Santech Automotive A/C Components

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Global Compressor Market Update

&

Protecting Profits Through Warranties

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Global Compressor Market Update

- Electronically Controlled Compressors
- Electric Compressors
- New Refrigerants
- Chinese Technology

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Part Failures

- Frustrates everyone from manufacturer to consumer levels
- Must be addressed at every level
- Requires everyone to understand what is happening to cause it
- Solutions will not come until everyone is trained to do the things necessary to resolve the issues

Recipe for Failure

- Manufacturers design a new item or try to resolve the problem without asking for the input of the users
- Sometimes the solution is so simple to the installer but the manufacturer spends an incredible amount of money and effort to find a solution
- Does your installation instructions dictate a failure?
- This assumes someone reads them
- Maybe 2-3 pages of disclaimers doesn't make the installer understand what he SHOULD be doing
- A flat rate tech will most likely not read more than 2-3 lines of instructions

Gather Input

- Talk to your jobbers
- Talk to their sales people or your reps
- Talk to your shop owners AND technicians
- Don’t assume your engineer or design team has the answers
- A new engineer may bring a new point of view to the table but may not be aware of the mistakes made 10 or 20 years ago that the old engineer wouldn’t make again
- Solicit the input of users before finalizing a design

A/C Compressors

- Examples of what I saw causing failures in his shop
- For an installer most of this is training issues but the direction from the manufactures is inconsistent at best and possibly outdated
- Cars have changed over the last 30 years. Have your recommended procedures changed?
- This is meant to help make you aware of the issues that need addressing, not necessarily the final answers

A/C Clutch Failures

- Low voltage issues Alternators lose 18%
- Old applications voltage drop 2-3volts
- Coils weak when hot
- Snap rings not seated
- Fan clutches (New out of the box bad)
- Shaft seal leaks (oil on clutch surfaces)
- Switches & transducers
- Overcharge oil or refrigerant

Bearing Failures

- Pulley bearings fail due to heat from the clutch slipping, The clutch doesn’t burn up because the bearing failed
- Front seals will leak due to clutches heating up or can cause clutches to slip if they leak oil onto clutch surfaces
- Internal bearing failures from vibration and lack of running or lubrication in the winter

Expansion Valves

- Too much flow slugging compressors with liquid
- Not enough flow starving a compressor from oil and internal cooling
- Valves that will not self start in heat soak conditions

System Design

- Compressor located at the bottom of the vehicle (oil and refrigerant migration) slugged on start up
- Badly located charge ports
- Trapping of oil in rear units or dual units due to design and lack of instructions to the customer (Think Suburban or Sequoia)
- Not enough condenser capacity
- Retrofit

Improper Charge

- Stickers wrong or read or entered wrong
- Machine errors-lack of maintenance
- Placing the machine against the bumper or bumping the machine while charging
- System not fully recovered before charging
- Capacity changes due to condenser design changes

Oil Charge

- Incorrect oil charge will ensure you will be off on refrigerant charge even if the correct amount of refrigerant is added
- Oil charts are usually TOTAL SYSTEM CAPACITY
- Wrong type oil or unknown type oil
- Injecting oil at every charge or service
- Belief that recovery or vacuum removes oil from the system
- Customers adding oil/sealer/etc before getting service done at a shop

Improper Type Oil

- Previous retrofit with unknown oil
- Add Double End Cap
- Retrofit back to R12 after a 134 retrofit

Low Side Charge

- We suspect this causes way more damage than anyone realizes
- Compressors were not designed to pump liquid
- If the low side port is in the suction line or on the compressor adding oil and liquid refrigerant will fill the line and compressor to slug the compressor on start up
- Blown gaskets
- Broken Valves
- Scroll seals
- If the charge is done on the high side the refrigerant goes through the normal cycle and returns to the compressor as a vapor
- If a top off is needed it needs to be added slowly to allow it to vaporize on the way into the vehicle since most machines charge liquid
- Charging with cans will almost certainly introduce liquid into the low side

Leaks

- Probably the biggest cause of compressor failure
- If the system is undercharged or leaks it will cause internal compressor temperature to rise significantly
- The rise in temperature will cause rubber to vulcanize and become less pliable allowing leaks
- Oil will not return back to the compressor along with the droplets of refrigerant remaining in the evaporator
- This is the equivalent of running an engine with out water. It will cause cylinder scoring and in turn scuff the rings off the pistons
- As little as 10% undercharge will cause comp temp to rise, 20-25% may not even be noticed by the customer as far as cooling the vehicle. It will certainly affect compressor life

Leaks cont.

- Encouraging customers to use dye for leak detection gives them a false sense of security
- They can’t check their work when finished and by the time the vehicle comes back more than 25% low on charge it has already started to score cylinders and started the process that will ultimately destroy it
- We have seen compressors run 25% low on a 110 degree day as little as 10 minutes already scored

Leaks cont.

- There are so many things that can go wrong with an ac job that will cause leaks or failures it may seem impossible to train the techs to cover them all
- One that has happened to every tech out there has been service valve leaks
- If they do everything right and the service cap is missing the gasket or it is flattened out it will depress the schrader a little when they screw it on and cause a leak
- Recommend electronic leak detectors so they can check their work
- Bad motor mounts are causing hoses to flex excessively and many of the hose leaks can be attributed to them

Condenser Design

- The condensers job is to get rid of the heat that is pumped out of the passenger compartment
- Pressure is determined by the condensers ability to do that
- The pressure will only go as high as necessary to get rid of the heat
- 134a needs almost twice the condenser capacity to do the same job R12 did at the same temperature and pressure
- At 110 degrees the pressure will go up approximately 100# and the internal temperature rises to the point of rubber vulcanization if the efficiency of the condenser is not adequate or air flow is compromised
- Many trainers have recommended reducing the charge level to compensate for the pressure issue thus overheating the compressor due to low charge as noted previously while starving it for lube

Condenser cont

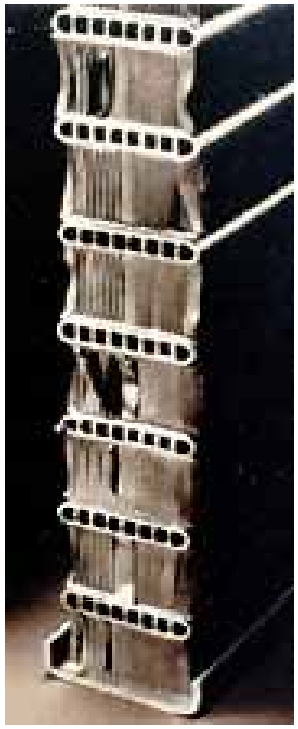
- A failed compressor that has dumped its ring material into the condenser will certainly reduce its cooling capacity
- Many vendors are using an inferior design to replace oe condensers
- Even some of the oe's have gone to the aftermarket and boxed condensers that have 30-50% less capacity (think bankruptcy and availability issues) just because is says Motorcraft or Delco on the box it is not always a good replacement
- Some of the aftermarket companies have introduced the more efficient parallel flows into the market to replace or upgrade the oe units. Know the designs to help evaluate what you are installing

Condenser Types

- T/F Tube and Fin 100% efficiency
- Serpentine 125
- Redirected T/F 130
- Piccallo 133
- Parallel or Multi Flow 155
- Sub-cooling ? 155+

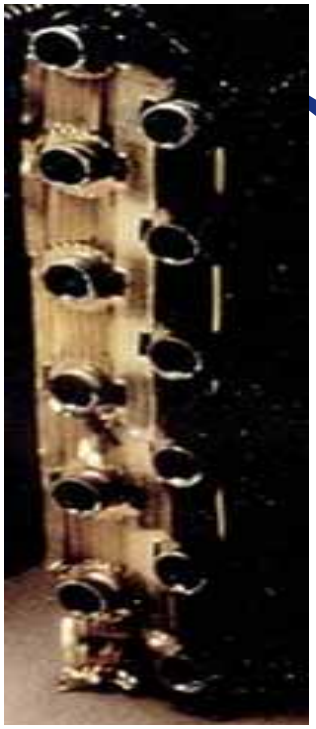
3/8” Tube & Fin

2 passes could usually be flushed



Serpentine

First high efficiency design used in later R-12 & early R-134a systems



6mm “Piccallo” Tube.

Still used by many OEM’s today because of efficiency. Limited flushing capability. Most are multi-flow designs

Parallel Flow

More passages – closer together. CANNOT be flushed completely!

Latest Parallel Flow

- Even if debris was dislodged during flush it would stay in the header cavity

Condenser cont

- Some vehicles just simply were not designed with enough condenser capacity to handle the heat in some parts of the country
- Everything the industry was told when 134a was being introduced said it would work ok and they gave us specs and pressure comparisons at 104 deg
- The reality was that is was NOT working well or at all in some applications
- We had ambulances that were opening the doors at 106degres because the air stopped cooling entirely and they were replacing compressors daily

Real World Conditions

- If 134a worked in the wind tunnel testing why wasn't it working in the field?
- We went to the street in Las Vegas to see. On a 118deg day at a stop light in front of my shop in 3 lanes of traffic we took air temp readings between the cars at bumper height
- Lowest was 152 and highest was 158 deg

Heat Transfer

- Remember heat transfers from warmer to cooler so no heat is removed from the condenser until the temp inside the cond is higher than the air temp flowing through it
- Some vendors feel that a 30 degree drop across the condenser is normal. I have seen 35deg on several
- Check the pres temp chart of 134a
- 190deg =approx 435#, 205deg=518#

Condenser Efficiency

- A parallel flow cond will transfer the heat more efficiently, I have proven some at a 5 deg drop in those conditions
- 165deg temp= 320#
- Do you think your compressors can handle an additional 200# pressure and a discharge temp of over 200 degrees
- These numbers are assuming the fan clutch and electric fans are working correctly and the air dams on the front end are in place

Flushing

- We feel that the industry should reconsider their directives to flush systems when compressors are replaced
- Most people don’t know how to properly flush and may be causing more harm than good
- System designs have changed and some of the service procedures that were recommended 20 or 30 years ago no longer apply to vehicles built the last 10 years

Why Not Flush

- The only real justification to flushing is to remove oil
- Removing debris from a failed compressor or drier bag that has come apart is almost impossible and flushing will only give the tech a false sense that he cleaned the system
- Parrallel flow condensers or plate & fin evaporators with headers do not allow the debris to be removed (think 100+ parallel paths as small as a pin, under 1mm)
- The flush will come out the other end through the open tubes but won't unplug a plugged tube

Why not flush evaporators

- Any debris that gets into the evaporator has to go through the orifice tube screen or expansion valve (think very small particles)
- The headers of the evaporator wont allow the particles to actually be removed
- 2-3 ounces of oil will remain in the evaporator if not flushed
- If the evaporator is flushed there is a strong possibility that some flush will remain in it
- Then the question is this

Plate and Fin Evaporator

- Bottom has baffles that will not allow removal of debris

What's Worse

- Would I rather have 2-3 ounces of possibly dirty oil or 2-3 ounces of flush left in the system
- Recovery machine manufacturers have proven that it is very difficult to get all the refrigerant out of the system on recovery and vacuum and refrigerant boils off easier than flush
- Most evaporators retain a certain amount of flush after pulling a vacuum
- Flush breaks down oil
- Would you do an oil change on the engine and then pour a qt of gas in the crankcase?

Debris

- We all know that the system needs to be clean for the compressor to live and the job to be profitable and successful
- Training the installer to replace the dirty components when a major failure occurs and just blowing excess oil out when an oil overcharge is suspected may result in a lower failure rate than flushing (It has on my customers)
- How many of the warranty return compressors still smell of flush when you get them back
- Catch oil and flush in a container the next time you flush a system and leave it stand for a couple of weeks and see if the flush evaporated or if you still smell it

Condenser Fan Belt Replacement Required on VW Jetta 2002-2007

Failure to do so will Void Warranty

- **Many VW's have two condenser fans with only one motor. The Second fan is belt driven from the primary fan.**
- **Over 50,000 KM this belt needs to be replaced. Failure to replace it may result in compressor failure and loss of Warranty.**

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Potential Causes for Compressor Failure

- Defective Clutch Fan, Fan failure,
- Defective Fan Temperature sensors/High pressure sensors
- Low voltage, wrong alternator, loose belt, weak battery
- Low refrigerant/air in system/contaminated refrigerant
- Wrong Oil, Improper Viscosity too much or too little
- Unusual Additives, Flush in the system
- Poor original vehicle or system design
- Low quality parts from previous repair
- Debris in the system, Road Hazards, natural wear

Protecting Profits through Warranties

- **Remanufacturers**
- **Distributors of new and rebuilt**
- **Manufacturers of New**
- **Service Work Shops & mechanics**

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Protecting Profits through Warranties

- Porthole into the Service Garage
- Know what can affect your product
- Warranty issues command attention
- Warranty Void if……

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Thank You

- I appreciate the opportunity you gave me to express my opinions.
- I know that some of you will not agree with my philosophy.
- I can only hope that I have given you something to take back to your businesses and maybe help you in some way to understand what we are all struggling with so solutions can be found.

Good Luck
and
Thank you