rod
Drop-forged, hollow for oil transport for crosshead pin lubrication and main piston cooling.

Incorporation of the crosshead scavenger piston gives the Bolnes diesel engine the following characteristics:

- low thermal and mechanical load of vital engine parts.
- good combustion-air flow.
- complete separation between combustion space and crankcase, resulting in very low lubricating oil consumption.

Air distribution



1 supercharger

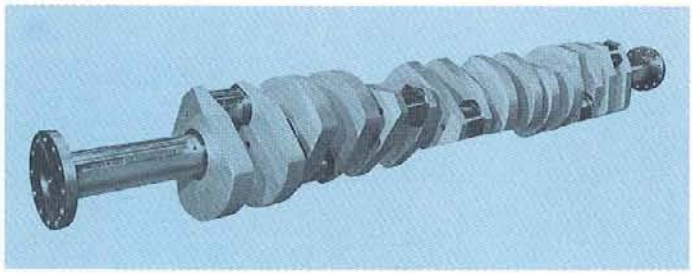
2 air cooler first stage

3 scavenger-air pump

4 air cooler second stage. Can be applied under special circumstances. (Consult the factory for definitive specification)

5 scavenging-combustion air

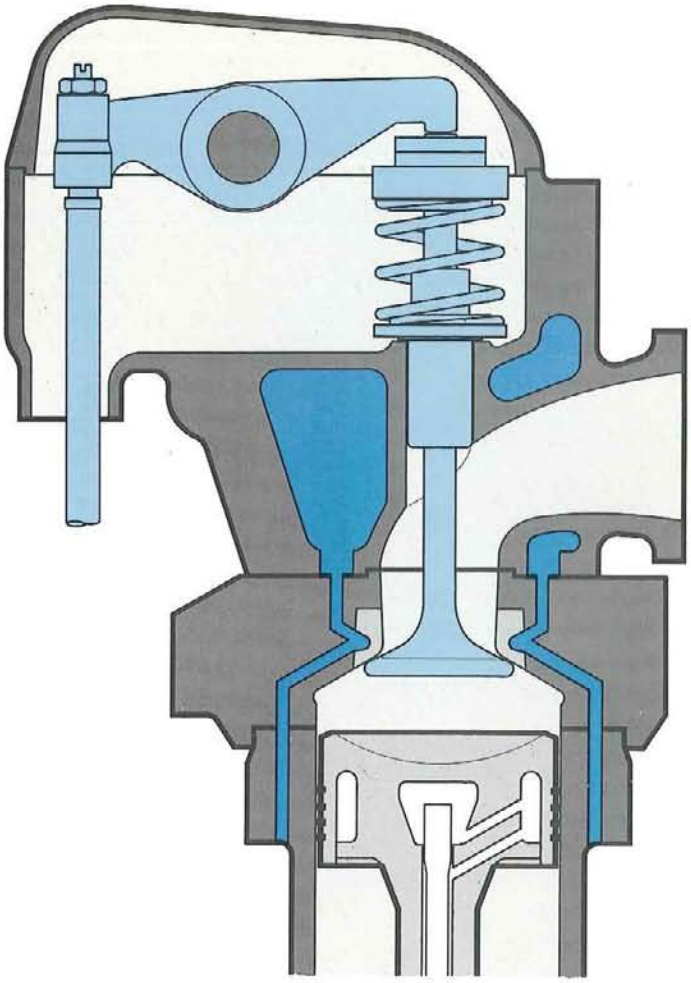
Crankshaft



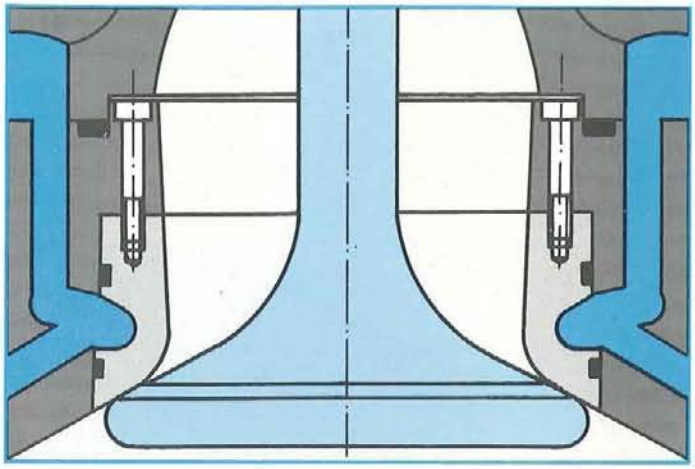
The crankshaft consists of crank throws and shafts, shrink-assembled. The crank throws and counterweights are drop-forged and, like the shafts, are made of CrMo steel.
The crankshaft is designed so that the entire engine output can be taken off at both ends.

Bearings
Both the crankshaft and the connecting rod bearings are of the thin-walled ternary type. A thin layer of lead bronze is applied to the steel substrate and is in turn covered with white metal and a galvanic layer.

Cylinder head

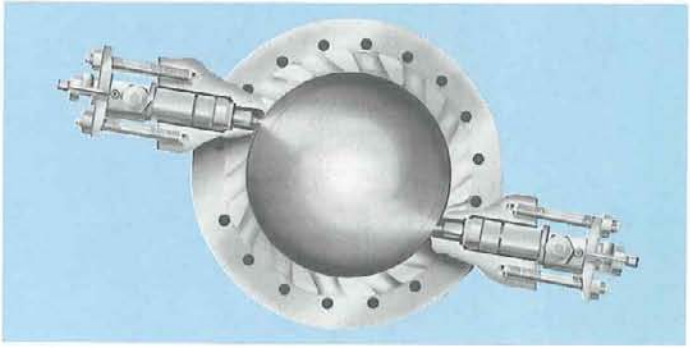


Manufactured form high-grade cast iron and provided with cooling-water channels
One centrally placed exhaust valve of Nimonic 80 A
Interchangeable valve seat
Extra features for heavy-duty applications:
- water-cooled valve seat
- exhaust valve fitted with valve rotator



Interchangeable water-cooled valve seat

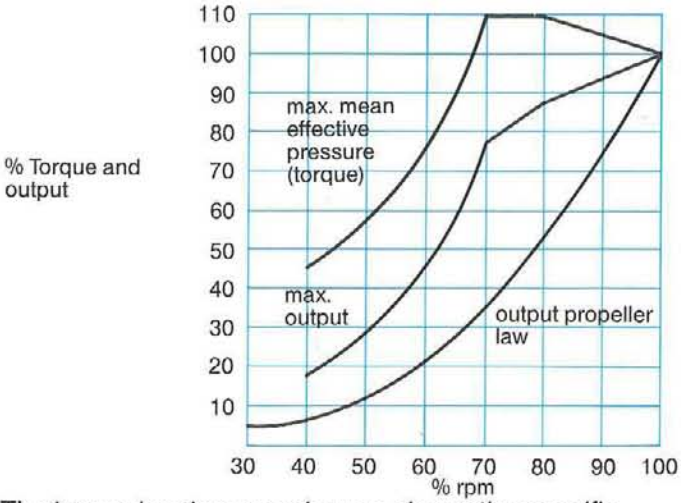
Features for heavy fuel oil version
- cooled valve seat
- valve fitted with valve rotator
- exhaust valve of Nimonic 80 A material
- special piston ring set
- cylinder liner with special chrome layer
- fuel pump with lubrication features and full-flow attachment
- fuel lines usually fitted with heating spirals
- supercharger with turbine washing installation
- scavenging-air temperature control



Fuel injection system

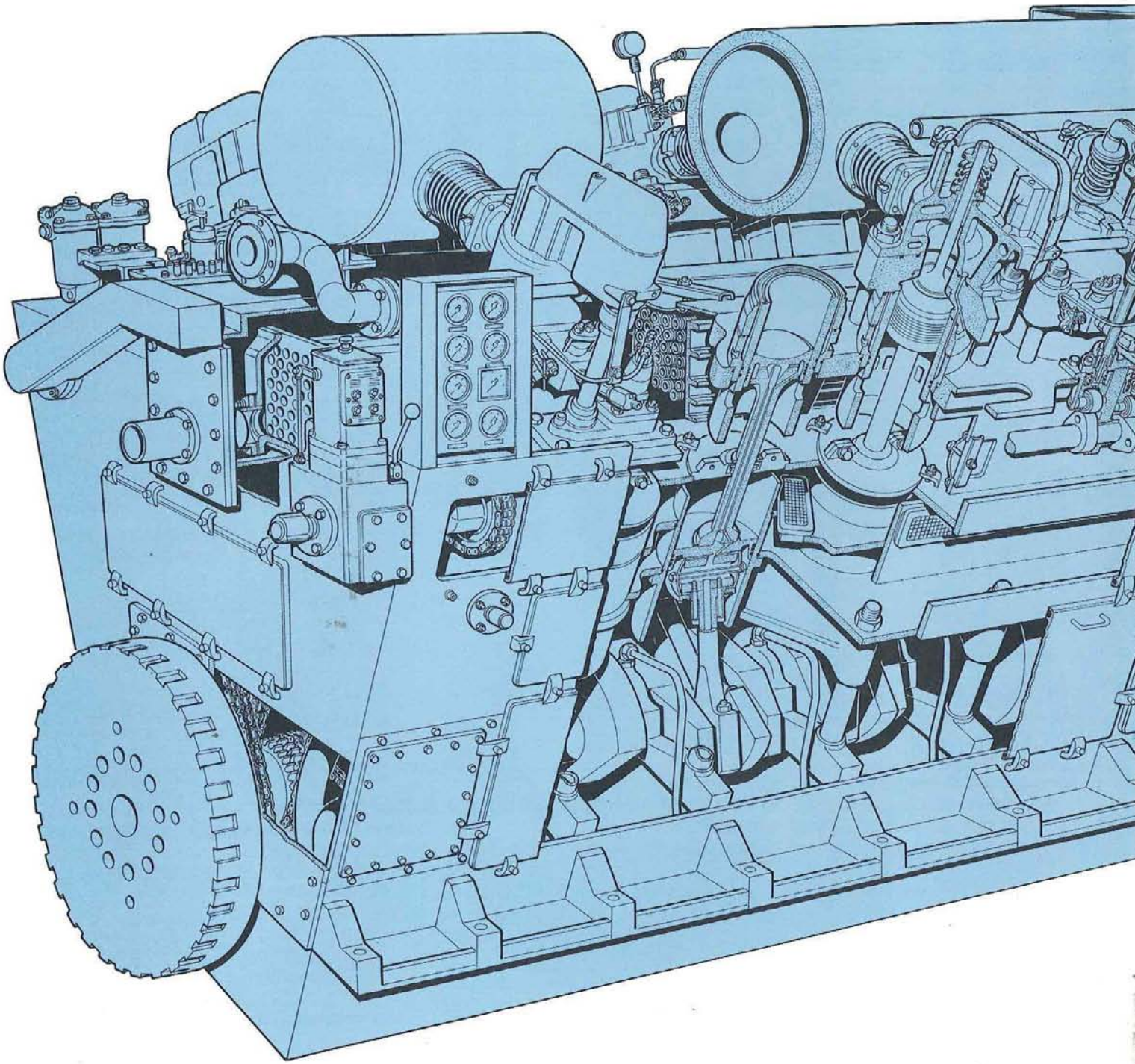
Each cylinder fitted with one fuel pump with two single-hole nozzles. This gives optimal smokeless combustion resulting in lower deposits and therefore less wear.

Cylinder liner
Manufactured in cast iron, with porous chromium plating. Provided with cooling water channels and tangentially bored inlet ports.
Optimal lubrication of cylinder and piston rings due to separate cylinder lube oil system.



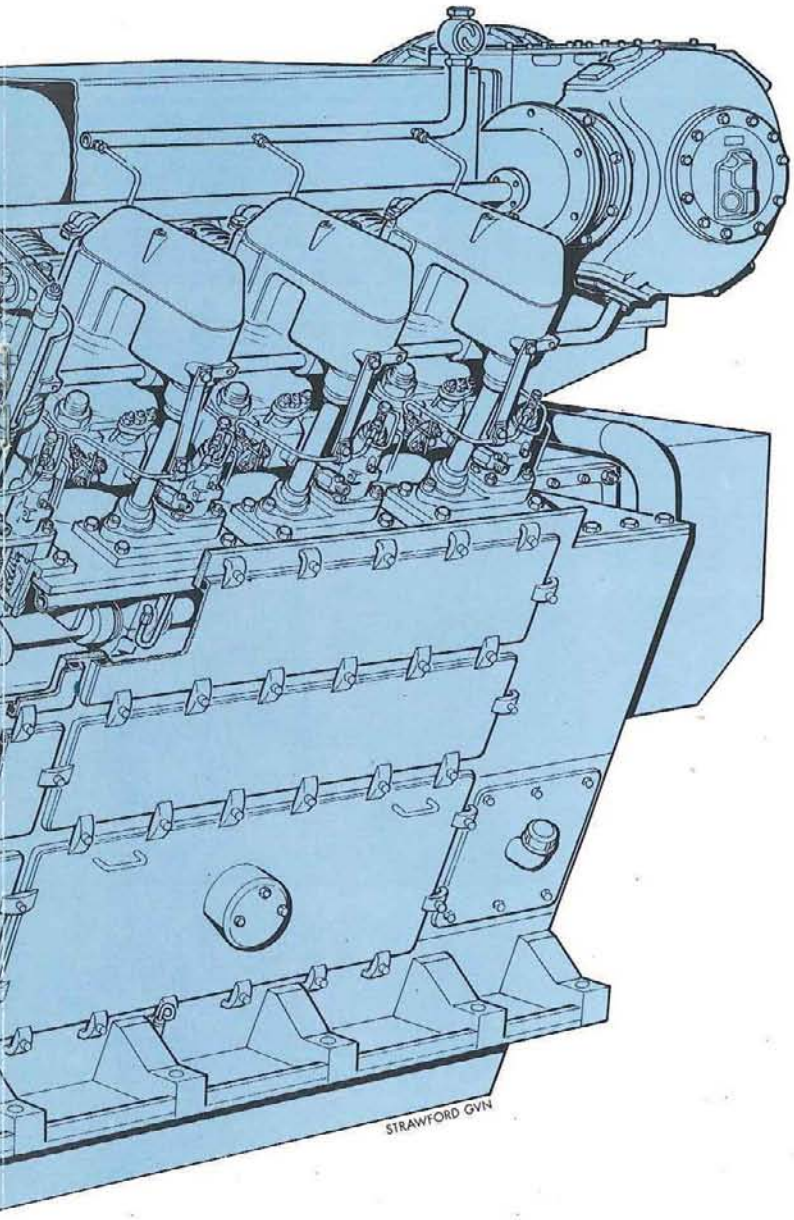
The torque/engine speed curve shows the specific load characteristic over the major part of the engine speed range.

BOLNES diesel engine 190/600



16 V-DNL diesel engine
output 2240 kW (3040 hp) at 600 rpm

BOLNES

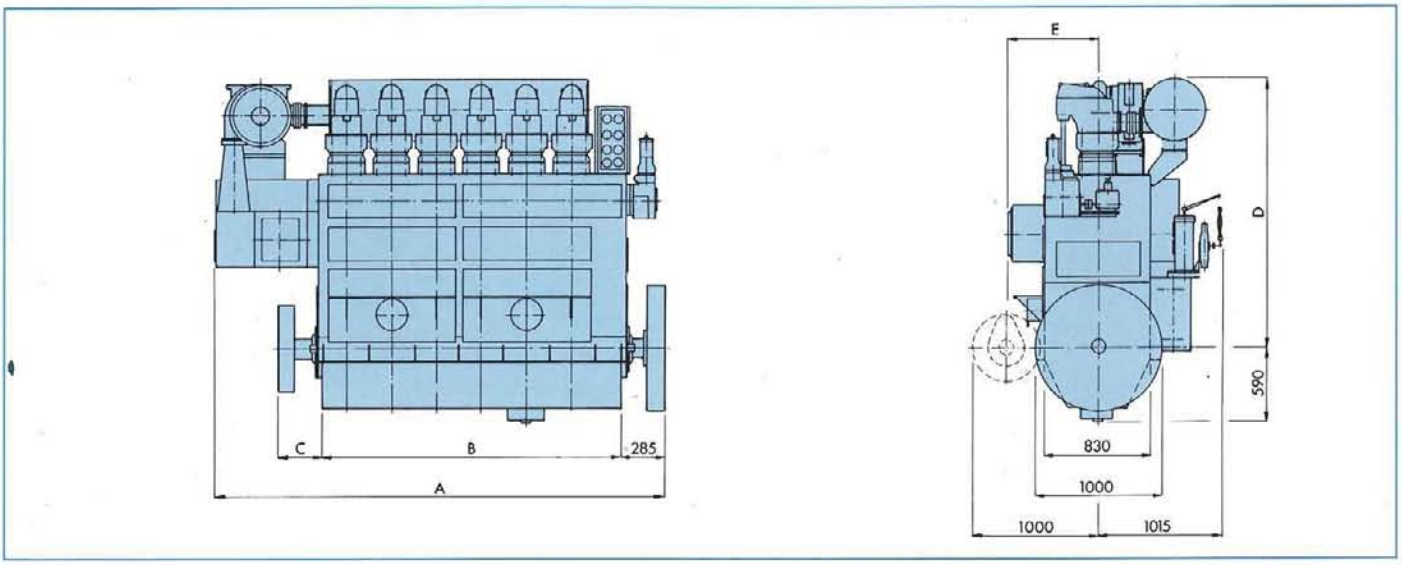


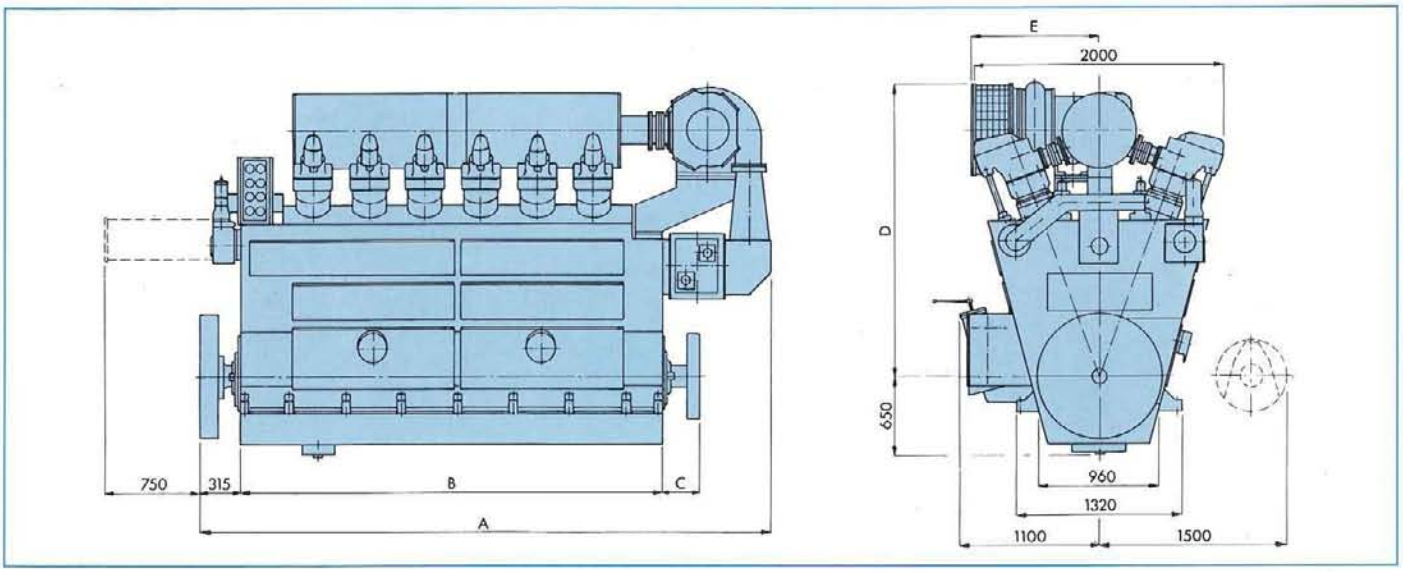
Technical data

Type	DNL 190/600 (in-line type) V-DNL 190/600 (V-type)
Cylinder bore	190 mm
Piston stroke	350 mm
Stroke volume	9.92 dm^3
Speed	600 rpm
Average piston speed	7.00 m/s
Mean effective pressure	14.1 bar
Power output	
Max. continuous power output according to ISO 3046/1	140 kW/cylinder (190 hp/cylinder)
Overload	10% during testing on the test bench
Energy consumption	
Fuel consumption at ISO standard power output. Tolerance 5% Lowest heat content 42.7 MJ/kg	199 g/kW.h. (146.5 g/hp.h)
Without built-on pumps	195 g/kW.h. (143.5 g/hp.h)
Lubricating oilconsumption	0.7 g/kW.h (0.5 g/hp.h)
Miscellaneous	
Scavenging-air pressure	2.1 bar
Air consumption	9.2 kg/kW.h (6.8 kg/hp.h)
Compression ratio	14.0
Maximum combustion pressure	130 bar
Crankcase oil change averages	16,000 h
Lubricating oil centrifuge not required	
ISO conditions	Barometer position 1000 mbar Air temperature 27°C Relative humidity 60% Cooling-water temperature 27°C
Recommended fuel quality	A1, A2, B1 and B2 distillate Heavy fuel oil meeting CIMAC specifications 1, 3, 4 and 6 (consult the factory for definitive specification).

Power ratings, weights and dimensions

Number of cylinders		3	5	6	7	8	9	10
DNL 190/600	A	2505	3292	3652	4012	4287	4786	5146
	B	1315	2120	2485	2840	3190	3550	3925
	C	390	315	315	315	315	325	325
	D	2065	2065	2065	2065	2065	2065	2065
	E	605	740	740	851	851	855	855
Output	kW	400	700	840	980	1120	1260	1400
	hp	545	950	1140	1330	1520	1710	1900
Weigth in tonnes		7.2	9.6	10.7	12.0	13.0	14.6	16.2





Number of cylinders		10	12	14	16	18	20
V-DNL 190/600	A	4165	4651	5101	5551	6115	6555
	B	2930	3380	3830	4280	4730	5180
	C	300	300	300	300	300	305
	D	2257	2320	2319	2319	2257	2257
	E	910	1063	1129	1129	1036	1036
Output	kW	1400	1680	1960	2240	2520	2800
	hp	1900	2280	2665	3045	3425	3800
Weight in tonnes		16.3	18.9	22.0	27.6	30.0	33.5

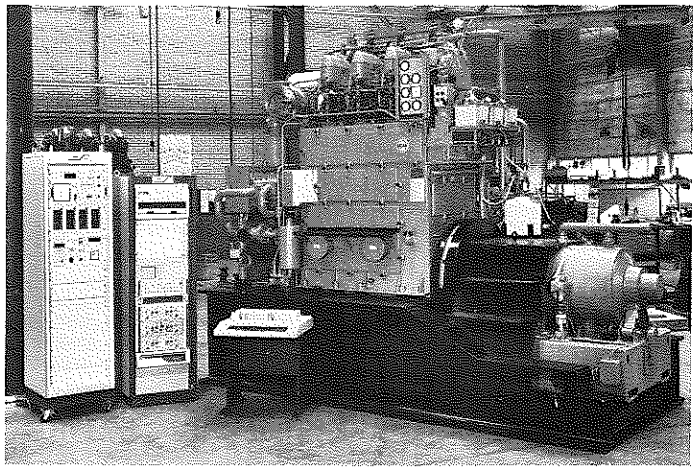
Generator drive
- The power output of the auxiliary engines can be raised by 5% according to ISO standard.
- Can be overloaded by 10% for 1 hour in every 12 hours.
- The engine speed of 600 rpm is suitable for both 50 Hz and 60 Hz.

Heavy fuel oil version
Using heavy fuel oil may affect the power output (Consult the factory for definitive specification).

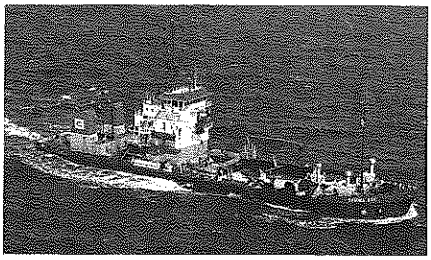
All dimensions in mm and not final.

Applications

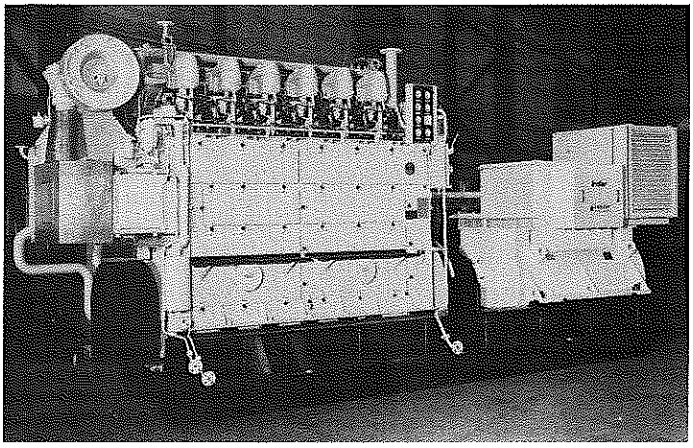
3-cylinder diesel engines for laboratory research with special measuring equipment.

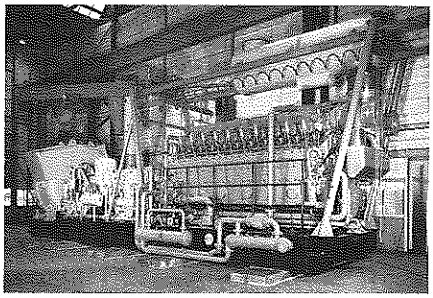


Self-propelled cutter suction dredger propulsion 2 x 660 kW pump drive and electrical output 1900 kW



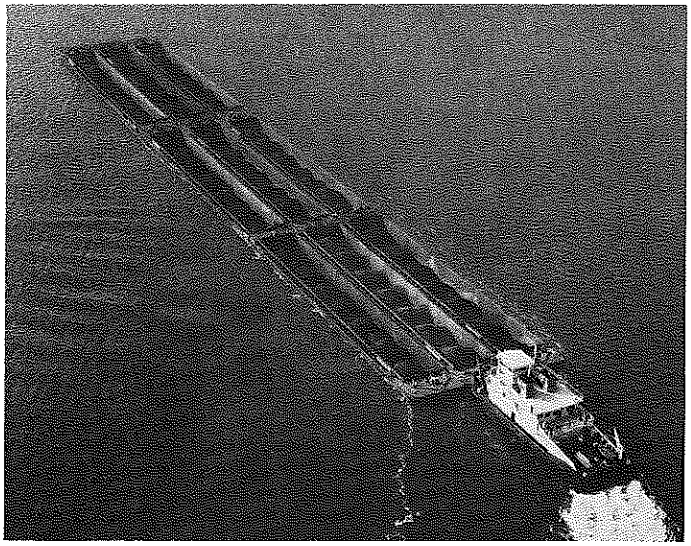
Trailing suction hopper dredger propulsion 2 x 2000 kW

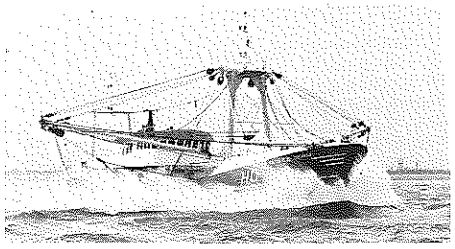




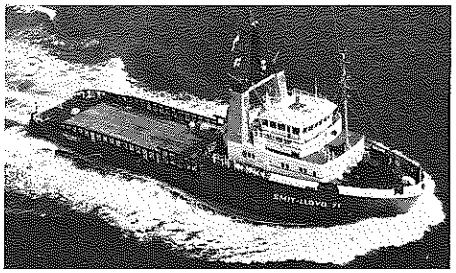
Sandpump set 2500 kW

Generator unit 700 kW



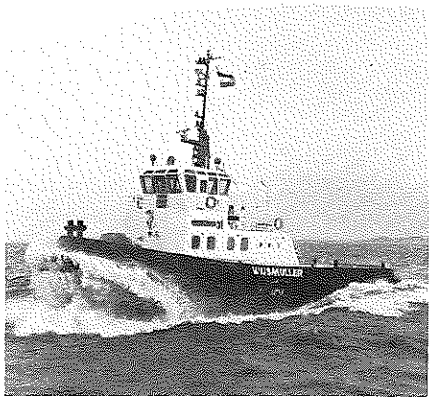


Fishing vessel propulsion 1500 kW

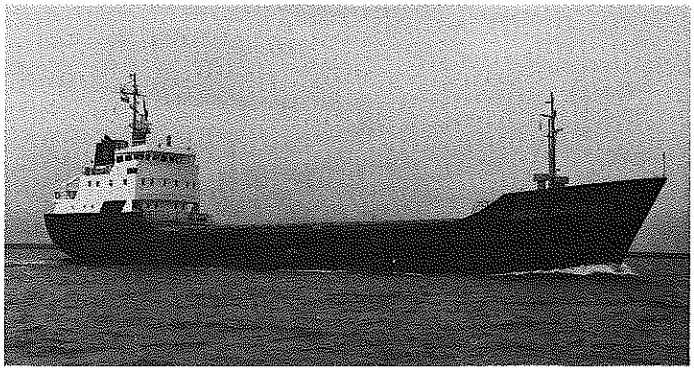


Supply vessel propulsion 2 x 2000 kW

Pusher tug propulsion 3 x 1250 kW



Harbour and coastal tug propulsion with Z-pellerdrive 2 x 880 kW

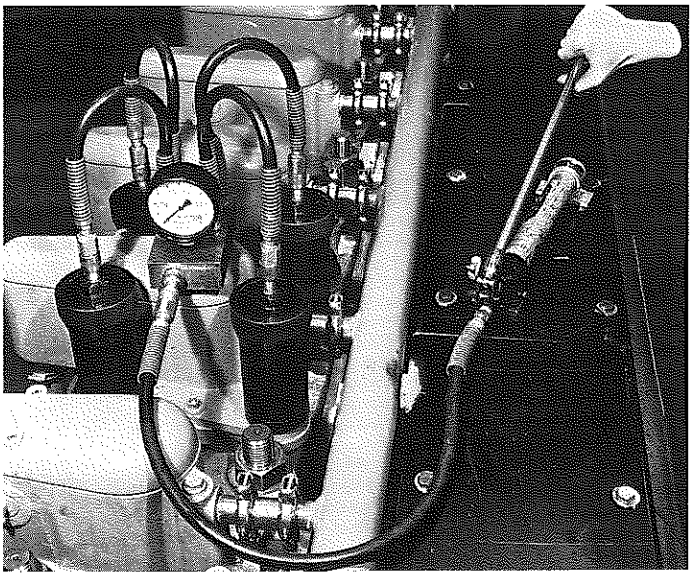


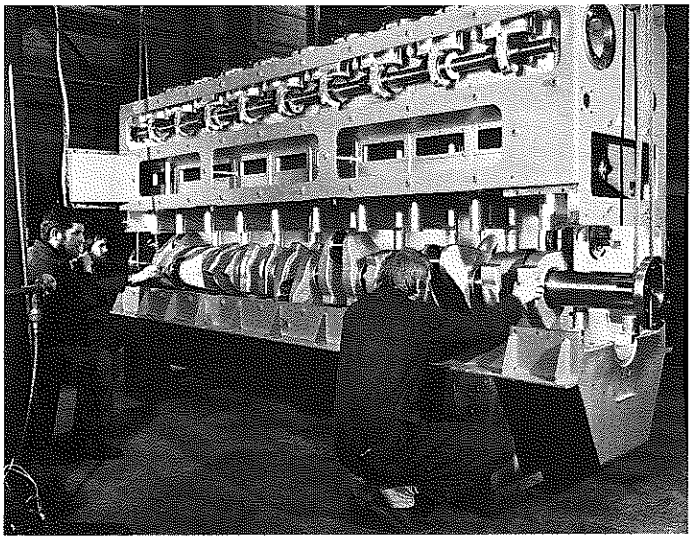
Coaster. propulsion 1 x 625 kW

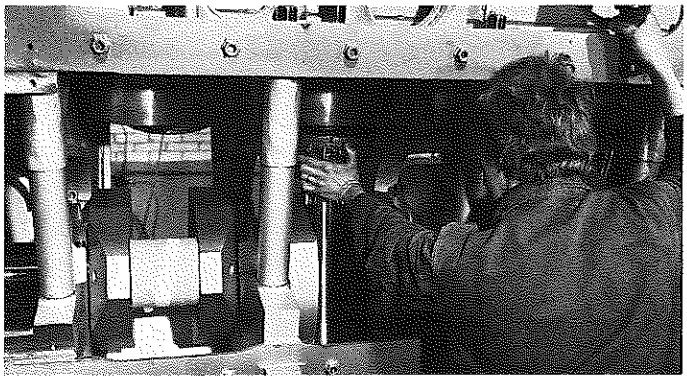
Maintenance

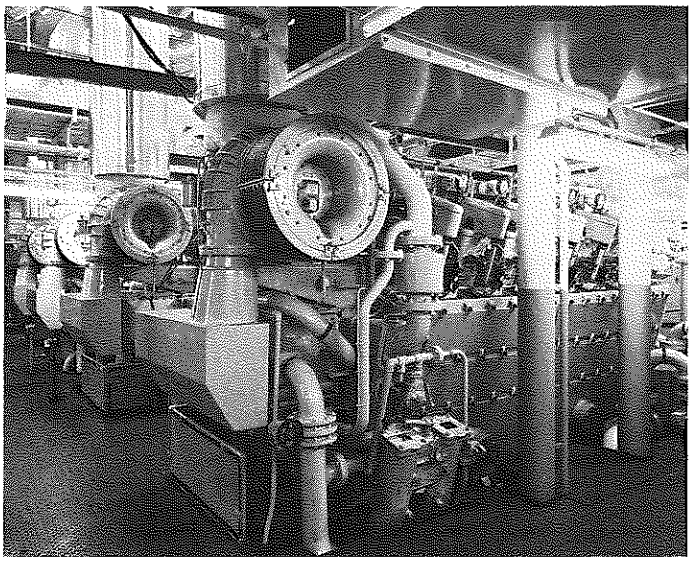
Due to its crosshead design this diesel engine has low maintenance requirements, saving both time and cost.

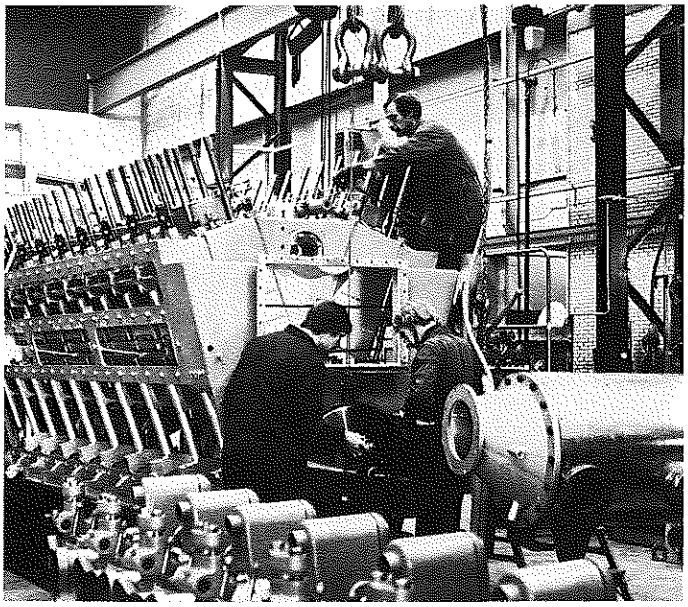
- Crankshaft, bearings and crosshead scavenger piston seldom require maintenance.
- Good accessibility to all moving parts without comprehensive disassembly of other engine components.
- Due to its simple conventional design repairs can be carried out with basic tools.
- Use of hydraulic tensioning tools for fixing cylinder head and stay bolts.
- Power output range from 400 kW to 2800 kW (545 hp to 3800 hp) using the same engine type, which means:
  - almost all engine components are interchangeable, even between in-line and V-engines, giving considerable reduction of spare parts stocks.
  - uniform maintenance procedures.
  - simple service training.











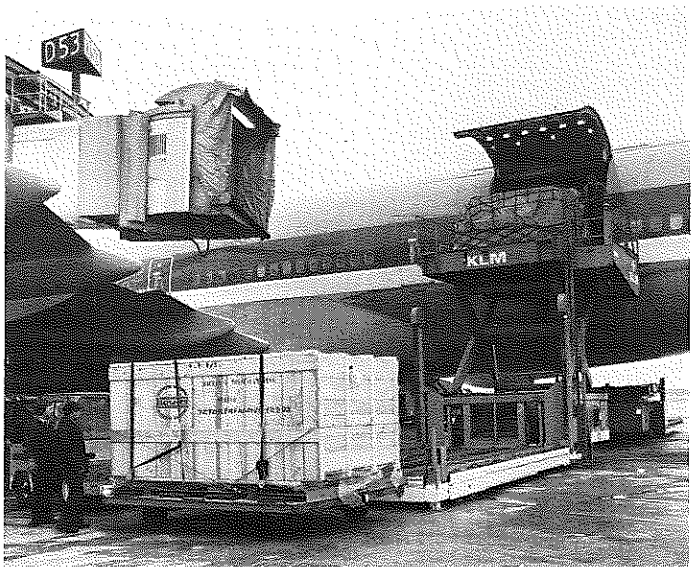
Service

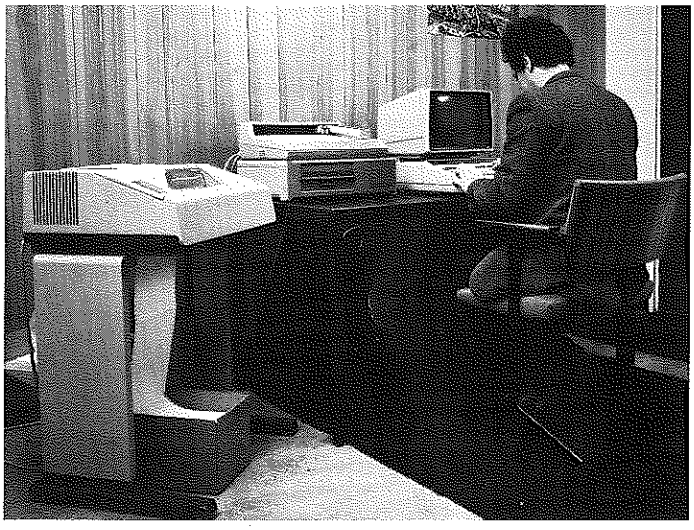
Our Service Department services some 1800 Bolnes diesel engines. Our service engineers are not only specialized - they are also familiar with pneumatic, hydraulic and electrical systems; this is vital for large engine installations. Service is available 24-hours per day worldwide.

Engine diagnosis
Engine diagnosis is an essential part of the service organization. By carrying out pre-planned diagnoses installation reliability is increased, so that maintenance can be scheduled and costs predicted, whilst at the same time reducing the risk of unforeseen repair costs.

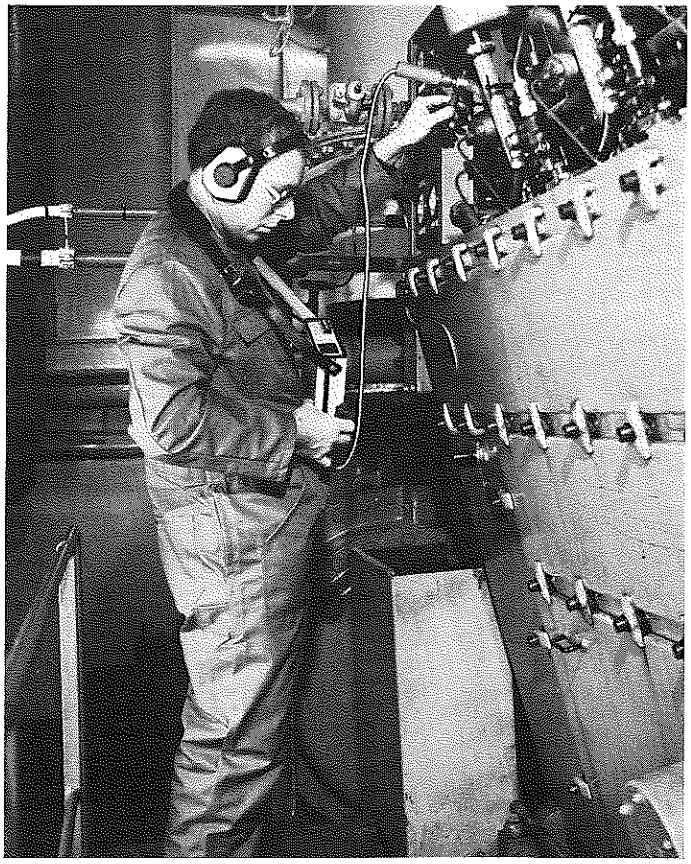
Information to our clients
This provides a system of information and instructions by which a Bolnes user is regularly informed about design modifications, and about changes or up-dates concerning maintenance or operation recommendations for his installation.
This ensures that an installation stays up-to-date and helps reduce costs.

Service training
The simple design of our diesel engine allows your own personnel to carry out any maintenance or repairs, if required, saving both time and money.
Regular service training courses are held to familiarize engineers and technical specialists with the activities required for Bolnes engine installations.





Computer processing of measured data



Diesel engine diagnosis

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