

The logo for Innovatium features a purple square on the left containing three white circles of varying sizes. To the right of the square, the word "innovatium" is written in a lowercase, sans-serif font. The "i" and "n" are purple, while the "o", "v", "a", "t", "i", "u", and "m" are white.

innovatium
inventors of carbon reducing technologies

TECHNOLOGY

PROCESS INTEGRATED ENERGY STORAGE

ENERGY RECOVERY



PRISMA is an innovative air compressor system for industrial applications that uses liquid air energy storage to cut energy costs and provide backup air supply

Energy is a precious commodity

New technology can overcome the barriers to an evolving energy system

Consumer behaviour will determine the success of technology uptake

the 4th Utility

Compressed Air in industry is considered the “4th Utility” after electricity, gas & water

10% of **ALL** industrial electricity is used to make compressed air:

9,200 GWhr

equal to the all the energy generated by a nuclear power station each year

up to 60% savings

PRISMA improvements to a compressed air system can make a significant impact to energy and cost savings

About Compressed Air The Challenge

Industry uses 26% of the UK’s annual electricity consumption totalling 90TWh annually.

In turn, the production of compressed air accounts for up to 10% of this.

The compressed air industrial “cluster” presents a huge opportunity to impact overall industrial energy usage with a single focused technology and new energy storage product.

	Sector	Electricity consumption / GWh	Estimated electricity to produce compressed air / GWh
1	Chemicals	15,446	1,545
2	Food, beverages, etc	10,734	1,073
3	Paper, printing, etc	10,596	1,060
4	Rubber and plastic products	10,443	1,043
5	Mechanical engineering, etc	6,238	624
6	Mineral products	6,019	602
7	Electrical engineering, etc	5,840	584
8	Water collection, treatment and supply	5,244	524
9	Automotive (Vehicles)	4,677	468
10	Non-ferrous metals	4,304	430
11	Fabricated metal products	3,729	373
12	Computer, electronic and optical products	3,578	256
13	Wood and wood products	2,557	256
14	Machinery and equipment n.e.c.	2,509	209
15	Pharmaceutical products & preparations	1,457	198

Combined sectors from Table 1 (DUKES) & Table 2 (ECUK 2017 Table 4-04)

The Need for Energy Storage

Energy storage is the valuable “missing link” in our energy system. It is needed to balance energy demand and generation. Most think of the intermittent nature of wind and solar power, however the same applies to energy intensive applications like compressed air production

PRISMA Liquid Air Energy Storage

The PRISMA concept is simple; it reduces wasteful variable loading by storing excess air as a cold liquid at times when demand is low. This allows PRISMA to balance compressor energy usage air with demand to operate at its most efficient point.

P R I M A

PRISMA contains a high efficiency air compressor coupled with a unique air liquefaction and storage vessel that holds 150 times the amount of energy as liquid air compared to existing compressed air storage.

At the heart of the PRISMA system is advanced machine and thermal storage technologies that store cold energy (or “coolth”, as we like to call it, the opposite of warmth) and return it for later use.

Utilising hi-tech heat exchangers custom designed by our engineers using specialist thermal design and simulation software, we are able to recycle this coolth energy with extremely low losses.

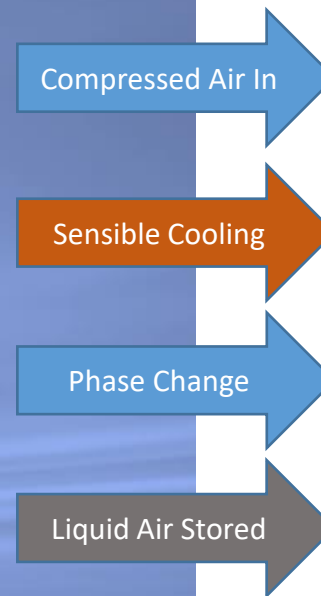


Ambient air is drawn in from the atmosphere to be cooled to extremely low temperatures, liquified and transferred to a vacuum insulated tank where it can be stored for long periods of time.

This whole conversion process is designed to run in reverse and discharge the stored air whilst recovering as much of the coolth to re-use on the next charging cycle.

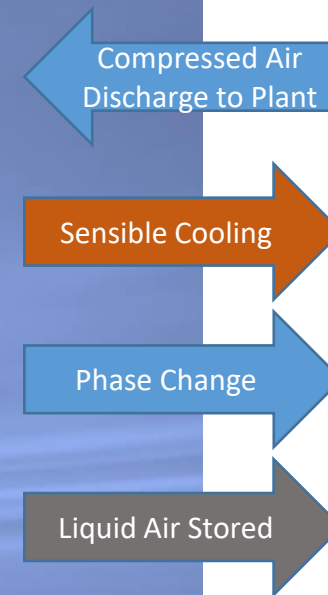
P R I S M A

During charging, the Liquid Air Store is supplied with ambient temperature compressed air from our high efficiency 2stage compressor package. This air is chilled to -150C using sensible cooling to the point where air liquefaction is beginning. In the same vessel, the saturated air passes to a 2nd section where the air is fully liquified and contained within a liquid air tank, again integrated in to the same vessel. The vessel is vacuum insulated in the same way that other common liquified gas are like nitrogen, oxygen, argon, helium and natural gas.



P R I S M A

During discharge, the liquid air within the pressurised liquid air tank passes to the phase change section where it picks up the heat that was removed during charging. The liquid air becomes a gas at just above -150°C . This cold gas then passes to the sensible storage section where, again it picks up heat to discharge ambient temperature compressed air.



Rotary Compressor: Fixed Speed

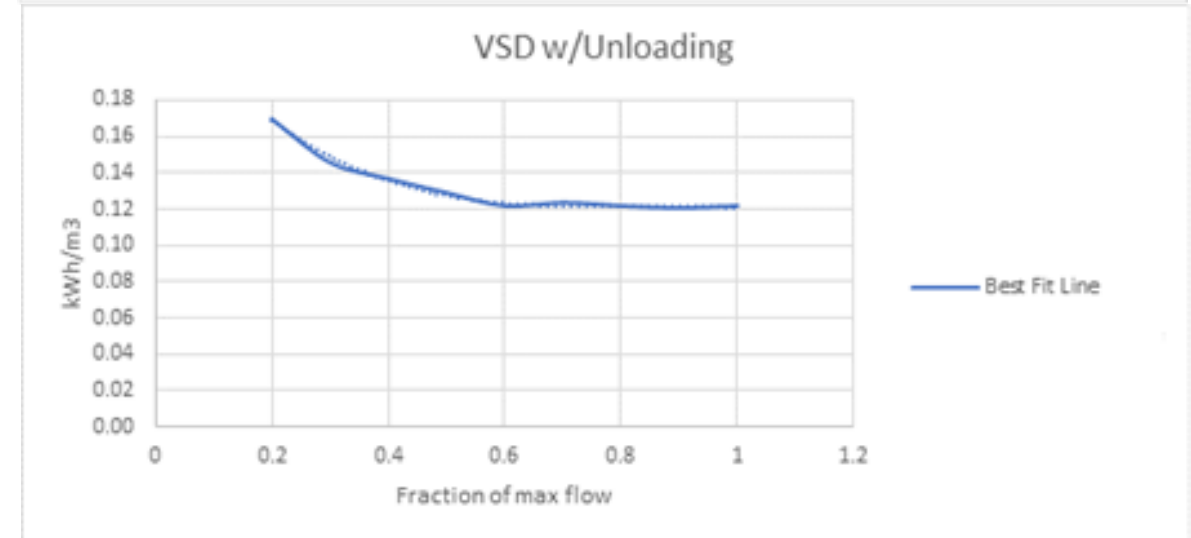
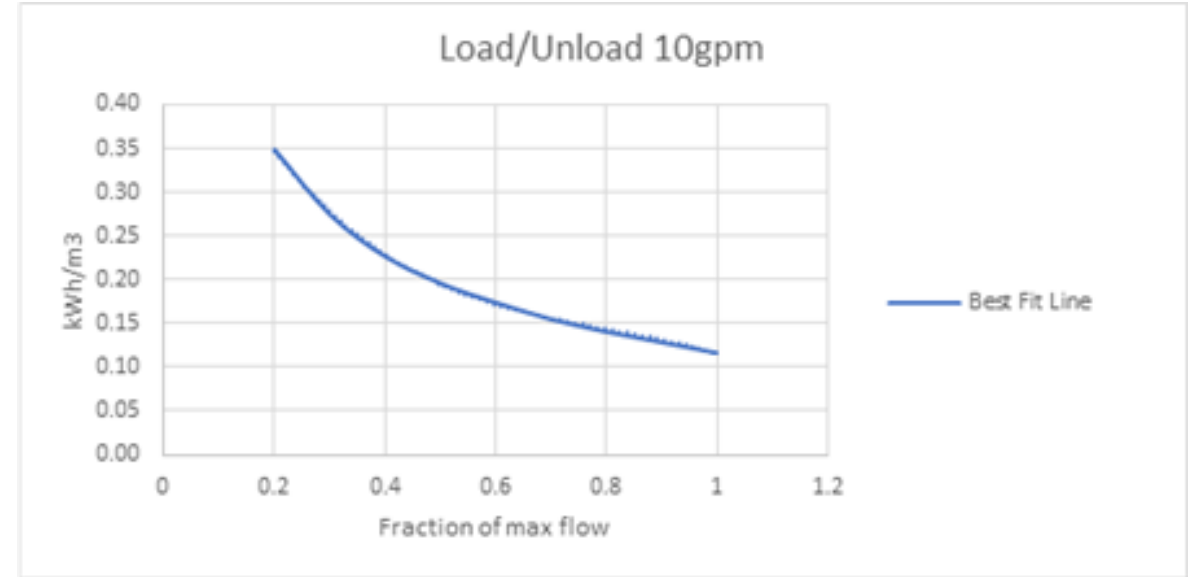
MODEL DATA - FOR COMPRESSED AIR			
1	Manufacturer:	Atlas Copco	
2	Model Number:	GA30-125 AP	Date: 12/13/2011
	<input checked="" type="checkbox"/> Air-cooled <input type="checkbox"/> Water-cooled		Type: Screw
	<input checked="" type="checkbox"/> Oil-injected <input type="checkbox"/> Oil-free		# of Stages: 1
3*	Rated Capacity at Full Load Operating Pressure ^{a, e}	178.3	acfm ^{a, e}
4	Full Load Operating Pressure ^b	125	psig ^b
5	Maximum Full Flow Operating Pressure ^c	132	psig ^c
6	Drive Motor Nominal Rating	40	hp
7	Drive Motor Nominal Efficiency	92.4	percent
8	Fan Motor Nominal Rating (if applicable)	1.1	hp
9	Fan Motor Nominal Efficiency	74	percent
10*	Total Package Input Power at Zero Flow ^e	9.0	kW ^e
11	Total Package Input Power at Rated Capacity and Full Load Operating Pressure ^d	36.9	kW ^d
12*	Specific Package Input Power at Rated Capacity and Full Load Operating Pressure ^e	20.7	kW/100 cfm ^e

*For models that are tested in the CAGI Performance Verification Program, these items are verified by the third party administrator. Consult CAGI website for a list of participants in the third party verification program: www.cagi.org

NOTES:

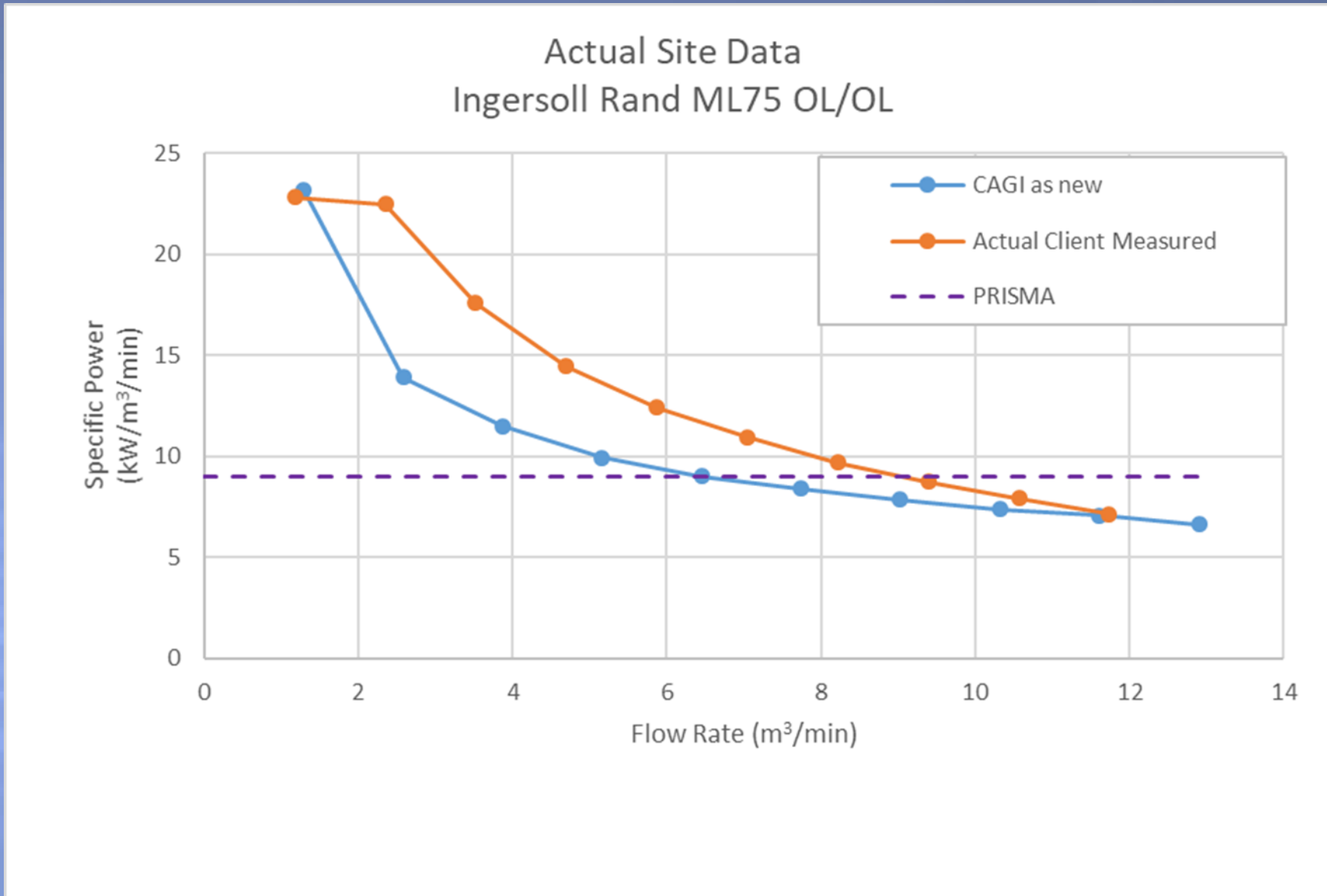
- Measured at the discharge terminal point of the compressor package in accordance with ISO 1217, Annex C; ACFM is actual cubic feet per minute at inlet conditions.
- The operating pressure at which the Capacity (Item 3) and Electrical Consumption (Item 11) were measured for this data sheet.
- Maximum pressure attainable at full flow, usually the unload pressure setting for load/no load control or the maximum pressure attainable before capacity control begins. May require additional power.
- Total package input power at other than reported operating points will vary with control strategy.
- Tolerance is specified in ISO 1217, Annex C, as shown in table below:

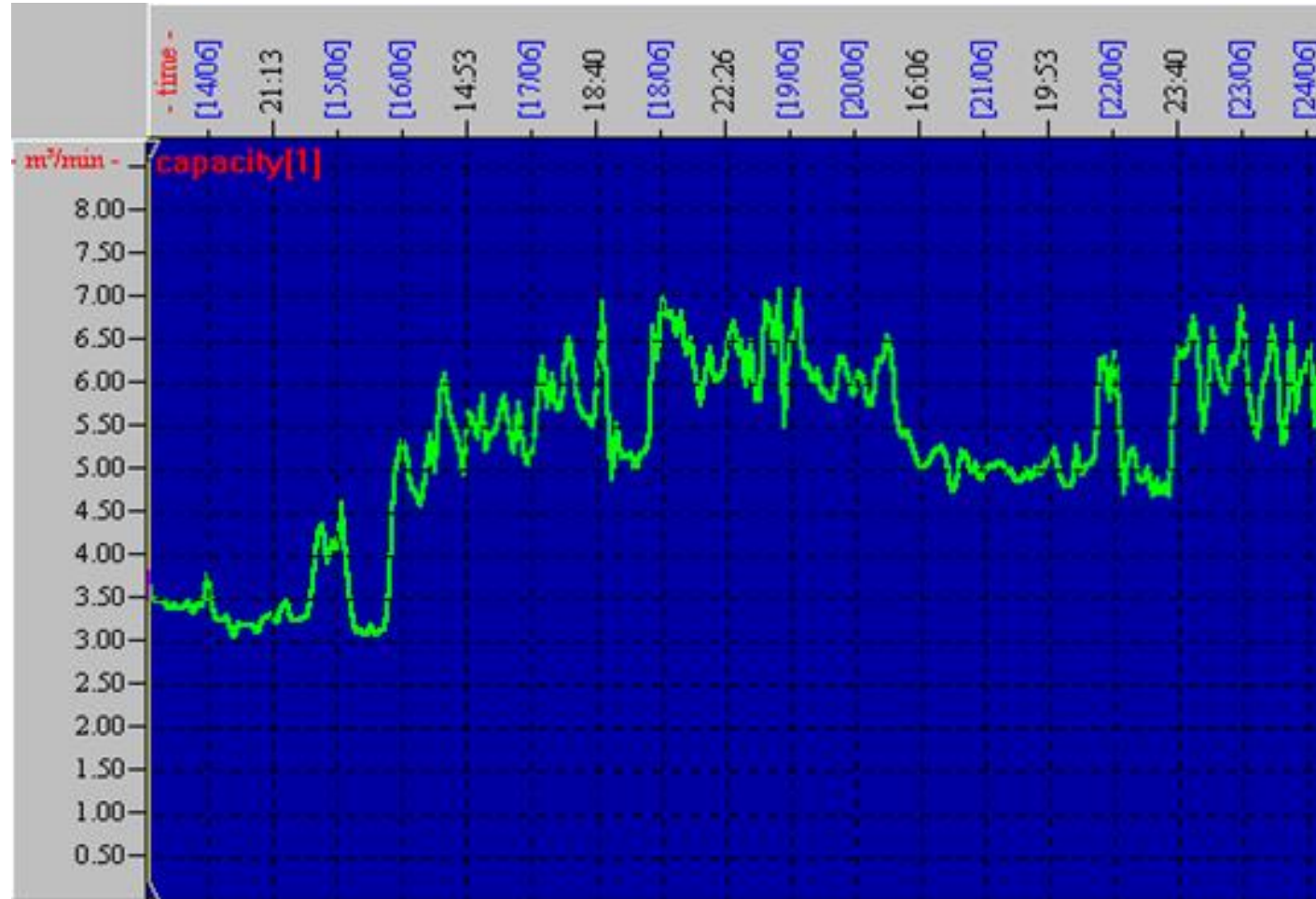
Volume Flow Rate at specified conditions		Volume Flow Rate	Specific Energy Consumption	No Load / Zero Flow Power
$\frac{m^3}{min}$	$\frac{ft^3}{min}$	%	%	
Below 0.5	Below 15	+/- 7	+/- 8	+/- 10%
0.5 to 1.5	15 to 50	+/- 6	+/- 7	
1.5 to 15	50 to 500	+/- 5	+/- 6	
Above 15	Above 500	+/- 4	+/- 5	



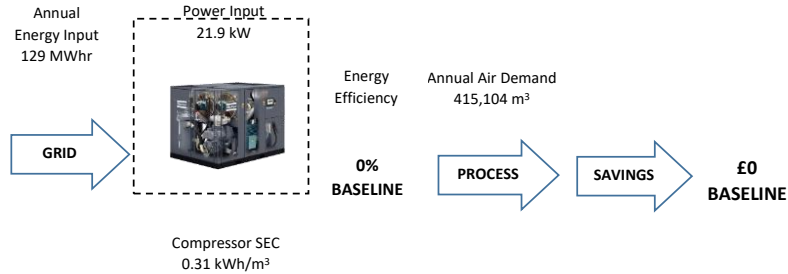
Member:



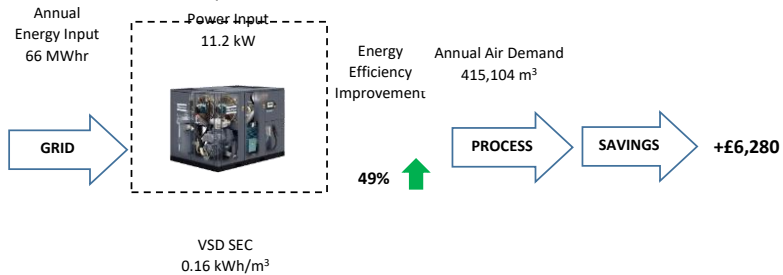




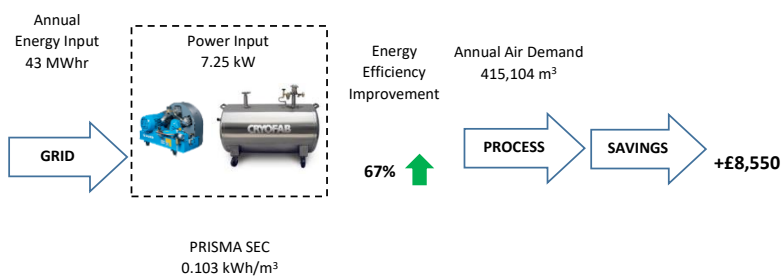
EXISTING COMPRESSOR INSTALLATION



BEST AVAILABLE TECHNIQUE VSD COMPRESSOR INSTALLATION



PROPOSED PRISMA INSTALLATION FOR 25% LOAD



	Power In (kW)	Air Output (m ³ /min)	SEC	Annual Savings @10ppkWhr	CAPEX	Payback
Existing 25% On-Load	21.9	1.175	0.31		BASELINE	
VSD	11.2	1.175	0.16	6,280	£30,000	
PRISMA	7.25	1.175	0.103	8,550	£35,000	1 yr 2mth*

*actual payback does not include addition 'red-rate' tariff avoidance savings described below that would be inherent in PRISMA as-is estimated to be £1830 per annum making the payback 9 mths. In addition, this payback excludes additional DSR benefit also described below that requires additional control from an aggregator to provide frequency services that generate extra revenue.

Innovatium are a technology developer with substantial IP that enables us to develop new products for the distributed energy sector in the areas of generation, storage, recovery and conversion.

Being a technology company, our route to market centres on licensing to manufacturers and direct sales through licensed sub-contract manufacture and distribution

Key Partners

Innovatium has a long history of building strategic partnerships. As a SME technology developer, we work with partners developing a “virtual organisation” around our core technology development and commercial activities. This provides the skills and experience needed from our partner subject matter experts giving Innovatium the ability to deliver high value technology developments and new products.



Design & Build Experience

Prior to forming Innovatium in July 2017, the owners were the main technical and commercial people at their former plc company delivering the products you see here.

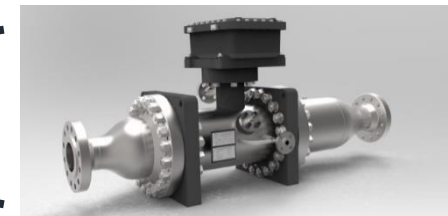


spirax
sarco

50kw modular
~1mmscfd
Pr = 2:1 per stage



ANAX
POWER



275kw modular
~13mmscfd
Pr = 2:1



Thank you

www.innovatium.co.uk