

# Don't Believe VRF Manufacturers Claims of Superior Energy Efficiency.

When it comes to moving BTU's around a building, **Hydronic Systems** are the most efficient!

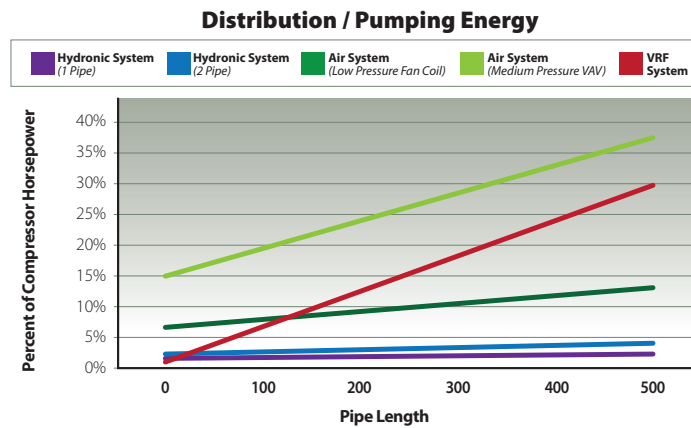
VRF manufacturers had been making claims of superior energy efficiency for a number of years without providing any data to back up their claims. In fact, one of the VRF companies likes to say that it's system is the "most energy efficient system ever developed."

Some VRF advocates have suggested that because a DX or VRF system does not have a separate pump or fan to push it's fluid (refrigerant) around a building that it is more efficient than hydronic or air systems in moving BTU's around a building. This is not the case.

The compressor in a VRF system serves double duty, it compresses and raises the temperature of the fluid and also serves as the pump to push the fluid around the building. As a result the oil to lubricate the pump motor (compressor) is carried with the fluid around the

system, unlike hydronic and air systems where the oil to lubricate the pump and fan motors is outside the fluid. The fluid (refrigerant) also undergoes a phase change with a portion of the system becoming a gas in the suction line. In order to carry the entrained oil in the gas the velocity in the suction line must be higher

than other portions of the system. These velocities are significantly higher than hydronic or air systems. In fact the velocity in a VRF system can be up to 5 times higher than an air system and 10 times higher than a hydronic system.



Higher velocities in a VRF system translate to significantly higher pumping energy as shown in the graph.

As the graph demonstrates, VRF systems require substantially more pumping energy than hydronic and some air systems.

Hydronic Systems are the most efficient system to move BTU's around a building.



Today's HVAC industry offers a number of choices when it comes to providing comfort air conditioning in large buildings.



## Four reasons to choose a Hydronic System over VRF

### 1. Lower first costs

Hydronic chilled water systems have generally been regarded as costing more to install. But that's no longer true. Today's advanced hydronic systems include application of technologies like integrated and single pipe systems that dramatically reduce piping, along with the use of variable speed pumps and fans. These help bring the first costs of a chilled water system in line with a VRF system.

### 2. Easier to install and maintain

VRV-VRF systems involve lots of refrigerant pipe and use oil for compressor lubrication. Control of oil return is critical. So special care in installation is necessary to ensure that contaminants don't enter the system and damage the compressor. Then there's all the copper piping, refrigerant tubing and fabrication of brazed joints required. Proprietary VRF systems therefore require specialized technicians, and building owners are dependent on the manufacturer for the life of the system.

Chilled water systems are easier to install and maintain. Their piping runs don't require brazing or special soldering; plumbers and pipe installers can handle the job, and there's no oil or refrigerant to deal with.

### 3. Lower life cycle cost

The owner can expect to get significantly lower life cycle cost out of a hydronic system. A VRF system lives a much harder life and consumes more energy; especially in the winter. The compressor is installed in a complex field installed refrigerant system and it is forced to reject its heat to air. Most important is that the compressor spins faster in heating reducing the life of the bearings and compressor. Furthermore, it requires a very specialized mechanic. Compare this to a factory packaged water source heat pump unit. It is a much simpler system and has a proven track record of life expectancy well in excess of 20 years; twice that of DX systems. A water source heat pump system will consume much less energy, cost less to install, and live a much longer life.

### 4. More Energy Efficient

Energy efficiency claims by VRF manufacturers have been difficult to verify, and without actual test data in hand it's been difficult to determine the actual facts. The ASHRAE building comparative energy usage study shows that a VRF system is not as efficient as a geothermal system. In all cases, new variable speed hydronic chillers and heat pumps outperform variable speed VRF.