Test Method for Measuring Power Consumption of Truck and Bus Engine Fans – SAE J1339 MAY83

SAE Recommended Practice
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THIS IS A PREPRINT WHICH IS SUBJECT TO REVISIONS AND CORRECTIONS. THE FINAL VERSION WILL APPEAR IN THE 1984 EDITION OF THE SAE HANDBOOK.

PREPRINT

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SAE Recommended Practice

Report of the Truck and Bus Fuel Economy Committee, approved July 1981, completely revised by the Truck and Bus Chassis Committee May 1983.

1. Purpose—This SAE Recommended Practice provides a recommended test procedure for measuring and comparing the power consumption of engine cooling fans used on trucks or buses over a range of speeds. The resulting power consumption data is intended for predicting the fuel consumption of trucks and buses using these fans and in comparing one fan versus another on the basis of power requirements.

2. Scope—The test procedure is intended for use in testing and evaluating the approximate power consumption of heavy truck and bus engine cooling fans. The procedure also provides a general description of the equipment necessary to measure fan power consumption, so that the parasitic power consumption of a complete vehicle may be predicted.

The test conditions in the procedure may not adequately match those of the vehicle for which fuel consumption information is desired. In that case, engineering estimates or extrapolations may be necessary. The procedure neglects the pressure drop caused by the radiator core (unless the actual vehicle is used as a test fixture). The effect of ram air due to vehicle motion is also neglected. Those two effects tend to offset each other. Finally, the effect of a fan clutch in reducing fan use and power consumption is not a part of this procedure.

3. Test Procedure

3.1 Equipment and Facilities

3.1.1 A calibrated dynamometer or torque meter.

3.1.2 Structure for supporting a sharp-edged orifice (a fan shroud) with minimum length and height of 150% of the fan diameter. The actual vehicle can be used if any shutters are blocked open and a torque meter can be installed. A separate belt drive using an auxiliary power source can facilitate power measurement.

3.1.3 A calibrated tachometer.

3.1.4 Equipment necessary for measurement of air temperature and barometric pressure.

3.2 Test Conditions—The fan is mounted within a sharp-edged orifice whose diameter is 108% of the fan diameter. The fan is mounted such that 50% of its projected width penetrates the orifice.

3.3 Test Procedures—The fan will be operated within a range of speed which is representative of actual use and the torque measured at each of several speeds. For all such measurements, the power consumption will be calculated. Sufficient discrete speeds must be selected so a curve can be established for the speed range.

4. Computations and Results

4.1 Definition of Symbols

Symbol	Definition	Units English	Units SI
A	Correction for absolute temperature	460°F	273°C
B	Barometric pressure	in Hg	Pa
C	Correction factor		
t	Ambient temperature	°F	°C
fan p	Fan power	hp	kW
Subscripts			
c	Corrected to standard conditions		
d	Dry air conditions		
t	Observed at test conditions		
Superscript*	To denote standard ambient conditions		

4.2 Standard Ambient Conditions

Barometric pressure	B*	100 kPa (29.61 in Hg)
Temperature	t*	25°C (77°F)
Water vapor pressure	e*	1.0 kPa (0.2961 in Hg)
Dry barometric pressure	B_d*	99.0 kPa (29.3139 in Hg)

4.3 Corrected Power

4.3.1 CORRECTION FACTOR

$$C_d = \frac{B_d^*}{B_t}\,\frac{t_t + A}{t^* + A}$$

4.3.2 CORRECTED POWER CONSUMPTION

$$(\text{fan p})_c = C_d\,(\text{fan p})_t$$

4.3.3 PRESENTATION OF RESULTS—The corrected power, $(\text{fan p})_c$, shall be plotted versus fan speed as shown in Fig. 1.

The ϕ symbol is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.