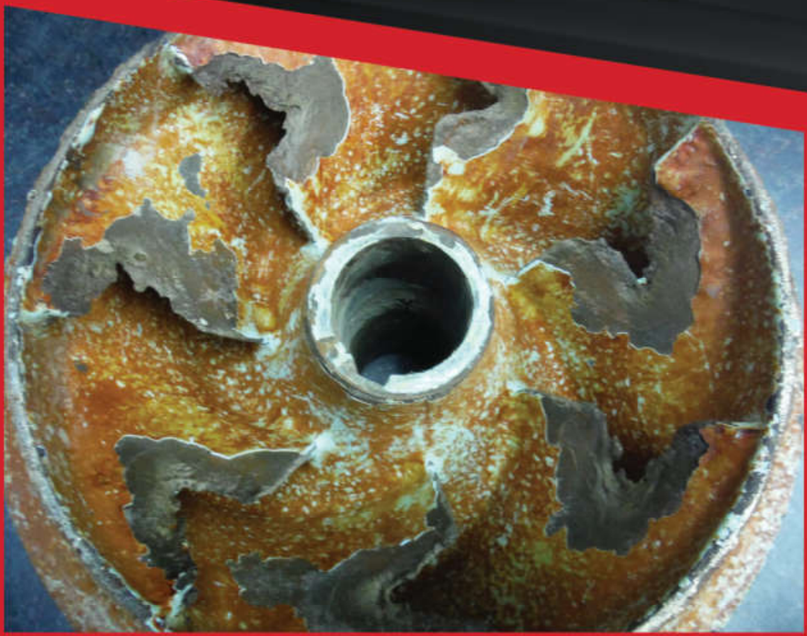
Stop Making Your Pumps an Annuity for Repair Companies & Shipyards



SIMS PUMP VALVE COMPANY • SINCE 1919

Stop Making **Your Pumps** an **Annuity** for Repair Companies & Shipyards

It is all too common of a problem–you send your pumps out for repair only to find that that they will need to be overhauled again in the very near future! This problem can be permanently eliminated with the installation of SIMSITE® Pumps and/or SIMSITE® Impellers & Casing Rings!

Money is always tight, and it is tempting to purchase cheap metallic products, but you must force yourself to **stop this practice! This practice of purchasing cheap metallic products is actually costing you ten (10) to fifteen (15) times more!**

To correctly calculate the **Return on Investment (ROI)** for any centrifugal pump when upgrading to **SIMSITE® Pumps, Impellers, & Casing Rings**, and to **Stop Making Your Pumps an Annuity for Repair Companies and Shipyards,** we must first fully explore the main causes of pump failure.

SIMSITE® Structural Composite Pumps NEVER CORRODE in Seawater, Wastewater, Sewage, River Water, Chlorinated Water and are Excellent with most chemicals.

SIMSITE® Impellers & Rings are Energy Efficient, Light Weight, Perfectly Balanced (and remain perfectly balanced for the life of the pump), DO NOT CORRODE, and DO NOT Support Electrolysis!

MAIN CAUSES OF PUMP FAILURE:

Corrosion Resistance.

Inefficiency, pump overhauls, pump repairs, and the mean time between failures are all substantially influenced by corrosion, erosion and cavitation when pumping corrosive fluids. Especially in sea water, sewage and waste water, corrosion is the number one cause of pump failure.

Damage from Corrosion, Electrolysis, Erosion, and Cavitation quickly destroys the Metallic Pump, Impeller & Rings and Pump Parts, which drives up costs and expenses.

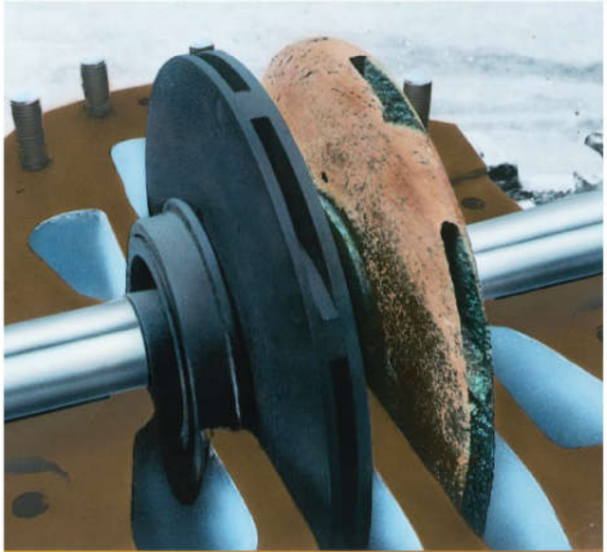
(a) Uniform Corrosion. **–** Corrosion that occurs uniformly over the piece and results in rust and metal loss over the entire metallic surface.

(b) Electrolysis or Galvanic Corrosion. **–** Corrosion that occurs as a result of two or more dissimilar metals that are electrically coupled together by the same medium (fluid). When a galvanic couple forms, one of the metals in the couple becomes the anode and corrodes faster than it would all by itself, while the other becomes the cathode and corrodes slower than it would alone. The metal with the lower nobility becomes sacrificial.

(c) Crevice Corrosion.–Crevice corrosion is a form of localized corrosion that occurs in crevices where the surface environment differs from the surrounding surface area. The different surfaces result in corrosion because of differences in concentration of oxygen, pH, and ferric ions. If there is an oxygen concentration difference, corrosion will accelerate at crevices where there is less oxygen than in the environment surrounding the crevice. Crevices are formed when two surfaces are in close proximity to one another, such as when two metal surfaces are against one another, even when a gasket is against the surface.

(d) Pitting corrosion.–Pitting Corrosion is a localized form of corrosion which causes "cavities" or "holes" to be produced in the material. Pitting is considered to be more dangerous than uniform corrosion damage, because it is more difficult to detect, predict and protect against. Pitting is caused by the following:

1. Localized chemical, or mechanical damage to the protective oxide film caused by low dissolved oxygen concentrations which breakdown the oxide, and/or high concentrations of chloride as in seawater.
2. Localized damage to the metallic product, or **poor applications of protective coatings.**
3. The presence of non-uniformities in the metal structure of the component.



This two stage pump ran for two years in sea water service. The SIMSITE® Structural Composite Impeller is "like new," whereas the coated bronze impeller has to be replaced.

(e) Cavitation corrosion.–The metal loss caused by the formation and collapse of vapor bubbles in a liquid near a metal surface. Cavitation occurs when a fluid's operational pressure drops below the vapor pressure of the liquid it is pumping causing gas pockets and bubbles to form and collapse. This form of corrosion will eat out the volutes and impellers blades of centrifugal pumps in a very short period of time. **Coatings are rendered useless against this form of corrosion.**

(f) Erosion-corrosion.–The accelerated metal loss from an initial corrosion mechanism associated with high-velocity flows and abrasion. Erosion-corrosion is caused by the relative movement between a corrosive fluid and a metal surface. This process leads to the formation of grooves, gullies, valleys, rounded ridges, wavy surfaces, holes, etc., and exhibits a directional flow pattern. (Comet tails, horseshoe marks, etc.)

In two-phase liquids (containing suspended solid particles, solids, or gas bubbles), the impact of the particles damages, or even eliminates the protective layers, passive films, or protective coatings causing the local corrosion rate to be markedly accelerated. This phenomenon is called abrasion-corrosion.

(g) Dealloying. — Dealloying is an electrochemical reaction in which one element constituting an alloy is selectively separated and removed from the alloy, causing deterioration of its essential properties. Dealloying is an unusual type of corrosion, occurring mainly in certain alloy metals such as copper alloys as well as in gray cast iron. When the dealloying takes place, the alloy metal loses its reactive element and retains the remaining alloy in a porous state.

For example, for a brass alloy, the reactive component, zinc, becomes the anode and is selectively removed due to galvanic corrosion, while copper remains in a spongy, porous surface. This process is called Dezincification. — The selective dissolution of zinc from brass alloys. It is recognized by a color change (e.g., from its original yellow brass color to a distinctly red, coppery appearance). The properties, such as mechanical strength, of the remaining material are significantly reduced and can fail during normal operation.

In the case of cast iron, the main constituents are iron and graphite, and graphite becomes the anode to be removed by galvanic action. This process is called Degraphitization — the selective dissolution of iron from cast iron, usually gray cast irons. It normally proceeds uniformly inward from the surface, leaving a porous matrix alloy that is composed mostly of carbon. Degraphitization can be recognized by a change from an original silver-gray color to a dark gray. The affected metal can be easily cut or pierced.

ROI STUDY:
Main Seawater Cooling Pump:

Design Performance:
Capacity = 600 M3/H; Head = 19 M; RPM = 1775

Operating Performance:
Capacity = 260 M3/H; Head = 6 M; RPM = 908

Motor: 50 HP with VFD System

What the Pump Company has done in this case is to take advantage of the Customer by shifting the sacrificial parts from the Impeller & Casing Ring to the Casing Ring & Pump Casing by changing the impeller material to stainless steel and the pump casing material to Nickel Aluminum Bronze PumpCasing while keeping the Wear Ring as Bronze. This is an Electrolysis Corrosion recipe that only benefits the Pump Manufacturer and hurts the Customer.

Metallic Impellers & Rings like the Impeller above are subject to Corrosion, Erosion, Electrolysis, and Cavitation, which is NOT the case with SIMSITE® Impellers & Rings!

The pump parts will fail as follows:

1. **The Bronze Wear Ring will fail first** since it is only bronze and has a lower nobility than the Nickel Aluminum Bronze Pump Casing and the Stainless Steel Impeller.

    (a) This will cause premature failure of the rings, bearings and the mechanical seals!

    (b) This will allow "pump washout" to occur where the rings sit in the pump casing causing extensive repair expenses!

    (c) Since the Stainless Steel Impeller is heavier than a Bronze Impeller, any hydraulic or mechanical imperfections or unbalances will cause an increase in vibration and shaft deflection.

2. **The Nickel Aluminum Bronze Casing** will start to corrode next because the nobility of Nickel Aluminum Bronze is less than that of the Stainless Steel Impeller and Shaft.

    (a) Since the Pump Casing is the most expensive part of the pump, these casing repairs will cause additional extensive repair expenses

All of the Above Issues and Problems can easily be Eliminated by replacing the Stainless Steel Impellers and Bronze Casing Rings with SIMSITE® Structural Composite Impellers and Casing rings which are INERT and WILL NOT CORRODE in Seawater and WILL NOT support Electrolysis!

SIMSITE® Structural Composite Horizontal Double Suction Pump which is more Energy Efficient and is NOT subject to Electrolysis, Corrosion, or Cavitation Problems!

SIMSITE® Impellers & Rings are Inert and NOT subject to Electrolysis or Corrosion. They are 100% machined on the Inside as well as the outside.

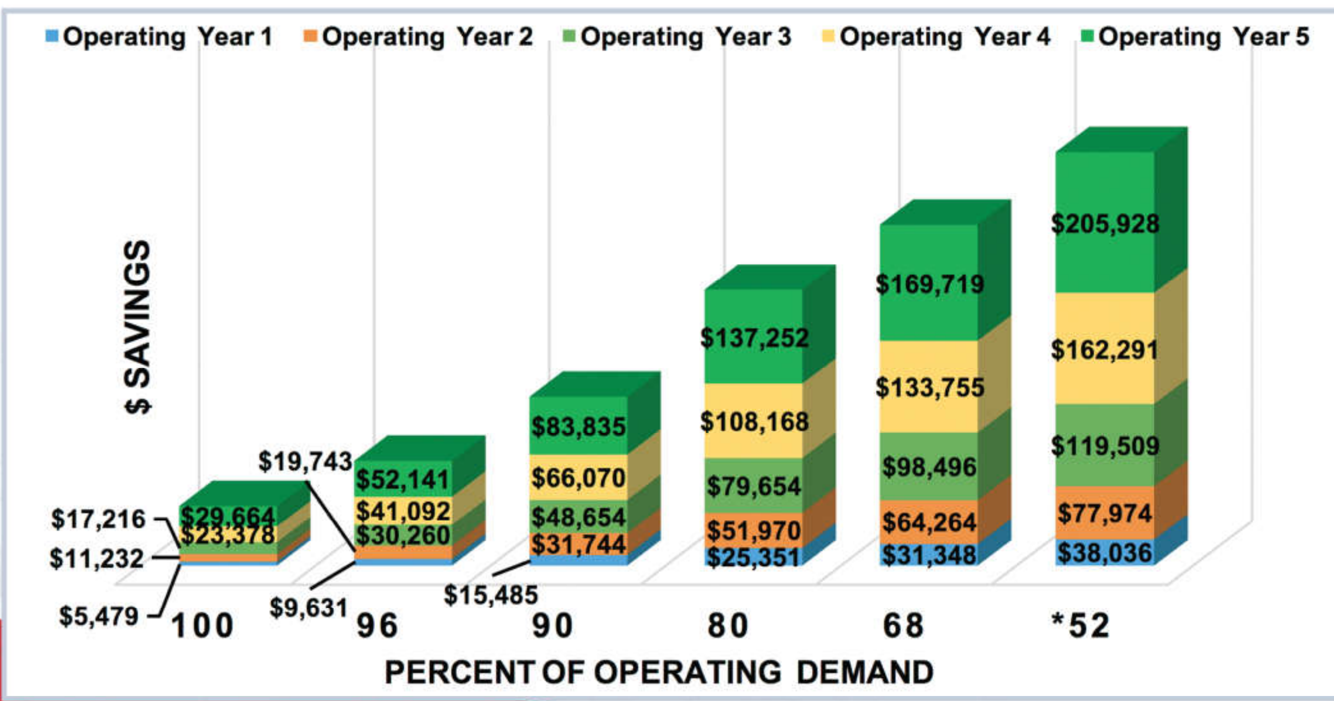
Analysis of Savings As a Result of Increasing Efficiency with the installation of **SIMSITE®** Impellers & Casing Rings with a VFD system:

ENERGY SAVINGS – VFD WITH SIMSITE® IMPELLERS & RINGS

* = Actual Operating Point

Oper Dem	VFD Eff	Eff w/ Mtal 1 yr	Eff w/ Mtal 2 yr	Eff w/ SIM ®	Eff w/ SIM & Vfd	BHP w/ Vfd & SIM	kW Sav	Cap m3/h	Hd M	RPM	Sav/yr1 w/ SIM® & Vfd	Sav/yr2 w/ SIM® & Vfd
100	98	75	70	85	83.3	50.9	5.3	600	19	1750	$5,479	$5,753
96	97	75	70	85	82.5	45.5	9.3	576	18	1680	$9,631	$10,112
90	96	75	69	85	81.6	37.9	15.0	540	15	1575	$15,485	$16,259
80	94	75	68	85	79.9	25.0	24.6	480	11	1400	$25,351	$26,619
68	91	75	67	85	77.4	17.2	30.4	408	9	1190	$31,348	$32,916
*52	80	70	65	85	68.0	8.5	36.9	260	6	908	$38,036	$39,938

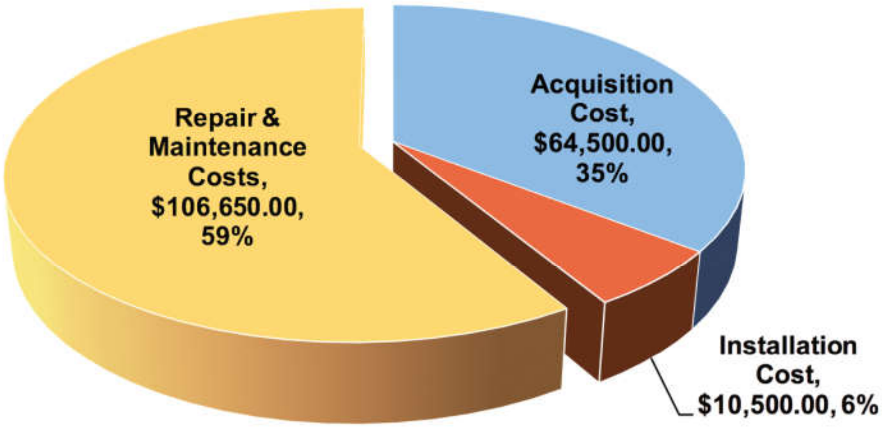
$ ENERGY SAVINGS USING SIMSITE® IMPELLERS & RINGS AND VFD



ESTIMATED OPERATING AND MAINTENANCE COSTS WITH THE STAINLESS STEEL IMPELLER AND BRONZE CASING RINGS:

Cost of Pump	$64,500
Est. Life of Bronze Casing Rings	6 - 8 months
Est. Life of Ball Bearings under these conditions	6 - 8 months
Est. Life of Mechanical Seal under these conditions	6 - 8 months
Est. Cost to Overhaul pump with new Rings, Bearings, Seals, & Gaskets	$12,500/yr
Est. Life of Stainless Steel Impeller	3 years
Est. Cost of Stainless Steel Impeller 11.26 x 5.00-S	$ 8,500
Period that the Pump Casing will need repair	3 years
Est. Cost to Overhaul Pump Casing	$18,000
Total Expenses for Repair & Maintenance over a 5 year period with Stainless Steel Impeller and bronze Casing Rings	$106,650

LIFE CYCLE EXPENSES FOR MAIN ENGINE SALT WATER COOLING PUMP / 5 YEARS WITH A STAINLESS STEEL IMPELLER



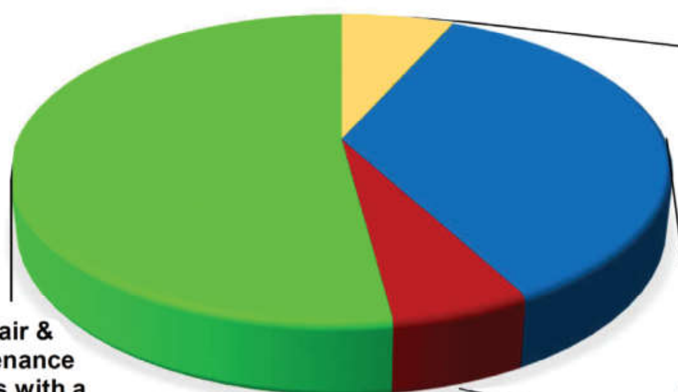
Sims

Since 1919

ESTIMATED COSTS WITH A SIMSITE® IMPELLER & CASING RINGS:

Cost of Pump	$64,500
Est. Life of SIMSITE® Casing Rings	4 Years
Est. Life of Ball Bearings under these conditions	4 Years
Est. Life of Mechanical Seal under these conditions	4 Years
Est. Cost to Overhaul pump with new Rings, Bearings, Seals, & Gaskets	$2,250/yr
Est. Life of a SIMSITE® Impeller	15 years
Est. Cost of a SIMSITE® Impeller 11.26 x 5.00-S	$5,000
Est. Period that the Pump Casing will need repair	10 years
Est. Cost to Overhaul Pump Casing	$12,000
Estimated Expenses for Repair & Maintenance over a 5 year period with a SIMSITE® Impeller and SIMSITE® Casing Rings	$12,055
Estimated Repair & Maintenance Savings using a SIMSITE® Impeller & Casing Rings over a 5 year period: (Not Including Energy Savings)	$94,595!

LIFE CYCLE EXPENSES FOR ME SW COOLING PUMP C2G-250 / 5 YEARS WITH A SIMSITE® IMPELLER



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