EXCESSIVE FROST TROUBLESHOOTING GUIDE

Overview

It is not unusual to see some frost on the product shelves and wall surfaces. The frigid air inside freezers will always hold less moisture than the ambient air outside of it. When ambient air enters the case, moisture from the air condenses on the cold interior surfaces as fluffy patches of frost. Frost can also be formed from moisture held by the air during the defrost cycle.

Frost will slowly be shed each time air circulates through the coil and around the case. However, excessive frost and even ice can accumulate over time if a large amount of ambient air enters the case through the door or a leak.

Solving Excessive Frost Accumulation

To eliminate excessive frost accumulation, you must eliminate the excessive exposure to moisture. The first step is to identify the path of the moisture.

Begin by looking for where the frost is accumulating the most. This typically indicates the source of the moisture.

Sometimes, frost accumulation is caused by a combination of factors. There are two strategies. You can address the most easily-corrected source of frost first for a quick and noticeable improvement, or you can diagnose all contributing sources for a complete solution. Your strategy may be determined by how much time you have.

The rest of this document describes possible sources of frost accumulation based on the frost observed. Each source is matched with the necessary correction.

General Info & Advice

When you visit a store for frost problems, here are some best practices that can improve overall case performance.

- Identify and record case model #, serial #, store name and location, date of visit, store temperature and humidity readings, and condition of case (any frost in case, stocking/shopping habits, etc.).
- Clear the ceiling and honeycomb holder of any ice.
- Level drain traps.
- Fix/replace drifting/stuck thermostats.
- Replace any stuck/failed fan motors.
- Replace any bent/damaged fan blades.
- Adjust closing tension on door closers.
- Check door gaskets and seal the case.
- Take velometer readings at the honeycomb to identify blocked evaporator coils and failed fan motors. Typical airflow in a fully stocked freezer: 400-500 FPM
- Adjust superheat.

Causes, Frost Patterns, and Corrections

Note: This table has most possible causes and frost patterns, but not all. "Reading" the frost pattern is important.

CAUSE OF EXCESSIVE FROST	RESULTING FROST PATTERN	CORRECTION
Excessively cold product temperatures (lower than -10°F for frozen food or -13°F for ice cream).	May be heaviest at the front center of shelf and at honeycomb holder. Diagnose by measuring temperature at or near product.	Raise temperature control to maintain product temperatures listed at left.
Excessively humid store (higher than 55% relative humidity or higher than 58°F dew point in store). *Note: This is possible even in an air conditioned store.*	Worst frost during humid (possibly cool) weather. Frost heaviest at front center of shelf. Possible sweating on case exterior.	Control store humidity independently of store temperature to maintain humidity levels listed at left.

Causes, Frost Patterns, and Corrections (Cont.)

Note: This table has most possible causes and frost patterns, but not all. "Reading" the frost pattern is important.

CAUSE OF EXCESSIVE FROST	RESULTING FROST PATTERN	CORRECTION
Door ajar (when not in use) or store stockers leaving doors open too long.	Frost heaviest at front center of shelf, possibly heavier on underside of top shelves.	Adjust door closers to close door from 2" ajar. Advise end user regarding leaving door open during stocking. Check whether the door closers are broken. Replace if needed.
Poorly sealed case joints, refrigeration exits, or wiring exits.	Varies. Inspect joints or exits for local frost, ice, or water. Attempt to shine a light through joint or exits. Air leaks can cause leaks to happen elsewhere to replace the air that is escaping. This can contribute to frost elsewhere.	Re-caulk or foam-in joints and exits as needed to form an airtight seal. Do not rely on adhesion of products like Permagum.
Poorly sealing door frames or air infiltration between door frame and case opening.	Frost or ice just inside door frame or mullions, possibly at the perimeter of the door.	Smoke test frame or disassemble and inspect to identify poor seal. Seal with caulk or putty.
Poorly sealing door gaskets. *Note: Anti-sweat controllers can make gaskets cold and stiff, which will not seal well.*	Frost or ice just inside door opening or door frame, possibly at the corners of the gaskets. Water forms on inside glass, which can indicate an air leak. Humid air can also travel a short distance (15") before depositing the water it carries, making the diagnosis difficult. A smoke pen helps here.	Test with a dollar bill, flashlight, or smoke pen to check gasket contact. Soften the gasket by hand or with gentle heat. You may also try to flip the gasket. Peel back the gasket corner and look for excessive flash round the dart. This prevents the gasket from seating properly. Remove excessive flash with a razor blade. Be careful not to damage the gasket. An offset in the gasket greater than 1/16" may cause frost pattern. Replace gasket if torn or deformed. Inspect gaskets along the hinge side. If gasket is rolled over, replace it or rotate the gasket. If the gap between the horizontal and vertical gasket magnets is greater than 1/4", replace the gasket. Check back plastic on door miter joints. If there is a gap, pull the plastic away, caulk, and then reassemble.
Delayed defrost termination (defrost cycle is too long) causing warm, moist air to form frost. Defrost termination thermostat stuck open or drifting away from proper calibration. Defrost termination thermostat improperly set or drifting to close.	Heaviest toward back wall and back of top shelf. May see ice on the ceiling, back wall, or back of drain pan.	Measure defrost termination temperature. Refer to installation & operation manual for proper set points. Replace thermostat if not closing at proper time.
Time-only defrost cycle (an installation choice typically discouraged).	Heaviest toward back wall and back of top shelf. May see ice on the ceiling, back wall, or back of drain pan.	Install defrost temperature terminating thermostat, if end user wants.
Too many defrost cycles.	Heaviest toward back wall.	Refer to installation & operation manual for proper number of defrosts.

Causes, Frost Patterns, and Corrections (Cont.)

Note: This table has most possible causes and frost patterns, but not all. "Reading" the frost pattern is important.

CAUSE OF EXCESSIVE FROST	RESULTING FROST PATTERN	CORRECTION
Residual ice on evaporator coil, causing delayed defrost termination.	Heaviest toward back wall and back of top shelf. May see ice on the ceiling, back wall, or back of drain pan.	Correct source of excessive coil frosting to prevent residual ice. Set defrost clock to 60 minute fail-safe.
Poorly trapped drain.	Varies. Inspect drain system for coolness on surface of trap and drain.	Install or modify trap so that air is not allowed to flow out through drain system. Make sure that the trap is primed.
Poor airflow due to failed fans, blocked return air grills, excessive coil frost, or bent fan blades	Ice and frost on ceiling, on top of product, top shelves, and brackets.	Restore airflow by fixing fans, unblocking return air grills, and/or troubleshooting a defrost cycle.
Mullion strikeplate to ceiling or floor connection not flush	Frost forming in the corner where the mullion meets the ceiling or floor. If you see this frost pattern, but the strikeplate is properly aligned, this could be from a door gasket issue.	Unscrew mullion strikeplate from ceiling or floor. Properly align strikeplate in opening in ceiling or floor and reattach. Make sure that strikeplate is now flush with ceiling or floor.
Leaks through the doors starting at the top pin or side electrical access. *Note: There needs to be a leak somewhere else to drive the air into the case this way. If the air enters these leak points, it may exit through the IG/breaker interface. This tends to not cause frost, but water droplets on the door.*	Typically results in water drops forming on glass.	Find and repair other leaks. Seal the top pin or electrical access panel.

Holiday Specific Recommendations

Temperature Settings:	Discharge Air: Refrigeration off at -10°F on at -4°F.
Defrost :	1 per day 45 minute with a fail safe 50 df termination setpoint.
Store Humidity:	Maximum ambient store conditions 75 df/55 % relative humidity.
Air Vents:	No HVAC air vents blowing in the case. No drafts from the store entry doors blowing into the case.
Doors:	Doors should close by themselves when opened 2" and released.
Gasket:	Gaskets should not be rolled at the hinge side and should not be torn or deformed anywhere on the door.
Fans:	All fan motors confimed they are operating.
Drains:	Drains should be level and trapped. If the trap is condensing water on the out side of the tube, it is most likely is not trapped. When drains aren't trapped, air is pulled into the case and frosts product.
Product:	Round product gathers the most frost. The bulk of the air sweeps into the case when a door is opened and hits the top two to three shelves. Frost on round product can be reduced by placing it below the top two or three shelves. Solid shelves or shelf liners are recommended to support the air curtain.

Other Technical Assistance Available

If you still have excessive frost after trying the corrections found in **"Causes, Frost Patterns, and Corrections,"** consider installing a temperature chart recorder at the back of a top shelf. This allows you to evaluate case temperature, defrost performance, and stocking habits over a week of operation. This is usually worthwhile for tough frost problems. Disposable, self-contained chart recorders are available for as little as $20 (Example: Cole-Parmer Single-Use Temperature Recorder.)

If you require further technical assistance, contact your Zero Zone sales representative or the Zero Zone Service Department at 262-392-1301.