

# INDEPENDENT TESTS CONFIRM SUPERIOR ENERGY PERFORMANCE OF GHS VSD+ VACUUM PUMP

Atlas Copco requested ENGIE Lab to perform tests on its GHS VSD+ vacuum pump and three competitive pumps. The GHS VSD+ overwhelmingly came out on top in terms of energy efficiency.

## The tests

Atlas Copco requested ENGIE Lab to perform a series of head-to-head tests on their GHS VSD+ vacuum pump and comparable pumps from three competitors. The aim was to determine the energy performance of all four vacuum pumps.

Five different flow profiles have been defined to represent different applications, taking into account typical production downtime including breaks, maintenance and when the machines are not operating during the night:

- Pick & place in a centralized system – pressure fluctuating between 100 and 250 mbar(a).
- Modified Atmosphere Packaging in a centralized system – pressure fluctuating between 50 and 100 mbar(a).
- Meat packaging in a centralized system – pressure fluctuating between 20-70 mbar(a).
- Woodworking/CNC application on a dedicated machine – pressure going from 100-300 mbar(a).
- Cycling application in vacuum packaging with a target pressure 5 mbar(a).

	Pick & place - centralized 100-250 mbar(a)	MAP packaging - centralized 50-100 mbar(a)	Meat packaging - centralized 20-70 mbar(a)	CNC - dedicated 100-300 mbar(a)	Meat - dedicated 5 mbar(a)
GHS 730 VSD+	X	X	X	X	X
Conventional Oil sealed rotary vane pump 630 m³/h	X	X	X	X	X
Conventional Dry vane pump 250 m³/h	X			X	
Conventional Claw pump 500 m³/h	X			X	

For each flow profile, all the tests have been repeated three times with each pump (in total 42 tests).

## The test equipment

The test bed consists of:

- A vessel with 5 valves of different sizes orifices.
- The valves are controlled by a PLC which opens/closes the valves, bleeding an air load into the vessel to simulate different air load for the applications.
- A vacuum pump.

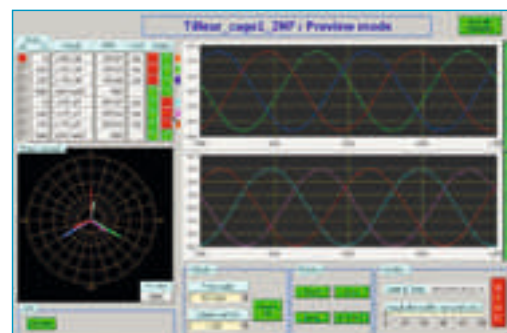
A Digital Wave Recorder was used to analyze the evolution of the energy consumption. Recording the wave shapes enabled calculation of the important Power Quality characteristics (RMS values, unbalance, harmonics, flicker...) as well as the active, reactive and apparent power. The sampling frequency was 8 kHz, and all measurements were carried out according to the IEC 61000-4-301 standard. Two calibrated energy meters were employed in parallel to validate the energy consumption during each 73-minute test.

## Who is ENGIE Lab?

ENGIE Lab is a leading research and competence center in electrical power technology. It is part of GDF Suez, a world leader in energy.

ENGIE employs over 150,000 people worldwide and is listed on the Paris and Brussels stock exchanges. Many companies turn to ENGIE Lab for their know-how and impartiality.

At its accredited laboratory in Belgium, ENGIE Lab uses certified tools to perform independent testing of a wide range of electrical equipment. Their sophisticated testing techniques for electrical measurements include and go beyond conventional power or energy consumption measurements to enable assessment of Power Quality issues such as harmony or reactive power. This enables ENGIE Lab to make an all-encompassing diagnosis of the electrical efficiency of equipment.



# RESULTS

The different tests applied have shown that the consumption of the Atlas Copco GHS 730 VSD<sup>+</sup> pump is consistently lower than the consumption of the competitor pumps represented.

The table below shows the average energy consumption recorded for all the tests:

	Pick & place - centralized 100-250 mbar(a)	MAP packaging - centralized 50-100 mbar(a)	Meat packaging - centralized 20-70 mbar(a)	CNC - dedicated 100-300 mbar(a)	Meat - dedicated 5 mbar(a)
GHS 730 VSD <sup>+</sup>	749 kWh	6.01 kWh	6.23 kWh	6.29 kWh	745 kWh
Conventional Oil sealed rotary vane pump 630 m <sup>3</sup> /h	14.11 kWh	12.26 kWh	11.34 kWh	13.47 kWh	9.65 kWh
Conventional Dry vane pump 250 m <sup>3</sup> /h	15.32 kWh			15.18 kWh	
Conventional Claw pump 500 m <sup>3</sup> /h	12.46 kWh			12.47 kWh	

Active power consumption

Its use of power electronics was found to **avoid reactive power** and led to **negligible stand-by power consumption**. The three competitive pumps were found to have a non-negligible reactive power consumption.

The table below shows the average energy savings recorded for the GHS VSD<sup>+</sup> in comparison to the three other pump technologies:

	Pick & place - centralized 100-250 mbar(a)	MAP packaging - centralized 50-100 mbar(a)	Meat packaging - centralized 20-70 mbar(a)	CNC - dedicated 100-300 mbar(a)	Meat - dedicated 5 mbar(a)
Conventional Oil sealed rotary vane pump 630 m <sup>3</sup> /h	47%	51%	45%	53%	23%
Conventional Dry vane pump 250 m <sup>3</sup> /h	51%			59%	
Conventional Claw pump 500 m <sup>3</sup> /h	40%			50%	

Energy savings done with GHS VSD<sup>+</sup> compared to the following competition pumps for each application

## Conclusion

In all the tests performed, the Atlas Copco GHS VSD<sup>+</sup> vacuum pump proved to be superior to the three other technologies in terms of energy performance. This can be related to the following key features:

- 1. Screw technology**  
 The screw element has been designed to give high flow with a minimum amount of absorbed power. This high ratio flow/absorbed power results in low energy consumption.
- 2. VSD control**  
 Fixed speed technologies are not able to respond to the changing demands from a process. The GHS VSD<sup>+</sup> speeds up and slows down according to the demand, consuming only the energy needed.
- 3. Inlet control valve**  
 One of the main functions of the inlet control valve is to limit the peak energy consumption at start-up.
- 4. Set-point control**  
 This leads to significant energy savings by maintaining the process at the exact pressure needed for the application and not deeper.