



Freezer Alternatives

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I have an "Indirect Drive" freezer that has worked well, with a few repairs, for many years. It now has a leak at the shaft seal, and I'm wondering if it is worth fixing or whether it should be replaced with a new unit that uses the new refrigerant instead of R12. Is R12 illegal now?

R12 is not illegal to use now, even though it has not been legal to manufacture or import into this country since 1995. It is very expensive, however, because all R12 added to new or old systems has to come from old decommissioned systems, and possibly very old stock from before 1995.

I presume that when you say you have an "indirect drive" system, you mean that it is a high capacity system that runs off of 12volts and draws so much current that it should be run only when the engine is running to keep up with the demand.

I personally would not replace an old "indirect drive" system with another similar system. These systems are a holdover from the days when inverters were much more primitive than they are now. With today's inverters, which most of us have for plenty of other reasons, you can run a large capacity 120volt hermetic compressor, which can replace your large 12volt motor, compressor and belt, for a fraction of the cost. "Hermetic" means that the compressor is in a sealed can like those used in all household applications, like refrigerators, air conditioners and dehumidifiers. They are incredibly inexpensive, efficient and long lasting.

There are a lot of options that you can consider, with respect to the refrigerant used and the capacity of the system.

Refrigerant Choice:

You can stay with R12 if you want, and you will have no problem buying compatible components that you need. You will have to pay a lot for the refrigerant, which is not so bad until you consider that you will pay more every time you need more due to repairs or possibly leaks. Using R12 also means that you will have to pay a certified technician purchase and charge the refrigerant into the system every time. This might be a problem if you are a hard-core do-it-yourselfer.

You can convert to R134a, which is the replacement of choice, as long as you take all the right steps to remove all of the lubricating oil from the old system, before installing new components. This includes circulating an appropriate solvent through the system components with a hand pump.

You could also convert the system to one of many R12 near-direct replacements. None of them are perfect, and are more appropriate for switching refrigerant types when the compressor is not being replaced. You could even consider going to R22, which is still an ozone depleter, but not nearly as bad as R12. By using R22 you'll avoid the oil incompatibility problem. It is still available at a reasonable price. This would require changing your expansion valve and maybe other components.

System Capacity:

You should consider using a much lower capacity 12volt-powered system. You can use a compressor with only one tenth to one fifth the capacity of your existing system. This means that it would run 10 or more hours per day instead of 1 to 3 hours. This would reduce the draw on the batteries from 30 or 50 amps to 4 or 6 amps. This would be most appropriate if you get a lot of your power from solar panels or a wind generator. It's always a good idea to match the nature of your loads and your power source. That way you end up using more of your power directly instead of storing it in batteries, with all the losses and battery wear and tear. The system would be very efficient because the evaporator (cold plate) and the condenser would be grossly over size.

If you do decide on a low capacity system, you should switch to a smaller seawater pump. You could give up a great deal of power efficiency if you continue pumping so much water. My favorite way to pump a small amount of water for a small system is to use a 24volt freshwater system multi-diaphragm pump, running on only 12 volts. You'll get about one gallon per minute for about one amp.

While you are considering changing to a small capacity system, consider replacing your cold plate(s) too. Low capacity systems have no need for the energy storage that the eutectic solution, that's in the cold plate, provides. You could replace your four-inch thick cold plate with a ½ inch thick "thin" plate. This opens up a lot of space for food. If you do replace the compressor and the cold plate you might as well purchase an entire system, which comes pre-charged and ready to install.

Don't be disturbed if you find the pre-configured system-in-a-box is air cooled instead of water-cooled. The engineer among you may comment that a water-cooled system is inherently more efficient because the condenser can be kept cooler. The thermodynamics theory says he's right, but the practical impact of dealing with yet another saltwater filled system and the power consumed by the pump, makes the air cooled system attractive. Premium brands of low power refrigeration systems use oversized condensers that narrow the efficiency gap and tip the balance toward air-cooled systems.

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