AAA Suspension CX02 12V Compressor

Compressor Duty Cycle Test

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Introduction

An air compressor's duty cycle determines the compressor's ability to operate continuously without overheating or experiencing excessive wear and tear. By examining the duty cycle of an air compressor, we aim to gain valuable insights into its operational limits, energy efficiency, and overall suitability for this specific application. It is determined by the following equation:

$$Duty\ Cycle = \frac{On\ Time}{Total\ Time} * 100$$

Equation 1, Duty Cycle Equation

The CX02 form an integral part of the AAA Suspension Y62 Air Suspension kit which manages ride height control by deflating and inflating air bags using mechanical height valves. Upon inflation motion air is called from the tank to inflate the bags. The pressure switch eventually detects lower pressure in the tank and turns the compressor on to recharge the tank. Once achieved the pressure switch turns the Compressor off. For optimal life expectancy of a compressor the goal is to not use higher rated pressure switches than required so compressors are not over worked unnecessarily. The proven effective pressure switch in this kit turns on at 110 psi and turns off at 135 psi. There are 1ltr and 2ltr tank options in the Y62 kit. It only takes a few minutes to charge the tanks and that is all less than 135psi as the unit turns off at 135 psi. This forms the basis for testing at 135 psi.

The objective of this experiment is to measure its duty cycle at 135psi to ensure that it is suitable for the application inside the AAA Suspension Y62 Patrol Airbag Kit.

Method

Materials:

1. AAA Suspension CX02 Small Compressor.
2. Workshop Compressor.
3. 2L Air Tank.
4. Digital Pressure Gauge.
5. 12v Power Supply.
6. Assorted Air Hoses and Air Fittings.
7. Stopwatch.

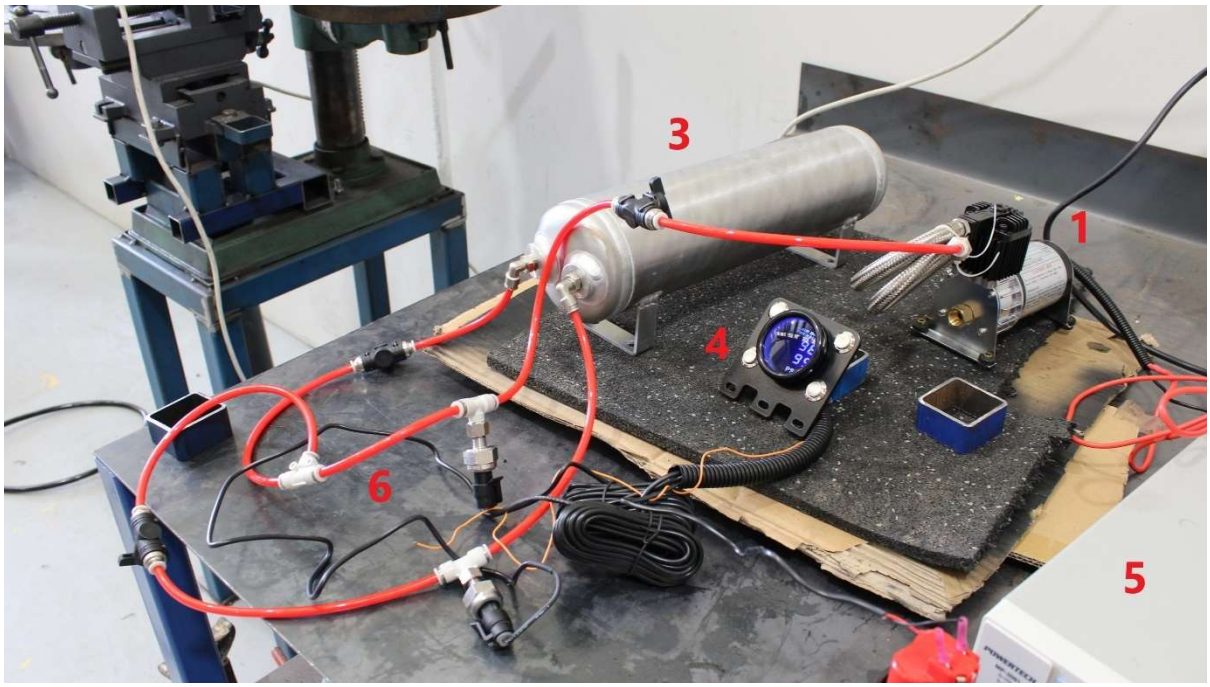

Figure 1, setup of equipment.

Procedure:

1. Connect the air tank to the workshop compressor via a closeable air valve and an inline pressure gauge.
2. Pressurise the air tank to approximately 135 psi using the workshop compressor.
3. Close the air valve connecting the workshop compressor to the air tank, then disconnect the workshop compressor from the air valve.
4. Connect the small compressor to the air tank via the closed air valve.
5. Connect the small compressor to the power supply and switch on.
6. Open the air valve and begin recording on the stopwatch.
7. Run for a total of 15 minutes and record time the compressor is pumping air and when the compressor is resting separately.
8. After 15 minutes, switch off compressor and let cool down before disassembly of equipment.

Results

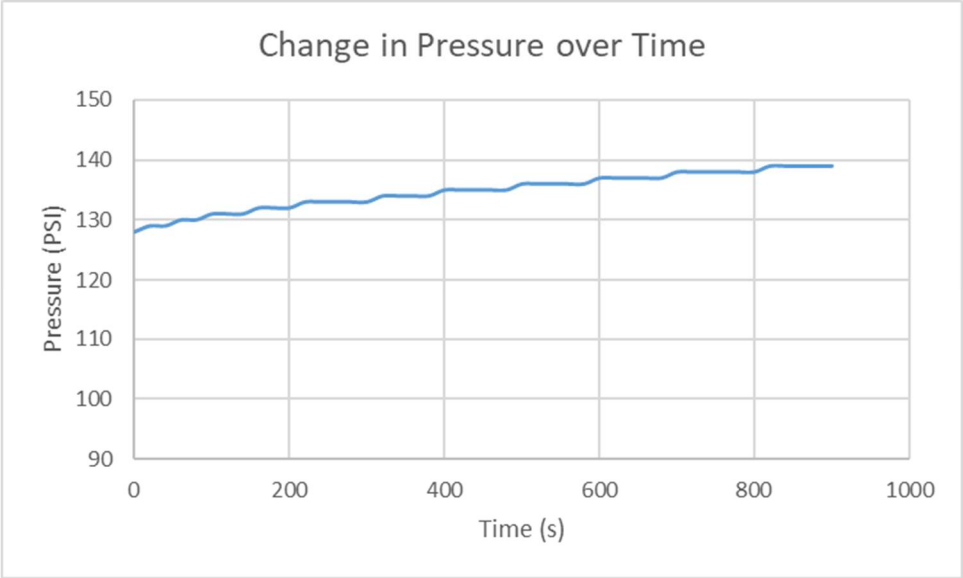

Figure 2, Change in Pressure over time.

The compressor started pumping the air tank from 128 PSI and reached 135 PSI after 400 seconds (6.6 minutes). It then increased up to a maximum of 139PSI before the test ended. At no point did the compressor switch off to cool down.

Using Equation 1, Duty Cycle Equation:

$$Duty\ Cycle = \frac{900}{900} * 100 = 100\%$$

This shows us that the compressor demonstrates a 100% duty cycle when operated for 15 minutes, which is much longer than it would be running in its given application.

The maximum working pressure of the compressor was also briefly tested when the power supply was increased to 24 V, where a maximum pressure of 200 PSI was recorded. This was held for 20 seconds before the compressor was manually switched off. It is strongly advised that the compressor is not run at such high a pressure though, as it could lead to damage to the compressor or other components in the system.

To improve this experiment, the compressor could be run for an extended amount of time, for example, 2 hours. This would give a more accurate reading of the duty cycle, and test if the thermal overload protector works. However, in the application of this compressor, it will only be operating for less than 5 minutes at a time, so it is not necessary.

Conclusion

The compressor was run for 15 minutes at approximately 135 PSI and did not switch off at all over the entire duration. Therefore, for this application, it represented a 100% duty cycle, demonstrating its suitability in the AAA Suspension Y62 Patrol Airbag Kit.