SAE International

SURFACE VEHICLE RECOMMENDED PRACTICE

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Charge Air Cooler Leakage

RATIONALE

This document is cancelled because its content has been included in SAE J1726 (February 2010).

1. SCOPE

This document is applicable to all air-to-air charge air coolers used with internal combustion engines.

1.1 Purpose

This document describes allowable air leakage and test procedures for measuring air leakage in air-to-air charge air coolers.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1148 Engine Charge Air Cooler Nomenclature

SAE J1542 Laboratory Testing of Vehicle and Industrial Heat Exchangers for Thermal Cycle Durability

SAE J1597 Laboratory Testing of Vehicle and Industrial Heat Exchangers for Pressure Cycle Durability

SAE J1598 Laboratory Testing of Vehicle and Industrial Heat Exchangers for Durability under Vibration Induced Loading

2.1.2 Other Publications

TMC Recommended Practice RP 331—Charge Air Cooler Integrity

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3. OBJECTIVE

This document describes the circumstances where small leaks in air-to-air charge air coolers are acceptable and describes test methods to measure these leaks.

4. BACKGROUND

Brazed aluminum, air-to-air charge air coolers have been used since the early 1980's on many turbocharged Diesel engines. It is difficult to manufacture charge air coolers completely free of leaks, and Diesel engine performance is not significantly affected by slight charge air leaks. Consequently, most engine manufacturers publish allowable leak rates for charge air coolers.

5. TESTING

Two types of leak tests are common:

5.1 Pressure Decay

5.1.1 Procedure

Cap the inlet and outlet of the charge air cooler. One of the caps needs to have an adapter for a supply of compressed air. **THE CAPS NEED TO BE SECURED TO THE CHARGE AIR COOLER WITH CABLES OR CHAINS TO PREVENT BLOW-OFFS**. Attach a shop air line to the adapter with a pressure gauge, regulator and shut-off valve. Supply air to the charge air cooler to the specified maximum pressure, then shut off the valve and measure the time for the pressure in the charge air cooler to decay to the specified minimum pressure.

5.1.2 Criteria

The specified pressures and times are available from the manufacturer of the engine or charge air cooler. Typical values are in the range of a 20-50 kPa (3-7 psi) pressure loss from 100-200 kPa (15-29 psi) gage pressure in 15-60 seconds.

5.2 Submersion Test

5.2.1 Procedure

Supply air per Procedure 5.1.1 above while the charge air cooler is submerged in water. Capture the air bubbles that leak from the cooler and measure the volume of leaked air during a specified time period. This procedure is difficult to perform in the field and is primarily used at the charge air cooler manufacturing facility.

5.2.2 Criteria

The specified leak rates at a given pressure are available from the manufacturer of the engine or charge air cooler. Typical leak rates are in the range of 10-200 cc/min (1-12 cubic inches/min) at 100 kPa (15 psi) gage pressure.

6. NOTES

6.1 Leak Rate Trends

In general, allowable charge air cooler leak rates are being reduced by engine manufacturers as newer engines become more sensitive to charge air leakage. The latest engine specifications must be utilized to determine up-to-date requirements.

6.2 Causes of Leaks

Allowable charge air cooler leaks are typically caused by minor defects in welding, brazing or casting processes. These leaks will not get worse over time. Fatigue cracks in a tube, header or tank are not considered allowable leaks and will result in higher leak rates over time as the cracks grow.