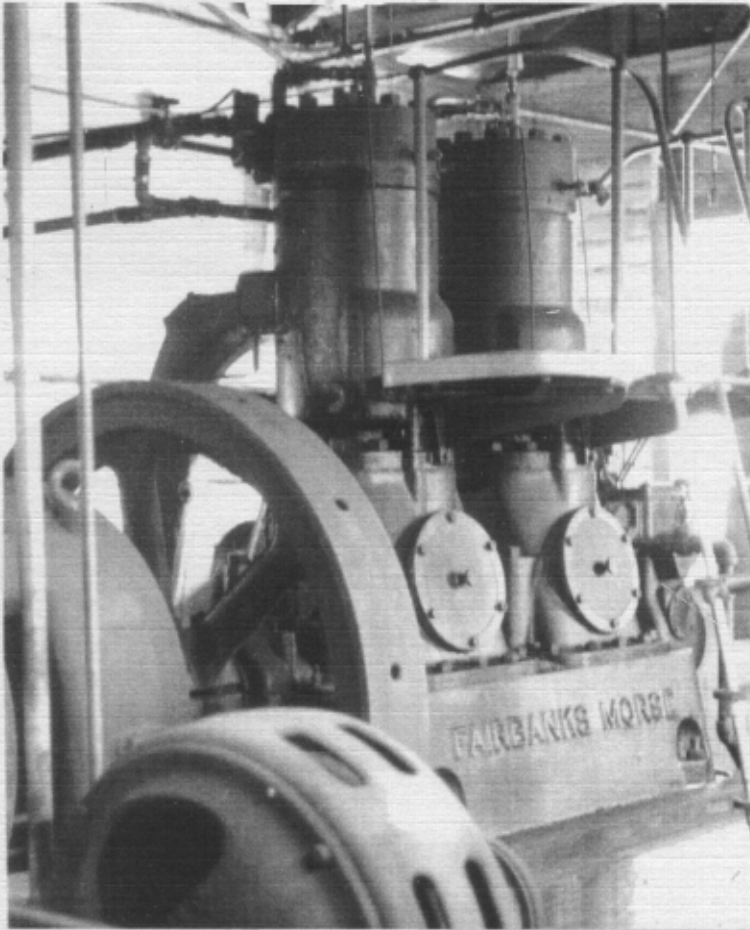




ASME International

# AN ASME HISTORIC MECHANICAL ENGINEERING LANDMARK



Fairbanks Morse Y-VA Diesel Engine  
Useppa Island, Florida

April 15, 2000

The American Society of Mechanical Engineers

# USEPPA ISLAND AND CHARLOTTE HARBOR

Useppa's occupation by ancient people for at least 10,000 years makes it one of the most significant archaeological sites in Florida. During the Archaic period, these early settlers in the area were attracted by the climate and abundant seafood. By about 500 AD, a unique culture was there, the Calusa, a powerful maritime nation that lasted until its decimation by Europeans in the 1700's. The presence of early inhabitants on Useppa and at other points around Charlotte Harbor is plainly evident by numerous large shell mounds in the area.

Human history on Useppa to the present time is very well portrayed in the Useppa Museum, where a Field Station of the Florida Museum of Natural History is maintained.

Nearby Boca Grande Pass, a deep water entry into Charlotte Harbor, offered a probable passage for Spanish explorers such as Ponce de Leon and Hernando de Soto in the 1500's. However, the importance of Useppa Island was not gold or silver buried in its mounds, but because its elevation and location in a rich surrounding fishery attracted people for hundreds of years. Spanish fishing operations to supply Cuba were run from Useppa in the 1700's and to about 1836.

The colorful history of tiny Useppa Island (less than 100 acres) includes its involvement in several armed conflicts dating from mid-1800's during the Seminole Wars, to its use as a post for Union troops during the Civil War, to finally as a C.I.A. training base just before the Cuban Bay of Pigs invasion in the 1960's.

Ownership in the modern era included John Roach from 1894, Barron G. Collier in 1911 (Mr. Collier was the first owner of the diesel engine), William Snow in 1962, Jimmy Turner in 1968, Mariner Properties in 1973, and finally Garfield Beckstead since 1976. Mr. Beckstead has received a Steward of Heritage Preservation Award for his efforts to research, preserve and restore the history of Useppa Island. He has given his full support toward restoring and preserving this diesel engine.

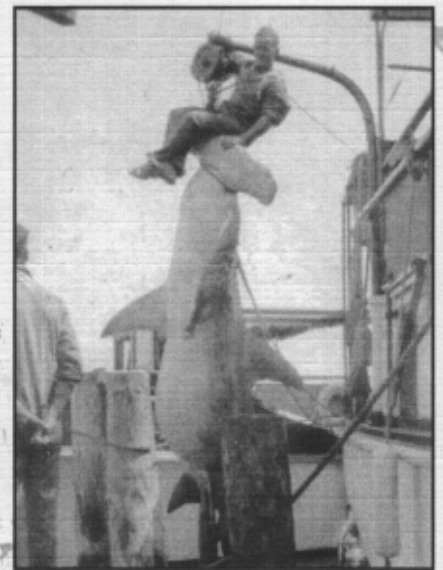
By the 1890's, it was not commercial fishing, but sport fishing, particularly for tarpon in nearby Boca Grande Pass, that gave the island its modern importance. Interest in fishing for large fish such as tarpon increased dramatically 100 years ago with the development of the first drag reel in this country by Edward vom Hofe, a friend of the owner of the island at the time, John Roach.



*Useppa Inn, Useppa Island  
(circa mid-1920's)*

# TE HARBOR

It was the need to suitably serve and house wealthy sport-fishermen attracted to this lightly populated area that resulted in the Fairbanks Morse Y-VA diesel engine finding its way to the island. This engine provided economic reliable electric power in this isolated location, resulting in the island being relatively self-sufficient before power became available from the mainland.



*Typical attractions of Useppa Island in 1924: An 56-lb. tarpon at left and a record 925-lb hammerhead shark.*



*Useppa Island*

**X**

# FAIRBANKS MORSE ENGINE

**R**oots of this well known engine manufacturer, now a division of B.F. Goodrich, date back to 1823. At that time, Thaddeus Fairbanks set up a small iron foundry at St. Johnsbury, Vermont to satisfy local demands for castings as used in plows, stoves, and various simple items.

Two other Fairbanks brothers joined the firm, which expanded into a very successful business manufacturing platform scales and postal scales. Prior to the Fairbanks platform scale, the only common method of measuring large weights was the steelyard, developed centuries earlier in Roman times. The Fairbanks scale line came to include over 10,000 different variations, with present-day Fairbanks mechanical scales having essentially

the same design features as set down in the 1830's.

Charles H. Morse joined the firm as an apprentice in 1850 for \$50 a year plus room and board. He rapidly advanced within the firm, taking over the Chicago office at the time of the Great Chicago Fire of 1871. Reportedly at a great personal risk, Morse salvaged what company records he could during the fire, including the company safe, and resumed business quickly as Fairbanks, Morse & Co.

The firm successfully developed a line of windmills or "wind engines," steam engines and pumps, and by 1893, in Beloit, Wisconsin, was the first in the United States to successfully market a gasoline engine. The



*Original Useppa power house  
with exhaust stacks in  
Background (1976).  
Also shown is Useppa Island  
Chief Engineer, 1923-1924.*

# DIVISION

company produced naphtha-burning and kerosene-burning engines of up to 200 hp (149 kW) by 1900 and coal gas-burning engines of up to 650 hp (485 kW) by 1905.

By 1914, Fairbanks Morse was experimenting with “semi - diesel” (hot bulb) engines, utilizing a glow plug heated to ignite the fuel. This heating was typically by means of a blow torch applied externally at the pre-combustion chamber, or by gas jet applied at the glow plug.

In 1924, Fairbanks Morse developed the first “full diesel” in the United States, meaning that it operated at a compression pressure (about 500 psig, or 34.5 Bar) high enough to cause combustion without a spark plug. This high compression pressure generated sufficient heat to self-ignite the diesel fuel being injected into the cylinders.

The Useppa engine, manufactured in 1924, is one of these first full diesel engines developed without the use of foreign patents, and is one of the earliest survivors of its kind. This type of engine is still in use generating electricity today in numerous power plants.

Family members continued the Fairbanks Morse legacy for over 135 years until about 1950. With the acquisition of several other businesses in the 1960's, including Colt's Patent Fire Arms, the corporate name became Coltec Industries, Inc., now a division of B.F. Goodrich Co. The Fairbanks Morse Engine Division continues a long tradition of being a leader in engine research and development, as it has for over 106 years.

## THE USEPPA DIESEL ENGINE

This 1924 Fairbanks Morse Type Y, Style VA diesel engine, still in its original location, probably replaced a steam engine. By the mid-1920's, steam engine-driven electric power plants were being replaced by diesel engine machinery in many communities. Steam power plants often operated at a loss or barely broke even. The favorable price of fuel oil at that time, plus the greater efficiency of full diesel engines, dramatically changed conditions. The Useppa generating plant provided power for lighting, refrigeration, water pumping, etc., to this isolated location during our country's era of increasing electrification. The horsepower rating of the Useppa engine was reportedly quite conservative, and it was intended to run for long periods without being shut down.

This engine incorporates two-cycle airless-injection crankcase scavenging, with simplicity of design, sturdiness of construction, and high combustion efficiency. Compression and fuel mixture auto-ignition within the cylinders therefore takes place with two strokes of each

piston. Replacement combustion air, after ignition and during expelling of exhaust gases, is drawn in (scavenged) from the crankcase on the piston upstroke.

Combustion air passages are built into the cylinder walls, and the crankcase is utilized as a pump in transferring scavenged air through automatic ring valves into the cylinders under slight pressure. Floating rings form a seal against crankcase compression at the crankshaft.

The Fairbanks Morse semi-diesel precursor engine had a listed fuel consumption of 0.60 pounds per brake horsepower-hour (lb/bhp-hr) at full load. Fuel consumption for the Y-VA was specified (guaranteed) to be 0.48 lb/bhp-hr, a 20 percent improvement.

The primary feature differentiating this model from the semi-diesel with its compression pressure of only about 265 psig, is that the Useppa engine is typical of early true diesels that did not require a pre-combustion chamber or glow plug.

This engine is rated at 37 1/2 hp (28 kW) per cylinder, or a total of 75 hp (56 kW) at 300

rpm. Each of the two cylinders is 12 inches (305 mm) in diameter with a 15-inch (381 mm) stroke. The machine serial number is 591532. Arrangement of the cooling and lubricating system allows practically automatic operation, requiring only casual operator attention. There are no points requiring manual oiling, since every point

is force-fed from a central system.

Large covered openings provide ready access to most all moving parts. There is a legend concerning the circular crankcase access plates, undocumented in company records; that is, that they could readily be broken out with a sledge hammer under engine runaway conditions. It is true that such action would

cause the engine to stop without the compressed scavenging air it needs to run. Obviously it would take a brave operator to accomplish this with the engine threatening to self-destruct.

Records in the Fairbanks Morse archives, Beloit, Wisconsin, indicate that the engine was tested at the Beloit plant on September 25, 1924, and then shipped by rail to Boca Grande, Florida, a small fishing community on nearby Gasparilla Island, in care of Barron Collier (the owner of Useppa Island at the time). Upon arrival at the Charlotte Harbor & Northern Railway railhead in Boca Grande, the engine was transferred to a boat for the last few miles of its journey to Useppa Island.

Transport to Useppa and erection and leveling of the machine on its concrete foundation must have taken substantial effort at this remote location, as the engine weighs around 25,000 lbs. The foundation would have a shell base, as do other structures on the island, from mounds of seashells built up over hundreds of years by early man. Machine erecting and operating instructions for Type Y, Style VA engines are clearly detailed in a 63-page booklet from 1924 furnished by Fairbanks Morse.

Direct driven by this engine is a Fairbanks Morse DC generator rated at 30 kW, 400 amps, and 125 volts. A 48-inch diameter, multi-belt pulley drives a 50 hp (37 kW) AC generator by Electric Machine Company, with 82-amp, 440-volt, 3-phase, 60 Hz rating.

Island electrification from the mainland took place in 1981, and the engine was last operated in 1976 prior to its current restoration. For several years prior to 1981, electrical service was by small diesel engine-driven generators set up in the power house.

Although this engine served reliably for over four decades, operation in such a remote locale was not without its challenges, both big and small. The solid design and construction of the engine and power house building allowed survival through several hurricanes without reported damage, but the operators overcame smaller challenges with creative solutions as well. Charles F. Cerny, Collier's chief engineer in 1923-1924, is known to have burned oily rags in cans inside the building so that the smoke would fend off the hordes of hungry mosquitoes inhabiting the island. Other operators likely did so, too. Fortunately, they were careful to avoid accidentally setting the wooden building on fire.

Restoration of the engine and associated apparatus has been by Useppa staff, Atlanta Section ASME volunteers, and by technical staff of the nearby Koreshan State Historical Site. Public access to this privately owned island is by boat, primarily by small ferries carrying visitors on day trips from nearby Captiva Island.

—John C. Cerny, P.E.

FAIRBANKS MORSE & CO. ENGINE WORKS

### ENGINE TESTING RECORD

ENG. NO. 591532    TYPE VA

TESTED BY W. A. Smith

FUEL USED BY W. A. Smith

Load	RPM	B. H. P.	I. H. P.	FUEL CONSUMPTION			
				PER HOUR	PER MIN.	PER HOUR	PER MIN.
Max	<u>495</u>	<u>194</u>					
Full	<u>404</u>	<u>300</u>				<u>4.90</u>	
1/2							
1/4		<u>282</u>	<u>308</u>			<u>5.87</u>	
0							
		<u>318</u>					

BRAKE RAD. 29    B. H. P. ENGINE RAD. 100    I. H. P. ENGINE RAD. 100

ANGLE OF INJECTION 100° A.C.

Cylinder	Comp. No. 1	Comp. No. 2	Comp. No. 3	Comp. No. 4
Compressed	<u>510</u>	<u>520</u>		
Timing	<u>520</u>	<u>530</u>		
Cylinder Dia.	<u>11995</u>	<u>11998</u>		
Piston Dia.	<u>11987</u>	<u>11987</u>		

GENERAL INFORMATION

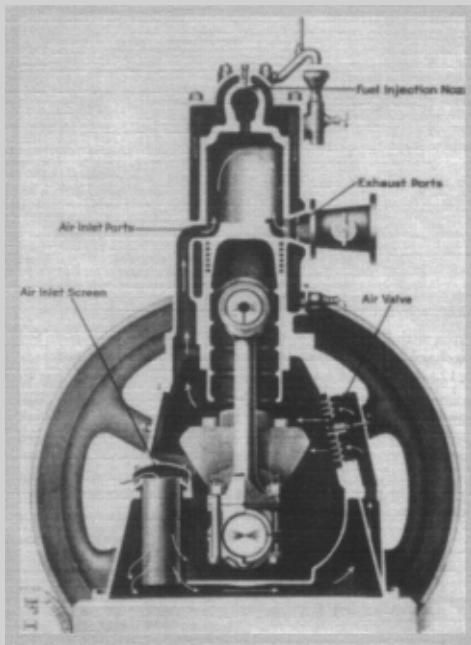
1800-H. P. lubricating oil test

Cleanse between pistons and head with Mobil 147 Mobile

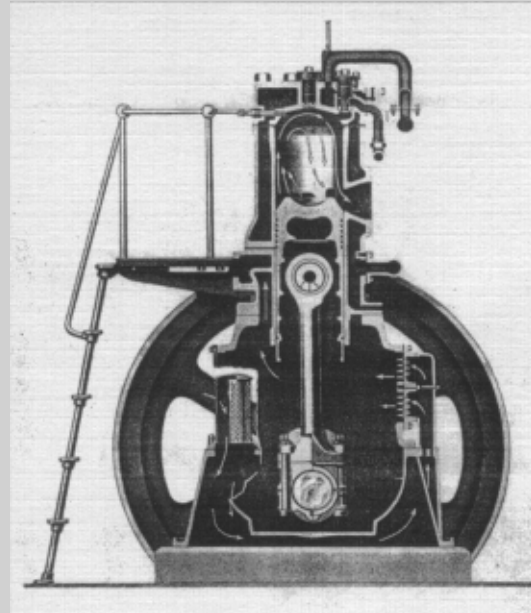
Shaft #4805 Heat 1333

APPROVED: E. Smith

Testing record of Useppa Engine performed September 25, 1924.



*Typical pre-1924 showing pre-combustion chamber at cylinder head.*



*Typical 1924 Y-VA and later.*

## THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

Founded in 1880 by prominent mechanical engineers, ASME International now has about 125,000 members worldwide, including 24,000 students. The only engineering societies in this country established earlier are ASCE (for civil engineers) and AIME (for mining engineers).

Policy for the Society is established by an eight-member Board of Governors along with the past and present President and President-elect. The basic work of the Society is done by Councils on Member Affairs, Engineering, Codes and Standards, Education and Public Affairs, along with their operating boards and committees.

ASME Headquarters are in New York City, with five field offices for its 12 U.S. regions being in New York, Virginia, Illinois, California, and Texas. In addition, the Government Relations office in Washington, DC, the International Gas Institute in Atlanta, Georgia, and the Petroleum Division in Houston, Texas represent ASME worldwide.

Today, ASME is an international engineering society focused on technical, educational, and research issues. The diversity of mechanical engineering is evident in ASME's Technical Divisions and Institutes, concentrating on subjects including Fuels, Power, Rail Transportation, Internal Combustion Engines, and Textile Industries.

The Society conducts one of the world's largest technical publishing operations, holds many technical conferences and professional development courses each year, and since its inception, has led in the development of technical standards.

## THE HISTORY AND HERITAGE PROGRAM OF ASME

In 1971, ASME established the History and Heritage Program to recognize and preserve historically important works of mechanical engineering. To achieve these goals, a national History and Heritage committee comprised of noted technology historians and mechanical engineers considers nomination of such works, whether worthy of landmark designation.

Primary consideration is given the following:

1. The historical significance of the subject;
2. What features set it apart from similar landmarks and similar or competitive items in existence;
3. Its existing physical condition;
4. What contribution this nomination has made toward the development of the region, state, nation, or world;

At this date, 205 ASME Historic Mechanical Engineering Landmarks, including Sites and Collections, have been designated worldwide, including nine in Florida. These nine range from this Fairbanks Morse diesel engine to giant crawler transporters at the Kennedy Space Center's launch complex, to the nearby walking dredge at Seminole-Collier State Park, Naples, Nationally, the earliest designation is the Saugus Iron Works of 1647 in Saugus, Massachusetts.

The ASME History and Heritage Program not only encourages the preservation of historically significant mechanical engineering works, but also provides a roster of these important sites to the public, helping to remind us technically of where we have been, and where the future will lead us.

## ACKNOWLEDGEMENTS

The Atlanta Section of the American Society of Mechanical Engineers gratefully acknowledges the contributions of the following individuals and organizations:

1. Garfield R. Beckstead, Chairman of the Board, Useppa Inn and Dock Company, Ltd., for his cooperation and generous support toward the restoration of the engine;
2. Vincent Formosa, President, The Useppa Island Club, and his staff for numerous varied services provided during the restoration;
3. Barbara L. Sumwalt, President, Useppa Island Historical Society, Inc., for her encouragement and furnishing of Useppa historic material;
4. Dean Chew, V.P., Quincy Compressor Div., for donation of a Quincy 200 psig compressor to air-start the diesel engine;
5. John W. Bottorff, VP., Human Resources, George Ferriter, Engineer, Bob Magee, Archives, and Richard Dudley, East Coast Sales, all of Fairbanks Morse Engine Division, for historic engine data and publications;
6. Jim Glenn of the Koreshan State Historic Site staff, Estero, Florida, and his associate Jim Purcell for significant "hands-on" restoration work, with periodic assistance from Atlanta Section ASME volunteers, including Fred Apple, John Proctor and Bobby Green.
7. U.S. Cleveland, area historian, and descendants of Charles F. Cerny, Master Machinist, for early Useppa photographs and background material;
8. Janet Morris and Autumn Buckner for graphic design and layout of the brochure.

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### HISTORIC MECHANICAL ENGINEERING LANDMARK FAIRBANKS MORSE Y-VA DIESEL ENGINE 1924

THIS 75-HP TYPE Y, STYLE VA ENGINE POWERING ELECTRICAL GENERATING MACHINERY IS AN OUTSTANDING EXAMPLE OF EARLY HIGH COMPRESSION, COLD- START, FULL DIESEL ENGINES (HAVING NO PRE-COMBUSTION CHAMBER) DEVELOPED IN THE U.S. WITHOUT THE ACQUISITION OF ANY FOREIGN PATENT. IT IS A DESCENDANT OF THE FIRST SUCCESSFUL DIESEL ENGINE PRODUCED IN 1897 BY GERMAN MECHANICAL ENGINEER RUDOLF DIESEL.

SIMILAR ENGINES DRIVING DC AND AC GENERATORS PROVIDED ECONOMIC, RELIABLE ELECTRIC POWER IN MANY REMOTE LOCATIONS SUCH AS USEPPA ISLAND DURING OUR NATION'S ELECTRIFICATION IN THE FIRST HALF OF THE 20TH CENTURY.



THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS - 2000