

## Refrigeration

Carsten Nachtigahl CS 36T *Polaris*

I would like to share my experience installing a Nova-Kool refrigeration system. I will outline the minimum requirements to enjoy your own refrigeration system. Everyone's situation and expectations are different. You must ask yourself "Do I need refrigeration and am I willing to spend the money for it?" My answer was an unqualified "Yes!"

Before you install refrigeration, look at your electrical system. You may have to upgrade your charging system, your batteries or add a battery system monitor. It is very important to have adequate energy storage and a charging system to refill the batteries in a reasonable time.

Minimum requirements for an electrical system to support refrigeration are:

- an alternator with an output of 70A to 100A @ 122 degrees F, c/w external regulator,
- a shore power charger with an output of 10A to 20A per bank,
- a set of batteries with a total capacity of 300 to 500Ah, and
- a monitor to check the state of all your batteries at any time.

The wiring from your charger to the batteries has to be adequately sized. Sizing tables can be found in *The 12 Volt Bible* or the West Marine catalog. Do not forget proper grounding.

Sizing your refrigeration system depends on the size of your icebox and the thickness and quality of the insulation. If you plan to go offshore, all components have to be heavy duty. The sizing of a system is usually based on a minimum of 2½ to 3 inch insulation. It would be a mistake to undersize a system.

I installed a 12 volt Nova-Kool Lt 200-RT6 and am very satisfied with it. It works well and produces ice cubes as well as freezes fish. It will keep ice cream frozen if required. Its operation is very quiet. Power consumption ranges from 1.2 Ah in the summer to 0.4 Ah in spring and fall. I keep it running all the time and use a shore power charger to top up my batteries when I am at the dock.

To install the unit I followed precisely the Nova-Kool installation manual. There are other refrigeration systems on the market, such as Adler/Barbour, Norcold and Grunert (see West Marine). I have no experience with the other systems, but I imagine that every one does a good job. What I like about Nova-Kool is that it is locally made in North Vancouver and priced competitively.

I installed the following system on *Polaris*:

A Balmar Marine alternator, dual foot (90 series) output 70A@2500 rpm and 95A@6000 rpm at 122° F. The alternator comes with a 2 ½" pulley and a ½" belt. The ratio between engine rpm and alternator rpm is approx. 1 to 2.4. That means it will put out almost 50A at idle speed. At no cost, Balmar also modified the pulley to suit my engine. After looking at many different alternators I found this one to be of better quality and still competitively priced. I coupled it with a Heart-Interface In-Charge regulator which was on sale at Steveston Marine. It is working now, but I had lots of initial problems which involved buying a second regulator. Next time I would choose the Balmar ARS-IV and buy everything at West Marine. I use a Professional Mariner Flyback 20A/3 bank 120W 12V charger. It was on sale at West Marine. I use 2 group 27 engine batteries, each approx. 90Ah @ 12V. For the house bank, I use two 6V 235Ah golf cart batteries. This gives me a total of 415Ah of which I can use 50% or about 200 Ah. I purposely chose two engine batteries. When I am sailing I use the engine batteries for my GPS, autohelm and refrigeration and I use the house bank only at anchor.

At an extended stay in one anchorage (i.e. four days), I drain both battery banks to approximately 50%. I use both battery banks extensively, but maintain 50% to start the engine. This gives me all the energy I

need to run my system. The monitor system is a Heart-Interface Link 20 two-bank Battery Monitor. It serves me well - after a year of initial problems involving a great deal of correspondence.

In order to reduce power consumption, I modified the icebox. I added "Isoboard" rigid foam insulation; one inch in the port lazarette, one inch on the icebox side of the engine compartment and one inch between the stove and icebox. One inch of Isoboard is R 8.5, more than your home refrigerator has. I also put a three part blanket of closed cell foam, 1/4 inch thick, on top of the icebox.

I installed the compressor/condenser unit in the port lazarette, close to the ice box and high up under the coaming so that it is completely out of the way. It is placed on a hinged platform, one part of which is glassed to the hull. The platform is held level by a threaded rod fastened to one of the genoa track bolts. The hinged platform allows access to the unit for servicing.

In order to disperse the heat from the condenser, I added a ventilation louvre in the cockpit just below the main winches. That gives me two ventilation openings to the lazarette. It is vital to remove the heat from the condenser.

I hope that my experience will help you make up your mind. Certainly there are more elaborate systems available but, on a limited budget, I installed a system that serves my needs adequately. It makes refrigeration affordable for ordinary mortals. Remember, it is not only the charging and battery storage that counts, but also efficient use of your available energy.

I took advantage of every sale that came my way, but sometimes I paid a price for it and had to fight to get replacements (i.e. Heart-Interface). Some marine stores have a hard time living up to their warranty commitments (i.e. Steveston Marine).

In conclusion, I would like to name some businesses that gave me good service: Western Starters on Mitchell Island, West Marine in Bellingham, Nova-Kool in North Vancouver and Professional Mariner in Ventura, CA.