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By Stephen Sommer

Max Air for Your Accumulator

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I just installed a new accumulator tank on my fresh water system, to stop the short cycling of the water pump. The pump is still cycling quickly. What's wrong?

Because it's a new installation, you should check to make sure that the new accumulator tank is in the proper part of the water circuit. The tank should be installed as close as possible to the water pump so that excess water from the pump can flow freely from the pump to the tank, without significant pressure loss. There should also be a good path for water to flow from the tank to the water distribution system. Normally the tank is connected to a "T" that is between the pump and the distribution system. It's best if the "T" is very close to the tank. This will provide the most consistent pressure at the faucets and showers.

If your system has a check valve, make sure that it is between the pump and the accumulator tank. Check valves are used to keep water from leaking back through the water pump itself. This is rarely a problem with modern multi-chamber pumps. If your pump does allow some leak-back, it is imperative that the pressure switch be plumbed in after the check valve.

If your system uses an in-line water filter, make sure that it is not between the pump and the accumulator tank. The pressure loss through the filter will cause the pump to short-cycle because the pressure sensed by the pressure switch on the pump will be higher than the pressure in the tank or the distribution system. This pressure difference vanishes when the pump stops, so it could restart much more quickly.

Once you have determined that the accumulator tank is plumbed in at the appropriate place, you should check the air in the tank. Accumulator tanks use air to store energy to maintain system pressure between pumping cycles. In most modern accumulator tanks, the air is contained in a flexible bag, instead of just being exposed to the water. This allows you to use more air without losing it every time you run out of water. It also allows for the possibility storing too much air in the tank. To get the most benefit from a given size tank, you should maximize the amount of usable air in the tank. If you put too much air in the tank, it becomes unusable when it finishes pushing all the water out of the tank. You have the maximum amount of usable air when the tank is almost empty (of water) when the pressure switch turns the pump on.

Here's how you can achieve the ideal amount of air charge: First, determine what the system pressure is when the pressure switch turns on the pump. Do this by draining water very slowly, while listening for the pump start-up. Turn off the pump the moment you hear it start up. At this point you can read the system pressure using an ordinary automotive tire pressure gage on the air fill fitting. This is the pump cut-in pressure. Next, drain all the water out of the system and measure the air pressure again. This is the air-charge pressure. The air charge pressure should be just a little less than the pump cut-in pressure.

If you find that both pressure readings are the same, then you are far over-charged with air. Don't be surprised, many new accumulators come charged with 50 psi of air. Very few boats run that high of water pressure. With that much pressure, the incoming water never compresses the air, so no water is stored in the tank. Bleed the pressure down some, but try not to let all the gas out. Some new tanks come charged with nitrogen instead of air, which is a little better for the rubber air sack than air. Try bleeding the pressure down to 25 psi and then check the pressures again. Continue bleeding 5 psi at a time until the empty tank air pressure a little less than the pump cut-in pressure.

A properly charged accumulator can make a big difference in the operation of your fresh water system. Traditionally, one of the best reasons for an accumulator has been to reduce the number of pump cycles to prolong the life of the pressure switch that controls it. These switches have become more durable than the average pump, so this isn't an important reason anymore. If you installed a modern captive-air one or two gallon accumulator you will see a big difference in a couple of ways. First you will feel that you have a larger capacity pump than you do, because the tank can provide extra flow for sort periods of time. Second, the noise of your pump will be less noticeable if it runs less often. You might even be able to brush your teeth without the pump ever coming on. Don't expect it to make a big difference when three showers are running at the same time, because the short-term capacity of the tank will soon be gone.

Stephen Sommer is a degreed electrical engineer with extensive experience in electrical, mechanical, refrigeration and air conditioning systems and holds a USCG Masters license. He consults in all areas of yacht systems, which include all the equipment on board yachts beyond a basic hull and motor or sails.

Have a systems problem or question? Ask Stephen Sommer. Email: steve@boatek.com