# NPAIP/PACT

# Risk Management Bulletin

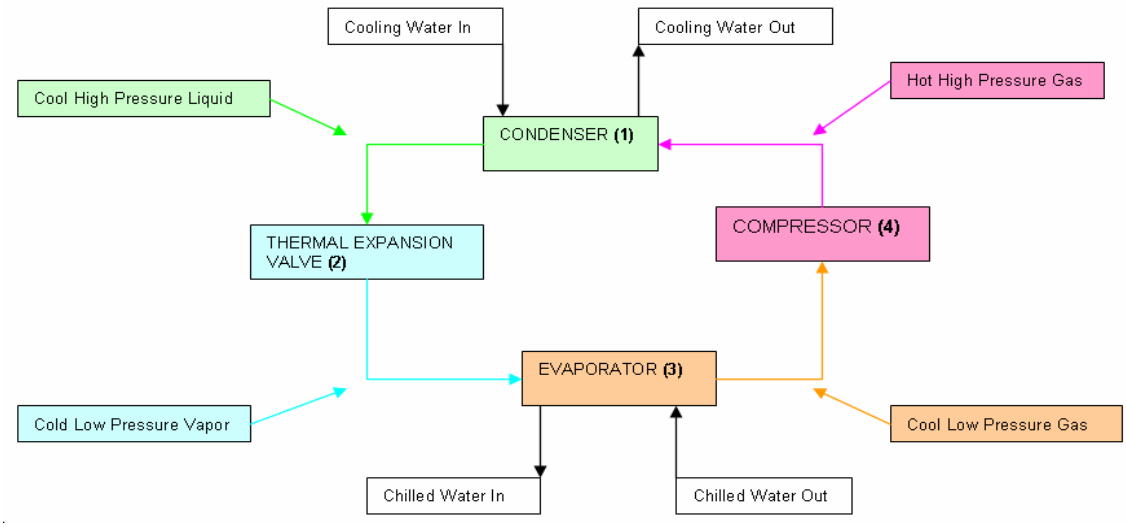
June 2007

## Air Conditioning Chiller Tips

Most modern buildings are designed for mechanical ventilation to provide heat and air conditioning. Windows cannot be opened and doors are designed for minimum infiltration of outside air. Heating, Ventilation, and Air Conditioning (HVAC) equipment and controls are sophisticated and expensive. We have become accustomed to precise control of our indoor environment without giving much thought to the equipment that makes it possible.

The equipment that performs the cooling function in the HVAC system is known as the chiller. Centrifugal chillers are packaged refrigeration machines that are made up of a centrifugal refrigerant gas compressor driven by an electric motor, two heat exchangers, and automatic controls all mounted on a common base. One of the heat exchangers is the condenser and the other is the evaporator or chiller.

Centrifugal chillers rely upon the vapor-compression cycle to produce cooling. In a closed circuit starting at the condenser **(1)**, liquid refrigerant under a pressure higher than the evaporator is expanded through a control device, the thermal expansion valve **(2)**, and becomes a lower temperature vapor in the evaporator **(3)**. The evaporator is made up of coils with 'chilled' water inside and refrigerant passing over the outside. The refrigerant vapor draws the heat from the chilled water and boils it into a gas. The chilled water from the evaporator is pumped in a closed system through coils which air passes over. The water picks up heat from the air and returns to the evaporator to be chilled once again. The warm air is moved over the coils by a fan, releases its heat to the water, and is supplied into the building as cool air. The low-pressure gas in the evaporator is returned to the compressor **(4)** and is discharged at a high pressure to the condenser where it is transformed into a liquid by giving up its heat of compression to cooling water, ready to begin the cycle over again.



To keep these machines safe and reliable, a well documented maintenance and inspection program must be established. All manufacturers of chillers provide guidelines for a maintenance and replacement program. Some jurisdictions having authority have implemented codes for the installation, operation and inspection of this equipment. Failure of any component in the chiller cycle usually results in damage to the compressor and weeks without the cooling capacity of the unit.

Common items that fail and result in compressor damage are: motors, compressor bearings, couplings, drive belts, and condenser or evaporator tubes. The condition of lubricating oil, the water that circulates through the condenser and evaporator, and all controls and safety devices should be tested according to manufacturers' recommendations and results documented by qualified technicians. Corrective action should be taken when deficiencies are discovered.

In most areas of the country, chillers operate from April thru October. The manufacturers' procedures for preparing the machine for the prolonged shutdown and procedures for start-up after the shut down must be followed or damage is imminent .

Maintaining a daily operating log should be part of standard operating procedures. The manufacturer or the jurisdiction having authority may have a log sheet that fits your needs. A generic Chiller Log Sheet is provided for your convenience.



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# CHILLER OPERATING LOG

***This chiller operating log is to be used in addition to the equipment manufacturer's operating requirements and instructions. All operational tasks and tests must be conducted in accordance with the manufacturer's instructions by a trained and qualified individual.***

| | |
|---|---|
| **LOCATION** | |
| **NAME OF QUALIFIED INDIVIDUAL** | |

**CHILLER # _____** **WEEK OF _____**

While recording the operating conditions on this log, visually inspect the controls, safety devices, relief valves, piping, and all associated equipment. Any unusual or adverse conditions should be recorded, reported and then corrected by a qualified technician.

| Record Actual Time Next To AM And PM For Each Day | % LOAD | MOTOR AMPS | PRESSURE | | | | | TEMPERATURE | | | | | | PURGE METER | SIGNATURE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Oil | Evaporator | Con-denser | Compressed Air Supply | Control Air | Outside Air | Oil | Chilled Water In | Chilled Water Out | Con-denser Water In | Con-denser Water Out | | |
| Sunday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |
| Monday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |
| Tuesday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |
| Wednesday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |
| Thursday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |
| Friday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |
| Saturday AM | | | | | | | | | | | | | | | |
| PM | | | | | | | | | | | | | | | |

Maintenance And Repair Activities: