Central Valley Chemical Safety Day

March 26, 2010

Tulare, CA

BASICS OF REFRIGERATION

By Russell Ramos, Sales Engineer, Joseph H. Schauf Co., Madera, CA

What is the Big Picture for Today's Chemical Safety Day?

- To do our "jobs" better.
- To get better at what we do and how we do it.
- To provide a means for all of us to gain more knowledge.

What is the Big Picture for Today's Chemical Safety Day?

- Because through knowledge:

  You, your Co-Workers, your Employees, your Plants, and Our Industries become safer.

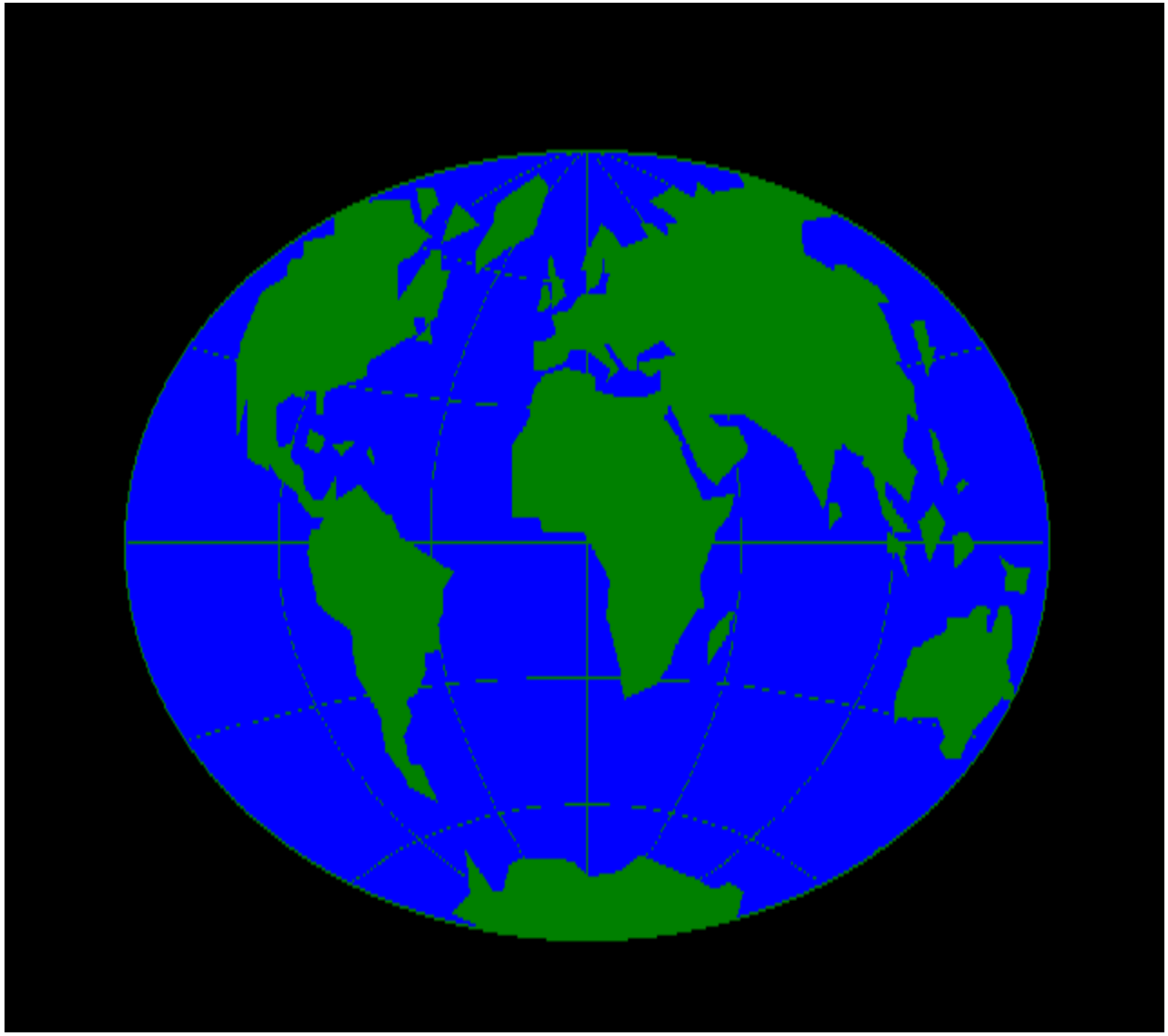
HAND TOOLS

- What is the significance of this picture?
- Who is using the tools?

This is a reminder.
FACT: The overwhelming majority of accidents and releases are caused by a person who is working on the system.

WE have met the Enemy

…and They are US!



So let’s keep our Eye on the Ball

And make contact with our goals!

My Simple View of the REGs

- PSM
- RMP
- CalARP

- AHM's Accutely Hazardous Materials

Prevent a Vapor Cloud at all costs!

The Goal of these REG's

(in my opinion)

#1.To operate the systems with AHM's Safely and properly.

The Goal of the REG's, con't.

#2. To mimimize the potential for a leak or a release.

The Goal of the REG's, con't.

#3. And to be prepared, in case the leak or release ever happens, to be able to react and respond, according to the "plan" you have already prepared with your "team", in a timely, safe and organized manner.

Let’s Go Learn Something!

Learning is an attitude.

Let’s get excited about learning.

I want to see some Attitude.

LET’s GO FOR IT!

Bring your “A” game.

Let’s Get It On!

Let’s Go Learn Something!

Your attitude towards me should be:

“Hey, don’t waste my time, teach me something”.

Let's Go Learn Something!

Here is my attitude as a trainer;

Don't waste my time…don't insult my intelligence by not asking any questions.

The process of learning for adults revolves around asking questions.

(Your job as the one who wants to learn is to find someone who can answer your questions).

It’s All About The HEAT

Terminology

Heat transfer

Compressor

Liquid and vapor

Condenser

High Side

Delta P

Evaporator

Low Side

Expansion Valve

King Valve

Suction

Discharge

HPR-High Pressure Receiver

HPL-High Pressure Liquid

Delta T

JUMP to Slide #42

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BASIC MECHANICAL REFRIGERATION SYTEM COMPONENTS

Refrigeration may be defined as the process by which HEAT is removed from a place (or an object) where it is not wanted, and then transferred to an area where it does no harm (usually the atmosphere).

BASIC MECHANICAL REFRIGERATION SYTEM COMPONENTS

- Basic HEAT law #1 –
- HEAT energy **ALWAYS** flows from a high temperature to a lower temperature.

- In other words, HEAT **ALWAYS** flows from “hot” to “cold”.

BASIC MECHANICAL REFRIGERATION SYTEM COMPONENTS

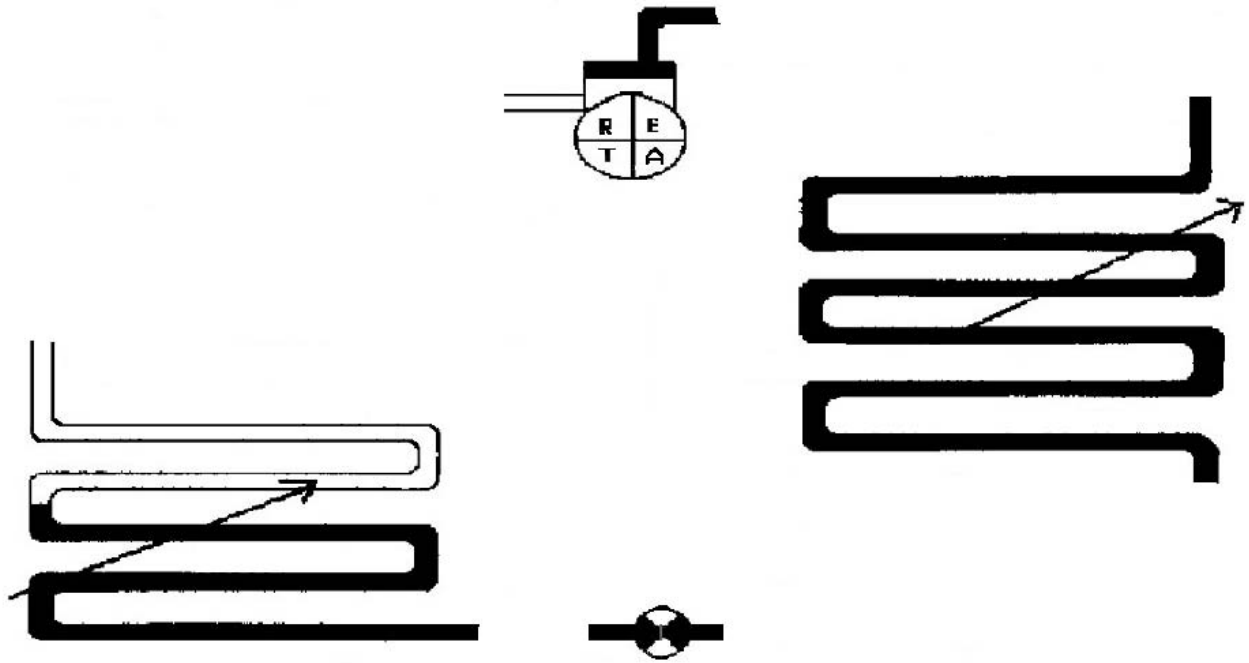
- Mechanical refrigeration is simply the process of a liquid changing state to a vapor and back again. This happens when enough heat energy enters a liquid to cause that liquid to evaporate (or boil) into a vapor. Remember, this liquid had to be the coldest substance in the area for the HEAT energy to flow into it. This is what happens in the EVAPORATOR.

- This same vapor then travels through the compressor and enters the “high pressure side” of the system. At this point, when the high pressure – high temperature vapor loses enough heat energy to cooler surroundings, it will condense back into a liquid. This is what happens in the CONDENSER.

- Now, the cycle can be repeated if this high pressure liquid can be properly throttled to the lower pressure (or suction pressure) side of the system again.
- This is what happens at the METERING DEVICE, which can also be called an EXPANSION VALVE.

Basic System

- There are 4 basic components of a mechanical refrigeration system.


R
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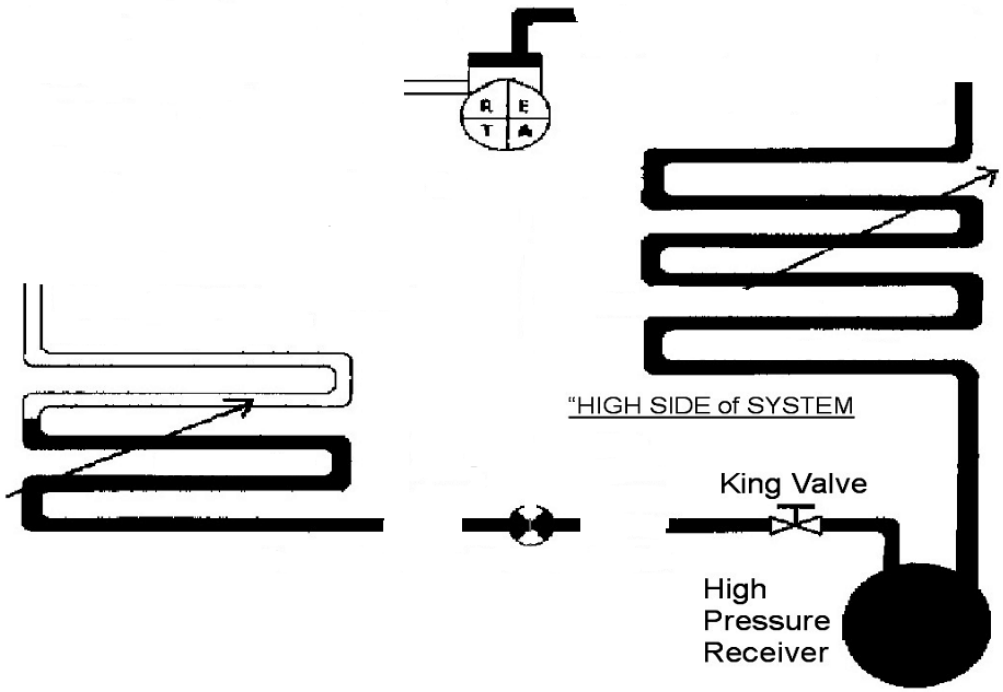
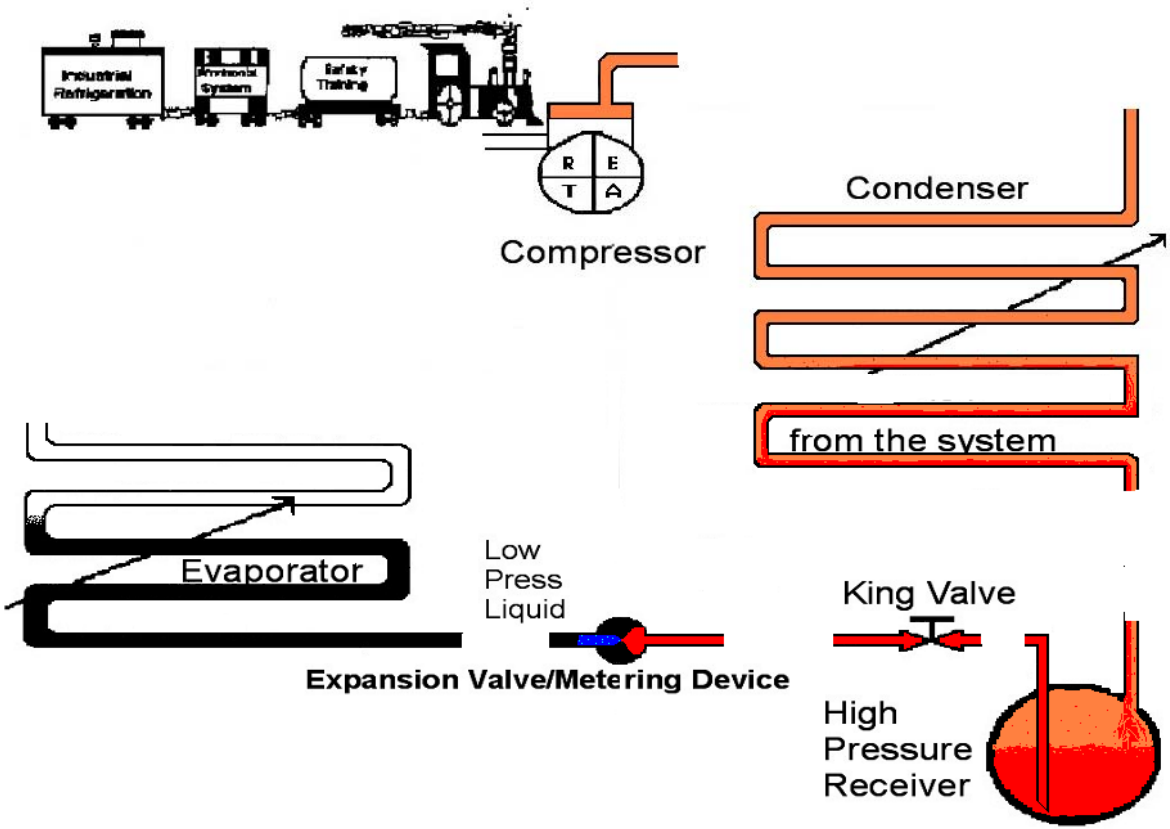
T
A

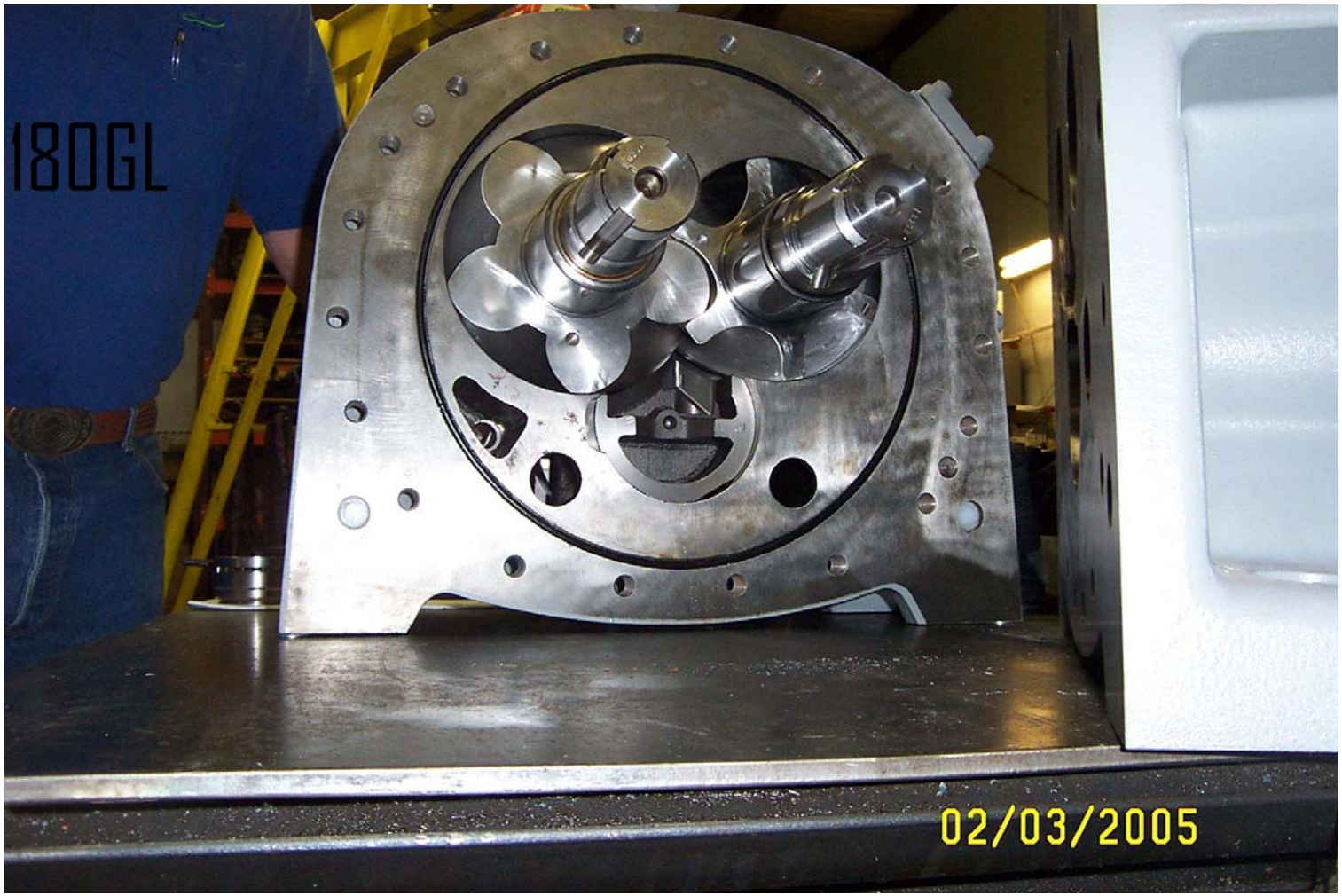

Reese's
PEANUT BUTTER CUPS
Milk Duds
09/25/2008


R E
T A
"HIGH SIDE of SYSTEM
King Valve
High
Pressure
Receiver


Industrial Refrigeration
Ammonia System
Safety Training
R E T A
Compressor
Condenser
from the system
Evaporator
Low Press Liquid
Expansion Valve/Metering Device
King Valve
High Pressure Receiver


CAT
Baltimore Aircoil
02/01/2006

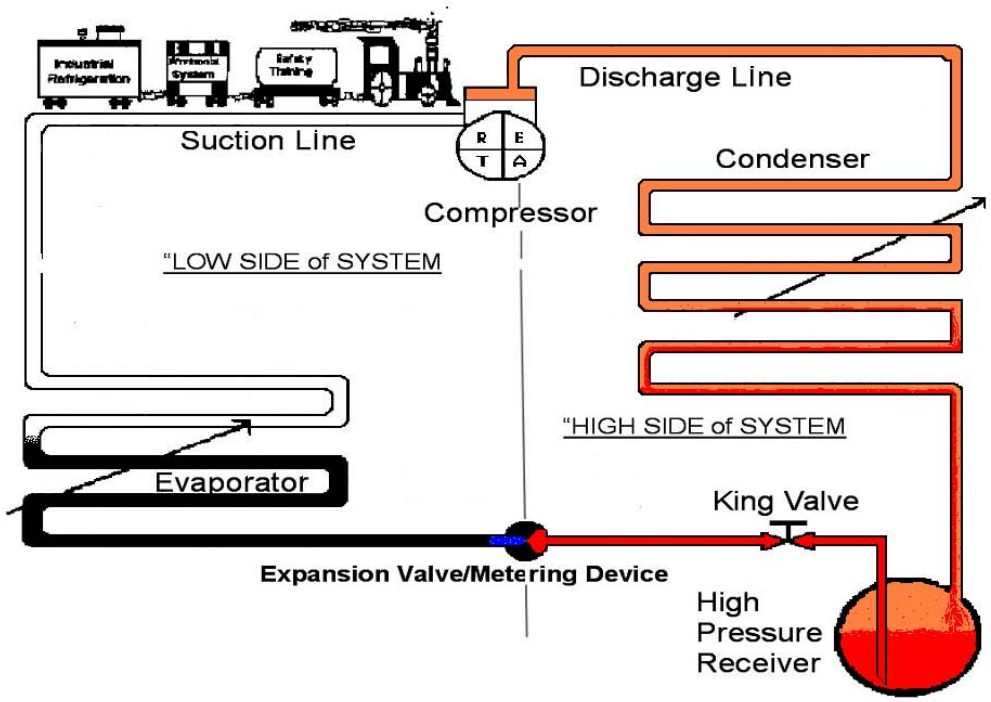

Fan panel open for inspection and cleaning
Baltimore Aircoil
02/01/2006


180GL
02/03/2005


180GL
02/03/2005


02/13/2007


Passivating only-Fans SN U040670901
are not on.
08/31/2004


Industrial Refrigeration
Ammonia System
Safety Training
Discharge Line
Suction Line
R
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Evaporator
King Valve
Expansion Valve/Metering Device
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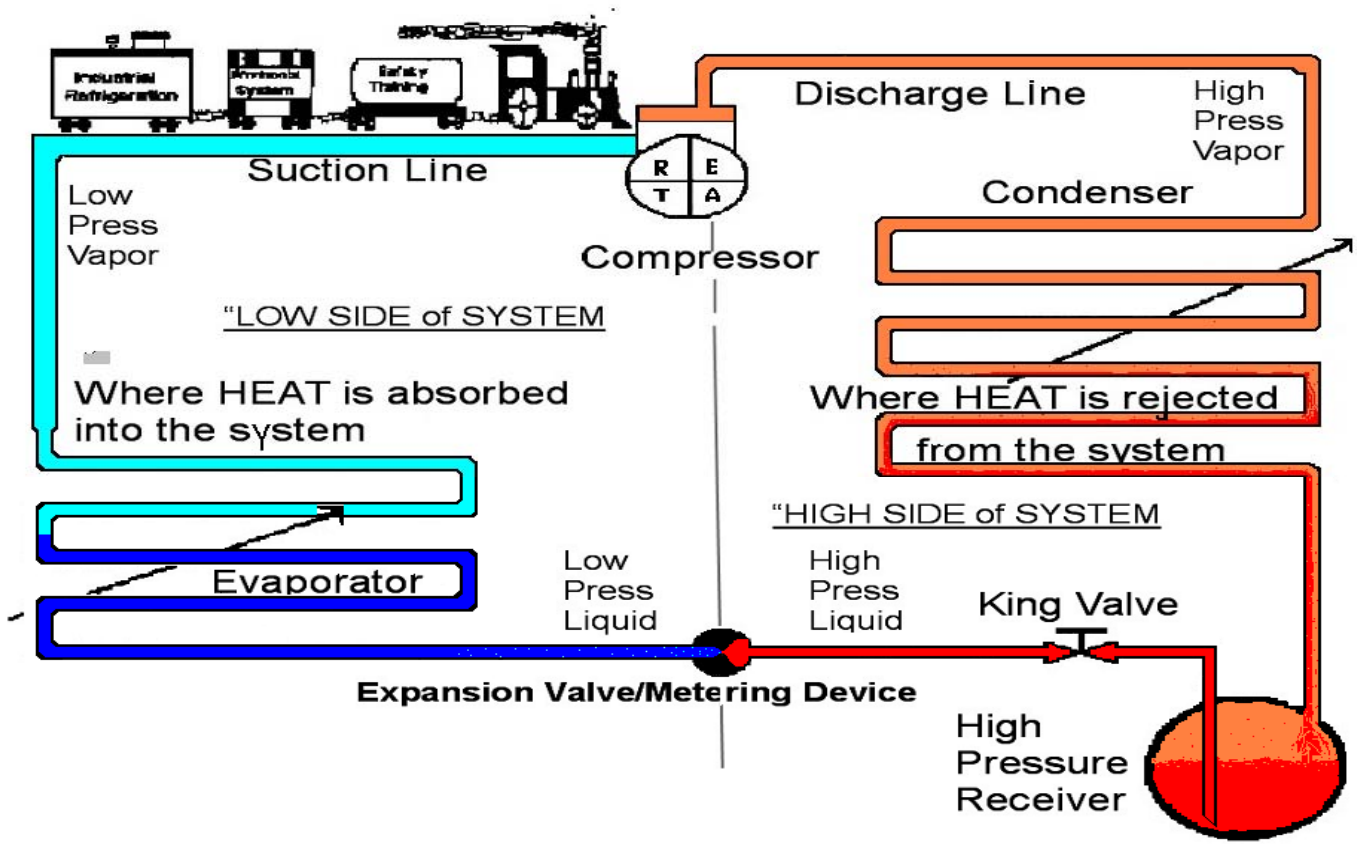

Discharge Line
High
Press
Vapor
Suction Line
Low
Press
Vapor
Condenser
Compressor
"LOW SIDE of SYSTEM
Where HEAT is absorbed
into the system
Where HEAT is rejected
from the system
"HIGH SIDE of SYSTEM
Evaporator
Low
Press
Liquid
High
Press
Liquid
King Valve
Expansion Valve/Metering Device
High
Pressure
Receiver

Challenge to all Operators-Old and New

Short list of things you need to be able to know and do.

Courtesy of Russ Ramos

#1:**You should be able to draw a sketch of your HPR** and accurately locate and describe all the piping connections.

This includes being able to locate the King Valve on the sketch and all the valves immediately upstream and downstream of it.

Challenge to all Operators-Old and New

#2: You should be able to tell me "**how close to perfect**" you can operate your system in regards to head pressure and non-condensables.

In other words how close can you get your actual system head pressure to the pressure that corresponds to your actual system condensing temperature.

Challenge to all Operators-Old and New

#3:You should be able to draw your entire system

(in a block flow diagram format) and represent every compressor, condenser, metering device, and evaporator (with vessels and pressure regulators if present) on the main system flow.

In other words draw the correct flow of liquid refrigerant from the HPR (or CPR) through every device out to every evaporator and bring the vapor back to the condensers through every device on the main system piping. You should be able to draw and explain this system to all of the top management and engineers in your organization, with no notes, explaining all the pressures and temperatures, the condition and relative speed of flow of the refrigerant in every component. (Initially you don't need to draw the "auxiliary" systems like defrost piping, purgers, oil pots, emergency diffusion systems, liquid transfer systems, etc. But when you know where they tie into the main system piping, and you can draw them too…WOW!

Challenge to all Operators-Old and New

#4:**You must be able to explain all these things in great detail**.

My philosophy is this. If you can't explain it, then you don't know it well enough yet.

Keep practicing.

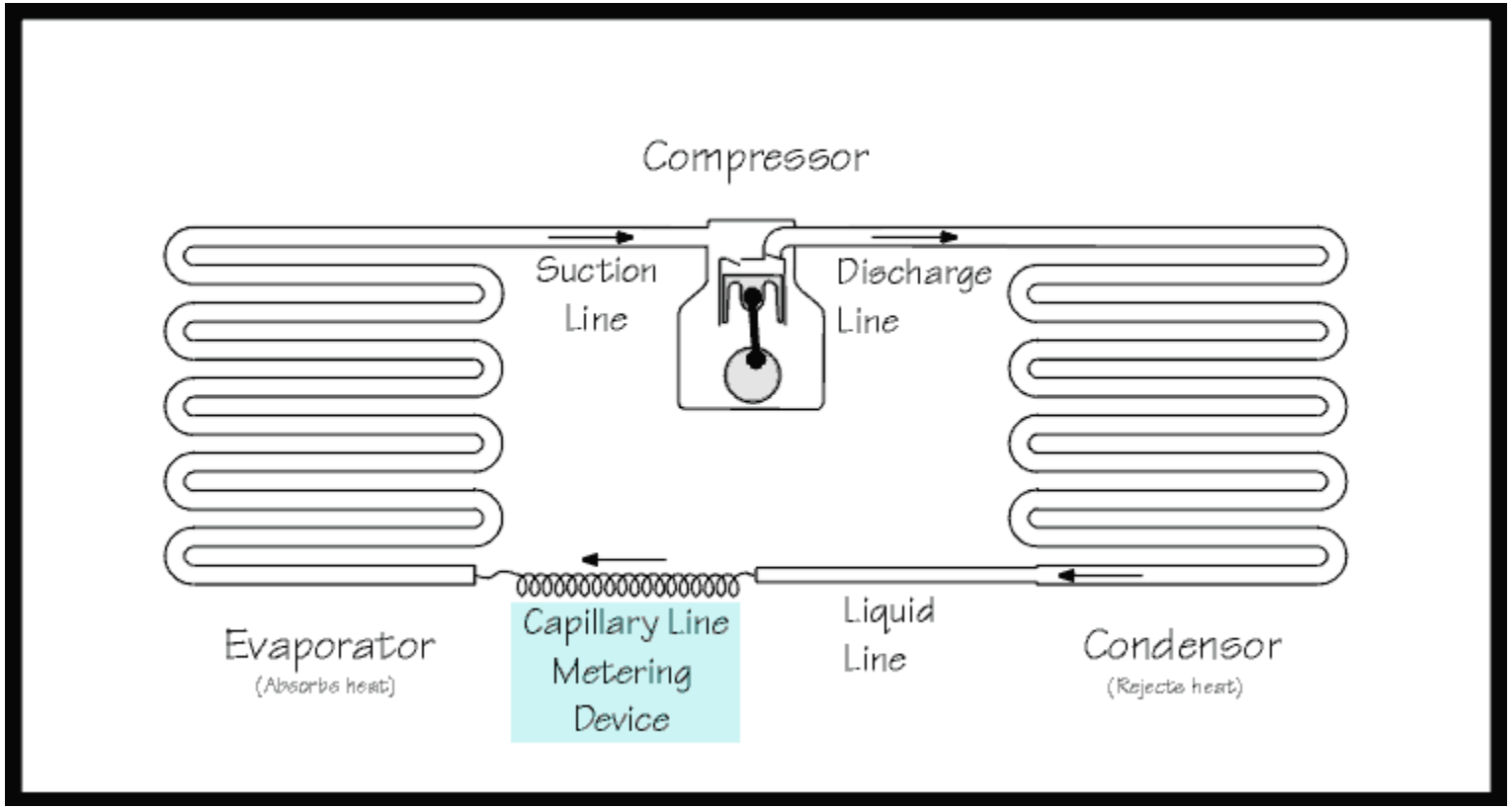
Challenge to all Operators-Old and New

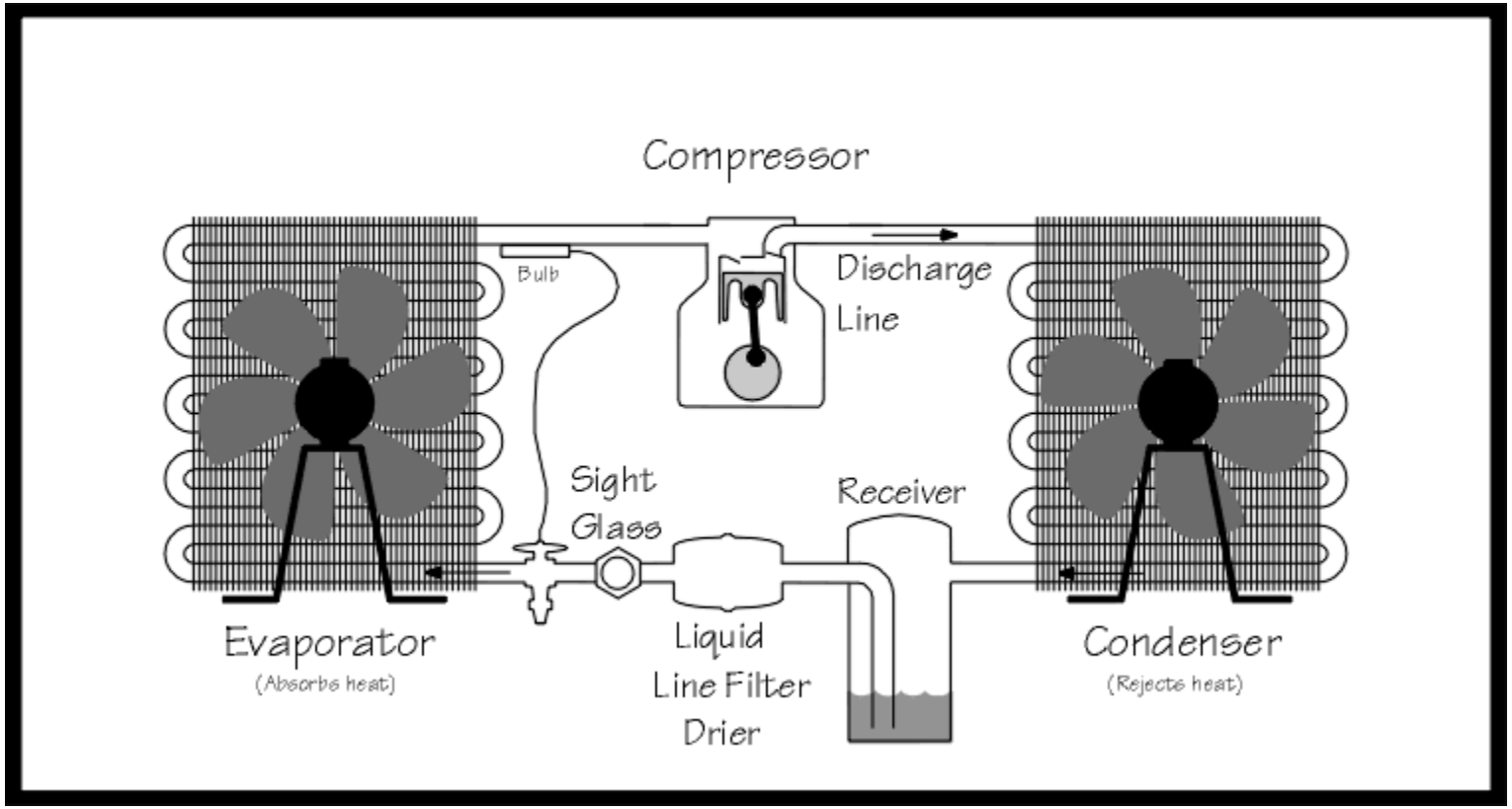
#5:

You need to have the attitude that **Learning Is Fun.**

Note: If you can accomplish these five things grasshopper, then you will be in a very elite group of operators.

Can you say; Kung Fu Master?


Compressor
Suction Line
Discharge Line
Evaporator
(Absorbs heat)
Capillary Line Metering Device
Liquid Line
Condensor
(Rejects heat)


Compressor
Bulb
Discharge
Line
Sight
Glass
Receiver
Evaporator
(Absorbs heat)
Liquid
Line Filter
Drier
Condenser
(Rejects heat)