

FM
Engines



Opposed
Piston Engines



a reputation
for powerful engines

Fairbanks Morse Engine Division, based in Beloit, Wisconsin (U.S.A.) is a worldwide leader in engine technology and manufacturing. Since the company's inception in the 1870's, Fairbanks Morse has produced a wide variety of products, including the Eclipse Windmill, the Train Master locomotive, and the first commercially successful gasoline engine in 1893.

Today, the core business of Fairbanks Morse is to provide its customers with the highest quality diesel, dual fuel, and spark ignited natural gas engines, OEM replacement parts and field service support. For stationary power generation applications, Fairbanks Morse maintains its leadership position with the environmentally friendly Enviro-Design® Opposed Piston engine, available from 1,200 to just over 3,100 kilowatts in a single unit. These engines have gained worldwide acceptance in a variety of power generation applications with a low cost of operation and extremely low exhaust emissions.

At Fairbanks Morse, we are committed to the highest quality manufacturing, factory-direct customer service, and the technological advancement of our engine products. It is this commitment that has kept Fairbanks Morse at the forefront of engine technology and customer satisfaction for over a century.

The Fairbanks Morse Opposed Piston (O-P) engine has been designed and developed for a wide array of electrical power generation and heavy industrial applications. You will find O-P engines propelling ships, driving locomotives, natural gas compressors, chillers and pump drives, and producing electricity in a variety of marine and stationary applications. O-P engines have even provided stand-by power for the country's most critical applications, including take-home power for nuclear submarines, emergency reactor cooling in nuclear power facilities, and emergency power for vital life support and telecommunications networks.

regardless of the application...

The OP Engine is one of the most efficient low emission, natural gas engines in the world

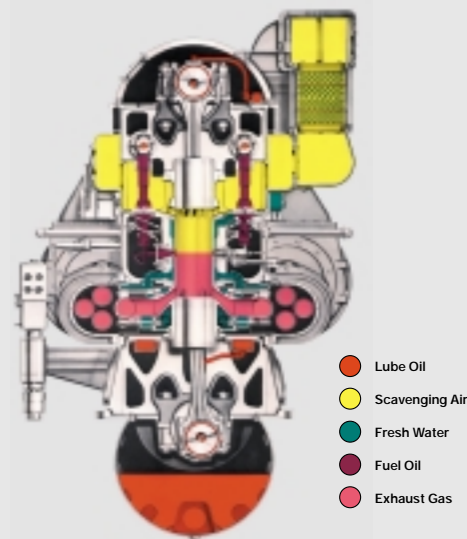
Today, the primary market for the O-P engine centers on the changing environment in the United States electricity supply marketplace. Evolving competition in the utility industry has created a growing demand for small power generation systems strategically located at or near the consumer or load center, often referred to as distributed generation, or DG. DG can benefit both the energy provider and the energy end-user, including providing all of a customer's energy needs, meeting peak load requirements, improving power quality and reliability, among others.

Regardless of the specific DG application, economics and environmental concerns determine the best technology – high efficiency and low emissions result in economical power generation and ease of site permitting. When equipped with Enviro-Design® dual fuel technology, the O-P engine is ideally suited for low-cost electric power production, and is one of the most efficient low emission natural gas engines in the world.

Natural Gas Engine Operation

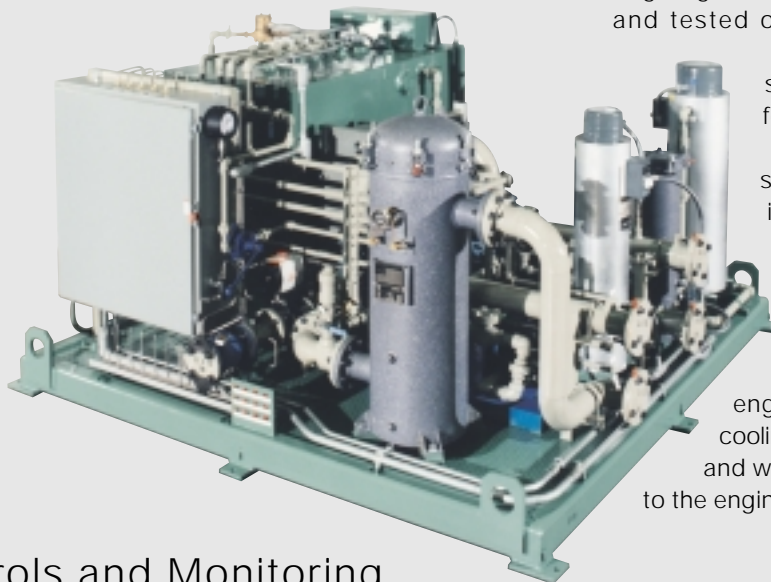
The Fairbanks Morse O-P engine operates on the 2-stroke cycle principle, without the need for cylinder heads, intake or exhaust valves. At the beginning of the cycle, air under turbocharged pressure enters the cylinder through intake ports encircling the top of the liner. As the pistons converge, the intake and exhaust ports are closed, thus compressing the clean air trapped in the cylinder. During this compression, gaseous fuel is admitted into the combustion chamber between the pistons.

Toward the end of the compression stroke, a small quantity of diesel fuel (nominally 1% of the total fuel input) or a spark plug (for spark gas engines) ignites the air-fuel mixture. After ignition, pressure resulting from the combustion forces the pistons apart, delivering power to both crankshafts, which are interconnected by a vertical driveshaft. Approximately 15% of the power generated is delivered to the upper crankshaft.



Power Generation Applications

Engine generator sets come factory assembled and tested on a common steel sub-base, ready for direct mounting on standard-reinforced concrete foundations. Mechanical auxiliary equipment can be provided separately for remote mounting or installed on a pre-engineered auxiliary equipment module. Auxiliary equipment modules reduce on-site installation costs and start-up time. Modules come complete with factory-engineered fuel, lubricating oil, and cooling water systems mounted, piped, and wired, ready for quick interconnect to the engine sub-base and system controls.



Controls and Monitoring

Each O-P engine generator set is equipped with a PLC-based monitoring and control panel designed to initiate the starting and stopping sequence, as well as manage the engine operations and diagnostic information. The control panel includes a programmable operator interface panel that displays critical engine functions, alarm status and history, along with real-time performance data.

The control panel can also be furnished with automatic control by signal from a remote point relayed by the plant central control center. All PLC monitoring and control functions can be easily adapted to Supervisory Control and Data Acquisition (SCADA) systems. A pre-engineered wiring harness simplifies the interconnection between the control panel and engine.

An Allen-Bradley SLC series PLC is the heart of the Fairbanks Morse engine control panel. Each panel is equipped with an Allen-Bradley PanelView programmable operator interface.

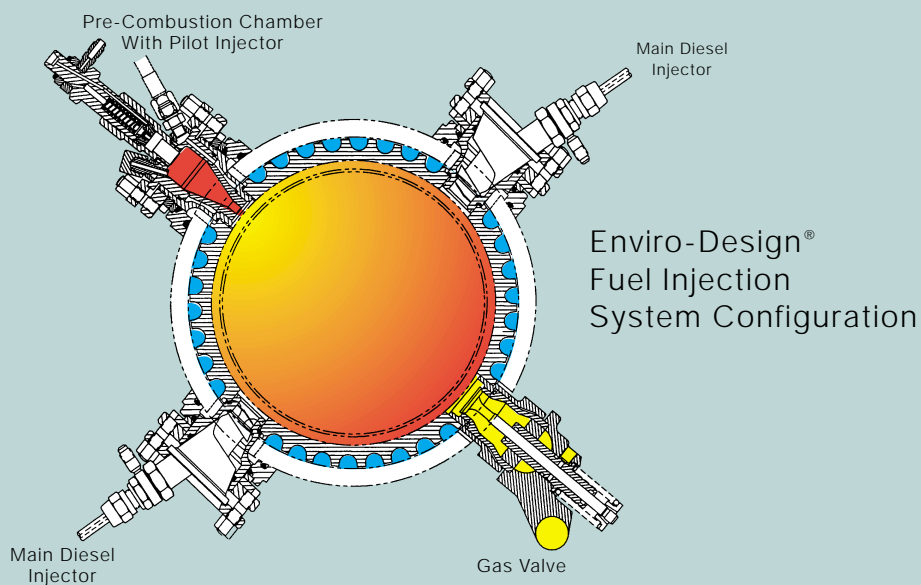


Enviro-Design® Dual Fuel Technology

The Enviro-Design® dual fuel O-P engine operates efficiently on either full diesel, or natural gas with pilot diesel fuel for ignition. Switchover from one mode of operation to the other can be accomplished under varying load conditions without interruption. In fact, a loss of gas supply automatically initiates a switchover to the full diesel mode, maximizing uptime and eliminating dependence on the gaseous fuel supply.

Unlike conventional dual fuel engines, the Enviro-Design® O-P uses a high energy pre-combustion chamber to reduce pilot oil quantities to approximately 1% of the total fuel input. A 12 cylinder unit utilizes only 2.9 gallons per hour (approximately 11 liters per hour) under full load conditions. This reduction in pilot oil quantity dramatically reduces NOx exhaust emissions to levels previously achievable only with spark ignited engines. And since pilot diesel fuel is utilized for ignition instead of spark plugs, downtime associated with ignition system and plug maintenance is eliminated.

Since the Enviro-Design® engine operates as a compression ignition engine, thermal efficiencies are improved by up to 20% versus conventional spark ignited engines. State-of-the-art electronic controls maximize efficiency and performance at varying load points. Enviro-Design® engines are also capable of operation on a variety of gaseous fuels, including various grades of bio-gas, at pressures below 90 psig.



One 6 cylinder Enviro-Design® O-P provides emergency stand-by and peaking power for a midwest hospital.



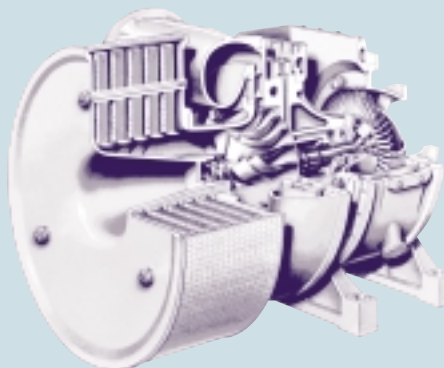
One 6 cylinder Enviro-Design® O-P installed in a midwest water treatment plant. The engine operates in the dual fuel mode with gaseous fuel from the plant's digester process as well with pipeline quality natural gas.

O-P Engine Design Features



Cylinder Block – A “shock qualified,” precision welded steel block designed for structural rigidity and a design life exceeding 40 years. Dry block construction eliminates leakage and extends frame life. Large access openings at five levels in the engine improve maintenance accessibility.

Turbocharging – High efficiency turbocharging and pulse manifolding improves cylinder scavenging, thereby improving efficiency and lowering emissions. Optional Turbo-Blower Series design provides fast starting and high load acceptance capability, ideal for combination emergency stand-by and peak shaving applications.

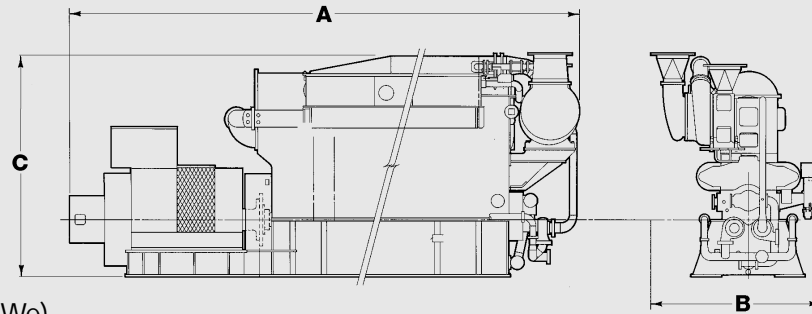


Cylinder Liners – Two pistons inside the cylinder liner form the combustion space, eliminating cylinder heads, valves, and associated hardware. Compared to other engine designs, O-P engines have less than half the moving parts.

Pistons, Bearings and Connecting Rods – Upper and lower piston assemblies may be removed from the lower crankcase, simplifying maintenance procedures. Connecting rods are forged from high tensile strength alloy steel. Due to the O-P's 2-stroke cycle design and conservative operating speed (900 to 1,000 rpm), aluminum alloy main and rod bearing life is extended.



Ratings and Dimensions



50 HZ & 60 HZ Ratings (kWe)

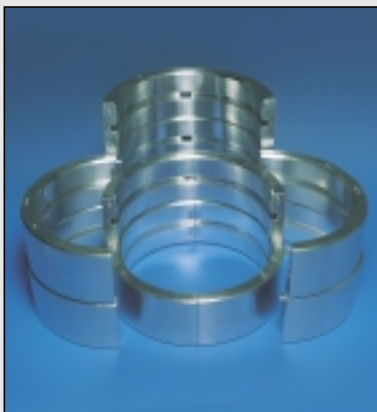
Diesel/Dual Fuel	Spark Ignited	CYL.	RPM	A		B		C		Completed Set Weight - Lbs (kg)
				in.	(mm)	in.	(mm)	in.	(mm)	
1,580	1,290	6	900/1000	251	6,375	103	2,616	130	3,302	62,000 (28,182)
2,370	1,940	9	900/1000	310	7,874	93	2,362	131	3,327	75,000 (34,091)
3,165	2,585	12	900/1000	354	8,992	84	2,134	121	3,073	86,000 (39,091)

Drawings and dimensions are for illustration only. For installations obtain certified prints.
Ratings for Turbo-Blower Series Engines are slightly lower. Consult Factory.

OEM Parts and Service



Quality Hands-On Training



Quality OEM Craftsmanship

With a major parts distribution center in Beloit, Wisconsin, and three service and repair facilities in the United States, Fairbanks Morse provides around-the-clock OEM replacement parts and field service support to customers around the world. Owners and operators of Fairbanks Morse equipment are supported by factory direct hands-on training from experienced instructors, either at the Factory Training Center or at the customer location.

A full range of service programs is available from Fairbanks Morse depending on specific customer requirements. Routine and emergency service is always available, or a customized service contract can be tailored to meet a wide variety of operational profiles. For example, Fairbanks Morse can provide remote monitoring and diagnostic support through the engine control system, or locate a factory-trained service technician at the customer location to provide complete on-site operations and maintenance through a full service contract.



Quality On-Site Service Support

Fairbanks Morse OEM Parts and Service - Quality you can depend on!



a reputation
for powerful engines

BF Goodrich

Fairbanks Morse

Engine Division

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