

Technical Articles

Fun with Generator Raw Water Pumps

Martin Basch (Molly Blossom)

(ed. This is a reprint of an article from five years ago in this newsletter. The topic of Northern Lights generator raw water pumps still shows up on various forums. Martin sent a five-year update, which follows the original article.)

Are you tired of finding salt water spewed all over your generator due to a failed saltwater pump seal? Are you tired of finding tiny pieces of broken impellers in your heat exchanger—all this action having taken place well hidden behind that wonderful sound shield? There's a solution: replace your Northern Lights generator raw water pump with an air conditioner pump!

After finding yet another leaking seal, I began looking for solutions. The Krogen List contributors report 250 to 500 hours between failed seals. The usual solution is to buy a new Northern Lights pump costing \$250 or having the existing pump rebuilt professionally for a little less. (A press is needed to replace the seals, so it's not easy to do yourself.) The Krogen List contributors also show that some people have had success using external air conditioning pumps. I decided to look into that solution. The 115-volt air conditioning pump runs directly off generator power. It starts only when the generator is producing 115 volts. If you have trouble starting the generator you don't have to worry about excess water getting into the water-lift muffler and then into the cylinders, as there is no saltwater feed until the generator is actually running.

Before choosing a pump, I first had to determine the water flow specifications for my 8 kW generator. The Northern Lights instruction book shows a specification of 9 gallons per minute. This seemed like a lot of water so I checked it by placing a 2-gallon bucket under the exhaust at the swim platform. The fill rate was 9 gallons per minute, confirming the published specification.

There are two common air conditioning pumps available: the CAL pump and the March pump. The CAL pump is cooled with oil inside a stainless steel case. It is the least expensive pump, but one Krogen

owner reported that his CAL blew up throwing oil all over his generator. That pump also has a seal to keep water out of the pump. Explosions and seal failures were problems I'd rather avoid.

I chose the March pump model LC-3CP-MD. The March pump is magnetically coupled from the motor to the pump and therefore has no seal. My experience with the March pump for our boat's air conditioning system has been good as it has not been replaced since the boat was new in 1993 and I have not had to maintain the pump since we bought the boat in 1999. It is important to note that we use wedge-shaped flat intake strainers outside on all our saltwater intake thru-hulls. The bronze screen is 10 inches by 4 1/2 inches with very small holes. With these flat exterior strainers we've never had to clean the interior sea strainers. They prevent Chesapeake jellyfish from stopping water flow outside or glopping up the interior sea strainers. This external strainer should prevent the need to inspect the internal strainer before starting the generator. The March pump has less suction capability than the Northern Lights pump so this is important. [Anchor Bay East](#), Dundalk, MD, (410-284-1044) has a good exterior strainer selection and prices.

The specifications for the [March pump model LC-3CP-MD](#) showed that it would pump about the right amount of water. After installing the pump in the engine room I measured the flow rate before connecting it to the generator, as I was worried about the long run from the saltwater intake on the port side of the generator to the pump that I put on the starboard side. (The pump output hose goes into the generator box on the starboard side.) The flow rate was 9.5 gallons per minute with the maximum head (top of generator). I put an anti-siphon loop at the pump output because the generator exhaust elbow is so low in the hull (see Figure 1). After I installed the pump on the generator I again measured the exhaust flow into a bucket. It was 8 gallons per minute. I measured the heat exchanger temperature with an infrared temperature probe. It measured 171°F after 20 minutes with a 40 amp AC load. I then measured the differential temperature between intake salt water and the exhaust elbow. The difference measured 21°. In the March 2007 issue of *PassageMaker*

Magazine, Steve D'Antonio recommends a 20° differential. Although the water flow is slightly less than with the Northern Lights raw water pump the differential temperature is good.

All the hose used is 3/4 inch for both input and output - the size used by the Northern Lights pump. I mounted the March pump on a King Starboard® base screwed to the aft engine room bulkhead. The pump is fused for 10 amps but draws only 2 amps. When the generator is turned on water starts coming out the exhaust pipe, stops for a couple of seconds, and then resumes after the pump starts.



Figure 1 - March pump with anti-siphon loop and connection to generator

It was necessary to remove the Northern Lights saltwater pump to prevent its running dry and destroying its seals. After removing it, I put a plate over the hole to prevent oil from leaking out (see Figure 2). The plate along with a gasket is available from Northern Lights. A Northern Lights representative said that it's OK to use a gasket or the original O-ring to seal the plate.

I sent my old Northern Lights pump to [DEPCO](#) to be rebuilt as a backup and asked them to replace the ceramic seal with a lip seal. (Ceramic seals are more expensive.) The cost for this was \$148 including shipping. (DEPCO, 2145 Calumet St., Clearwater, FL 33765, phone: 800-445-1656).

Steve Bruckner (Duchess), installed the March pump but left the original hoses intact and put in separate hoses for the March pump. That way he has an easy backup with the Northern Lights pump. He had mechanic [Bruce Melius](#) (954-565-9143) do the installation in Fort Lauderdale and was very pleased with his work.

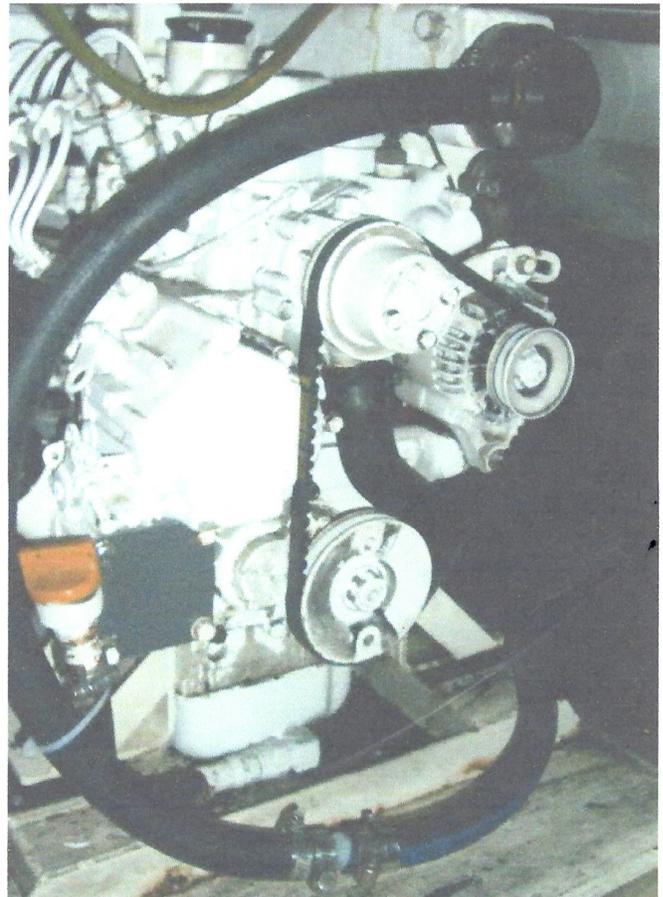


Figure 2 - Hose going into heat & plate covering pump hole

March Pump Air Lock Problems

Installing the March pump was a learning experience for me. I first put the outlet hose from the pump into the bilge and ran it to bleed the air. I then connected

it to the generator where it ran 10 minutes before the generator stopped due to overheating. The pump had an air lock due to air in the top of the inlet strainer. So after running the pump into the bilge, I stopped it, took the top off the strainer until water flowed and then closed it. The pump then ran for over an hour until I turned it off with no problems.

I then connected the pump to the generator with the new anti-syphon loop in place. When I first started the generator there was no water flow. So again I took the hose off the generator and ran it into the bilge. The pump was air locked. This time the cause was probably due to air in the hose from the anti-siphon to the heat exchanger. Until there was power from the generator, the exhaust pressure probably pushed air into the pump. I bled the air by removing the top of the hose into the anti-siphon loop and connecting an extension hose into the bilge. I then powered the pump from boat AC, not from the generator. After bleeding the air out of the pump and reattaching the hose to the generator everything worked well with good water flow. (Steve Bruckner says he just breaks the seal at the pump output until all the air is out.) This time I ran it for an hour while connected to the generator to make sure there would be no problems. The pump does not seem to have been harmed by running dry due to the air lock problem. The generator stops soon enough if the pump has an air lock, so the pump is not damaged. This should only have to be done when the boat is launched from a boatyard.

Bruce Melius installed a check valve in the vertical hose going into the heat exchanger on **Steve Bruckner's *Duchess***. This prevents the problem mentioned in the previous paragraph where the exhaust pressure pushed air into the pump.

RyanHerco.com sells a very nice check valve that I've purchased just in case the problem happens again. (ed. *Also still in business.*)

We have started the generator eleven times for a total running time of 19 hours so far on our trip north with no problems.

I want to thank **Steve Bruckner (*Duchess*)** for his support. Since he has been using the March pump for his Northern Lights generator 8 hours a day for quite awhile, his encouragement kept me going in spite of the above problems.

Generator Air Conditioning Pump Five Years Later

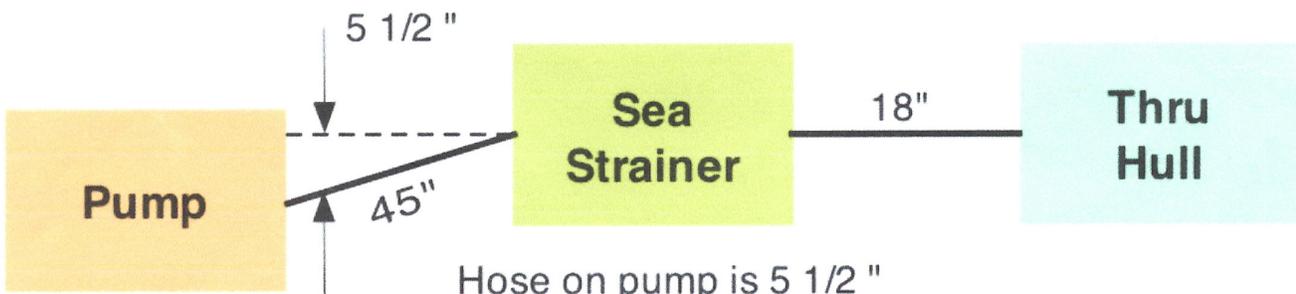
Martin Basch (Molly Blossom)

Our original Northern Lights generator pump seal often leaked salt water inside the sound shield after a couple of years use. Additionally, I needed to replace impellers at frequent intervals to prevent them from breaking and clogging up the heat exchanger. On January 7, 2007 (see above article), I replaced it with a March air conditioning pump. This pump has a plastic impeller, no seals to leak, and it is magnetically coupled to the motor. It gets the power directly from the generator so there is no start switch. The pump connects to the generator with a 110 V plug and socket inside the sound shield. This arrangement allows me to test the pump by temporarily connecting a hose from the output of the pump to the bilge using power from the inverter without the generator running.

I had problems priming the pump the first year which necessitated rearranging the hoses and pump. The solution is to have every part below the water line with the output hose on the input strainer above the pump (see diagram below). The hose from the thru hull drops down to the floor of the boat and then up to the strainer. I would often get an air blockage in the hose from the thru hull to the strainer, but there is enough water in the strainer and hose from the strainer to the pump to prime the pump and pull the air through. The pump is on the starboard aft wall and the strainer is on the port side of the generator; thus there is about 45 inches of hose and strainer to hold water. After that troublesome first year, the setup has worked well for four years. One time during the first year, I actually pulled the boat out of the water and replaced the thru hull because when I checked the system by removing the top of the strainer no water would flow into the boat. There was an air lock in the hose between the thru hull and strainer. Now the pump gets primed even with an air lock. I still check water flow at the outside exhaust every time I start the generator because of the first year's problems, but the problem seems to be solved.



Hose position from through-hull to strainer



Hose on pump is 5 1/2 " below hose on strainer

Not to scale

Pump System Configuration