

# ***KRAMER TECHNICAL BULLETIN***

## **INTERNAL CORE TUBE LEAKS IN HOT GAS DEFROST EVAPORATORS**

Kramer has been in the business of building refrigeration evaporator coils for over 50 years. During that time, we have designed and built literally hundreds of thousands of evaporator coils for hot gas defrost systems, both OEM and proprietary equipment applications.

Over the years, we have analyzed and identified numerous causes of refrigerant leaks in our coils, some the result of manufacturing defects, but many more that could be directly attributed to such things as;

- Equipment mis-application
- Shipping or installation damage
- Environmental corrosion
- Improper operation
- Incorrect operating control settings

To further categorize these failures, based upon our experience, the vast majority of internal refrigerant leaks reported on hot gas defrost coils overall, regardless of system design or length of operation, are the result of crushed tubes. Crushed tubes are the direct result of an incomplete defrost cycle and the resulting residual ice accumulation in the evaporator coil.

In a hot gas defrost coil, the heat for defrosting emanates from within the refrigerant carrying tube, not outside the tube as in electric defrost for example. Because of this, the frost built up around the circumference of the tubing and fin melts from the inside out. Once a defrost cycle is initiated, if the cycle is interrupted for any reason before all the frost is melted from the coil, a minute amount of water may be trapped by the unmelted frost in the area immediately surrounding the tube circumference, between the tube wall and finned collar.

This trapped water will freeze when the system goes back into refrigeration, exerting literally thousands of pounds of pressure per square inch downward into the coil tube. Initially, this creates a small void or pocket that will continue to expand downward with each subsequent freeze / thaw cycle initiated by the system time clock. Continued freezing and thawing eventually collapses the tube inward upon itself until the tube wall fractures, resulting in a refrigerant leak.

**In most cases, the damage manifests itself in the lower portion of the coil since heat naturally rises and the bottom of the coil is the last portion to completely clear during the defrost cycle.**

**There are many possible causes for incomplete defrost to occur. These include;**

- Incorrect operating or safety control settings**
- Defective controls**
- Refrigerant shortage**
- Sticking or otherwise malfunctioning solenoid valves**
- Improper air flow**
- Inadequate spacing between evaporators or lack of defrost cycle synchronization between different systems within the same room**
- Drain line freeze-up**

**Unfortunately, once a coil has been initially damaged by ice accumulation and a void or pocket created, it will normally progress to the point of catastrophic failure. Depending upon the individual circumstances, this failure might occur within only a few weeks or a few years beyond the onset of damage. In most all cases, it is virtually impossible to affect satisfactory repairs in the field, necessitating replacement of the entire coil assembly.**

**Like any other manufacturer of commercial refrigeration products, Kramer reserves the right to void the original equipment warranty on any coil that, based upon post-failure inspection, developed refrigerant leak(s) as a result of ice accumulation / crushed tubes.**