SURFACE VEHICLE RECOMMENDED PRACTICE

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Laboratory Testing of Vehicle and Industrial Heat Exchangers for Durability Under Vibration-Induced Loading

RATIONALE

Routine Five-Year Review.

1. SCOPE

This SAE Recommended Practice is applicable to all liquid-to-gas, liquid-to-liquid, gas-to-gas, and gas-to-liquid heat exchangers used in vehicle and industrial cooling systems. This document outlines the test to determine durability characteristics of the heat exchanger from vibration-induced loading.

1.1 Purpose

This document provides a test guideline for determining the durability of a heat exchanger under specified vibration loading.

2. REFERENCES

2.1 Applicable Documents

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 International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada), www.sae.org.

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 J1726 Charge Air Cooler Internal Cleanliness, Leakage, and Nomenclature

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3. OBJECTIVE

To verify compliance with established criteria that ensure durability in a specific application. This document describes a system to induce stress in a heat exchanger resulting from vibration loading. The process is accomplished by subjecting the unit to vibration at specified frequencies and amplitudes.

4. FACILITY REQUIREMENT

The facility should provide the following as required:

4.1 Equipment

Vibration equipment with controls on frequency, amplitude, and acceleration (for 50 Hz and below, electrohydraulic is suggested; higher frequencies may require electrodynamic). It should be verified that the test equipment will meet the parameters of the agreed upon test plan. Examples of test equipment include multi-axis shakers, sequential axis random shakers, etc.

4.2 Test Fixture

4.2.1 Best practice is using customer-provided vehicle/machine structural members to create a test fixture which represents actual installation.

4.2.2 If actual installation is not available, a fixture should support the heat exchanger with orientation as in service or as specified. The fixture must be rigid so as not to induce any additional dynamic inputs.

4.3 Means of checking heat exchanger integrity.

4.4 Equipment to monitor motion of units during test.

4.5 Source for pressurizing and heating test unit as required.

4.6 Additional equipment may include, but is not limited to, the following:

a. Accelerometers

b. Automatic data logging equipment

c. Automatic emergency shutdown

d. Cycle counters

e. Digital signal analyzer

f. Function generator (sine wave, random noise, square wave, ramp function, etc.)

g. Load transducers

h. Pressure gauges

i. Pressure regulators

j. Data recording equipment

k. Safety features as specified by regulatory codes and common practices

l. Strain measurement equipment

m. Temperature monitoring and control equipment

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