Simple Engineering Fan Comparison Testing

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Test Setup

I built a small test fixture with a wind tunnel type measuring section in front of the radiator. I needed to be able to accurately measure the air that actually flows through the radiator of the SSR, along with a few other parameters. I did not have an A/C condenser mounted to the front of the radiator. The parameter list is as follows:

- Voltage (Volts) – Power input to the fan measured with a digital voltmeter. This is a pretty straightforward simulation of the installation. Measurement variability is estimated to be +/- 0.4vdc from vehicle installation. Data recorded is an average of at least 5 tests.
- Running Current (Amps Continuous) – The continuous running current measured with a clamp-on current loop and a digital voltmeter on the main wire to the fan. Possible measurement variability is +/- 2 amps. Data recorded is an average of at least 5 tests.
- Inrush Current (Amps Max) – The peak inrush current measured with a digital storage scope, using the same clamp-on current loop. Possible measurement variability is approximately +/- 5 amps. Data recorded was typical for at least 5 tests of inrush current.
- 1 Sec Current (Amps 1 Sec.) – The inrush current value (as it is decreasing to continuous current) after power applied for 1 second, measured with the same digital storage scope. Possible measurement variability is approximately +/- 5 amps. Data recorded was typical for at least 5 tests of inrush current.
- Airflow – calculated in CFM by a digital anemometer in the measuring section of the test fixture. The anemometer had an internal calculation of duct airflow, using the square footage of the measuring section as an input variable. Measuring section area calculated to be 1.918 square feet. Measurement variability estimated to be +/- 10%. Data recorded was an average of approximately 15 seconds of data.
- Decibel level – measured with a hand-held meter approximately 3 feet aft and 3 feet left of the fan exhaust. Although not representative of the installation, this provides a comparative measurement of sound between the fans tested. The meter was set on fast response and used the "A" weighting scale. Data recorded was an average of approximately 15 seconds of data.

Please note that my variability estimates are based on my "best guess" of how the test system compares to the actual vehicle installation. All of the measuring devices were calibrated to their original specs.

Fan diameter, motor speed, airflow area, radiator coverage, shroud (or lack of), air leaks and all the other physical characteristics of the fans are considered unimportant when comparing installed performance. The test was accomplished "back-to-back" on three fan systems:

1) **OEM** – This is a stock GM P/N 15816298. It is a single speed motor with an internal voltage dropping circuit to provide two speed operation.
2) **Simple Engineering MFK-1** – This is fabricated using a "Flex-a-Lite 180 Extreme" as the core with a replication of the OEM internal dropping circuit for two speed operation.
3) **Simple Engineering MFK-2** – This is fabricated using a GM P/N 15819952 made by Delphi as the core. This is the fan that is supplied from GM on the 2005 and newer Corvette family and the Cadillac XLR. It has been modified using the same dropping circuit as the MFK-1 to provide two speed operation. Also added to the system is an "on-board" 100 amp relay with separate 8 gauge wiring for connection to main bus power.

Data:

OEM (GM 15816298)						
	CFM	Volts	Amps (Cont.)	Amps (Max)	Amps (1 Sec.)	dB Level
Low Speed	1000	14.2	9.4	n/a	n/a	58
High Speed	1900	13.5	28.7	95	40	76

MFK-1 (Flex-a-Lite 180)						
	CFM	Volts	Amps (Cont.)	Amps (Max)	Amps (1 Sec.)	dB Level
Low Speed	1300	14.3	7.1	n/a	n/a	62
High Speed	2500	13.8	18.4	65	25	78

MFK-2 (GM 15819952)						
	CFM	Volts	Amps (Cont.)	Amps (Max)	Amps (1 Sec.)	dB Level
Low Speed	1200	14.2	8.8	n/a	n/a	60
High Speed	2850	13.5	32.6	125	45	82

Findings:

MFK-1 Radiator airflow is 30% higher than the OEM on low speed and 32% higher on high speed. Fan efficiency and low power consumption (lower than OEM in all aspects) is an advantage. Full shroud is a significant advantage at very low vehicle speeds. This is the recommended replacement for the OEM fan for stock SSRs.

MFK-2 Radiator airflow is 20% greater than the OEM on low speed and 50% higher on high speed. Power consumption is greater on high speed and is above the commonly accepted 30 amp limit for 10 gauge wiring. Direct connection to power source and optimum ground using 8 gauge wire is required. Half shrouded fan housing is less efficient than a full shroud at very low vehicle speeds, but offers less restriction at very high vehicle speeds. This fan is the recommended replacement for the OEM fan for modified SSRs.

Notes:

The MFK-1 will continue to be the fan recommended for the greatest percentage of SSRs. The low speed performance gives it the advantage over the MFK-2 with only a slight compromise in high speed performance.

The MFK-2 is now the fan recommended for the small percentage of SSRs with modified engines. Although it moves slightly less air on low speed, the high speed performance gives it the advantage over the MFK-1. At sustained high vehicle speeds (well above legal limits) with very high heat loads (uphill in the summer) the half shroud has the advantage of less restrictive ram air flow and will offer slightly better cooling than the MFK-1. This is especially important for supercharged trucks.

The data for the GM 15819952 only applies to the Delphi fans sold through General Motors.

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