

Volvo Wine Aficionado

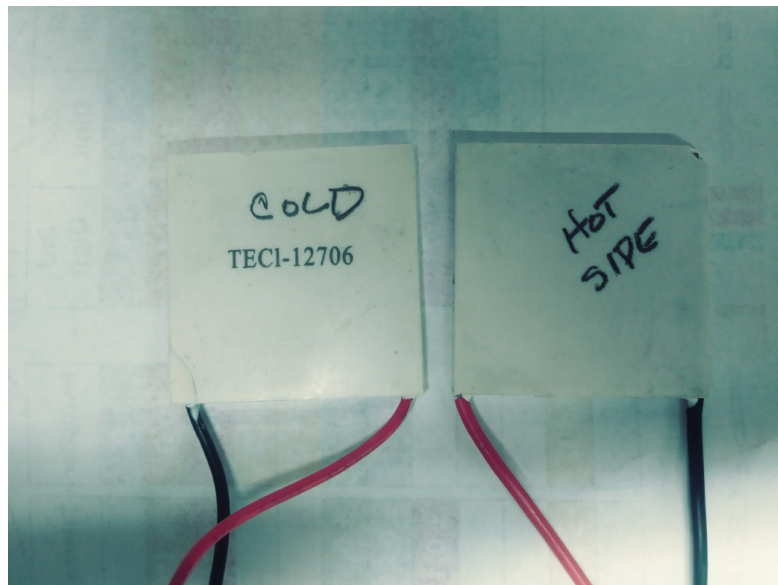
Keeping Wine Properly Chilled

Wine RED metallic paint is to Volvo as Ferrari RED is to the Testarossa. The bane of the sophisticated Volvo enthusiast is how to keep wine properly chilled while driving to a car show, picnic or a social engagement without the use of ice.

Volvo enthusiasts, like me have a well stocked wine cellar. Mine resides in three wine coolers, one for reds (62°F -68°F) to prevent overheating during the Southern summer. I've another for whites (49°F -55°) plus one for ice wines and beer (40-50°F). [I understand Swedes prefer to drink beer at room temperature, but we Americans prefer C O L D beer.]

My area of interest is thermoelectric refrigeration which uses electricity and dissimilar metal 40 mm square solid state (Peltier) devices to create refrigeration.

A thermoelectric cooler can achieve -40°F or -40°C with a peltier stack, a temperature well below the optimal serving temperature for white wine or even the slightly lower target temperature for serving ice wine. I've paid little or have been given broken wine coolers, many costing hundreds of dollars; that were being discarded because they failed.



Thermoelectric coolers operate according to the **Peltier** effect. A temperature difference is used to transfer heat between two surfaces. A current applied across joined conductors (dissimilar metals) creates the peltier effect. Heat is transferred

from one side to the other, thus cooling one surface and heating the other. A thermoelectric cooling unit is made by attaching a heat sink to each side of a peltier; then inserting it into a custom opening in a well insulated beverage cooler. Upon activation, the interior is cooled by transferring energy to the outside air.



Cooler Box Side

I've repair thermoelectric wine cooler refrigerators because I hate to see them stacked up at the landfill and find them easier to repair than a compressor R134A style refrigeration unit. [Any compressor style refrigeration unit can be converted to thermoelectric cooling.] With proper insulation and enough current, a peltier stack will cool to -40°F or -40°C .

Portable thermoelectric coolers, wine and Coleman style, are discarded when the power supply or the peltier fails. I search Craigslist and yard sales to find these gems. Most often the 12 volt power supply fails because the peltier becomes overheated due to the owner's failure to clear dust, dirt and grime from the heat sink. The heat sink must breathe.

Recently, I encountered an interesting problem upon installing a new power supply (\$100) and replacing a bad peltier with a high efficiency module in a wine cooler. The system would not cool. Why? Because peltiers require constant current (amps) at a specific voltage and the manufacturer's replacement "constant" current 12 volt power supply was not up to the task. Peltiers vary in internal resistance (load) as related to their energy transfer efficiency.

Upon discovering this, I investigated the cost of robust constant 12 volt 5-10 amp power supplies. Constant current devices are in the \$230+ range while regulated 12 volt 5 amp power supplies are \$10. For these projects, an off-the-shelf constant current power supply is not a cost effective solution.

Challenge, how to convert a constant voltage power supply into a constant current device? I accomplished this by placing a 2 ohm load wire wound high wattage resistor in series with the peltier to create a load and current demand. Peltier internal resistance ranges from 0.7 ohms to 3 ohms depending upon efficiency and input voltage rating.

The solution was discovered by pure accident. I decided to test the current draw on the non-working new peltier and as soon as I placed the VOM (amp setting) in series with the peltier, it began to cool.

Using another meter, I determined the resistance of the VOM's amp setting to be 1.2 ohms. I pulled a 2 ohm wire wound resistor from an old circuit board, placed it in series with the peltier to serve as a load, and the peltier cooled the box to 53°F. I ordered several 1 and 2 ohm 25 watt wire wound resistors; I'll configure two to serve as a permanent load. [See Ohm's Law]. Alternately, I could use a less efficient peltier with a higher internal resistance or a 50 watt resistor.

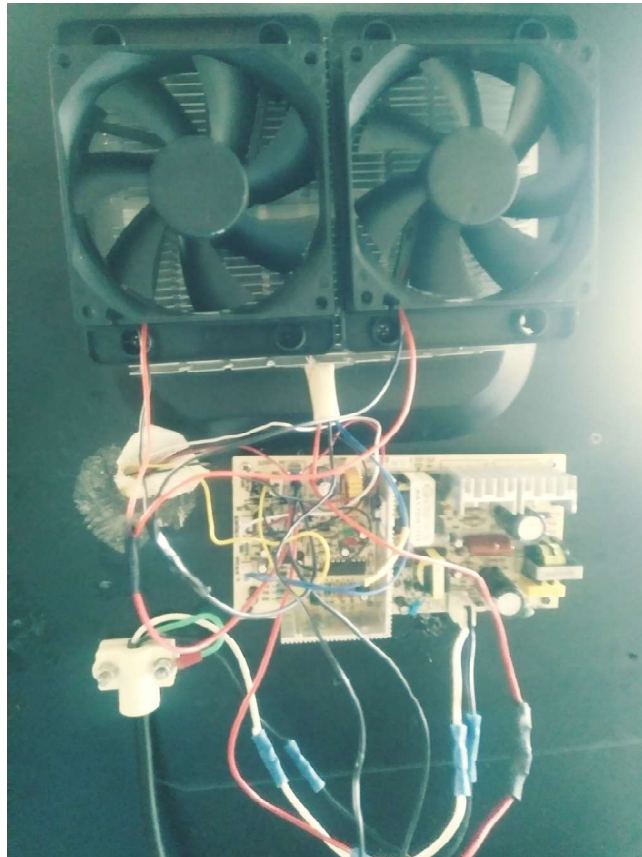
A 12 volt automotive battery is a great a power source for a peltier thermoelectric cooler because a lead-acid battery provides constant current (amps) at 12 volts. The Coleman portable thermoelectric cooler is one such pricy example; it can be plugged into any 12 volt DC outlet. Find these at yard sales or make your own from an old insulated box style beverage cooler. No need for ice.

Tip#1: If the resistance of a peltier is infinite or exceeds 5 ohms, it is bad. It likely overheated and burned out. It's critical to keep the heat sinks free of dust and debris. Replace it with like and kind. Always buy two, even if you need one; you'll use it. Trust me on this!

Tip#2: Thermal paste is an absolute necessity. It increases heat transfer; thus, maximizing performance. Too little is bad, place a dime sized dab in the middle of the peltier, one on each side, and squeezes the heat sinks together to create a peltier sandwich. The thermal paste will spread and become paper thin. Wipe off any excess squeezed out by the compression.

Tip#3: You can use the original power supply to control power from a beefy auxiliary power supply to two or more peltier devices via relays (turbo cooling). I

use salvaged Volvo 12 volt relays because they handle the current load without burning out; twenty or forty ampere rated are ideal.



Atmosphere Side: Heat Vent

Reversing the polarity of power fed to a peltier reverses the heat/cool sides; hence the box to become heated (138°F possible). Good news if you care to enter the hot food delivery service (Meals on Wheels, Grub Hub, Uber Eats or Door Dash).

VCOA members are challenged to rescue non working thermoelectric refrigeration units and repair them. They're inexpensive to repair. Fixing or making a thermoelectric cooler is a great project; if you can fix a Volvo, you have the skills to revive thermoelectric refrigeration/heating devices.

The CHALLENGE: Convert a Volvo center console or glove box to a thermoelectric cooler. I'll bet Irondequoit Larry can do this.

If someone is interested in this project contact me and I'll supply the "Ink Bird" (Google it!).

BTW, peltier coolers are great for an off grid solar powered situation, especially in California. Consider this strategy if you need refrigeration and only have 12 to 20 volts DC available.

Be responsible, don't drink, drive or vape impairing substances. An open container will result in your arrest and a chance to walk the white roadside line backwards.

Bob lives in Cary, NC and is co-chairman of the Blue Ridge Chapter of VCOA and partner in Vessel Wine, Inc. Contact him at rfsepe@gmail.com or 919-417-5019. He'll respond pleasantly to questions about your Volvo or wine pairing needs.