1. Project – Compressed Air Measurement

Factory has 2 air compressors, BOGE SLF 75-3 running as the main compressor and a Ceccato DRE 100 operating as backup compressor (client said this compressor is not running; therefore, it was not measured the energy usage of compressor DRE 100).

- BOGE SLF 75-3 (VSD) – Main Compressor
  - Rated Power: 55 kW
  - Rated Pressure: 10 bar
  - Rated Flow: Min 2.10 m^3/min - Max 8.50 m^3/min
- Ceccato DRE 100 – Backup Compressor
  - Rated Power: 75 kW
  - Rated Pressure: 10 bar
  - Rated Flow: Min 4.28 m^3/min – Max 12.37 m^3/min

2. Compressed Air Measurement Analysis

2.1. Annual usage and costs

Table 1: Compressed air usage and costs

Description	Values
7 day energy usage	4 MWh
Annual energy usage	221 MWh
Electricity average unit rate	$0.14/kWh
Annual energy cost	$31,000
7 day air production	16,513 m^3
Annual air consumption	858,676 m^3
Average unit cost of air – energy component only	**$0.036/$m^3$**

2.2. Compressor Efficiency

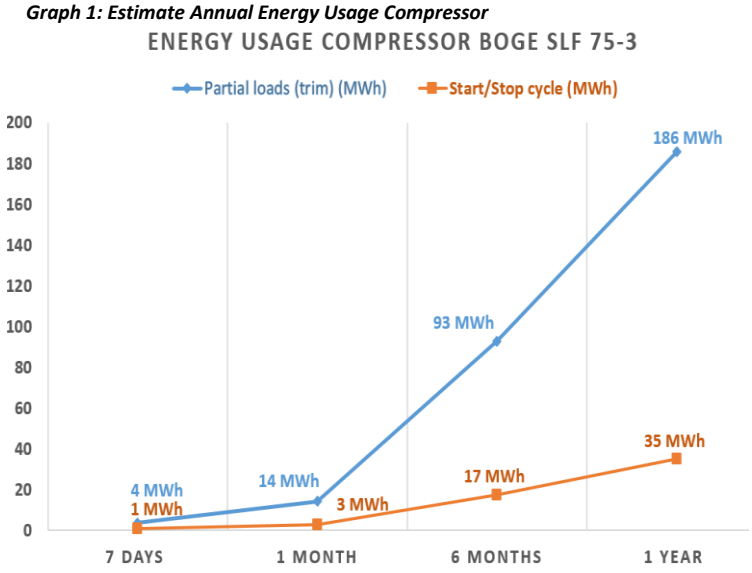
Table 2: Air production and energy consumption over 7-day period

Energy consumption (kWh)	Air Delivered (m^3)	Specific power (kW/m^3/min)	Energy consumption kWh/m^3
4,241.40	16,513	15.42	0.257

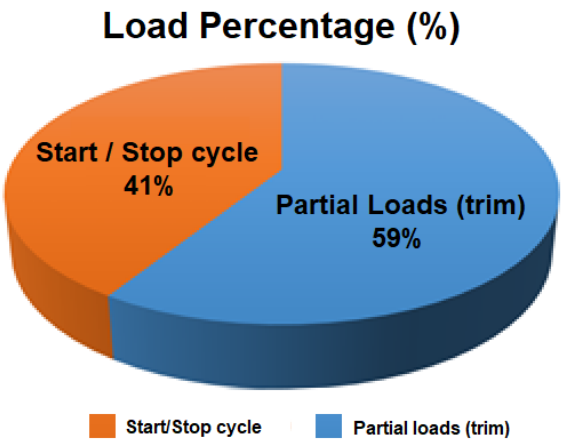
Note:
Approximately 16,513 m^3 of compressed air produced over 7-day period, with energy consumption of 4,281.40 kWh. The specific energy consumption shows that the efficiency of the compressed air system is **low**, at 15.42 kW/m^3/min.

2.3. Energy Consumption & Load profile

Graph 1: Estimate Annual Energy Usage Compressor



Graph 2: Load Analysis Compressor BOGE SLF 75-3



2.4. Total Air Demand

The rated capacity of the Compressor 1 is 8.50 m^3/min. Over the 7 days period, the high air demand measured air was around 4.4 m^3/min. The average air flow is 1.65 m^3/min which is below of minimum free air delivered (2.10 m^3/min) by compressor Boge SLF 75-3. This suggests that this air compressor is oversized.

2.5. Dew Point

The compressed air system dew point is controlled by Ceccato DLX300 refrigerant dryer, rated capacity of 30 m^3/min. A compressed air system with refrigerant dryers is expected to have dew points around the 3°C, but the dew point measured fluctuated between -2.5°C and -0.5°C.

3. Summary

Compressor BOGE SLF 75-3 is oversized to meet the demand of production. When compressor starts-up, it immediately meets the demand, and then stops; it then realizes that demand is present and will start-up again. The excessive start/stop cycles can also result in motor burnout, future mechanical problems and potential failure of the compressor.
Oversized dryer is wasting electricity and creating unnecessary energy costs.

4. Recommendations

Table 3: Summary of Recommendations

Description	Energy Saving
Correct size Compressor – No start/stop cycles (Reduce Energy usage by ~ **16%**)	**$4,900 p.a.**
Leakage repairs (Reduce leakage by ~ **21%**)	**$6.485 p.a.**
Correct size Dryer (Reduce Energy by **~ 64% from Current Dryer**)	**$4.150 p.a.**
Total Estimated Saving	**$15,535 p.a.**

Recommendations:

- Choose a compressor with the correct power, pressure, and capacity to suit your needs is essential in keeping costs down. Also the correct size Dryer, preventing the formation of ice in the piping, reducing maintenance and increasing of energy savings.
- Keep the leakage level as low as possible. Encourage fitters to report and/or repair any compressed air leak (15 leaks) found as soon as possible.
- Check each optimisation opportunity (timed drain, diaphragm pump, open blowing, vacuum generator) for air demand reduction, considering substitution of compressed air for other technologies and finding sensible methods to optimise the air consumption of the existing compressed air end users.