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Title: *Evaluating the Impact of Speed of Air Pistons on Performance, Efficiency, and Thermal Characteristics on gas applications in a 2018 VW Atlas SEL VR6 CDVC*

Abstract

This study conducted by Fisher Motor Works examines the effects that installing Speed of air Pistons has on the performance, fuel efficiency, and thermal management of a Volkswagen VR6 CDVC engine found in the 2018 to 2023 Atlas. The Atlas VR6 engine, originally rated at 276 horsepower (hp) and 266 foot-pounds (ft-lbs) of torque, underwent baseline testing with stock pistons, showing deviations from factory specifications in power output, fuel efficiency, and exhaust gas temperature (EGT). Following the installation of Speed of Air pistons, notable improvements were observed in horsepower, torque, and fuel economy, as well as a reduction in peak EGT. These findings highlight the potential of Speed of Air pistons for enhancing engine performance and efficiency.

1. Introduction

This study documents the baseline performance metrics of a 2018 VW Atlas VR6 with stock pistons and then examines changes following the installation of Speed of Air pistons. The objective is to determine whether Speed of Air pistons yields measurable improvements in power, fuel economy, and thermal characteristics.

The Volkswagen VR6 engine was first introduced in 1991 in the Passat and Corrado platforms. With its narrow V configuration, the VR6 resembles a cross between an inline 6 and a V6 configuration utilizing one cylinder head and a staggered piston configuration. Because of this the VR6 has a smaller footprint then both configuration and is able fit into smaller engine bays that normally would house a 4-cylinder engine.

The VW Atlas VR6 came with a 3.6-liter VR6 direct injection CDVC engine. This engine, with an 89 mm bore, 96.4 mm stroke, and 12:1 compression ratio, is rated by the manufacturer to deliver 276 hp and 266 ft-lbs of torque measured at the crankshaft, with fuel economy estimates of 17 miles per gallon (mpg) in city driving, 23 mpg on the highway, and 19 mpg combined.

Due to the Atlas' transverse mount configuration, exchanging pistons is possible while leaving the block in frame. This, and the ease of removing the cylinder head, made the Atlas an ideal candidate for testing.

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2. Methodology

2.1 Baseline Testing with Stock Pistons

Initial testing for baseline performance metrics was conducted at 6 Star Performance in McKees Rocks, PA, using a Mustang all-wheel drive dynamometer. This setup allowed for accurate and consistent measurements of the VR6's horsepower, torque, and exhaust gas temperature (EGT) under controlled conditions. Key parameters recorded included:

- **Horsepower and Torque**: Measurements were taken across a range of engine speeds to determine both peak and average outputs.
- **Exhaust Gas Temperature (EGT)**: Peak EGT was recorded to assess thermal load and combustion efficiency.

Fuel economy tests were conducted separately under real-world driving conditions on various roads to capture accurate fuel consumption data. These tests included:

- **City Driving**: Measurements taken under typical stop-and-go conditions.
- **Highway Driving (55 mph)**: Fuel economy tested at a steady 55 mph.
- **Interstate Driving (75 mph)**: Fuel economy tested at a steady 75 mph.

2.2 Installation of Speed of Air Pistons

After baseline testing, the factory pistons were replaced with stock pistons modified by Speed of Air. New total seal rings, factory head gasket and valve cover gasket where the only parts replaced during installation. After a break in period of 2,000 miles, post-installation tests were conducted on the same Mustang dyno at 6 Star Performance, following identical protocols to maintain consistency and comparability between stock and modified configurations.

2.3 Data Collection and Analysis

Data on horsepower, torque, fuel economy, and EGT were collected after the installation of Speed of Air pistons. These values were compared to the baseline

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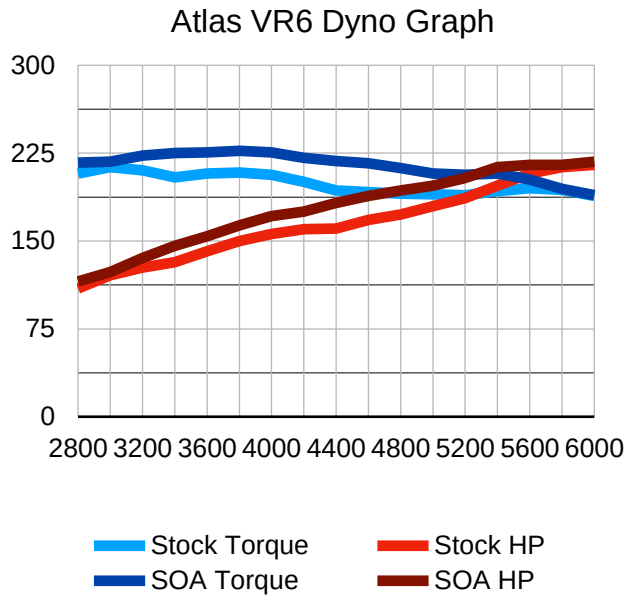
measurements to evaluate performance improvements or trade-offs associated with the modified pistons.

3. Results

3.1 Baseline Performance with Stock Pistons

The 2018 VW Atlas VR6 with stock pistons yielded the following results:

- **Horsepower**: A peak output of 217 hp, with an average horsepower of 166 hp across test conditions.
- **Torque**: Peak torque reached 213 ft-lbs, with an average of 198 ft-lbs.
- **Exhaust Gas Temperature (EGT)**: Peak EGT was recorded at 1527°F, indicating substantial heat generation under load.
- **Fuel Economy**:
  - City driving: 13.5 mpg
  - Highway driving (55 mph): 22 mpg
  - Interstate driving (75 mph): 20.5 mpg



3.2 Performance with Speed of Air Pistons

After installation of Speed of Air pistons, performance metrics showed the following changes:

- **Horsepower**: Peak horsepower reached 216 hp, with an improved average of 175 hp (7.3%).
- **Torque**: Peak torque increased to 227 ft-lbs, with an improved average torque of 214 ft-lbs (7.5%).

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Notably, at 4400 rpm, horsepower increased by 22 hp (13.6%) and torque by 25 ft-lbs (13%), demonstrating enhanced performance in the mid rpm range.

- **Exhaust Gas Temperature (EGT)**: Peak EGT decreased to 1422°F.
- **Fuel Economy**:
  - City driving: 16 mpg (up 18.5% from 13.5 mpg)
  - Highway driving (60 mph): 23.5 mpg (up 6.8% from 22 mpg)
  - Interstate driving (75 mph): 21.5 mpg (up 4.8% from 20.5 mpg)

4. Discussion

The installation of Speed of Air pistons in the VR6 engine yielded several key improvements:

1. **Power Output**: Although peak horsepower was not significantly different than with stock pistons, horsepower was increased till peak power at 6000 rpms with the most substantial gain being 22 hp at 4400 rpms. Torque was increased through the entire rpm range with a gain of 14 ft-lb at peak and the greatest increase of 25 ft-lb at 4400 rpm.

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Atlas VR6

RPM	Stock Torque	Stock HP	SOA Torque	SOA HP	Torque Difference	HP Difference
2800	208	110	217	115	9	6
3000	213	121	218	123	5	3
3200	210	127	223	135	13	8
3400	204	132	225	146	21	14
3600	208	141	226	154	18	13
3800	208	150	227	163	19	13
4000	206	156	226	171	19	15
4200	200	160	221	175	21	15
4400	193	161	218	183	25	22
4600	192	168	216	188	25	21
4800	190	173	212	193	22	21
5000	190	180	208	197	18	17
5200	189	187	206	204	17	17
5400	192	197	208	213	15	16
5600	195	208	202	215	7	7
5800	194	213	194	215	1	2
6000	188	217	189	216	1	-1
Average	199	165	214	177	15	12

2. **Thermal Management**: The reduction in peak EGT from 1527°F to 1422°F suggests a more efficient combustion process. Lower EGTs can reduce the risk of engine knocking, thermal stress, and component wear, thereby potentially extending engine life.

3. **Fuel Efficiency**: Improvements in city, highway, and interstate fuel economy indicate that the optimized pistons may contribute to better fuel utilization, likely due to enhanced air-fuel mixture combustion. This results in more efficient energy production per fuel unit, which is particularly beneficial in urban driving where stop-and-go conditions demand higher fuel consumption. Increased fuel economy is also likely due to an increase in torque throughout the rpm range.

5. Conclusion

The installation of Speed of Air pistons in the 2018 VW Atlas SEL VR6 CDVC engine led to measurable improvements in horsepower, torque, thermal efficiency, and fuel economy. While peak horsepower remained close to stock levels, the overall average output increased. Reduced EGT further indicates better thermal management, which could translate to longer engine life and fewer emissions.

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Fisher Motor Works is an independent shop and was not asked nor compensated by Speed of Air to perform this test.