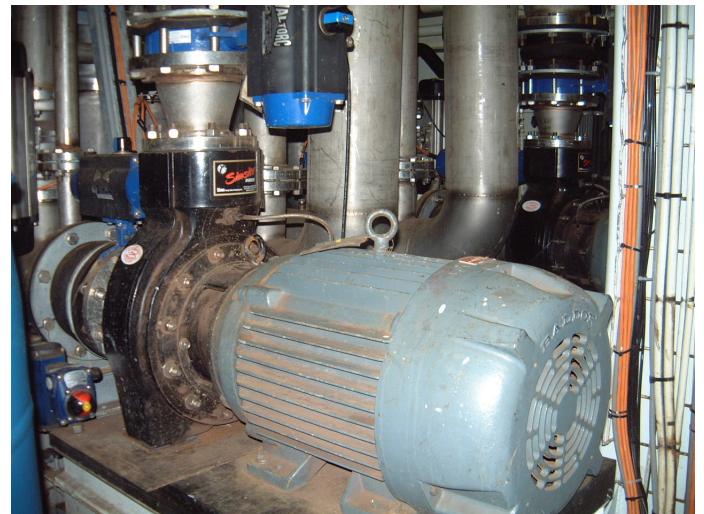
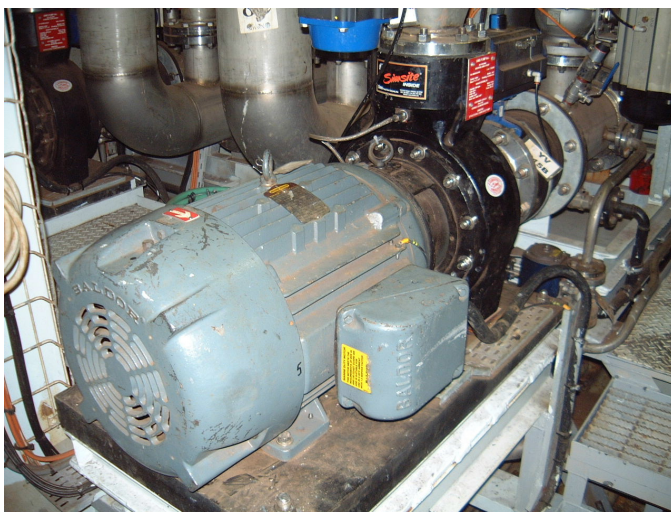


Structural Composite Pumps Solve Corrosion Problems for Wastewater Purification Systems

SIMSITE® Structural Composite Pumps Installed on Advanced Water Purification (AWP) Systems for Royal Caribbean Cruise Lines (RCCL)

These **SIMSITE®** structural composite pumps were specifically designed and engineered for the environmentally friendly, “green,” advanced wastewater purification (AWP) systems built by NAVALIS Systems and installed on Royal Caribbean cruise ships. A total of 12 (twelve) pumps per vessel were designed and manufactured for this system from **SIMSITE®**, a patented, high strength, structural composite. These pumps were manufactured from **SIMSITE®** grade SMS-300, a continuously interwoven structural graphite fiber composite with a hybrid phenolic resin system.



SIMSITE® pumps are not cast, or molded, like metallic pumps or non-structural composite pumps; rather, they are completely machined from solid blocks of the structural composite which makes them much stronger more reliable and more efficient.

This new AWP system was outfitted with the following pump sizes: 6 x 4 x 10 horizontal close coupled pumps with a 30Hp motors, 3 x 2 x 10 horizontal close coupled pumps with a 5Hp motor, and 6 x 4 x 10 Vertical Pit Pumps with a 25Hp motor. These pumps were designed using state-of-the-art machined impellers, which were designed using computational fluid dynamics (CFD) systems to maximize performance, efficiency and reliability.

The customer specified the use of **SIMSITE®** Structural Graphite Composite Pumps for this application, because of their long life, superior durability and corrosion resistance in salt water and waste water applications. RCCL has been using **SIMSITE®** Impellers, Casing Rings, Sleeves and Guide Bearings as upgrades for their centrifugal pumps for more than 30 years.

SIMSITE® structural composite pumps are far superior to metallic pumps in these services, because they will not corrode in waste water or salt water applications. This longevity reduces the maintenance required on the wastewater system, saving thousands of dollars. Other advantages of **SIMSITE®**



Structural Composite pumps are their light weight, low noise, corrosion & cavitation resistance and high efficiencies. These pumps will not corrode at all in salt water or waste water!

SIMS also designed special vertical structural composite pit pumps for the very large waste water holding tanks located on the cruise vessels. Two (2) pumps for this system were designed to meet a performance requirement of 220 GPM at 66 FT at 1750 RPM with a 10HP motor. The other vertical pit pumps were designed to meet a performance requirement of 440 GPM at 66 FT at 1750 RPM with 25 HP motors. These composite vertical pumps included a specially designed base plate (DNV approved) that would prevent any possibility of leakage from the tanks should the cruise vessel roll. Additionally, these pumps were outfitted with special vapor barrier seals to prevent methane gas from seeping into the bilge area.

Many of the cruise ships that are currently in service are in the process of having their waste water systems upgraded to make their cruise vessels “green.” These advanced waste water process (AWP) systems can be installed while in port or, in some case, while in service. Once completed, these systems will exceed all international ship wastewater discharge standards making them the first “green” cruise vessels.