By: Grant Laidlaw

Welcome to the Solutions page

Many people ask for assistance in the understanding of theoretical and practical aspects of the industry. I will endeavour to enlighten

John sent in this: Hi Grant, I am interviewing technicians for a position and was wondering if you could give us an idea as to what type of questions we could ask? We are an air conditioning and refrigeration company dealing in commercial applications. Thanks

Hi John. I looked at your question in the last issue and as I mentioned previously and I think this gives me a good opportunity to share some of the answers I receive to some basic questions. You could use the same questions to evaluate candidates. I would expect any qualified person to have little difficulty in answering.

As before let us expand your question to include trade test applicants.

In my position I conduct many interviews as part of the pre trade test assessment process for trade testing. The people coming for the interviews therefore consider themselves as trade test ready. As you will see the response is poor. Of course this does indicate that people are not been trained. There is an expectation that after - say around five years, people should be able to pass a trade test. Really!, well then, lets look at the answers.

So: Question 6

On a pipe / tube cutter there is a groove in the rollers, what is the purpose of this groove? (Only around 5% of candidates answer correctly)

Common Answers:
- No Idea

Maybe this question is a bit tricky and not critical but nevertheless this is a basic.
So, people, you want to write trade test and work in industry, the tube cutter is a basic refrigeration tool. If you do not even know the basics how do you expect to pass a trade test and then actually work in the industry?

So let me enlighten.
It's for accepting a flared end of tubing so you can cut the flare off. Why not just cut further down and avoid the flare? Well in some instances you may find the pipe getting to short for use so cutting just behind the flare may be necessary.

Tube cutter with the grooves in the roller clearly visible and use.

Question 7

Although seemingly delving into the dark arts, superheat is something which I do ask, however the candidates anticipate this question (And still get it wrong). I do not ask what is superheat but rather: Why is superheat important?
(Hardly any of candidates answer correctly)
Common Answers:

- To cool the evaporator.
- It's in the evaporator.
- To evaporate the liquid refrigerant.

Again let me enlighten:
In order for the evaporator to operate at maximum efficiency but at the same not allow liquid refrigerant to enter the suction line and compressor we need to control the evaporated super heat accurately.
To much superheat results in lower evaporator efficiency.
To little superheat may result in liquid entering the compressor.

I am aware we can go into this in more detail but I need at least to see a basic understanding.

Question 8

When transferring refrigerant into a service cylinder, how do you know when the cylinder is full?

This is a hit and miss situation.
Some candidates know that one needs to weigh the cylinder but the devil is in the detail.

Common answer:
Shake the cylinder.

I am aware that if the cylinder is correctly filled and one gently shakes the cylinder from side to side then one does feel the liquid refrigerant moving in the cylinder. Of course this is nowhere nearly accurate enough to safely fill a service cylinder.

So let us look into the correct way

The idea here is to never over fill a service cylinder. When transferring refrigerant, the maximum amount of refrigerant should be determined and the refrigerant should be weighed into the cylinder. For this operation, an accurate digital scale is necessary.

The following markings can be found on the cylinder:

- WC (water capacity)
- TM (tare mass)

The formulae to be used is: Gross mass = TM + (WC x 0.7)

When the cylinder is placed on the scale, the weight of the cylinder and the weight of the refrigerant must not exceed the calculated gross mass.

Question 9

What is a liquid line distributer used for?

Again, very few candidates can answer this question. (Less than 5%)

So what is this mysterious component?

In large dry evaporator coils, as used in some air-conditioning / refrigeration installations, it is necessary to divide the cooling coil into sections to decrease the pressure drop across the coil, thereby increasing the capacity of the coil.

Each section of the cooling coil is supplied separately with refrigerant. Instead of using a separate TEV for each section of the cooling coil, a single TEV with a liquid distributor is used. See figure 8. This distributor is attached directly to the TEV.

The designs of liquid distributors are such that they ensure a uniform supply of refrigerant to all sections of a multiple circuit evaporator. Care must be taken that the tubing from each port of the distributor to each section of the evaporator coil, is the same length.

Liquid distributors

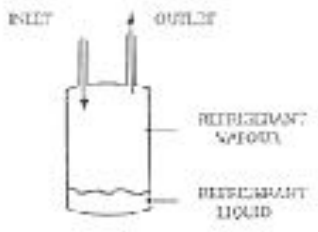
Question 10

What is a suction line accumulator used for and why is it necessary?.

Around 50% of candidates know what a suction line accumulator looks like and know that liquid refrigerant is part of the equation. When asking why is a suction line accumulator necessary the wheels come off.

Answer:

The accumulator is a safety device to prevent liquid refrigerant from entering the compressor. Any liquid refrigerant in the suction line will flow into the accumulator and evaporate before it leaves the accumulator. The outlet is at the top of the accumulator and only vapour will return to the compressor. The device is usually placed in the condensing unit where the warm air from the condenser will flow over the accumulator further ensuring that any liquid refrigerant present will be boiled off. If liquid refrigerant were to flow into the compressor damage to the compressor may result.



Suction line Accumulator

Delving a little deeper

Why are accumulators necessary? After all your T.E.V or electronic expansion device should be controlling superheat so that no liquid refrigerant enters the suction line!

Responce: Stunned silence.

Answer:

Suction line accumulators are used in systems where the use of a fixed orifice device is necessary.

This may be a capillary tube. In such instances the unit has the refrigerant charge required to allow the unit to run at its optimal capacity. If the operating conditions change (i.e: drop in heat load) then the refrigerant may not boil off fully in the evaporated. As the fixed orifice device cannot control the refrigerant flow, liquid refrigerant may enter the suction line as part of the units normal operation. Under these conditions the suction line accumulator will protect the compressor from liquid refrigerant flood back.

These are typical reverse cycle units so the fitting of electronic expansion devices or T.E.V's is not a cost effective option

Question 11

When speaking of thermostatic expansion valves what is an external equalised expansion valve. Why do we have extremely equalized valves?

Here again most candidates do have an idea as to what is an external equalised expansion valve. The reason for, or how these valves operate is often not known.

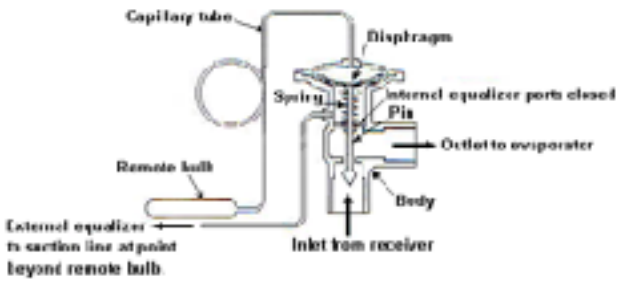
Answer

You may think that the pressure in an evaporator remains constant throughout the coil. This is not correct as the movement of the refrigerant results in a pressure drop in the coil. The internally equalised thermostatic expansion valve, is as the name implies, internally equalised, that is, the pressure under the bellows in the valve is the low side pressure at the beginning of the evaporated coil.

This arrangement is satisfactory for small cooling coils where pressure drops in the evaporator do not exceed about 21kPa in normal applications.

In larger coils, however, there may be an appreciable pressure drop in the cooling coil, with the result that the pressure on the inside of the valve body will be much higher than the pressure of the boiling refrigerant near the bulb location. This action tends to starve the cooling coil, as a higher than normal superheat is required for the operation of the valve. This additional superheat will result in a loss of coil capacity due to the large amount of coil surface used only for superheating gas.

To overcome the effect of excessive pressure drops in larger evaporators, externally equalised valves, should be used. In this type of valve, the low-side pressure within the valve is isolated from the underside of the bellows, by means of packing around the push rod. A pipe connecting the space under the bellows to the far end of the evaporator ensures that the valve controls superheat for the true outlet pressure of the evaporator.



Externally equalised valves

The equaliser connection at the suction line must always be made on the compressor side or the bulb.

John, these are samples of actual questions I ask on a regular basis. The answers give an indication of where you stand as to the candidates knowledge and skills.
As far as trade testing is concerned, honestly these are really basic questions and I expect any person who considers himself as ready to qualify to be able to answer.

John I will give you some more questions that I ask in the next issue as this may be of great help to our candidates.

Thank you for all your questions. Send your problems (and sometimes your creative solutions) to acra@netactive.co.za with "Solutions Page" in the subject line. You may include pictures.

References:
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