

Diagnosing Walk-in Coolers & Freezers

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A systematic approach to walk-in cooler and freezer maintenance is the technician's best guide.

The ubiquitous walk-in cooler or freezer is an essential part of many cafeterias, restaurants and convenience stores. It is also a large energy user in these facilities but is rarely considered until problems emerge.

Problems include failure to maintain pressure and compressor failure, both of which can result in expensive losses to the products stored in the cooler. These problems, as well as unnecessarily high energy use, can be avoided by observing equipment and taking corrective action.

Evaporators

Moisture from the air freezes onto the evaporator coils (the cooling coils in the freezer) and forms an insulating barrier to heat transfer. Airflow also decreases as the passages narrow due to ice buildup. Each evaporator has a defrost cycle to melt frost/ice that has built up on the evaporator coils. Water from the melted ice is drained from the freezer . . . ideally.

It's not unusual, however, to find evaporators in a state of poor maintenance. For many evaporator units, the ice isn't melted, or the water isn't properly drained, resulting in a block of ice taking over the evaporator. When the coil freezes, heat transfer is greatly reduced resulting in the compressor working harder and longer. It works harder because the suction pressure drops making the compressor work at a higher differential pressure, thus requiring more power. It works longer because heat transfer is reduced. When ice buildup is excessive, the compressor will run all the time and the freezer temperature setpoint will not be maintained.



Remind customers to avoid placing items directly in front of fans, for efficient operation, and easier service access. PHOTO COURTESY US COOLER

As the ice melts, the water has to drain out of the freezer. This doesn't always occur. Trapped water that freezes can do significant structural damage to a freezer; especially older ones where cracks allow water to seep in, then freeze and expand. Stalactites and stalagmites of ice appearing in your freezer are reason for swift action to avoid costly damage.

Condensers

The condenser coil of the refrigeration system removes heat from the system. It's not unusual to find condensers located in enclosed spaces or spaces with inadequate air flow to remove heat from the space. The temperature around the compressor rises resulting in higher head pressure for the compressor, which again increases compressor power.

To effectively remove heat, the condenser should be placed in a well-ventilated area where the temperature is controlled to allow heat to be removed easily. Enclosed spaces will require openings for cooling air intake and exhaust. In many cases, a fan will be required to move enough air through the space. If the condenser heat is never needed, it should be exhausted directly outside if possible.

In cases where it may be used for space heating — such as for a nearby dry storage room — controls may be installed to direct the flow indoors for heating, and outdoors when heating is not required.

Condenser coils should also be checked regularly for cleanliness. Dust and debris will act like ice buildup on an evaporator coil. This will insulate the heat transfer surface and reduce airflow, which will make the compressor run harder and longer. In extreme cases, compressors may fail.

Refrigerated Space & Shell

Although the space itself doesn't have any mechanical parts or equipment, it shouldn't be ignored. The shell of the cooler or freezer should be inspected regularly for leaks and loose insulation or panels. Leaks and other voids in the shell can cause excess moisture to accumulate, potentially causing even bigger problems. The door is also a key component of the cooler. Doors must be sealed properly to eliminate air infiltration which increases the cooling load and may cause moisture buildup within the space and on the evaporator. Frost buildup on the door itself is a common occurrence when the door heater fails and has a tendency to either freeze the door shut or keep it from closing. Proper care should also be taken when placing items inside the space. If the space is overcrowded with items, or items are placed in front of the evaporator fans, the circulation of air is greatly reduced along with the performance of the refrigeration system.

Maintenance Helps Avoid Energy Waste & Repairs

Operations and maintenance issues should be addressed to avoid excessive energy use and costly repairs, as well as potential product loss. Additional maintenance issues can be reviewed in the Walk-in Cooler/Freezer Diagnostic Protocol table shown below.

Walk-in Cooler/Freezer Diagnostic Protocol		
MALFUNCTION	POSSIBLE CAUSE	SOLUTION
Power is on, but control board does not display	Phase loss or fuse blown Power phase open or transformer shorted Control board failure	Check wiring for breaks and replace fuse Check Transformer output voltage (12V) Replace cold storage room control board
Control board displays, but compressor does not run	Compressor relay tripped. Hi-Lo pressure safety switch shut down. Defective contactor or coil Cold room temperature is lower than operation setpoint Internal thermal overload tripped. Compressor malfunction	Determine reason and take correct action Determine type and cause of shutdown and correct it before resetting safety switch. Repair or replace Reset operation temperature setpoint Wait until compressor cools down for reset Check compressor motor winding
High discharge pressure	Dirty condenser coil Fan not running System overcharged with refrigerant	Clean walk-in cooler and walk-in freezer condenser coil Check fan motor and its electrical circuit Reclaim excess refrigerant
Low discharge pressure	Insufficient refrigerant in system. Low suction pressure	Check for leaks; repair and add charge. See corrective steps for low suction pressure
High suction pressure	Excessive load. Expansion valve overfeeding	Reduce load Regulate superheat
Low suction pressure	Lack of refrigerant Plugged suction filter Evaporator dirty or iced. Fan not operate Expansion valve underfeeding	Check for leaks. Repair and add charge Replace suction filter Clean and defrost Check fan motor and circuit control Regulate superheat
Large difference between actual cold storage room temperature and set point on control panel	Incorrect room temperature Sensor placement, wire too long. Sensor contactor open	Re-position sensing point of temperature sensor Enlarge wire section Reconnect sensor
Heavy frost builds up on evaporator fins	Too much time between defrost cycles or incomplete defrosts	Manual defrost and adjust defrost cycle
High temperature alarm	Overload and door open door excessively Bad refrigeration performance Heavy frost build-up on evaporator	Reduce load and door opening See corrective steps for discharge and suction pressure malfunctions Manual defrost and adjust defrost cycle
Coil not clearing of frost during defrost cycle.	Heater malfunction Not enough defrost cycles per day	Check heater operation. Adjust defrost control
Ice accumulating in drain pan	Defective heater. Drain line plugged.	Check heater; replace if necessary Clean drain line
Display screen flashes, unit emits humming noise	Observe alarm indicator	See alarm indicator for remedy

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