HOSHIZAKI CARE
TECH-TIPS

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Volume 110
October 6, 1994

Ice Machine Refrigerant Charge

The refrigerant type and charge amount for all Hoshizaki ice machines is printed on the model nameplate. This nameplate is located in 2 places on the machine; on the rear panel, upper right hand corner and inside the compressor compartment on the wall, base of control box cover.

From a factory standpoint, the charge amount is critical and must be correct for proper operation and production. The standard Hoshizaki policy for a sealed system repair is to recover the existing charge, replace the drier, evacuate the unit and weigh in the correct refrigerant type and charge as per the model nameplate information. Topping off the refrigerant charge or guestimating the additional refrigerant needed to make the unit operate properly, commonly known as the "S.W.A.G." method is not an acceptable practice. Also, installing a sight glass on a system for charge purposes is not recommended for Hoshizaki applications.

Most likely the question in your mind now is what is so critical about this charge. The answer is simple. The Performance Data which is provided in the service manual is used for refrigeration system trouble-shooting. This data is taken from detailed test conducted under varying water and ambient conditions with the exact factory charge in the system. When the charge is varied from the factory recommendations, this data will not hold true. The charge amount is also calculated to provide maximum production and efficiency from the sealed refrigeration system.

This critical factory charge extends for all models including remote applications. While it is true that the receiver included in a remote system will hold additional refrigerant, the proper receiver level is important for proper operation throughout the wide yearly condensing temperature range. There is only one application when the factory charge should be altered. This is in the case of a remote installation where the line set length is over 66 feet long. In this case additional refrigerant should be added to fill the liquid line for the additional length over 66 feet up to a maximum of 100 feet. Add .5 oz. for each additional foot of 3/8" liquid line. You should always mark the total charge on the name plate labels for future reference if additional charge is added. This information is covered in the installation instructions for remote applications.

The Hot Gas Valve Diagnosis By Perry Maxwell

The hot gas valve is installed between the discharge line and expansion valve outlet. It is used to divert the discharge gas from the condenser directly to the evaporator. to harvest ice from the plate. Hoshizaki KM model ice machines utilize an electro-mechanical snap action valve. There are three different sizes of hot gas valves. Each valve is sized to match the size of the ice maker. For field replacement of the valve body you must use the correct size. For field replacement of the coil you can utilize one universal coil thus reducing the amount of parts stocked. The universal coil replacement part # is 440353-01.

In diagnosing hot gas valve problems there are a few different problems that can occur. The most obvious is an open solenoid coil. When the solenoid coil has an open winding the valve will not open when energized.

Another possibility is a sticking valve. The valve can stick fully open, causing hot gas to be supplied to the evaporator continuously throughout the cycle This will

allow heat to build up in the evaporator and possibly cause a high temperature safety shutdown. A valve that is stuck fully closed will do just the opposite. It will not allow hot gas to be supplied during harvest. This will cause a self-contained air-cooled machine to trip on the high pressure safety. A water cooled unit will frost the evaporator and drop ice strictly on water temperature thus prolonging the harvest cycle. A remote system will pull into a vacuum if a line valve is present. A valve can also stick in any position in between. The symptoms will vary depending on where the valve sticks. If the valve sticks partially open, but not enough to overpower the refrigerant supplied by the expansion valve, the machine may make ice but will have a long freeze cycle. One of the best ways to diagnose a valve stuck partially open. is to check the temperature at the valve outlet.

A bullet strainer is installed ahead of the hot gas valve to protect the valve from contaminants. A plugged strainer will resemble a partially closed valve and not supply enough hot gas to harvest the ice.

The coil on the hot gas valve could also cause a problem if the windings are weak. A weak coil will open the valve when voltage is first applied. As the valve warms, the coil's magnetic field will start to weaken and the valve will start to close. As the valve closes, hot gas will be diverted back through the condenser. The symptoms of a weak coil will vary with the different types of machines. For example:

1) An air-cooled machine does not run the condenser fan motor during the harvest cycle. As the gas valve closed down the head pressure will climb and the machine will trip the high pressure safety switch during the harvest cycle. This could occur in 30 seconds to 3 minutes depending on the weakness of the coil.

2) On a remote unit, as the coil weakens, the gas is diverted to the condenser. Since the remote condenser fan runs all the time, the unit will not shut down on high pressure safety. It will however, pull into a vacuum due to the liquid line valve being closed during harvest. On early model units without a liquid line valve the expansion valve will be forced open and start feeding the evaporator. In both cases, the harvest is extended. The common complaint related to a weak coil is "the pump motor will not run in the freeze cycle." This is because the unit remains in harvest. You will continue to have voltage applies to the coil even though it is not opening to divert the gas.

3) A water-cooled unit will also leave you with the impression that the pump is not running in the freeze cycle. When the unit is in harvest, with a weak coil, hot gas in not diverted to the evaporator. The pressure increases in the condenser, the water regulator valve will open to cool the condenser and maintain a constant head pressure. This will force the expansion valve to open and frost the evaporator coil on units with no liquid line valve. The result here is also and extended harvest.
These failures would be considered the most common problem associated with hot gas valves.

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Pre-Chillers Pro's and Con's

To chill or not to chill, that is the question. There are several different manufacturers of water pre-chillers who state that their product will increase ice machine production and efficiency. This increase promises a quick return on investment which will mean free ice at some time in the near future.

There are 2 basic types of pre-chillers available. (1) refrigerated pre-chiller utilizes a separate compressor system and water jacket to cool incoming water. (2) A mechanical pre-chiller employs the unit and bin drain water in a water jacket to cool the incoming water. Typically a mechanical pre-chiller will give only a 10° to 15°F drop in water temperature at best. A refrigerated pre-cooler will provide a 40° to 50°F drop, however, there are definite energy costs, as well as, a high initial equipment costs.

Let's take a quick look at a KM-1200MAE to see what chilled water will do for production. Keep in mind that there are 2 major factors which effect ice machine production, they are ambient air temperature and incoming water temperature.

At a 90°F ambient temperature and a 90°F water temperature, the production will be 1052 lbs. per day or approximately 2.7% more ice production.

Chill the water to 50°F and your production is 1127 lbs. per day, another 4.4% increase. The total increase in production by pre-chilling the water 40° us 7.7% or 75 lbs. per day. The increase in production would vary somewhat depending on the model.

The only way to chill enough water needed for a KM-1200M by 40° is to utilize a refrigerated water chiller.

Considering the cost of such a system, plus the energy to operate i.e., a 7.1% increase is not worth the effort.

I'm sure you get the picture here. A pre-chiller will increase production, however, over all it is probably not a cost effective measure.

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Coming Next Month...

1. Remote Installations...
2. Large Bin Application...
3. Crossword?...