TXV APPLICATION, CHARGING AND TROUBLESHOOTING

As we enter the cooling season, we must install, operate and maintain thermal expansion valves (TXVs). They are the preferred metering device for the high-efficiency coils, and they serve to protect the compressor from excessive refrigerant slugging.

The purpose of a TXV is to maintain superheat. As the compressor pumps, the powerhead of the TXV will meter the refrigerant based on a balance between three pressures:

1. The bulb pressure (suction temperature)
2. The spring pressure (often set by the manufacturer)
3. The evaporator pressure

The bulb location is critical. It must be insulated and strapped tightly to the suction line. If the bulb is not insulated, the airflow around the bulb, which is at a greater temperature, can provide a false reading, causing the TXV to be confused.

> *Did you know that ADP ships its coils with the bulb in shipping locations? If not moved and insulated, your TXV could never provide optimal performance. We see this a lot, so be sure to check out the IOM when installing ADP coils.*

Ask yourself this when preparing to change the TXV because the pressures look off: “Have I tested and understood why these pressures and readings are off?”

When we check the charge of a TXV coil, we always start with airflow. If you have the AHRI data available, establish rated airflow before charging. If AHRI data is unavailable, we suggest testing at a nominal 400 cfm per ton. If you make adjustments to the airflow, you must keep an eye on your pressures as well as the superheat and subcooling.

We’ve all been taught to charge TXVs using the target subcooling. The target subcooling is often listed on the outdoor unit data tag and always found in the installer’s guides and service manuals. This is the first step to testing performance as well as TXV operation.

Getting the charge close to final will depend on your service situation. Did you pump down the system, or are you starting from scratch with a deep vacuum? In both cases, you will start the compressor with a known shortage. It might take 20 minutes to see the system temperature and pressure stabilize. You will monitor superheat and subcooling as this occurs. Once superheat maintains 12-15°F, you will focus on subcooling and tweaking the charge to achieve the target.

Many will say, “I thought we only care to look at superheat when charging a piston coil.” It’s simple: We must know the condition of the refrigerant in BOTH coils.

Here are a couple of system analysis scenarios:

1. If superheat is low (1-4°F), we are flooding the evaporator and will often see lower suction pressure. Load indoor temperatures are a culprit here as the TXV will clamp without a load. Airflow will also cause low superheat so it's time to test static pressures and confirm that our airflow is correct.

2. If superheat is high (25+F), we are starving the evaporator coil, which could lead us down two paths.
   - Are we low on refrigerant? If we dialed in subcooling, we should have the proper charge.
   - Is there a restriction on the high side? This is a universal term. It could be a metering device failure (TXV), kinked liquid line or perhaps a blockage (line drier, wire nut, etc.).

If you're not sure what to do, we suggest that you:

1. Recheck your airflow.
2. Analyze the air temps and take a Delta T.
   - How do you take a Delta T? Take the temperature of the return air as close as you can to the filter and supply the air temperature just after the evaporator coil. You should see around 20°F as a rule of thumb. If the Delta T is low, around 15°F, ensure you aren't moving too much air across the coil. A good rule of thumb is 400 cfm per ton of cooling. Five-ton systems often run at 350 cfm/ton to reduce static pressure and increase cooling performance.

   - A TXV with higher superheat (20-26°F) may not be faulty. However, if you see a higher superheat like mentioned above, check your Delta T. If your delta is around 20°F, your TXV is likely fine! We've seen newer coils/TXVs designed to operate under a larger window of superheat due to multistage AC/HP units, coils size, etc.

3. Check the liquid line temperature at the outlet of the outdoor unit and before the coil.
4. Check the suction line temperature at the outlet of the evaporator coil and as it enters the outdoor unit.
   - The line temperatures in steps 3 and 4 (inside and out) should not be more than 2-3°F at max. If so, we more than likely have a restriction. This includes the filter drier, so the same steps of taking the temperature before and after the line drier will indicate if there is a restriction. Again, no more than 3°F.

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If you're still finding high superheat after you've dialed in your subcooling, checked the line temperatures inside and out and correctly confirmed your airflow (moving 400 cfm per ton), we will move on to the next steps.

1. Is the bulb properly mounted and insulated? If not, fix it. Remember, those ADP coils have the bulb in the shipping location. Move it per the instructions and insulate. Give it some time to adjust, around 20 minutes.

2. If it is adequately mounted and insulated, you've provided time for the system to adjust and are not seeing results, remove the TXV bulb and warm it up. A glass of hot water or even holding it in your hand for some time may offer you a solution. If the bulb has been warmed, your suction pressure should go higher. If so, we know the TXV reacted. If not, perhaps the TXV is stuck and will not give us proper performance. The heating and cooling of the bulb should have a direct effect on the system pressures and performance.

STAY COOL!