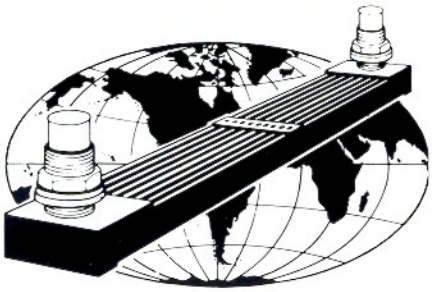
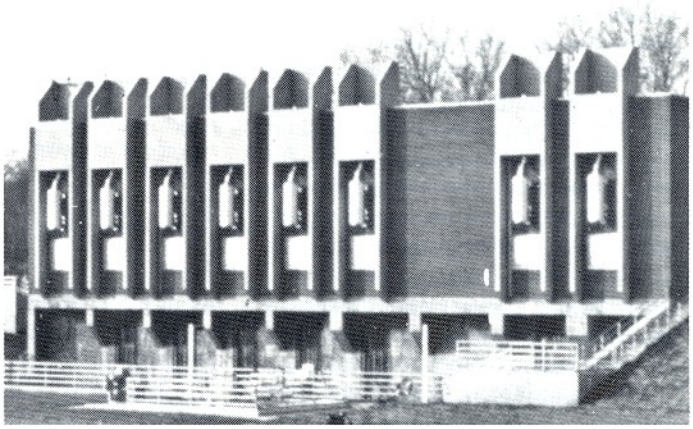
GRIDCOOLERS®
AT WORK ON PUMP STATIONS



FERNSTRUM
ENGINEERED KEEL COOLING

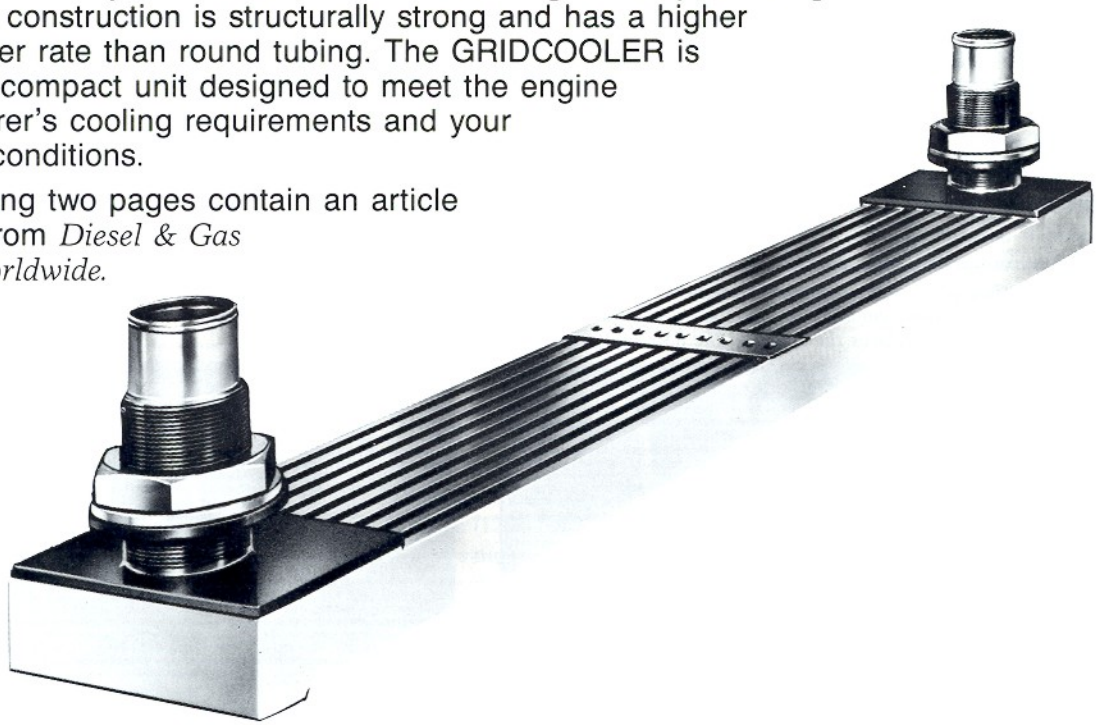
STATIONARY PUMPING STATIONS – Whether it is a sewage treatment plant, lift station, storm sewer system, or any other type of pump station, they all play vital roles in our daily lives. Because of that fact, the equipment used by these stations must be reliable, dependable, and always ready for emergency situations, as well as their everyday workload. Fernstrum GRIDCOOLERS have lived up to expectations like these for over 20 years in the pump station field and over 40 years in the marine industry. If you need a solution to a cooling problem, or want a compact cooling system for your particular application, give us a call. We will ask you a few questions and then design the cooling system that is right for you.



SOUTHPORT WASTEWATER TREATMENT PLANT, INDIANAPOLIS, IN.

The Fernstrum GRIDCOOLER is a unique heat exchanger that comes as a completely assembled unit, silver wire brazed and factory tested to assure dependability. It is not a kit that requires additional assembly before installation. The rectangular shaped tubing used in its construction is structurally strong and has a higher heat transfer rate than round tubing. The GRIDCOOLER is a durable, compact unit designed to meet the engine manufacturer's cooling requirements and your operating conditions.

The following two pages contain an article reprinted from *Diesel & Gas Turbine Worldwide.*



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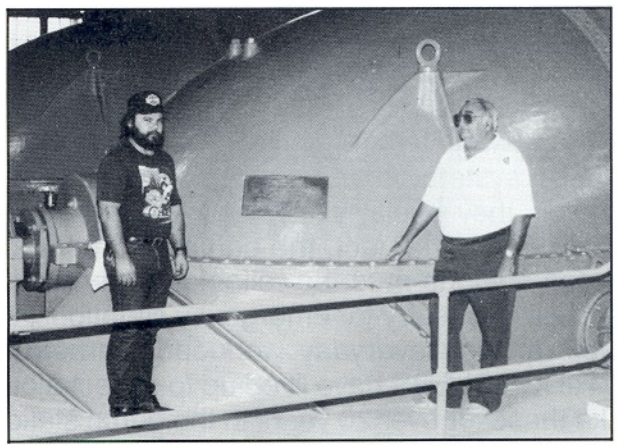
Repowering Uses Excess Pump Capacity In Flood Control Upgrading

Flood control on the lower reaches of the Mississippi River is an on-going saga, especially in the New Orleans (Louisiana, U.S.A.) area, where a large portion is up to 1.5 m below sea level. The area includes Orleans, Jefferson, St. Charles, Plaquemines and St. Bernard Parishes. These areas were once above sea level, but upon the initial lowering of water levels by drainage, the organic soils compressed and shrunk over a long period of time. The various commissions responsible for both flood control and land reclamation are faced with never ending activity of adding to an already comprehensive system of canals, levees and pumping stations and upgrading those presently installed as the increase in population places demands for more land on which to build.

Consequently, the New Orleans area's propensity to flooding is legend, and many an older native are quick to draw attention to Good Friday of 1927 when some 355 mm of rain fell upon the city during a 24-hour period — and the hurricanes that pass through the area each year. The 1927 event was considered a freak until the last ten years, when such heavy rains began occurring about every two years, culminating in the November 7, 1989 rain in which record totals of over 432 mm in 24 hours were recorded for various rain gauge locations. Without the system, only disaster would ensue.



Shown here with the two 4.27 m diameter Wood screw pumps are Randy J. Rivero, station technician, on the left, and Doan D. Modianos, P.E., consultant for Jefferson Parish. Each station is assigned approximately 16 km² for land reclamation and flood control. These pumps are capable of moving a total of 57 m³/s of water.

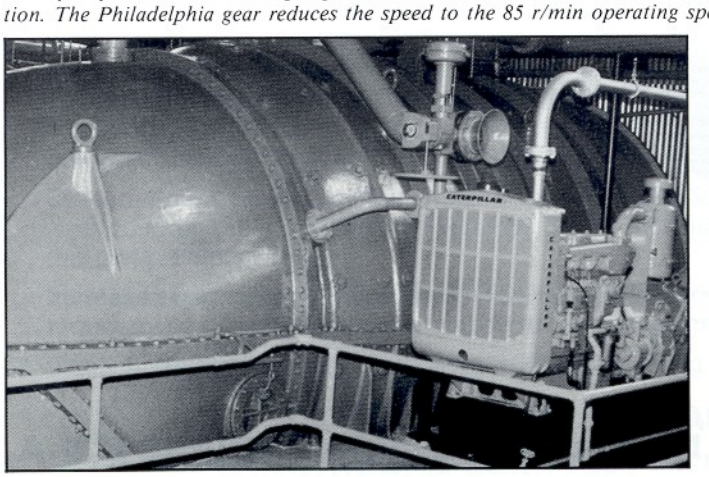
Average annual rainfall is 1524 mm which means the system has plenty to do without recurring abnormal conditions.

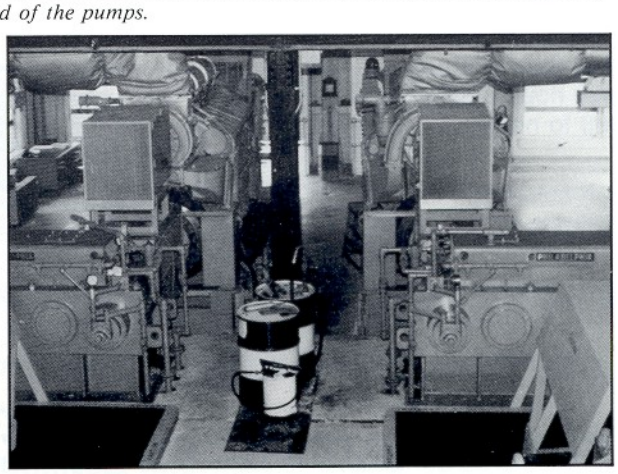
The Hero pumping station, built in 1915 and named after the man who donated the land over which it rests, is perhaps a not-so-typical, yet, the most interesting of the some 20 stations in Jefferson Parish. We had an opportunity to visit the station and discuss its many features with no less an expert than Doan D. Modianos, P.E., the consultant for the parish, a recognized authority in pump design and a specialist in water pumping.

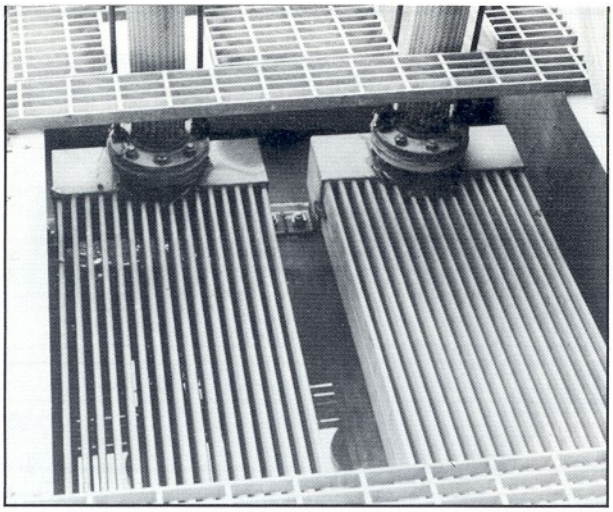
This station, which spans the Bayou Barataria on the west bank of the Mississippi River, pumps against a nominal 3.7 m head at normal tide (when there are no storm disturbances) from the low side to the high side of the bayou which drains eventually into Lake Salvador. Tropical storms can bring heavy rainfall and wind-driven high tides that can increase the station head to as much as 5.2 m. The station recently has undergone a repowering of its two main pumps and has several unique features that set it apart from the others.

First, the two main pumps are called Wood Screw Pumps, the name being derived from their inventor, Albert Baldwin Wood, and the shape of the impellers, which are like a ship's propulsion screw with eight blades. These 4.27 m diameter pumps were originally installed in 1930 and are still in an as-new condition. These

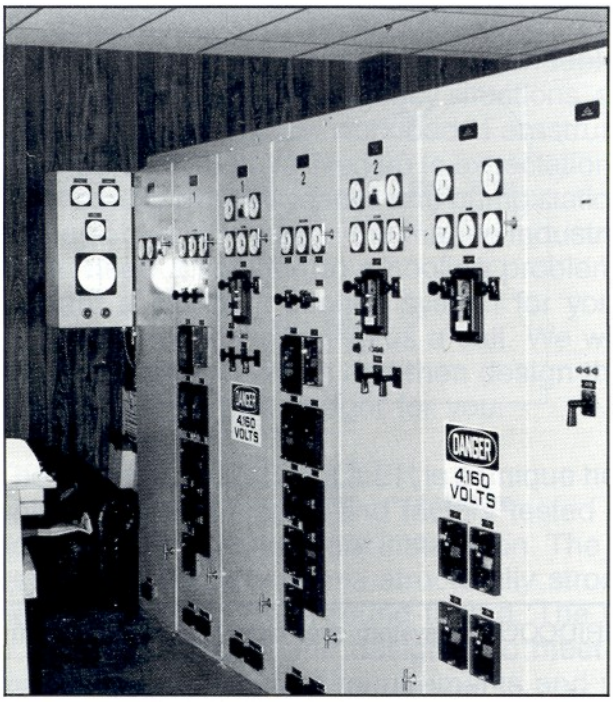
(Left) Shown is the Caterpillar priming pump engine with the Bingham wet displacement vacuum pump. (Right) Looking away from the two Wood screw pumps toward the driving engines and reduction gears. Each 12-cylinder EMD 645 diesel engine is rated 932 kW at 900 r/min in this application. The Philadelphia gear reduces the speed to the 85 r/min operating speed of the pumps.







Fernstrum Gridcooler heat exchangers serve as the cooling system of the engine and gear.



The Point Eight Power control panel for both EMD 16-645-Ideal generator sets which provide 100% backup power for the electric motor driven pumps.

highly efficient and durable machines were designated as engineering landmarks some 15 years ago by the American Society of Mechanical Engineers. Through the years, the pumps were underpowered and, as more head and capacity were required, higher-capacity engines were installed to drive them.

The latest repowering, one of eight or nine phases of upgrading that this station will undergo, was with two EMD, 12-cylinder 645-E4B turbocharged and charge-air cooled diesel engines, of present design, each rated 932 kW (1250 bhp) in this application. The engines are equipped with Ingersoll-Rand air starters. Each engine drives one of the pumps through a Philadelphia reduction gear, reducing the nominal 900 r/min engine speed to the 85 r/min pump speed. Other elements of the drive line, designed by Modianos, are a Kopper's Holset torsionally-flexible coupling between the engine and gear, and a two meter tubular shaft from the gear to the pump drive flange. Each pump moves some 28.3 m^3/s (1000 cfs) of water when operating at present capacity.

Another of the station's unique features is the design of the cooling system for the engine jacket water, turbocharger charge-air and lube oil for both the engine and gear. Coolant is pumped through four 5.18 m x 51 mm (17 ft. x 2 ft.) Gridcooler heat exchangers mounted outside the station in concrete channels about one meter (three feet) above the low-side water level. They were completely assembled and constructed from rectangular shaped copper-nickel tubes connected to copper-nickel headers with silver brazed joints. The tubes have a smooth external surface and a wall thickness of 1.57 mm. The coolers were produced by R.W. Fernstrum & Company of Menominee, Michigan, U.S.A., and supplied through Oarline Marine Sales of Mandeville, Louisiana.

During operation, cooling water is siphoned from the high side of the bayou and directed through the channels to flow over the grid coolers at approximately 0.46 m/sec (1.5 ft./sec) to the low side. To move this amount of water back to the high side absorbs from two to four kW, compared to the 19 to 22 kW for a fan-powered cooling system of equivalent capacity.

The station is manned 24 h/day and water level is monitored every half hour and transmitted to a central office for evaluation. Estimates are made of rain volume during a storm, as well. At a specific level, when pumping is required, the station is manually started. First, the siphon is turned on for the cooling system. Then the pump engines are started along with a Caterpillar priming pump drive engine. The Bingham wet displacement type priming pump draws a vacuum on the main pump casings, drawing water from the low side of the bayou up through the impellers for prime. Once the main pumps are primed and water is flowing, the priming pump is shut down. The main pumps continue to operate until the water level on the low side of the bayou stabilizes at a specified level. The start-up procedure, up to when water starts to flow, takes approximately 15 minutes.

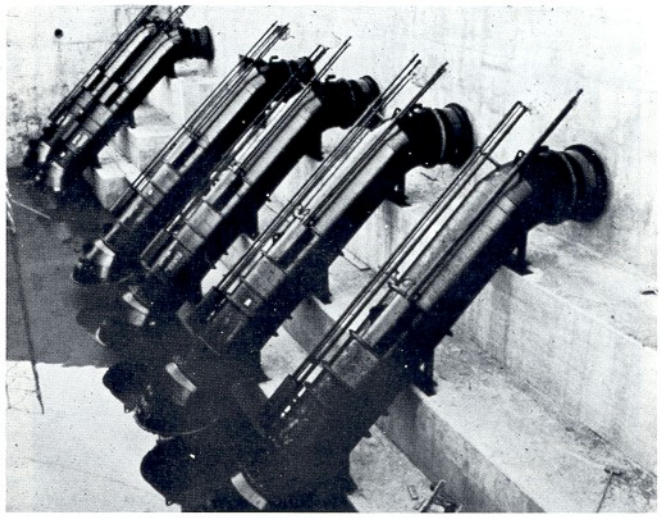
Two 16-cylinder EMD 645 diesel engines each drive 900 r/min, 60 Hz, 2040 kW Ideal generators rated at 4160 V. These generator sets serve eight electric motor driven pumps totalling 57 m^3/s (2000 cfs) in capacity with 100% backup.

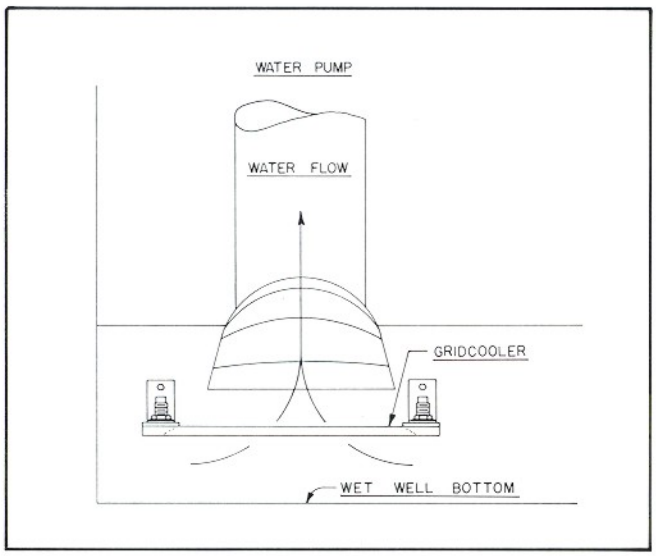
Control for the backup system was supplied by Point Eight Power, Inc. of Belle Chase, Louisiana. It provides load transfer from utility lines to the generator bus, startup and synchronization of the two generator sets, breaker and protective relaying and load acceptance. The control panels are fully insulated for 4160 V.

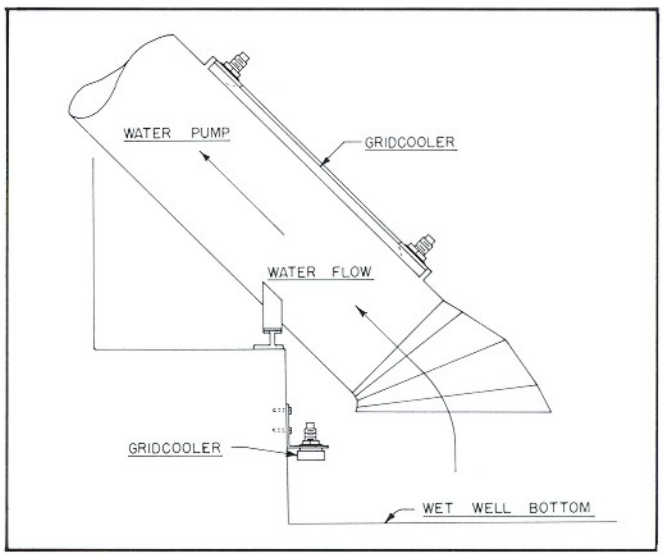
The Hero pumping station is under the management of the Drainage Pump Station Division of the Department of Public Works, Jefferson Parish. Mr. Ross W. Ketchum, director of the division, was particularly responsible for the unique cooler design. The installation was in service for the November 7, 1989 record rain, and performed admirably. The consulting engineering firm for this project is Barnard & Thomas Engineering, Inc., Gretna, Louisiana. ★

TYPICAL INSTALLATIONS OF THE GRIDCOOLER IN PUMP STATION APPLICATIONS

In pump station applications, the Fernstrum GRIDCOOLER gives you the choice of being able to mount the units in one of several locations. They can be mounted in the sump or inside of the flow chamber itself. (See following diagrams.) A variety of different connections can be used to meet your needs (i.e. flanges, hose connectors or tapered pipe thread). Such flexibility often allows for simplified piping schemes to and from the GRIDCOOLER.







There are numerous advantages in choosing the Fernstrum GRIDCOOLER system over other methods of engine cooling. These include:

Ease of installation – Just use the nuts, washers, and gaskets supplied with the cooler to attach it securely to your mounting brackets. If our standard units present an installation problem, we can design a special unit to accommodate your application. There are many installation savings effected with the use of the Fernstrum GRIDCOOLER. For example, the tube and bundle or plate type heat exchanger, auxiliary pump, strainers, and centrifuge are eliminated.

Compact design – The highly efficient rectangular tube makes the unit very compact. This allows the unit to be mounted within the flow chamber without restricting the water flow to the pump. The Gridcooler can also be easily recessed into the wall of the flow chamber.

Lower maintenance cost – Once installed, the Gridcooler eliminates the problems of plugged strainers and the need to disassemble the heat exchanger assembly for cleaning. The design of the Gridcooler is such that it is unlikely for debris to become attached to the unit. It is always free of foreign matter as the motion of the raw water keeps it flushed clean, thereby giving continuous service without interruption.

Closed circuit cooling system – The closed circuit allows for the use of a glycol solution and eliminates the need to drain the system in cold weather. There is no need to worry about priming the system before starting the pump engine.

Increased engine life – Fernstrum GRIDCOOLERS are designed to meet the engine manufacturer's exact cooling requirements. This enables the engine to operate at the optimum temperatures, increasing engine life.

All of these factors make the Fernstrum GRIDCOOLER a very cost effective method of pump engine cooling.

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