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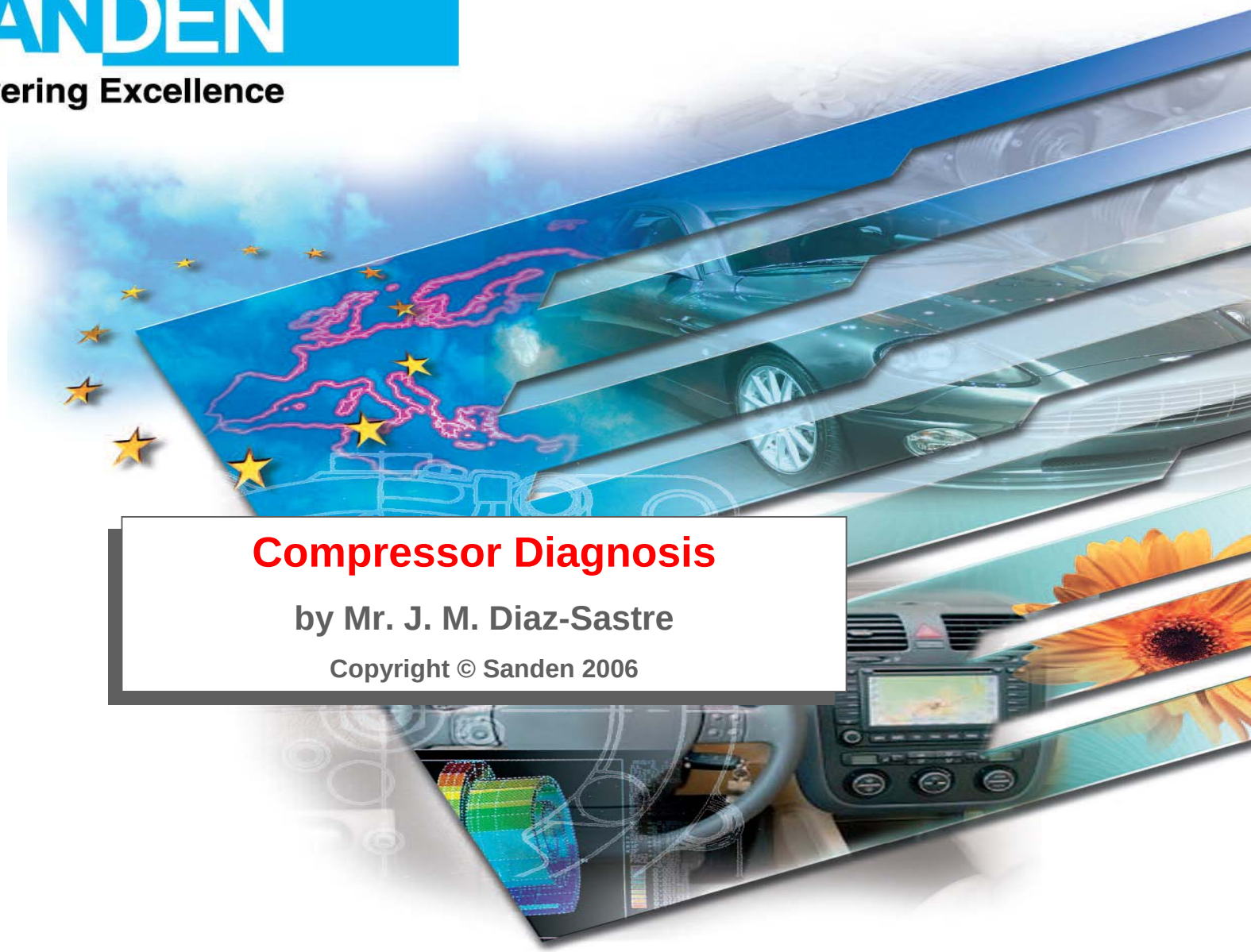


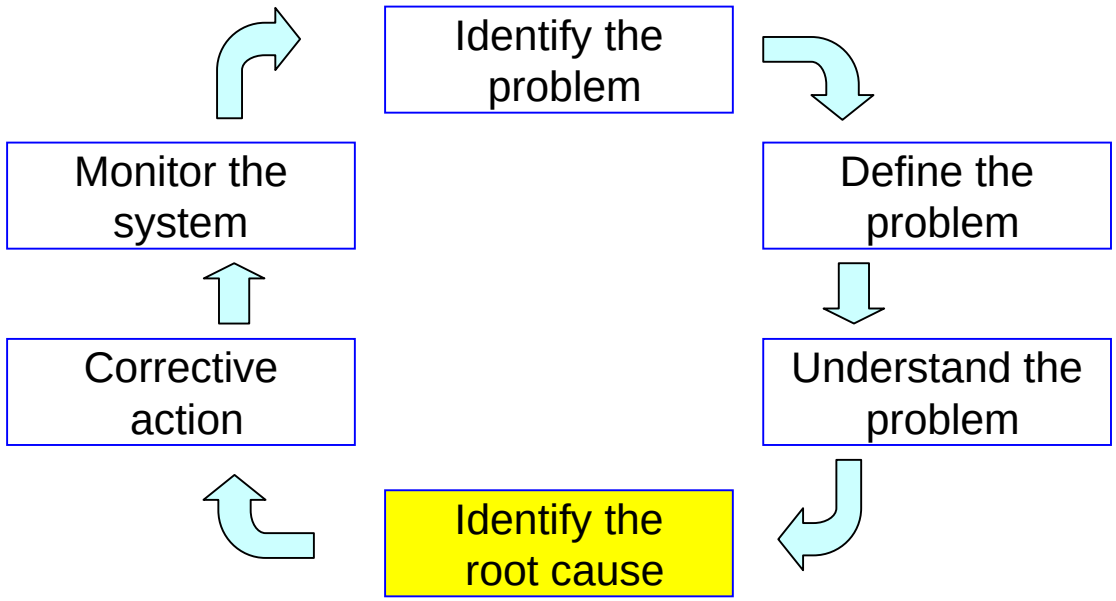
Compressor Diagnosis

by Mr. J. M. Diaz-Sastre

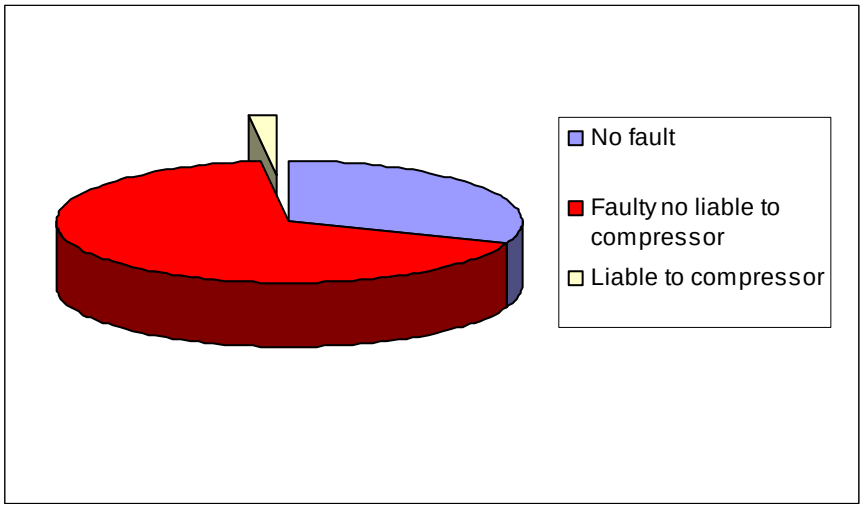
30 YEARS Sanden Europe

A Global First Class Supplier of Automotive Air Conditioning Technology

Compressor diagnosis: Root failure causes and solutions



Compressor inspection results



Compressor replaced in new cars during warranty period

30% of compressors are OK
< 5% Warranty

Consequences:

-Cost to Sanden
-Cost to vehicle manufacturer
-Cost to dealer
-Cost to final customer
-Bad image

Why?

Wrong diagnosis

Wrong repair

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Compressor enemies

- **Hits**
- **Dirtiness**
- **Refrigerant/oil wrong circulation**

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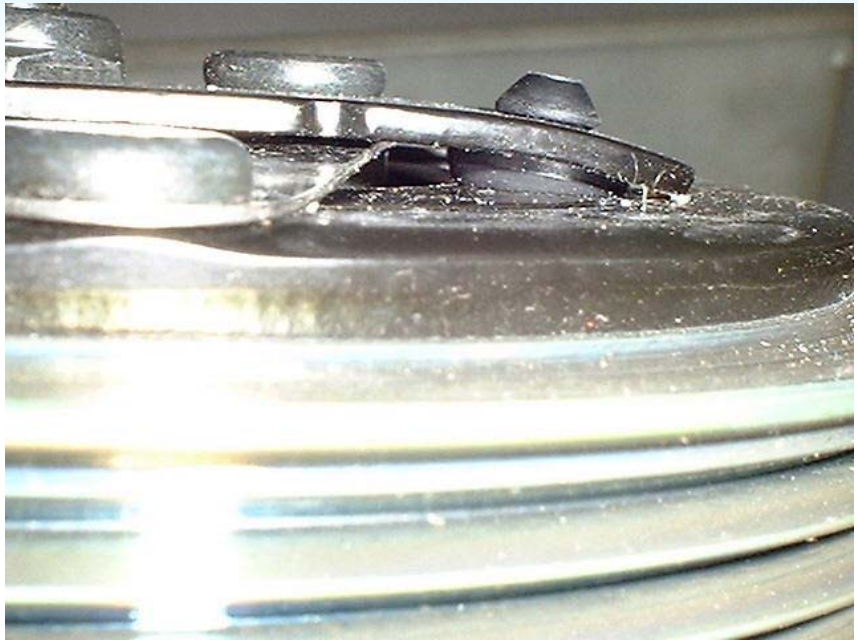
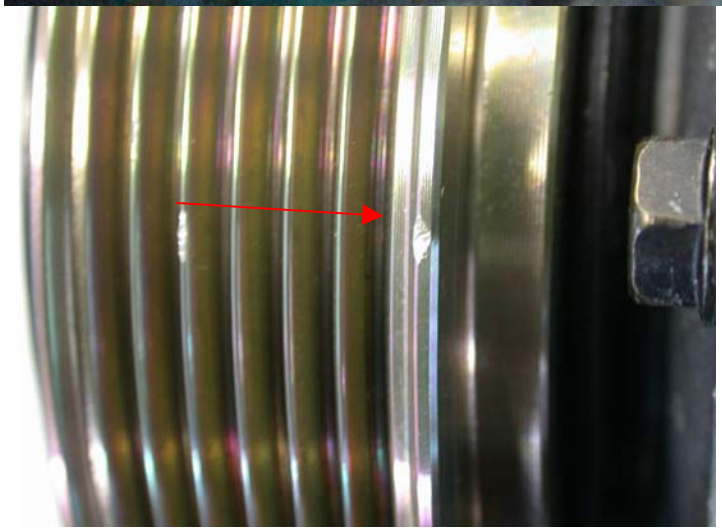
Hits



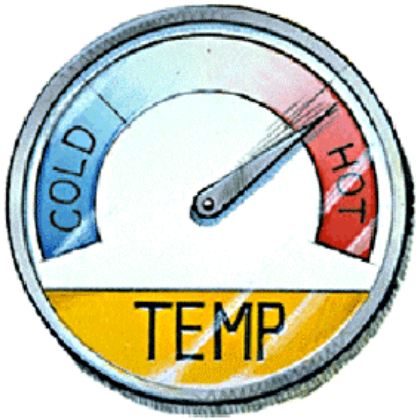


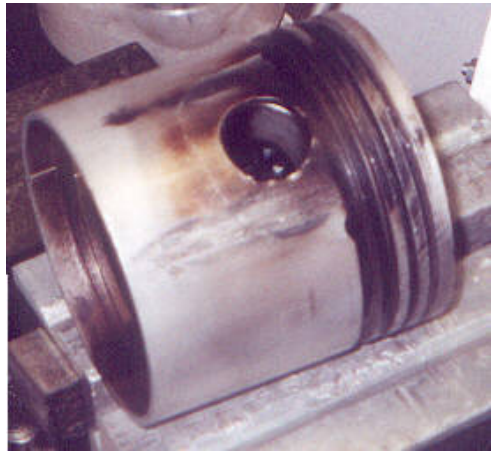
Dirtiness

- **System not cleaned in previous repair**

- **Small particle under discharge valve**

Refrigerant/oil wrong circulation





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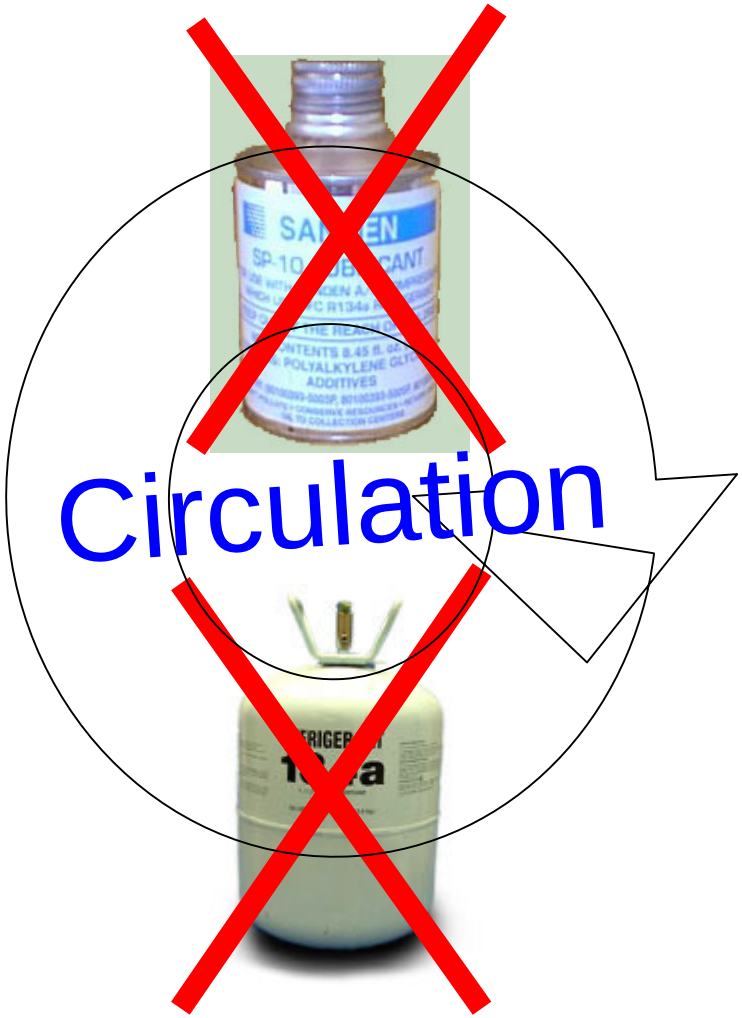
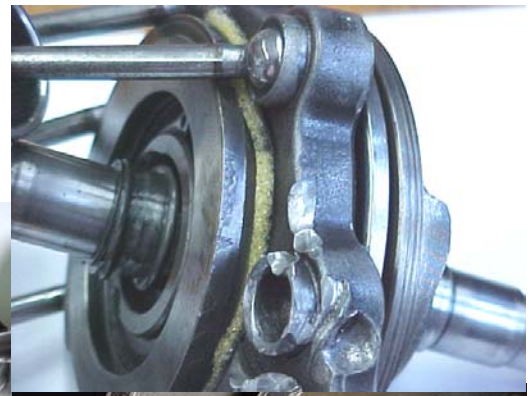
Consequences of Refrigerant/oil wrong circulation





Cause of Refrigerant/oil wrong circulation

- Wrong amount

- Lock

Receiver Drier

Expansion device

- Small leak

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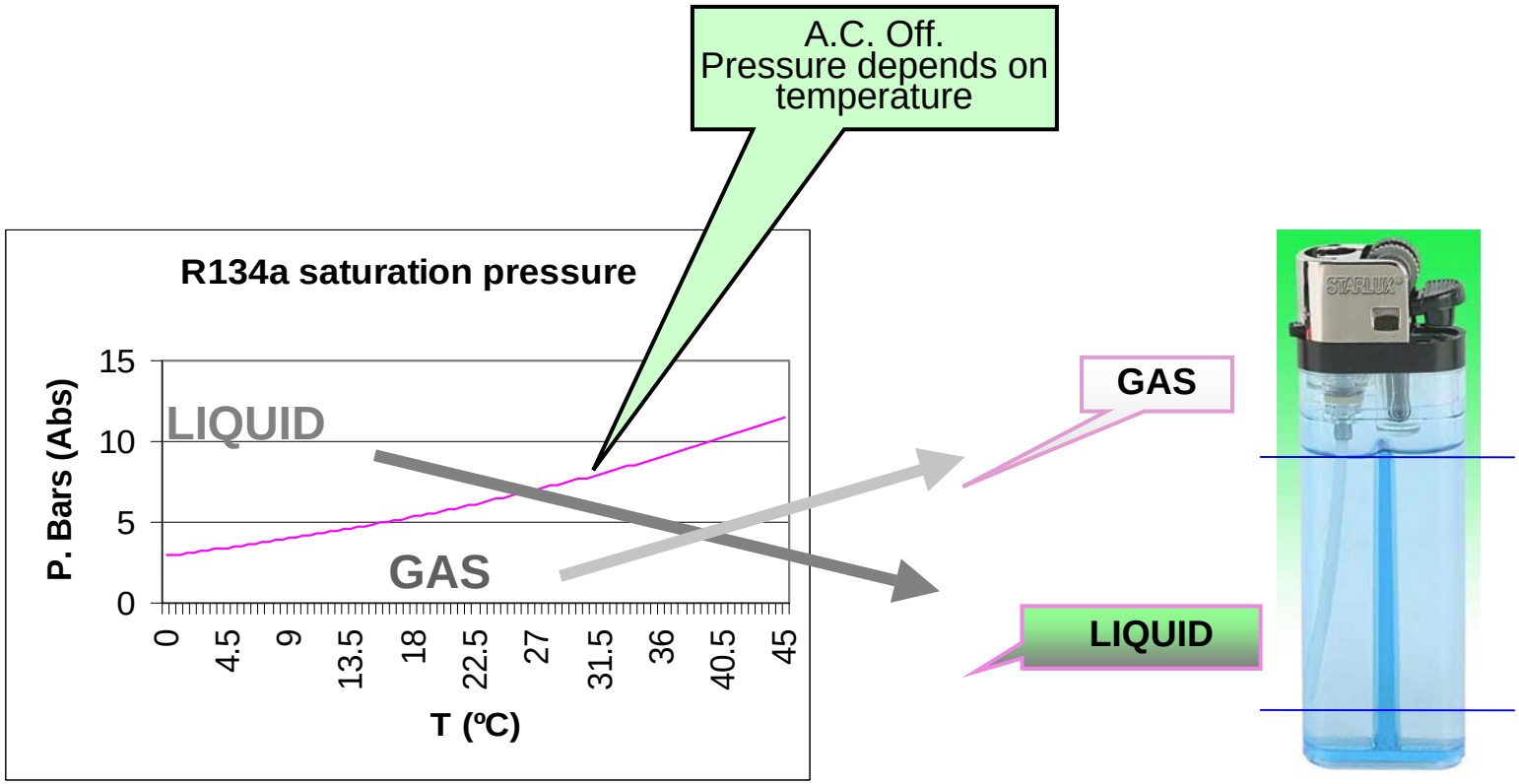
Why pressure switch does not protect from small leaks



Ambient temperature	Vehicle charge spec. grs - R134	R134a charge to reach 2 bar grs.	%
19ºC	650	50	7.70%
25ºC	740	38	5.10%

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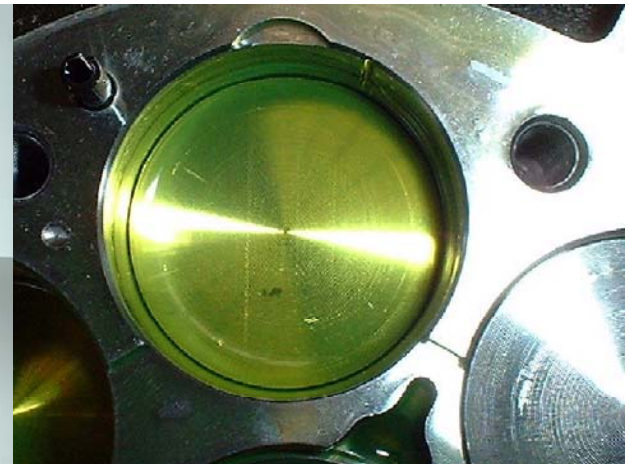
Important!!

- **It is impossible to replace only the compressor!**
- **Refrigerant is always replaced!**
- **Check leaks carefully!**

Diagnosis by oil color



Clear yellow color.

•OK. New oil, used oil

Light grey color

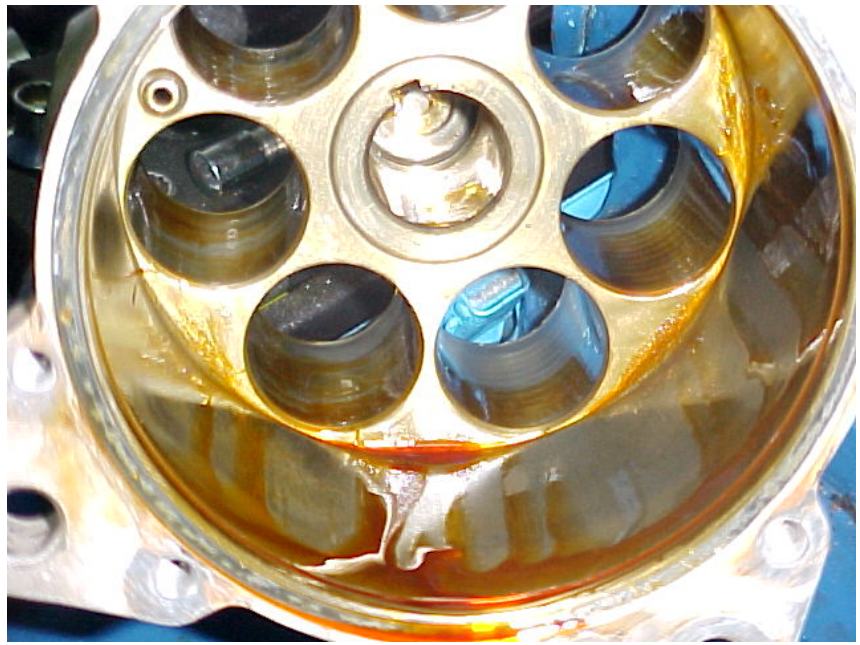
•OK. Common in compressors with few running hours

Green color. Clear oil

•OK. Leak detector additive

Symptom: Orange oil

Diagnosis: System contaminated by humidity

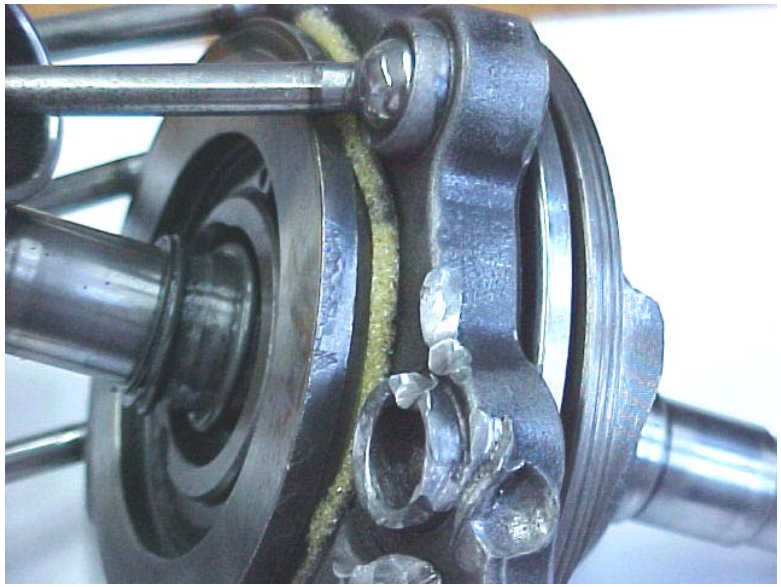


Possible root causes:

- Poor vacuum.
- Components contaminated by water.

Symptom: Dark grey oil

Diagnosis: Balance ring wear, compressor seized



Root cause:

- Poor oil/refrigerant circulation

(See related material)

Symptom: Silver color oil

Diagnosis: Damaged compressor.
Medium/big particles in suspension

Root causes:

- Compressor defect
- Abnormal running conditions

Symptom: “Label blistering”

Diagnosis: Seized compressor.

Root causes:

Poor oil/refrigerant circulation

(See related material)

Symptom: Burned clutch

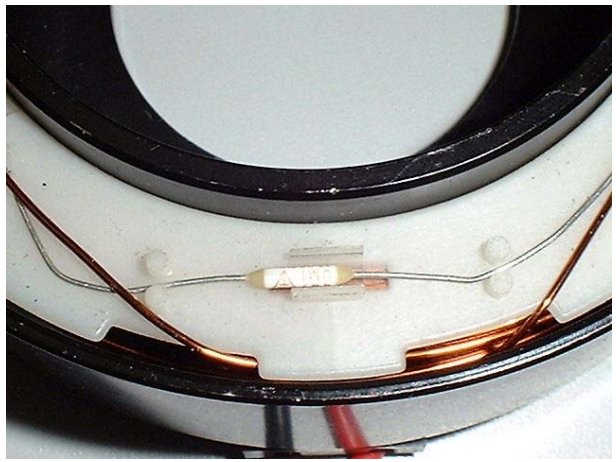
Diagnosis: Internal damage or oil in clutch friction area.

Root causes:

-Poor oil/refrigerant circulation
-Particle under discharge valve
-Oil leak by shaft seal
-Oil on friction surface from external source
-Low voltage supply

Symptom: Open coil

Diagnosis: Internal damage or clutch slippage.

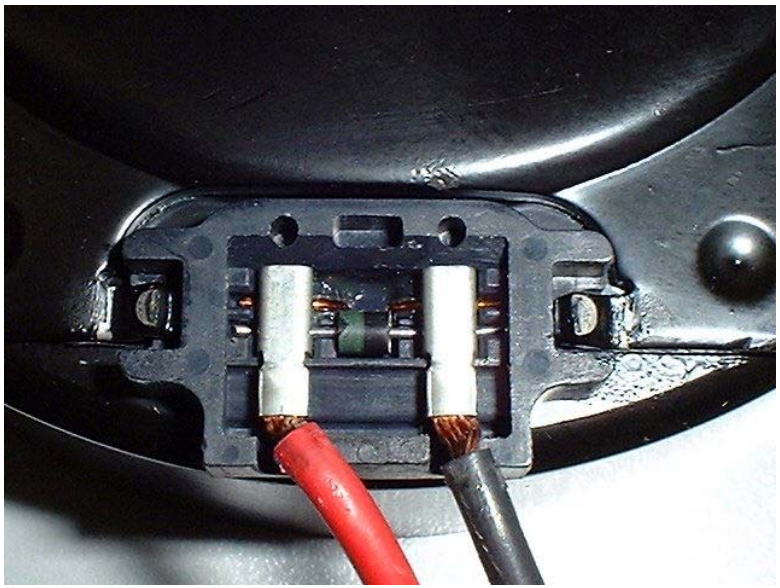


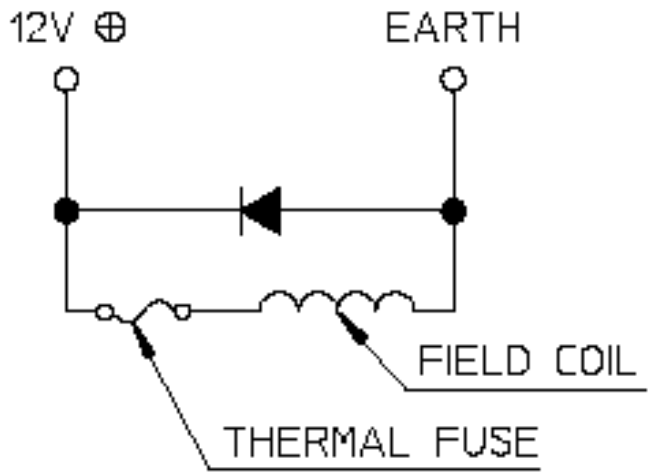
Root causes:

-Poor oil/refrigerant circulation
-Particle under discharge valve
-Oil leak by shaft seal
-Oil on friction surface from external source
-Low voltage supply

Symptom: Short circuit coil

Diagnosis: Short circuit diode



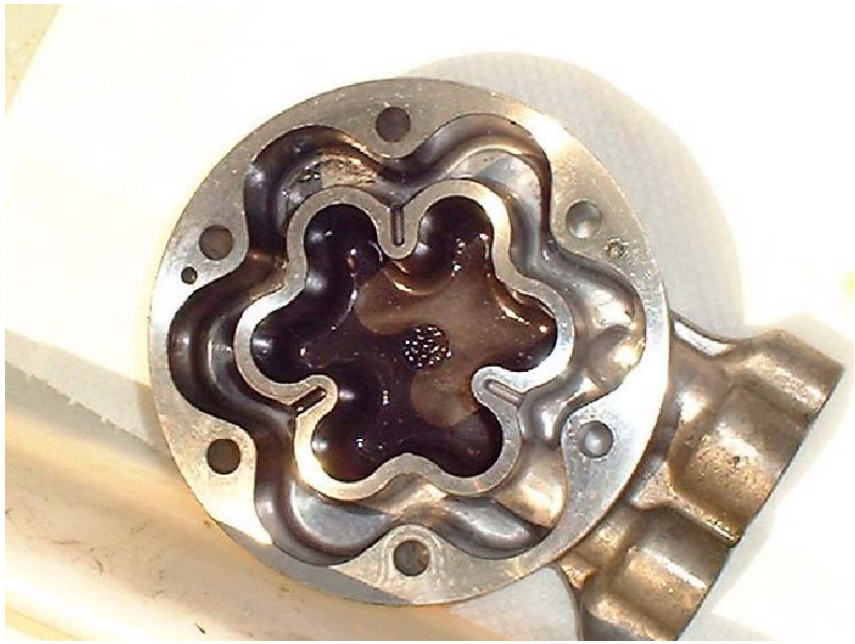


Root cause:

- Wrong polarity applied to compressor

Symptom: Dark discharge area

Diagnosis: High discharge pressure/temperature



Possible root causes:

- Dirty condenser
- Fan electric problem
- Refrigerant overcharge

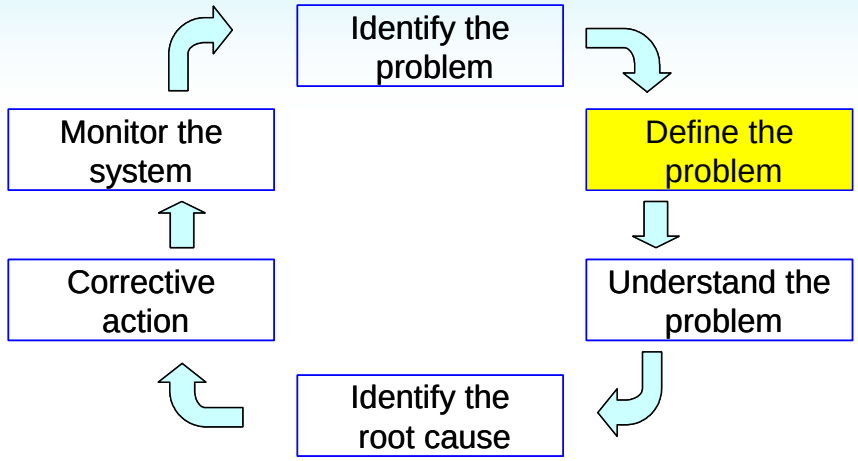
A.C. Noise


Sanden's NVH chamber

- The compressor (like any other machine) creates noise. Noise level inside the vehicle depends on many factors rather than compressor's NVH level itself.

- A proper design of the A. C system (compressor bracket, hoses, pipes, HVAC insulation, etc.) is key to avoid noise.

Abnormal A.C. Noise

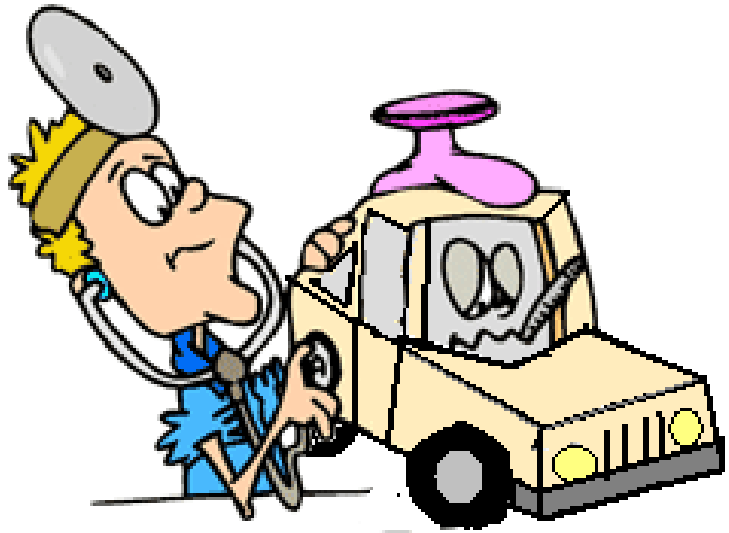


When the noise appears:

- Idling/specific rpm range
- Ambient temperature cold/hot days
- Continuously/sporadically
- Pressure values

Kind of noise:

- Metallic
- Contacts
- Whistle
- Etc.



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Abnormal A.C. Noise

WITH CLUTCH UN-ENGAGED.

1. **Armature contact with pulley. -> Replace clutch**
2. **Pulley oscillation due to external hit.->** Replace clutch
3. **Pulley contact with foreign element -> Remove contact**

WITH ENGAGED CLUTCH

1. **Incorrect refrigerant amount -> Verify charge**
4. **Liquid refrigerant arriving to compressor -> Check expansion valve**
5. **Pipes/hoses contacts with vehicle body-> Remove contact**
6. **Clutch slippage due to oil -> Remove compressor**
7. **Particle under discharge valve -> Pressures are quickly balanced when AC stops**
8. **Internal compressor damages -> Replace compressor**

Second compressor fails. Why?

- **Leaks?**
- **Clean system?**
- **New filter?**
- **TXV ok?**