HOW EFFICIENTLY ARE YOU USING COMPRESSED AIR AND NITROGEN GAS ON SITE?

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Atlas Copco

COMMITTED TO SUSTAINABLE PRODUCTIVITY

We stand by our responsibilities towards our customers, towards the environment and the people around us.
We make performance stand the test of time. This is what we call – Sustainable Productivity.

AGENDA

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- Two topics will be covered in this presentation
  - Compressed air
    - Production of compressed air
    - Lifecycle costs and losses involved with compressed air
    - Monitoring and measurement solutions
    - Technologies available that minimise/eliminate losses and reduce running costs
  - Onsite nitrogen generation
    - Its uses within the winemaking industry
    - Advantages over other technologies currently available
    - Cost savings and benefits of using onsite nitrogen generation highlighted

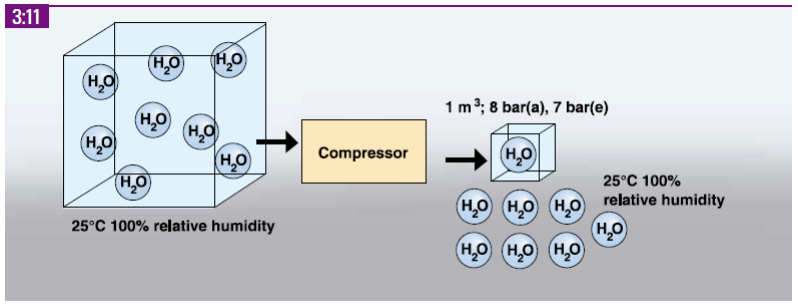
TOPIC 1: COMPRESSED AIR

WHAT HAPPENS WHEN AIR IS COMPRESSED?

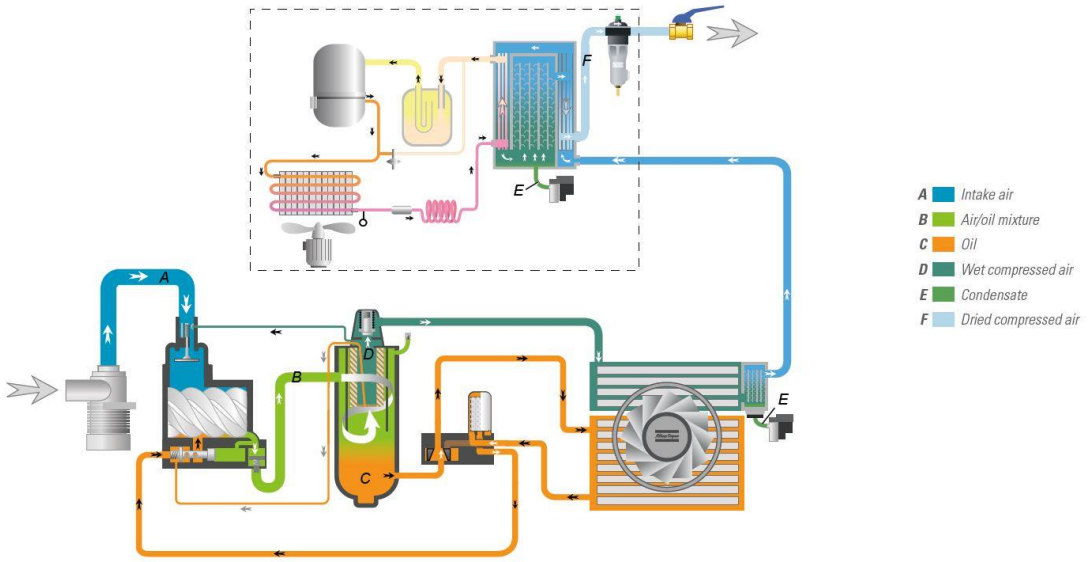
HOW IS AIR COMPRESSED?

Mechanical Process of Compression

- Typical compressors used in the wine industry are oil injected rotary screw
- Ambient air drawn through the inlet of the compressor will have a relative humidity
- When air is compressed, it increases in temperature and decreases in volume
- The water vapour contained in the air condenses as it is compressed, water is almost an incompressible fluid
- When air is compressed, its ability to hold moisture is reduced
- A refrigerated dryer is used to reduce the temperature of the compressed air to further condense moisture from the saturated air, the dryer then heats the air to approximately 15°C to get the compressed air out of the saturation zone
- A refrigerated dryer can achieve a Pressure Dew Point (PDP) of 3°C-5°C



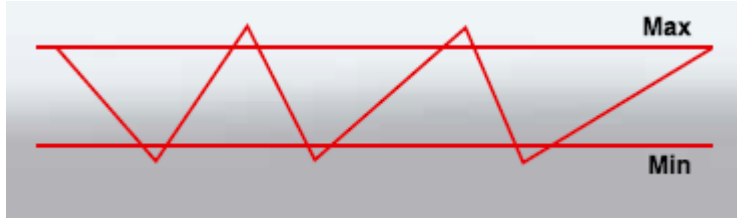
A compressor that works at 7 bar(e) gauge pressure, compresses air to 1/8 of its volume.

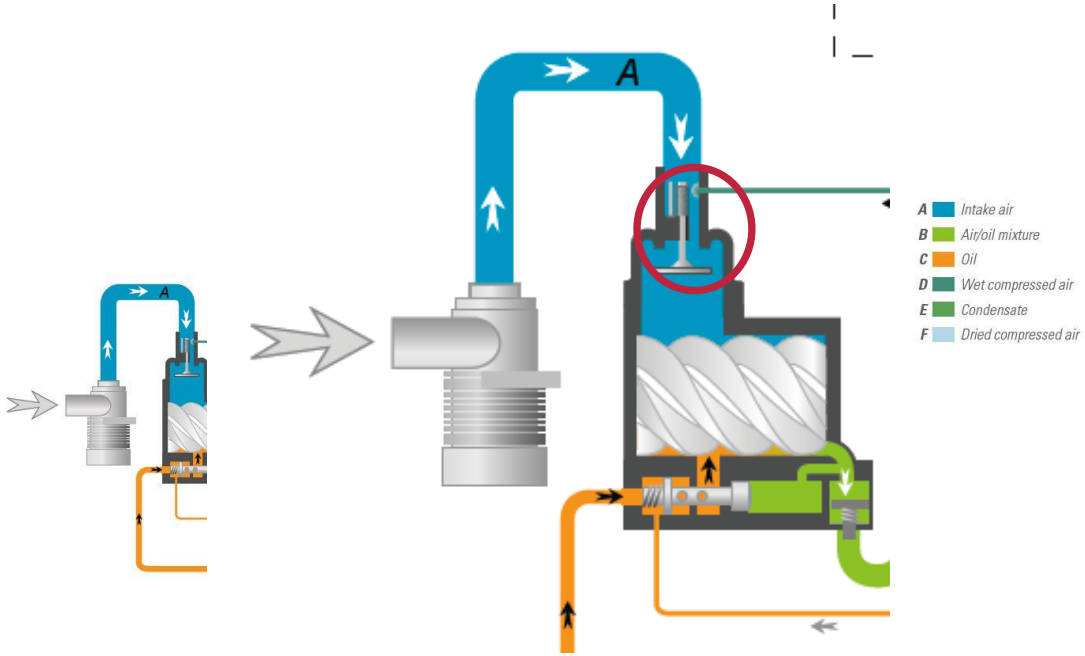


HOW IS AIR COMPRESSED?

Compressor Regulation- Fixed Speed

- General compressor regulation
  - Load/Unload method
- Pressure will have a ‘saw tooth’ profile over time
  - The compressor will be loaded and will produce compressed air between the minimum pressure and maximum pressure limits
  - Once system pressure reaches maximum set value, a solenoid valve closes off the inlet valve and no ambient air is admitted to the screw element
- Unloading is a form of ‘idling’ which means that the compressor is using energy but not producing compressed air
- VSD will be explained later in this presentation



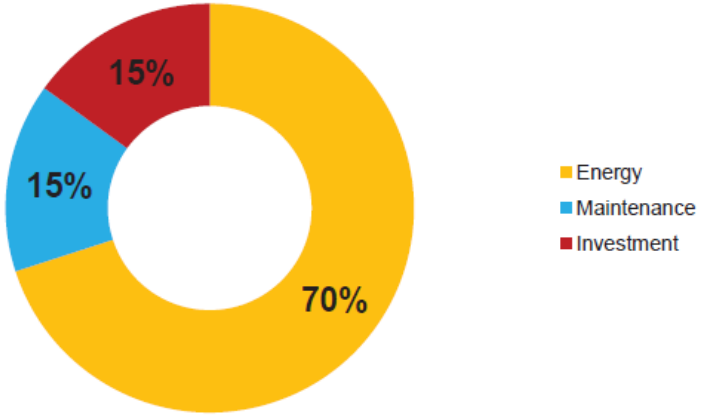


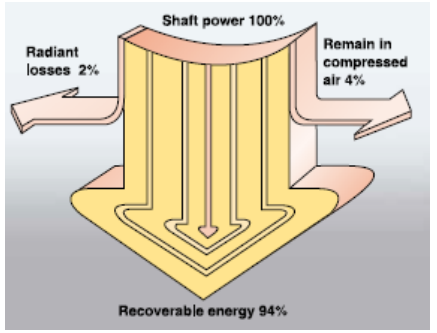
COMPRESSED AIR LOSSES

LIFECYCLE COSTS & LOSSES

Typical Costs Due to Losses

- Energy is the largest factor to be considered in the lifecycle of a compressor
  - Minimising running costs and optimising the type of compressor used will provide long and short term cost benefits
- Compressor maintenance costs become a more significant cost as the compressor ages
  - The performance and maintenance requirements of a compressor tend to increase with the age of the compressor
- Air leaks can create significant baseloads on the air demand
  - Minimising leaks will help with optimising compressed air usage





Hole diameter		Output flow at 7 bar working pressure	Power requirement for the compressor
Size	mm	l/s	kW
	1	1.2	0.4
	3	11.1	4.0
	5	31	10.8
	10	124	43

MONITORING AND MEASUREMENT SOLUTIONS

LIFECYCLE COSTS & LOSSES

Measuring & Quantifying Losses

- Atlas Copco specialises in compressed air energy auditing
  - Proprietary software called AIRchitect is used to analyse data measured from a data logger placed on the incoming electrical phase of each compressor on site
  - Data includes:
    - Graphical representation of air consumption for a 7 day period
    - Loaded hours
    - Unloaded hours
    - kWh consumed over 7 days and extrapolated to annual consumption
  - Simulations of energy saving solutions can be made to give dollar figures of savings

LIFECYCLE COSTS & LOSSES

Measuring & Quantifying Losses

AIRchitect

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LIFECYCLE COSTS & LOSSES

Measuring & Quantifying Losses

- Atlas Copco specialises in Ultrasonic Leak Detection
  - Ultrasonic Leak Detection measures the ultrasonic sound level of air leaks which correspond to an approximate of flow through the leak
  - An Atlas Copco service engineer will survey the entire plant and record the cumulative air leaks
  - A comprehensive report is produced to give information on the leaks
  - Air leaks are also tagged at the points so that they can be repaired

SOLUTIONS TO MINIMISE/ELIMINATE LOSSES

INNOVATIVE SOLUTIONS

Solutions to Reduce Losses and Costs

- Atlas Copco VSD+ Compressors
  - AIRchitect analysis will provide a simulated calculation of energy savings based on current measured flow
    - This is the most accurate method of justifying VSD+ investment
  - VSD+ can save energy by measuring system pressure and adjusting flow to suit demand
    - Fixed speed compressors produce a fixed amount of compressed air, therefore when the demand drops, pressure increases and the compressor must unload. This means that the compressor runs on idle which is considered to be wasted energy consumption
- Fix Air Leaks
- Smarter Use of Compressed Air
  - High velocity nozzles on air duster guns
  - Reduce system working pressure if appropriate
    - Each 2 PSI (g) pressure reduction will reduce energy consumption by 1%
- Energy Recovery Technology
  - Heat exchangers are installed to transfer heat from oil coolers in compressors to pre heat boiler feed water, this greatly reduces the ΔT required to be produced by the boiler, thus reducing energy input proportionally

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TOPIC 2: ONSITE NITROGEN GENERATION

USES OF NITROGEN IN THE WINEMAKING AND BOTTLING INDUSTRY

NITROGEN GAS

Properties of Nitrogen Gas- How Is It Used In Winemaking/Bottling?

- Nitrogen is an inert, colourless and tasteless gas
- That makes it perfect for displacing air which contains oxygen!
  - Bottling
  - Sparging
  - Flushing
  - Storage
  - Transfer Processes
- Normal purity used in wine industry is 99.5%-99.9%
- Normal pressure used in wine industry is 4-6 bar(g)

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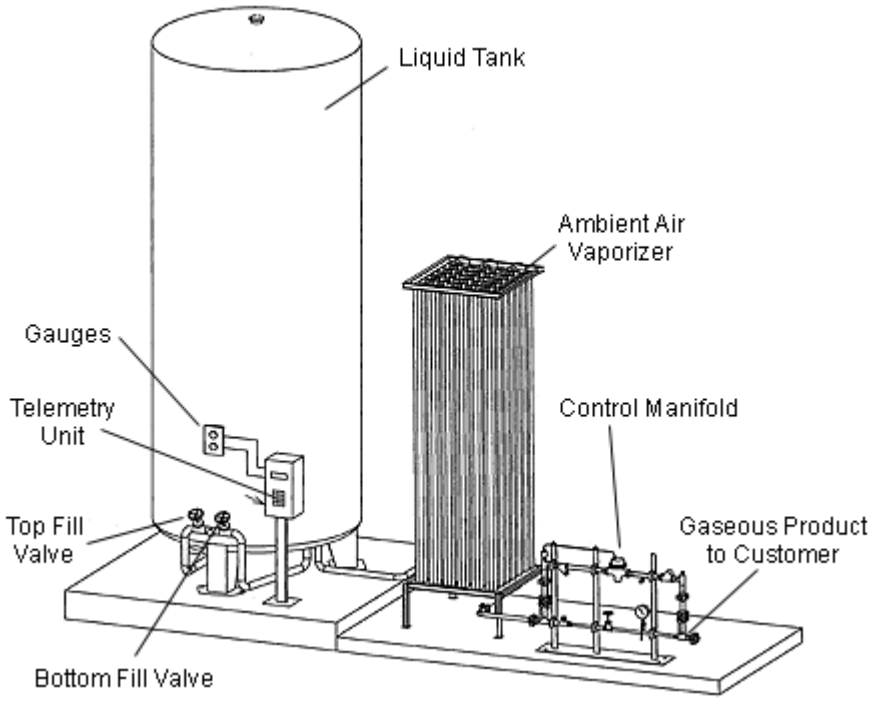
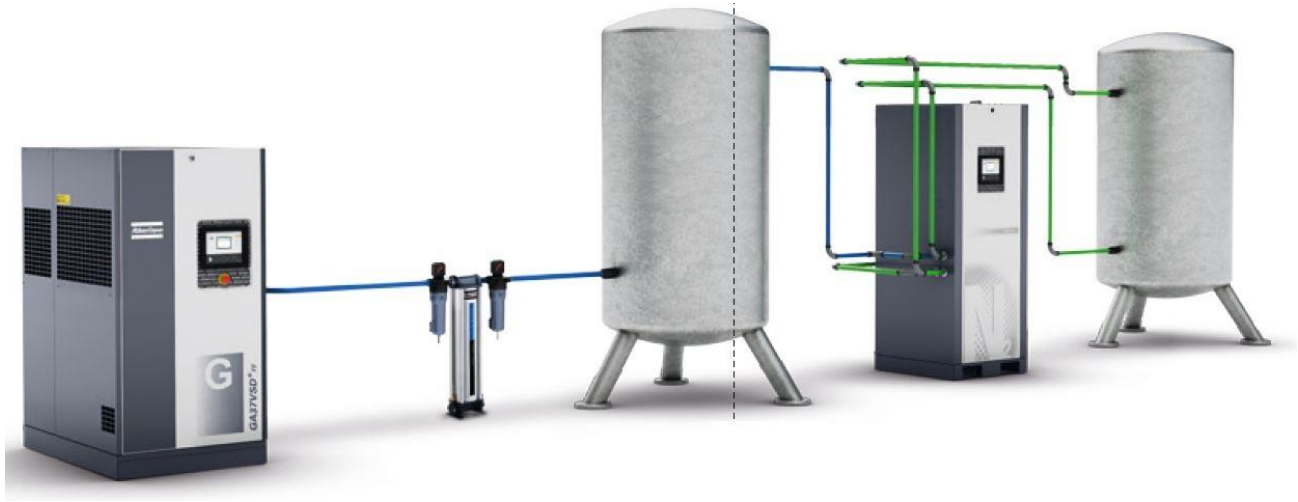
NITROGEN GAS

Common Sources Of Nitrogen Used In Industry

- Bulk liquid storage
- “Manpacks”- Cells of pressurised nitrogen gas tanks
- Onsite nitrogen gas generation



Courtesy www.airproducts.com



NITROGEN GAS

Head to Head Comparison

Bulk Liquid/Manpacks	Onsite Nitrogen Generation
Expensive rental of infrastructure	Capital/lease
Transport of gas/liquid	Maintenance and power consumption
Ongoing high costs	Rapid return on investment
Fluctuating costs (contracts)	Running costs based on usage
Evaporation losses	Generate nitrogen as required
Ultra high purity (unnecessary)	Purity available 95%-99.999%

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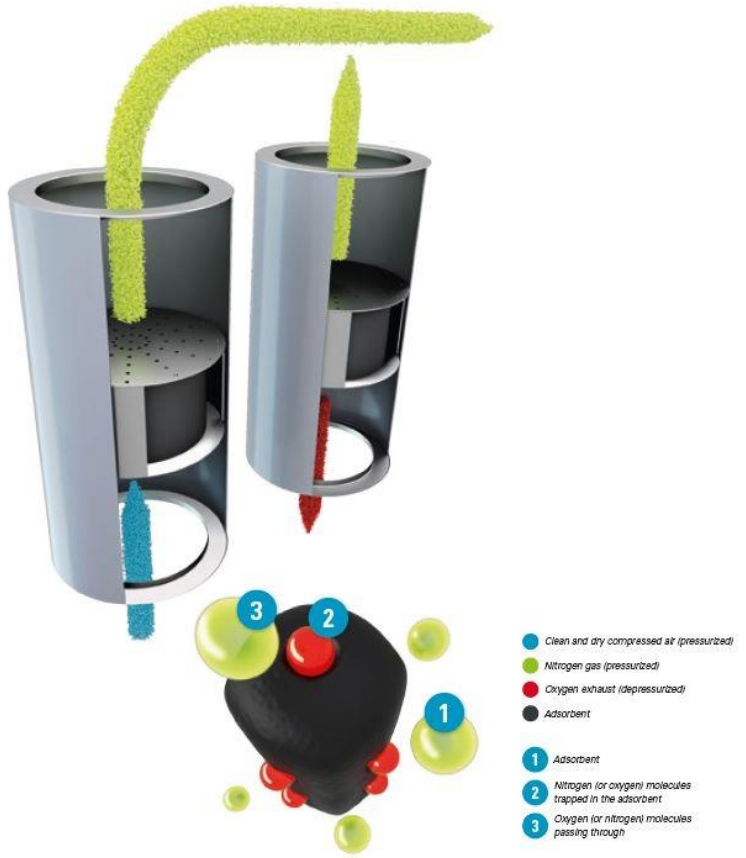
NITROGEN GAS

Onsite Nitrogen Gas Generation

- How does it work?
- Air is a mixture of roughly 78% N_2, 21% O_2, 1% other gases
- Input: Compressed air packs a large number of air molecules into a small volume
- PSA (Pressure Swing Adsorption) is a technology whereby N_2 molecules are isolated from other molecules in the air gas mixture by the adsorption of other gases.
- Multiple chambers are used to turn this batch process into a continuous supply
  - Whilst one chamber is producing N_2 the other(s) are regenerating by purging adsorbed gases



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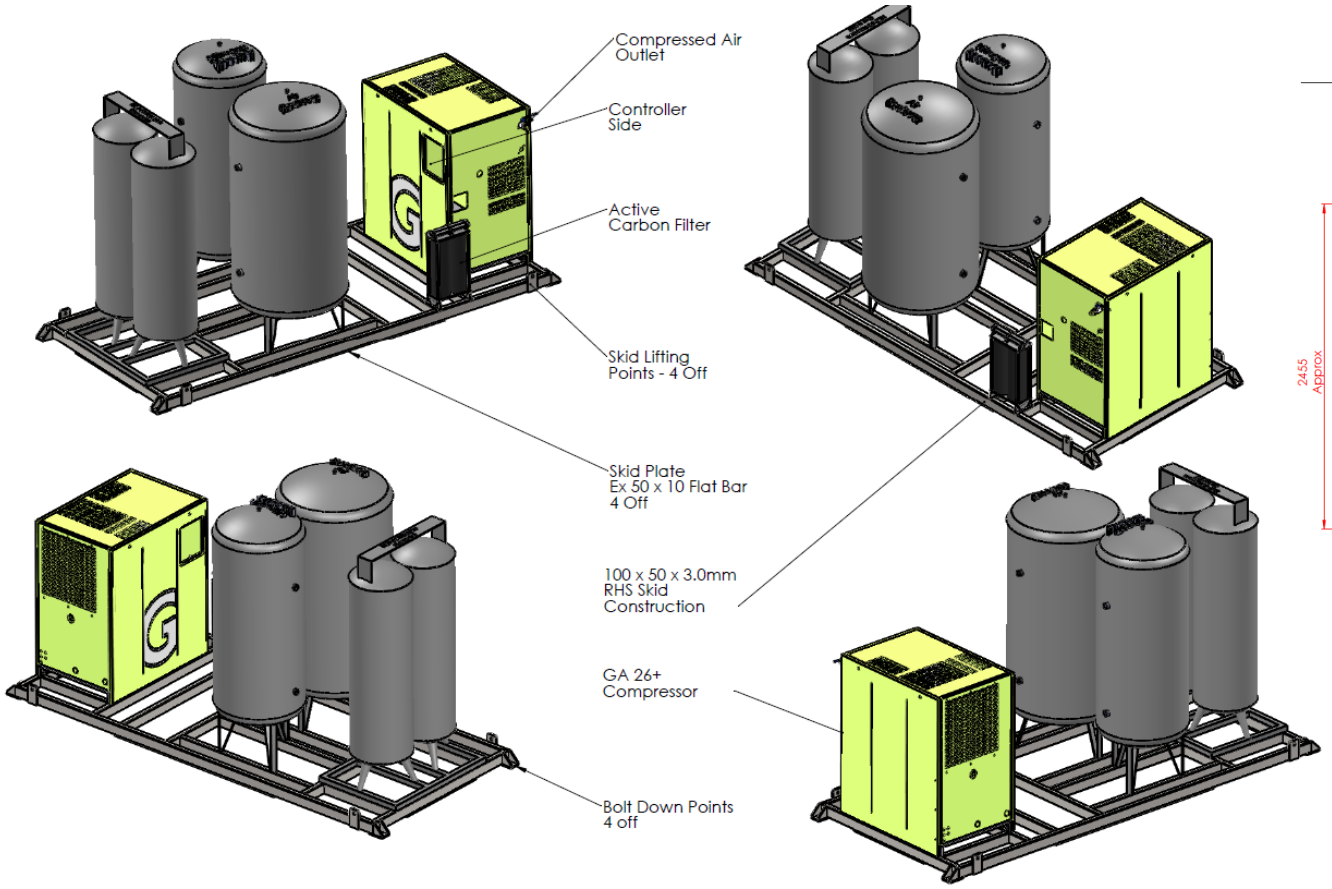
ATLAS COPCO SOLUTIONS

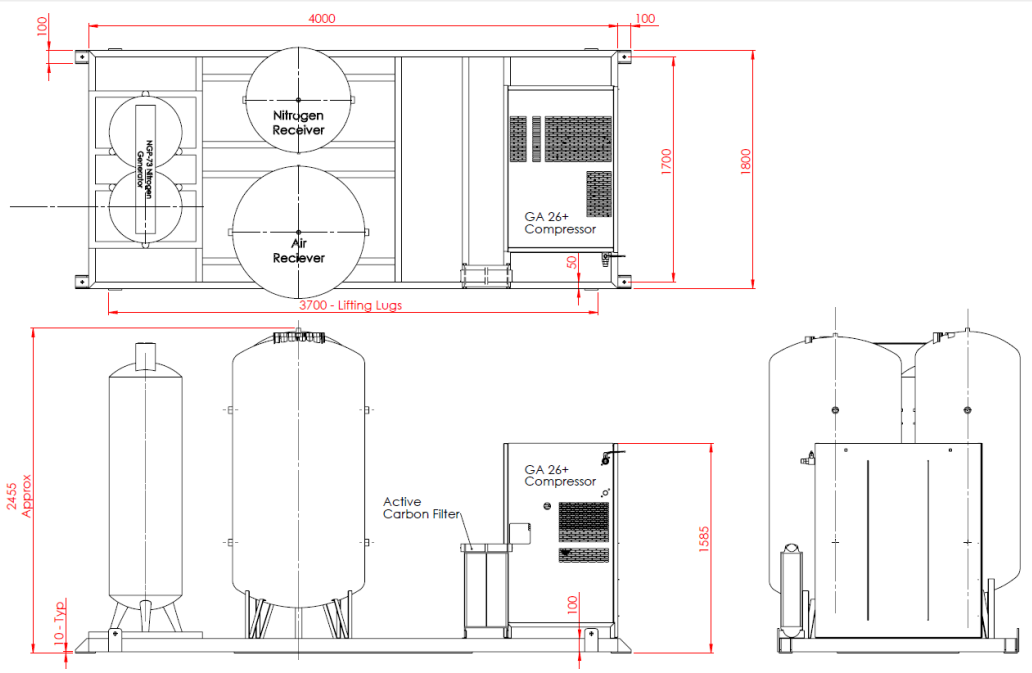
What Do You Demand On Site?

- Comprehensive system analysis
  - Measurement of flow & pressure
  - Measurement of purity requirements
  - Allowance for system expansion
- Reliability of equipment
  - Quick service response
  - Arrangements to supply bottled nitrogen in emergency breakdowns to minimise downtime
  - Frequent service visits to ensure equipment operates as expected
  - Atlas Copco Smartlink technology to wirelessly transmit warnings, alarms and performance data to customer and Atlas Copco HQ
- Smart system design
  - Built in redundancies
  - Safe operation
  - Greatly reduced operating costs with < 2 years payback

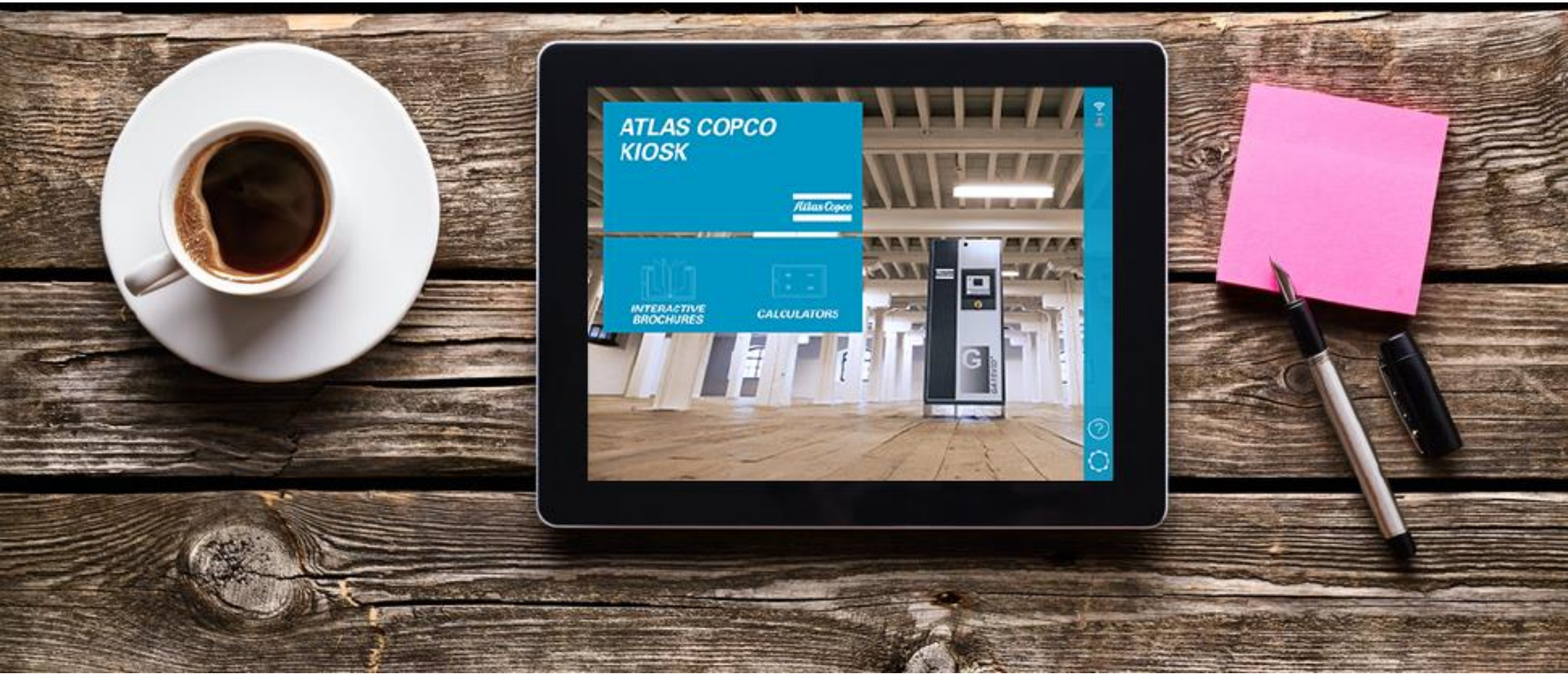
ATLAS COPCO SOLUTIONS

A Success Story





QUESTIONS?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