

SIMSITE® Structural Composite Pumps

A new technology for Ship Engine Room Pumps

Introduction

The Staten Island Ferry is one of the New York City famous landmarks, which connects Staten Island with Manhattan.

The Ferry consists of (8) eight vessels and is operated by NY DOT (New York Department of Transportation). All together these Vessels carry over 19 million passengers per year!

The salty waters of the Hudson River take a toll on metallic pumping equipment, and pump corrosion & erosion are one of the main concerns of the Ferry operators.



Figure 1. Staten Island Ferry.

Two of the vessels, the [MV Andrew J. Barberi](#) and the [MV Samuel I. Newhouse](#), known as the “*Barberi class*,” were built 1981 and 1982 respectively. Each boat carries 6,000 passengers and no cars. The general service pumps on these vessels were upgraded from Metallic Pumps, which were having severe corrosion and maintenance problems to **SIMSITE®** Structural Engineered Composite Pumps, which will **never corrode** in Sea Water!



Figure 2. A new SIMSITE® Structural Composite Vertical In-Line Pump for the Staten Island Ferry.

The Engineering Department of the Staten Island Ferry concluded that the most efficient way to deal with the corrosion/erosion problems and the constant maintenance expenses of the Ferries Raw Water General Service Pumps was to replace the metallic Pumps with **SIMSITE®** Structural Composite Pumps.

SIMSITE® Structural Composite Pumps are built out of a structural graphite composite, which **NEVER Corrodes** in Sea Water, hence completely eliminating any future corrosion problems.

Engineers at the SIMS Pump Company were tasked to design Structural Composite General Service Pumps to replace the existing Vertical Double Suction Bronze Pumps. The required guidelines were to keep the overall sizes close to the original, minimize any piping modifications and maintain, or exceed, the pump performance and efficiency. The new SIMSITE® pumps had to fit into the same confined space with the minimal piping modifications.

Configuration of the SIMSITE® Structural Composite General Service Pumps

While evaluating the existing pump and system configuration, SIMS engineers realized that the location of the General Service Pumps, almost (6) six feet under the ship water line, offered a significant Net Positive Suction Head available (NPSHa) for the pump. With enough Net Positive Suction Head Available (NPSHa) the SIMSITE® Pump could be designed and manufactured as a Single-Suction Pump vs the original metallic pump, which was designed as a Double-Suction Pump. Significant space and weight savings could be realized by changing the Pump design from a Double Suction to a Single Suction Close Coupled Configuration.

The Table below compares the number of pump components in the two concurrent designs. Having less than half of the components, the Simsite® Single-Suction Design promised a much higher reliability rate with less downtime, a better life-cycle and less than half the cost of spares. Additionally, the Single-Suction Design led to an Impeller design with Specific Speed, which is 1.4 times higher than the Specific Speed of the Double-Suction Impeller working at the same Operating Point. In our case, the Specific Speed of the Double-Suction Impeller was 981 and the corresponding Specific Speed of the Simsite® Single-Suction Impeller is (1.4×981) or 1378. It is a known fact that a Centrifugal Impeller of higher Specific Speed will provide higher efficiency than an Impeller of lower Specific Speed. The Pump efficiency gain will save the ship's fuel consumption, and bring the hydraulic noise down adding more comfort to the passengers of the ship.

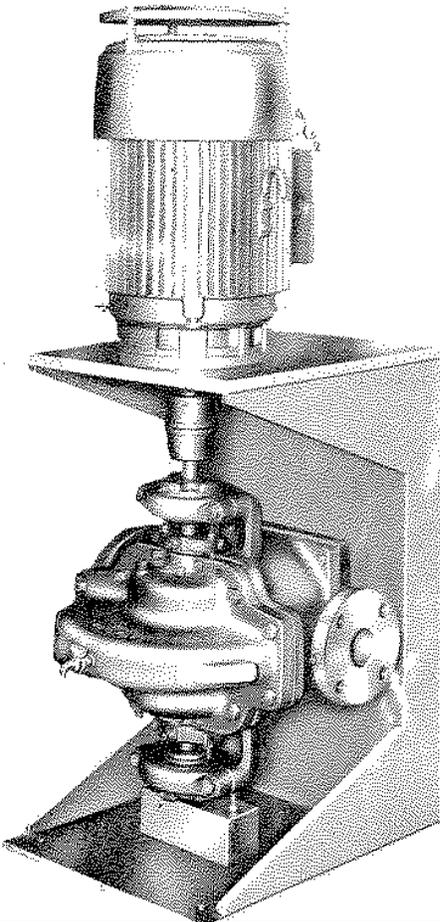


Figure 3. The old design of the Metallic Double-Suction Pump

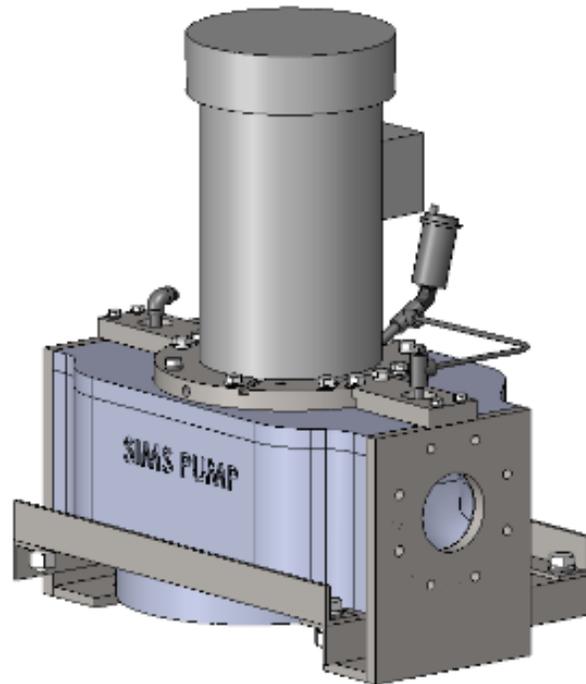


Figure 4. A 3-D Model of the SIMSITE® Single-Suction Pump

Item	Number of Parts		Comments
	Metallic Double Suction Pump	SIMSITE® Composite Single Suction Pump	
Pump Shaft	1	0	Composite Pump, Close Coupled Single Suction, vs. Metallic Pump, Direct Coupled Double Suction.
Shaft Sleeves	2	1	
Seals	2	1	
Pump Bearings	2	0	
Motor Bearings	2	2	
Coupling	1	0	
Specific Speed	981	1387	
Pump Efficiency, (theoretical)	69%	76%	
Motor Current, Amps (Actual)	21	16	
Energy Savings		14%	



Figure 5. The old design Metallic Double-Suction Pump which is subject to corrosion

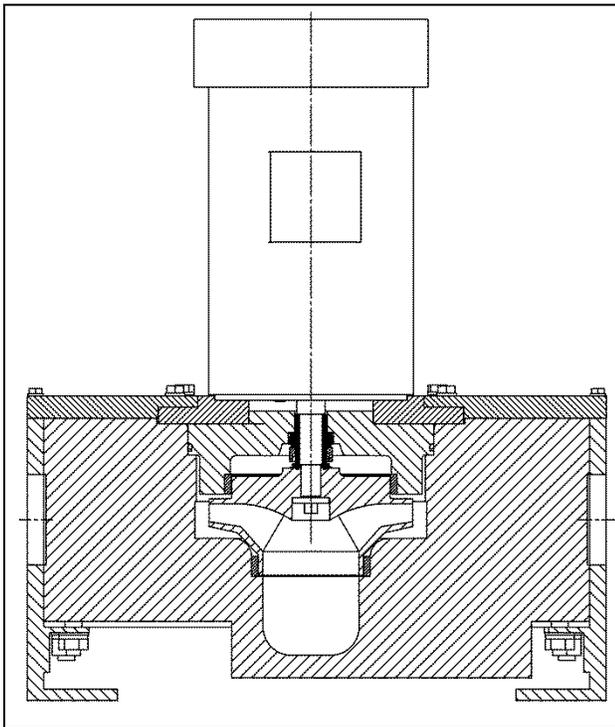


Figure 6. The new design of a SIMSITE® Single-Suction Pump which Never Corrodes in Sea Water!

Design of the SIMSITE® Structural Composite Pump

The drawing below shows a schematic of the **SIMSITE®** Structural Composite Pump. All of the “wet end” parts are made out of **SIMSITE®** Structural Composite material therefore they are corrosion & erosion resistant to salt water for the **life of the pump**. The In-line design allows for in-between pipe flange installation. The SIMSITE® Pump weights less than 60% of the metallic counterpart, which is a **saving of 210 Lbs per pump!**

Conclusion



The **SIMSITE®** Structural Composite Pump is a new and proven technology, which is breaking into the old world of metallic Engine Room Pumps offering the Customer a much better solution with lower operating and maintenance costs!

SIMSITE® Structural Composite Pumps completely eliminate corrosion problems, which are inherent to metallic pumps! **SIMSITE®** pumps are light weight, energy efficient, and last much longer than metallic pumps with little, or no, maintenance costs! All **SIMSITE®** Pumps are completely machined as opposed to being cast or molded, eliminating balance problems, casting defects and porosity problems inherent in metallic pumps!

In the case of the Staten Island Ferries, the analysis of the pump system by SIMS engineers, presented an opportunity to utilize a Single-Suction Pump design versus the original Double-Suction Design of the metallic pumps. The

upgrade to a Single Suction Design with a **SIMSITE® Pump** led to a more efficient, lighter and more reliable pump!

The **SIMSITE®** Structural Composite Pump also had the additional benefit of reducing the noise level to an audible level.

The old Double-Suction Metallic Pump design cost the Customer higher running costs (as a result of lower efficiencies, corrosion, and erosion) and much higher maintenance and operating costs (as a result of the effects of Corrosion, Cavitation, Erosion and the additional number of spare parts required for a metallic double-suction designed pump).

Upgrading the old metallic general service double-suction pumps to **SIMSITE®** Structural Composite Single-Suction Pumps which will never corrode in sea water was an excellent solution for the Staten Island Ferries!