

# Automotive Application of

## ***The Vortex Tube:***

The Vortex Tube is a device where a gas flow is depressurized as it passes through, releases its inlet pressure and undergoes temperature division, forming two separate flows; one cold, one hot. It has no moving parts, no freon or chemicals, no risk of a spark or explosion, easily controlled and is almost instantaneous in its cooling or heating effect. The Vortex phenomenon has existed for decades but the Vortex tube's industrial applications were restricted due to requirements for the high inlet air pressure to operate efficiently, and the relatively small cold fraction value available for utilization in the conventional design. The Universal Vortex design eliminates these restrictions, and UVI has also developed a new Vortex Tube operational concept/design-Vacuum Vortex Tube. The UVI products are available in two basic forms: 1. Low Pressure Vortex, which provides significant temperature differences under relatively small inlet gas pressures, and 2. Vacuum Vortex, where the inlet gas flow has a pressure equal to atmospheric pressure.

## ***Automotive Application of the Vortex Tube***

**Beverage cooler in heavy vehicles with pneumatic brakes:** The Low Pressure Vortex is used in heavy vehicles equipped with on-board air compressors. A prototype beverage holder using this technology was tested during the summer season. A small amount (< 5 scfm) of compressed air from the air tank of a Paccar truck was used to power the Vortex Tube and the Vortex cold fraction was applied to cool a 12 oz. can of water mounted in the cab of the truck. The time to cool down water from the initial temperature of low 80°F to a comfortable cold drink temperature of high 30°F was around 14 minutes. The air consumption to maintain the beverage at a given temperature is a fraction of the amount required to achieve a 40°F temperature drop.

**Beverage cooler in passenger cars, minivans, etc.:** The Vacuum Vortex (VV) is used in cars with internal combustion engines (IC) with no source of pressurized air. The VV's driving force in the car application is a differential between atmospheric pressure of the intake air and rarefaction created in the engine's cylinders. The air stream to power the VV is drawn from the intake air manifold of the IC engine. This air, a minor stream of about 4-5% of the original intake flow is routed through the VV, while a major stream of about 95% routinely goes through a diffuser directly to the engine. The VV side stream rejoins the major stream at the engine after giving up its energy to produce a cooling or heating load in the VV. Again, in prototype testing in a Chevy minivan with a 12 oz. can holder using the VV principle, the temperature of water dropped from ambient 75°F to about 40°F in about ½ hour. Obviously, the air consumption to maintain the beverage at a given temperature is a fraction of the amount required to significantly drop a beverage temperature.

**'Cold Start' assistance in passenger cars:** The Vacuum Vortex (VV) can be applied to minimize the 'cold start' emission in the first 30-40 seconds of engine performance when the Catalyst Converter is still not warm enough to oxidize the exhaust gases and some amount of the fuel's high fractions are exhausted unburned due to the 'cold' engine. The VV, driven by the differential between atmospheric pressure of the intake air and rarefaction created in the engines cylinders, is able to create heating duty instantly and maintain gasoline vaporization while the engine is heating up.

**Competitive positioning.** This Vortex Tube device is completely unique; there are no other comparable products on the market to date. Two beverage-cooling devices, the Koolatron Thermofrost, which plugs into a vehicle's cigarette lighter, and the Twin-Up 365, a stand-alone battery or cigarette lighter operated cooler/warmer, cannot match either the temperature range or the speed of the UVI products. The 'cold start' application has no economic alternative.



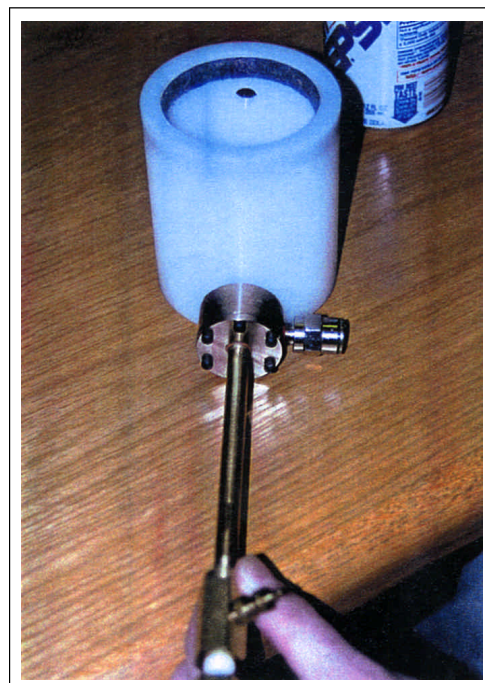
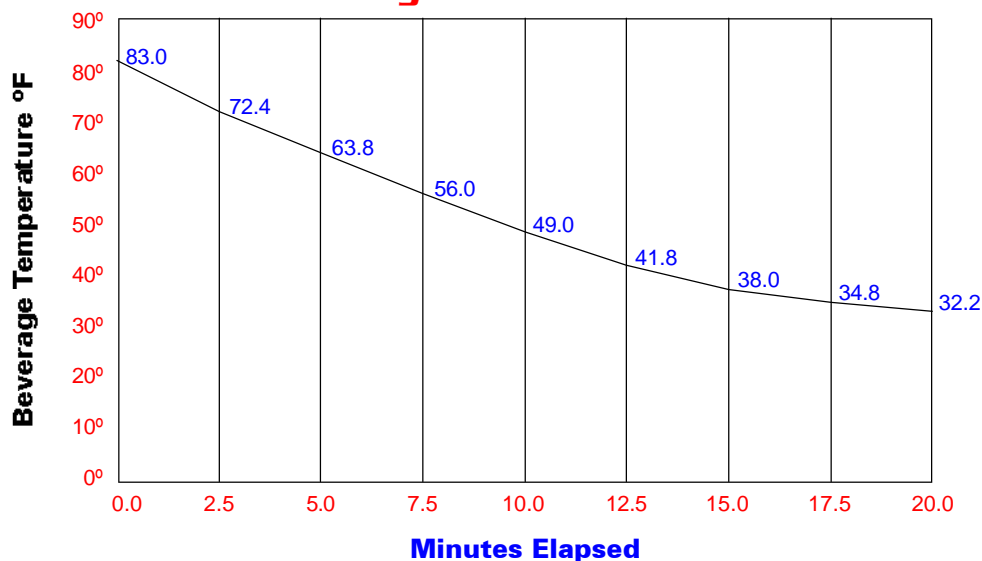
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The following table summarizes the results of a test comparing the performance of the two Vortex Tube coolers and the Twin 365 device.

	<b>Liquid Initial Temperature, °F</b> <small>(EQUAL TO THE AMBIENT AIR TEMPERATURE)</small>	<b>Liquid Final Temperature, °F</b>	<b>Duration of Cooling (minutes)</b>
<b>Vortex Cooler FOR TRUCKS</b> <small>see also Performance Chart</small>	83°	39°	14
<b>Vortex Cooler FOR CARS</b>	75°	41°	26
<b>Twin-Up 365</b>	70°	48°	140

*(Note: even after 2½ hours of operation, the Twin-Up 365 could not cool liquid below 48°F)*

**Vortex Beverage Cooler Performance Chart**



**Vortex Cooler**

**Future Direction:**

**Beverage Cooler:** A testing program is necessary to accomplish this premise and bring it to market in the form of a modification to the existing dash board. Also, further testing is required for the heating mode, so either cooling or heating of a beverage may be provided with the same holder with the flick of a switch!

**'Cold Start':** A development and testing program is necessary to incorporate VV into the fuel vaporizing system and determine the most efficient VVT mode of operation.

There may be other automotive applications for the actually 'free' cooling duty available with UVI's unique VT and Vacuum Vortex: Air conditioner booster, spot cooling etc.

**For additional information on this product, please contact Dr. Lev Tunkel at (609) 443-4545 or LevT@upe.com**



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Plant Site: 1180 Route 130 South, Robbinsville, New Jersey 08691 USA  
 Mailing Address: P.O. Box 338, Roosevelt, New Jersey 08555-0338 USA  
 Telephone: (609) 443-4545 • Fax: (609) 259-0644 • E-mail: LevT@upe.com