

PRISM® APack™ Generators



“The strength of the PRISM® APack™ product is the broad range of oxygen production, combined with co-production capabilities, all integrated into a cohesive product line. The result is a highly competitive offering that addresses the major oxygen markets”

Paul Householder,
Oxygen Product Owner
Europe



Air Products has designed, engineered, manufactured and operated on-site gas generation systems for over 40 years, which has created an outstanding global product line.

Air Products' PRISM® APack™ product line comprises a portfolio of plants with a broad range of capabilities. APack™ offers highly reliable supplies of high purity gaseous oxygen, with the ability to provide co-production nitrogen and/or compressed dry air. Liquid oxygen and liquid nitrogen are also available as co-products.

A combination of Air Products' extensive operating experience, innovative design, in-house manufacturing capability, and efficient project execution, produces a highly competitive product offering.

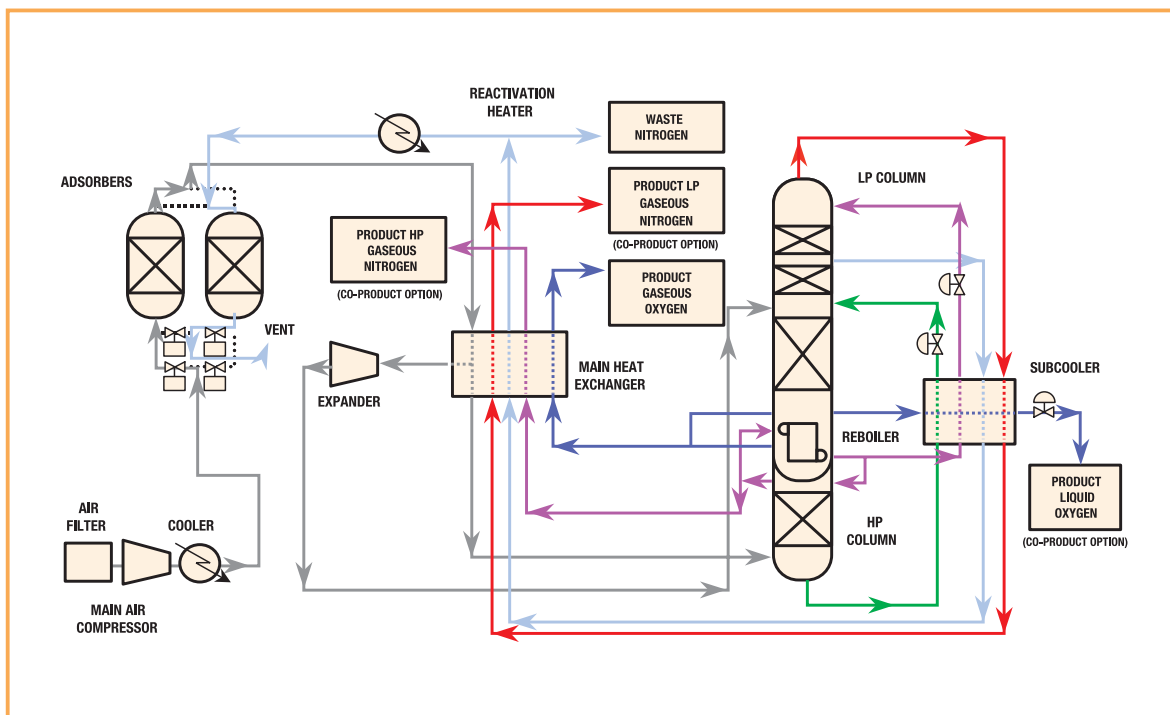
The uniqueness of the PRISM® APack™ product line lies in the modularisation that can be tailored to suit individual customer requirements, using state-of-the-art technology.

The wide portfolio of available product line models, coupled with standard options, allows us to flex the product in order to closely match individual customer requirements. This ability to match the need and yet remain competitive results from our experience with Mass Customisation and Lean Engineering.

Features and Benefits

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|---------------------------|--|
| Low Capital Cost | <ul style="list-style-type: none"> • Standard, pre-engineered system for the full plant product range • Highly skidded, modular design for low cost site installations • Compact plant design requiring minimal plot space |
| High Reliability | <ul style="list-style-type: none"> • Full local and remote operation with automatic call-out for 24 hours per day 7 days a week support • Integrated instrument air system |
| Low operating cost | <ul style="list-style-type: none"> • Fully automatic controls for unmanned operation resulting in low manning costs • Low oxygen product pressure as standard for low operating cost; compression is optional • Turndown for power savings at reduced consumption rates |
| Flexibility | <ul style="list-style-type: none"> • Co-production available for GAN, GOX, LIN, LOX, and CDA supply • Steady product pressure and flow with high purity available as a standard |

Process Description



Filtered air is compressed and cooled by the main air compressor and is sent to the adsorbers. In the adsorbers, water, carbon dioxide and most heavier hydrocarbons are removed from the air stream. Two adsorber vessels are provided, one on-line and one being regenerated with waste nitrogen. After a period of time, the adsorbers are automatically switched so that continuous operation can be maintained.

The clean dry air is sent to the main heat exchanger where it is cooled against returning low pressure streams and passes to the high pressure column. A stream of air is also sent through an expander for additional cooling and passes to the low pressure column.

In the high pressure column, separation is effected to produce pure nitrogen reflux stream at the top of the high pressure column and a liquid oxygen stream at the bottom of the column.

A portion of the pure nitrogen can be taken off the top of the high pressure column, warmed through the main heat exchanger, and available as high pressure nitrogen product.

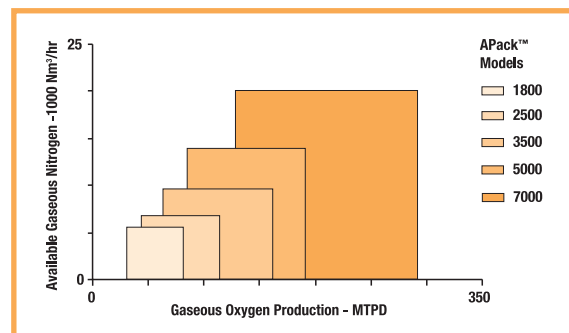
Both the pure nitrogen and bottoms liquid oxygen pass to the low pressure column. At the bottom of the low pressure column, product oxygen is withdrawn and warmed in the main heat exchanger. This oxygen stream is available without the need for further compression.

Towards the top of the low pressure column, a gaseous low pressure nitrogen stream is taken. This stream is warmed in the main heat exchanger against the cooling air stream and is either vented or used to regenerate the adsorbers. At the top of the low pressure column, a high purity, low pressure gaseous nitrogen stream can be taken off, warmed in the main heat exchanger against the cooling air stream, and becomes available as high purity nitrogen product.

PRISM® APack™ Performance

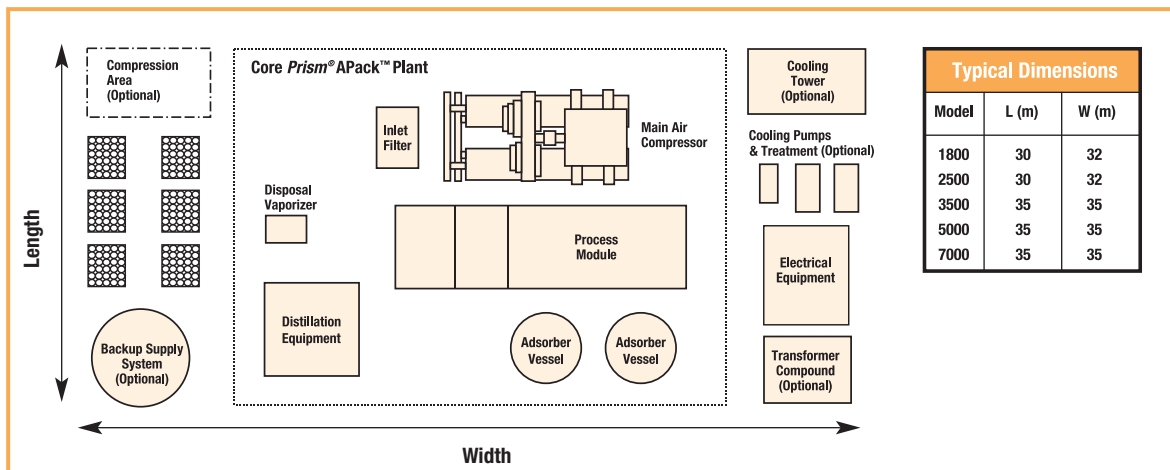
The Air Products **PRISM® APack™** product line has been designed to offer a range of gaseous oxygen production across five available models. Within each model there is the option of providing gaseous nitrogen, as illustrated in the chart.

In addition to the available gaseous oxygen and nitrogen productions, the **PRISM® APack™** product line can also produce either liquid oxygen or nitrogen. Finally, by effectively integrating the supplied equipment, Air Products is able to supply compressed dry air at flow and pressures to suit individual requirements.



Typical Plant Layout

The standard equipment arrangement for the Air Products **PRISM**® APack™ product line is illustrated on the drawing below. The high degree of packaging allows for a compact and efficient equipment layout. The arrangement can be modified to adjust to the specific plot space available. The overall size of the required area is dependent on the scope of supply.



Typical PRISM® APack™ Facility

With the **PRISM**® APack™ product line, Air Products has a product capable of producing oxygen and co-production nitrogen and/or compressed dry air. The product line consists of five pre-engineered models, with oxygen production capacities ranging from 50 to 280 tonnes per day. Within each of these models, there is a range of plant configurations designed to offer any combination of: low or high purity oxygen delivered at the required pressure; 99% or 5ppm purity nitrogen delivered at the required pressure; liquid oxygen or liquid nitrogen; and compressed dry air.

The illustration on the right shows an equipment photo for a recently commissioned **PRISM**® APack™ product, supplying 98% purity oxygen and compressed dry air for a glass making facility. This is one example of several **PRISM**® APack™ products that have been installed throughout the world.

The typical industries served by a **PRISM**® APack™ product are glass, steel, metals, and chemicals processing.

Air Products' extensive engineering and operating experience has enabled us to tailor the development and design of the **PRISM**® APack™ product line to satisfy the specific requirements of these industries. The product design, coupled with Air Products' application integration equipment and services, enables Air Products to deliver a complete solution, from gas generation through to point-of-use delivery.



Standards and Specifications

Safety, Health & Environment

Air Products believes that nothing is more important than safety.

We have extensive Safety Management systems, procedures (including HAZOP analysis) and detailed engineering standards, as well as 50 years of Air Separation plant operation experience. This expertise is applied to all plant and equipment that Air Products operates and sells, to ensure the safety of employees, customers and the general community. As a result Air Products is widely acknowledged to be the safety leader in the industrial gas industry and also has one of the leading performances in the chemical industry as a whole.

Quality

Air Products PLC engineering and manufacturing operates under QA procedures, certified under ISO9001 since 1983.

Pressure vessels

These are normally manufactured to ASME VIII (with U-stamp) or to European PED, but other codes can be accommodated where necessary.

Piping

ASME B31.3 as standard, DIN where required.

Electrics

IEC, CE plated as standard, NEMA where required.

Standard Schedule

The standard execution schedule for the Air Products **PRISM**® APack™ product line, is typically around 12 months depending on size, complexity, and degree of turn-key scope. During the project, the dedicated Air Products Commercial Manager and Project Manager will interface with the Customer to assist in the completion of Customer responsibilities. Below is a standard schedule:

Project Kick Off & Equipment Fabrication	[Bar chart showing activity from month 1 to 9]																
Delivery to Site										[Bar chart showing activity from month 10 to 11]							
Customer Site Scope									[Bar chart showing activity from month 9 to 11]								
Equipment Installation									[Bar chart showing activity from month 10 to 12]								
Commissioning & Start-up												[Bar chart showing activity from month 12 to 13]					
Months	1	2	3	4	5	6	7	8	9	10	11	12	13				

Scope of Supply

Descriptions:

Air Products **PRISM**® System products have been designed to meet a wide range of applications in order to satisfy the requirements of each Customer. The scope of supply of each plant can also be tailored to best address the interests of the Customer. As well as supplying the generation system, Air Products offers a broad complement of service options. These service options build on the base equipment package to provide a full product supply system, complete with ongoing operation, maintenance, and ownership of the equipment. This full product supply system would represent the typical Air Products scope of supply, equipment and service options, offered as part of a standard lease package. An Air Products Commercial Manager would work directly with the Customer to identify the optimum level of service options.

Available service options:

- Licence and Permit Assistance
- Foundation Design and Construction
- Product Compression
- Equipment Delivery and Full Installation
- Utilities Design and Supply
- Startup and Commissioning of System
- Plant Overview and Safety Training
- Ongoing Operation and Maintenance
- Liquid Supply System for Backup & Peakshaving
- Product Pipe Line to Point of Use
- Application Testing & Optimisation
- Product Validation

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