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Moderate Variable Refrigerant Flow System

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ABSTRACT

This paper tells about emerging space conditioning technology of variable refrigerant flow (VRF) systems. Material involved in this paper was combination from the open literature papers, private interviews with industry experts and data obtained from manufacturing systems. variable refrigerant flow systems are creative versions of ductless different systems, it consisting more indoor element to be connected to each outdoor element and providing additional features such as concurrent heating and concurrent cooling and heat recuperation processes . Variable refrigerant flow technology uses smart non-segregated controls, different speed drives, refrigerant piping system, and heat recovery to provide products with combination that include more energy efficiency, flexible operation, ease for installation processes, low sound, and consolation using all-electric technology system . VRF systems are very popular in Asia and Europe countries. And increasing support available from majorly U.S. and Asian manufacturers are availability considering for multi-zone commercial building applications in the U.S. This paper tells how computers simulating the software while operating the Variable refrigerant flow system.

Keywords: VRF Systems, Non-Segregated Controls, Simulating.

I. INTRODUCTION

Variable refrigerant flow (VRF) systems vary the flow of refrigerant according to the indoor demand. This ability to control the amount of refrigerant that is provided to required (fan coils) units located throughout a building. This makes the VRF technology ideal for applications with varying loads and where the more refrigerant is required.

VRF systems are available either as heat pump systems or as heat recovery system processes for those applications where simultaneous heating and cooling processes are required.

In addition to providing superior comfort, VRF systems offer design pliability, energy savings, and cost effective installation.

This paper will reveal the benefits of a typical VRF system, tells about the advantages offered by the most advanced outdoor units available, and provide general Guidelines for selecting a heat pump and heat recovery systems.

In global commercial air conditioning market VRF is about 25 percentage, and about 34 percentage market share in China, India, the European Union, and Eastern Europe countries. The VRF share is 3% only in the united state market still (LG 2012). But multiple manufacturers sell these systems in the U.S. and sales are growing. These manufacturers provide according to the installation and design training and sometimes provide part or all of the design product, as well as quality control based. And there is little secondary market for components manufacturing.

Computer based building energy modelling and comparing [Hong 2000] has been indicated as an effective way to assess energy and cost benefit of building technologies. In this study, Energy Plus was

Selected to simulate the energy performance of variable refrigerant flow systems for residential blocks in California.

There are three steps to overcome the goal:

- ✓ Research and development for the new VRF models.
- ✓ Modern the energy models in house with four comparable HVAC systems.
- ✓ Comparing the homes energy performance and estimation of VRF system energy savings.

Multiple indoor units and single outdoor unit will be consisting of the VRF HP controlling system for the refrigerant flow. Typically, only one variable-speed compressor modulates outdoor unit capacity to reach the varying load capacities and this computer model employs a single variable-speed compressor. And manufacturers will be allow connection of multiple outdoor units to reach larger capacity ranges. Sensors will be sense temperature in atmosphere and the outdoor and indoor refrigerant flow will be controlled by the compressors according to the requirement of flow.
Volumes of air longer distances. With a VRF based air conditioning system, you have one outdoor unit feeding a number of individual indoor room units, each connected to the compressor with its own insulated copper refrigerant line. The compressor will only run at a speed needed to provide the right amount of refrigerant to each room for maximum efficiency and quietness

To highlight how a VRF Air Conditioning system works, a room that face the rising sun are likely to warm up early in the day. As these rooms warm, the rooms thermostat will send a request to the outdoor compressor to provide just enough refrigerant for just that room – no more an no less. As the sun continue to rise and expose more of the home, each room requests refrigerant and the compressor responds to demand and not try to cool an entire home and/or zone. Basically, it's a demand driven system instead of a system that is on or off for that entire A/C systems.

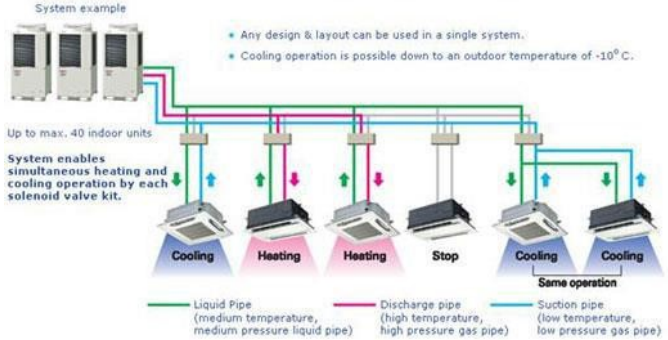


Figure 1. Modern VRF air conditioning system reduces ductwork

Load matching refrigerant flow

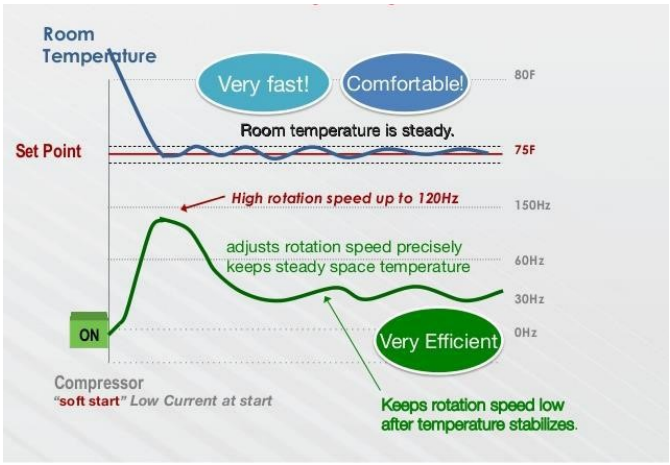
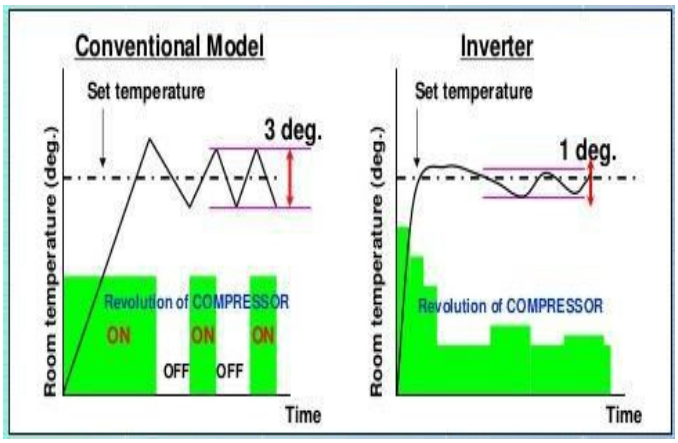


Figure 1. Factors to be consider for VRF system

With more traditional home air condition systems, you tend to have one outdoor, single or dual speed compressor, that feeds refrigerant to a much larger indoor air handler mounted in a closet or attic space. From there, flexible air ducts move cool air to each room. These systems can have multiple zones, but they tend to use air baffles to regulate the flow of cool air. Because most air ducts tend to reside in hotter attic spaces, there is a slight loss in energy in each air duct run and the noise level is increased as you move large

Not every air conditioning contractor can design a VRF Air Conditioning system and most all air conditioning manufacturers will not sell a VRF system to a contractor that is not trained and certified to design, built and start up a new system. In fact, because of the complexity of these systems to as its own network, each vendor has to be certified to have the warranty be valid. Those contracts that are not certified, and find a way to buy a VRF system, they likely won't be able to start the system up and most often have to call in the factory at an additional cost for the warranty to be valid.

For new home construction or major remodelling jobs, an architect will bring in a mechanical engineer to spec out and design a VRF Air Conditioning system. It's important for architects to know that **Berkun Ai**r has over 10 years of certified design and build experience in high end new home construction and major home remodelling experience in Palm Beach with VRF systems.



Conventional: Room temperature drops rapidly when compressor turns OFF which result in an unstable room temperature

Inverter: Range of room temperature change is small. Because after set temperature reached, compressor will not shut off to control temperature but will maintain temperature by decreasing or increasing revolution.

Buildings consume more than one-third of the world's primary energy, of which about one-third is consumed by HVAC systems. Reducing energy use by HVAC systems is a key strategy to energy savings and reduction of carbon emissions in atmosphere, and VRF (Variable Refrigerant Flow) systems present a potential opportunity for such energy savings. VRF systems can vary refrigerant flow to meet required cooling and heating load conditions, which leads to high efficient operations during part-load conditions, and have minimal or no ductwork, which may reduce heat losses [Liu 2010]. In addition to energy benefits, VRF systems have smaller indoor fans that significantly reduce indoor noise. One outdoor and multiple indoor will be having typical refrigerator Each indoor unit can have its own thermostat to control its operation.

Applications of VRF:

1. New data centres and where the situations spot cooling required.
2. Any case in which there is an advantage to delivering personalized, compartmentalized comfort conditioning, those are office buildings, shopping malls, hotels hospitals and nursing homes, banks and schools etc.
3. Minimum and Maximum variable refrigerant flow required places.
4. Retrofit situations where air conditioning may be an addition/upgrade to the space can be good applications of ductless systems since additional duct work and conditioning needed for ventilation can be reduced with VRF systems compared to ducted systems.
5. Offices and strip malls have occupants with different space conditioning requirements, making the good opportunities of VRF attractive for these applications.
6. Reducing power consumptions and saving outflow energy.

II. CONCLUSION

A VRF system offers flexible installation and energy-saving cooling and heating comfort and should be considered as an alternative to traditional systems for those applications where zoning or part load operation is required.

Energy savings calculated using the new VRF models in a custom version of Energy Plus. For the VRF systems, compared with the other three systems, are significant. The HVAC site energy savings range from 54 to 87%, while the TDV energy savings range from 32 to 68%. Domestic hot water not considered while calculating the energy saving. When included, the whole house energy savings in percentage will be lower. The highly energy savings observed from the Fresno climate, followed by Sunnyvale and Pasadena. Various characteristics (design and operation) of the VRF systems contribute to the energy savings. VRF systems performance will be vary for real houses under real operating conditions for example when considering pressure drop or heat loss in the piping, defrost cycle in heating operation, and effect of fan power to the capacity in cooling operation. The second phase of the project wills analyse the actual performance data from VRF system installed in an actual house in Stockton.

The collected data will be used to validate the VRF model and to calibrate the developed energy models and algorithms.

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