

Hot Pull Down and What it Means



If you work in refrigeration you may have heard the term “hot pull down”. This phrase is used to describe a condition where the load on the evaporator is above design due to the box temperature and/ or the temperature of the product in the box being higher than it would normally be.

My grandpa called me a few month back all upset “I just slaughtered a bunch of chickens and I’m going to lose all my meat because this freezer you got me isn’t working” he gasped into the phone. Now I had helped him pick out a commercial freezer a year or two back and he put it in his garage (a less than ideal location to begin with). What I had forgotten to mention to him was the importance of only loading with meat that was already down to temperature.

I showed up to look at it and sure enough, there sat a bunch of freshly slain birds PACKED into his freezer and the box temperature struggling to get below 15° instead of the 0° we really needed.

Most refrigeration equipment is designed to only maintain the temperature of the product, not to bring it down to temperature all at once, at least not in large quantities. This is due to two aspects of the design.

1. **Capacity** – Most freezers and refrigerators just don't move enough pounds of refrigerant to generate the necessary refrigeration effect to "pull down" warm product in a timely fashion. In other words, just like many A/C systems don't keep up on a freak 98 degree day in Indiana, refrigeration equipment won't pull down quickly if you add in more BTUs of heat than it is sized to remove.
2. **Coil Feeding Range** – In the case of a cap tube or other fixed orifice metering device, the amount of refrigerant fed into the evaporator is directly proportional to the amount of refrigerant pressure differential between the liquid line and the evaporator. With a TXV the valve responds to superheat in order to open and close, opening as superheat rises and closing as the superheat falls. In a hot pull down the load on the evaporator is so high that the expansion valve goes wide open but still, the coil "starves" or underfeeds refrigerant. This results in high superheat, high suction pressure and high head pressure but will also often result in low subcooling because so much of the refrigerant charge will move to the evaporator coil.

During a hot pull down the compressor will draw higher than usual amperage due to the increased density of the suction gas, this coupled with high superheat can result in compressor damage if it is allowed to run outside of specs for an extended period (Sporlan has a great piece on compressor

overheating you can read [HERE](#)).

The conclusion is that most equipment should be allowed to get down to temperature before being loaded with product and the product should generally be at or near the design temperature. There are freezers and refrigerators that are designed specifically for “flash freezing” or pulling product down to temperature often called a “blast freezer”.

In the case of my grandpa’s freezer, we moved some of the meat around to other freezers and got it down in time to prevent salmonella... at least I hope so... I was feeling funny after Grandma’s chicken soup for Sunday dinner....

– Bryan