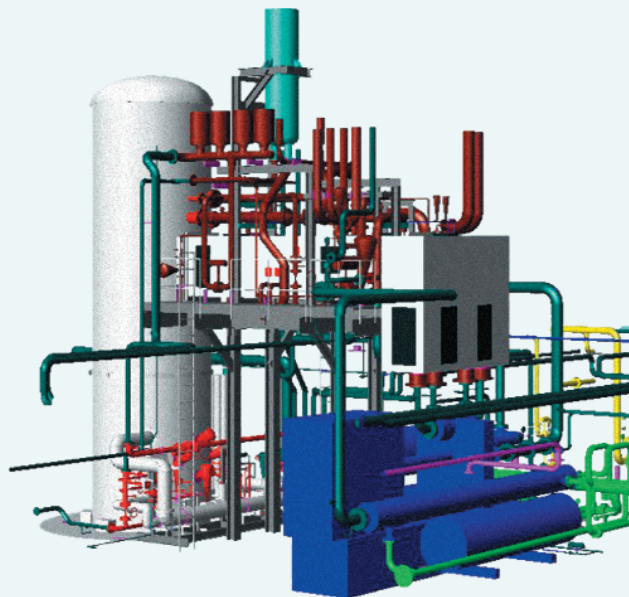


# **PRISM<sup>®</sup>**

## **Packaged Liquefier System**



“The **PRISM<sup>®</sup>** Packaged Liquefier Systems incorporate Air Products’ operating expertise with state of the art technology to meet the needs of small and mid sized operators. The design provides a compact, cost effective and reliable package, whilst also achieving a performance normally associated with larger liquid making facilities”

*Kevin Steele,  
Product Engineering  
Manager*



*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<sup>®</sup>** Packaged Liquefier (PL) Systems provide state-of-the-art technology in producing liquid nitrogen (LIN) from a gaseous nitrogen (GAN) source. These systems offer a highly reliable supply of LIN and can provide significant cost savings over trucked-in LIN.

**PRISM<sup>®</sup>** Packaged Liquefier Systems are designed to satisfy a wide range of customer needs. The plant can run either continuously or in a “campaign” basis, where the plant is run whenever necessary to maintain storage tank levels. Optional features are available to meet specific customer requirements.

**PRISM<sup>®</sup>** Packaged Liquefier Systems use a high efficiency process cycle. This high performance significantly reduces the energy necessary to generate the liquid, making **PRISM<sup>®</sup>** Packaged Liquefier systems the low-cost liquid nitrogen solution for many applications.

The standard design can also be used to liquefy air and can be supplied with a standard Air Separation Unit (ASU) to generate liquid oxygen (LOX).

### **Features and Benefits**

#### **Low Capital Cost**

- Standard, pre-engineered plant range
- Highly skidded for low installation cost
- Compact Plot layout

#### **Low operating cost**

- Low power consumption due to high efficiency process and mechanical design
- Fully automatic for unmanned operation giving low manning cost

#### **Flexibility**

- Single Integrally geared turbo compressor with expanders
- Continuous automatic monitoring, locally or remotely

## Applications

**PRISM**® Packaged Liquefier Systems are ideally suited to the following applications:

- Supply of LOX/LIN to distribute in local area in bulk liquid form, in cylinders filled at high pressure from vaporised liquid
- Supply of LIN for direct uses such as food freezing, tyre recycling, CCR regeneration
- Utilise a surplus source of GAN from larger Air Separation Unit (ASU) which would normally be vented
- Development of new markets, where small LOX/LIN plants may initiate market penetration at low cost

## Options Available on Air Products **PRISM**® Packaged Liquefier Systems

Air Products offers a number of options to the standard Packaged Liquefier system:

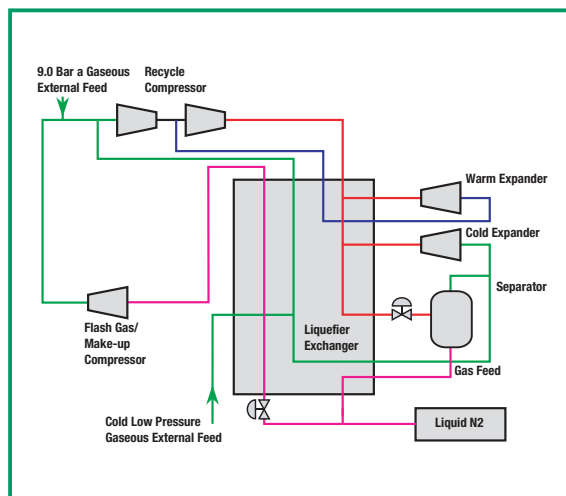
- ASU for liquid oxygen (LOX) generation
- Open/Closed Loop cooling water system
- Electrical equipment such as: transformers, switchgear, reduced voltage starting etc.
- Complete civil design and/or installation
- Storage system design, supply and installation
- Tanker fill & weighbridge system
- Noise abatement systems
- Configure for feed GAN supply and product LIN pressure at 1.05 Bar a

## Process Description

The feed gas, normally at approx 8 bar g, is compressed to high pressure in the Recycle Compressor. It then enters the vacuum insulated Cold Box and is cooled in the Liquefier Exchanger. Part of the stream is expanded in the Warm Expander and is then reheated before returning to the second stage of the Recycle Compressor.

A second stream is taken off further along the Liquefier Exchanger and expanded through the Cold Expander, mixed with flash gas from the separator, reheated and added to the Recycle Compressor feed gas. The remainder of the flow is partially liquefied and is flashed down into the separator. The gas from the separator returns to the Recycle Compressor feed gas. The liquid, at about 8 bar g, is then sent to storage.

If LIN is required at lower pressure, then it is subcooled in the subcooler section of Liquefier Exchanger. Refrigeration is provided by partial flashing of the subcooled liquid. This gas is recycled through the make-up compressor, which is sized to match the level of subcooling required.



## Integration

**PRISM**® Packaged Liquefier Systems have been designed as a fully stand-alone self-contained unit which will liquefy GAN supplied from any suitable source. The Packaged Liquefier can be integrated with:

- A standard Air Products **PRISM**® HPN Nitrogen plant to make LIN only
- An Air Products standard ASU sized to produce required LOX, LIN, GOX and GAN
- An existing ASU with surplus GAN, enabling the production of LIN and, where practical, LOX

Whilst integrated with any of these other plants, the Packaged Liquefier remains a fully self-contained unit which can be operated independently.

## **PRISM**® Packaged Liquefier Performance

Plant design and performance is based on the supply of utilities consistent with Air Products specifications, and specific plant performance varies with cooling water temperature.

Product purities will be the same as the purity of the feed gas. Typical production rates with feed GAN at 9 bar a are:

	Metric Tonnes per Day (MTPD)	Power Consumption (KW)
<b>PL5</b>	60	1100
<b>PL7</b>	68	1300
<b>PL12</b>	125	2200



## Scope of Supply

### Descriptions

Air Products **PRISM**® Packaged Liquefier plants are designed to be tailored to meet the specific 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 designing and supplying the equipment, 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 long-term operation, maintenance, and ownership of the equipment. An Air Products Commercial Manager would work directly with the Customer to identify the optimum level of service options.

### Typical Equipment Supply

- Compression System
- Cryogenic Cold Box
- Cryogenic Expansion turbines
- Process Skid with valving
- Instrumentation and Controls
- Interconnecting Piping

- Liquid Storage System (optional)
- Preparation for Shipment
- Delivery to Agreed Point
- Engineering & Procurement Services
- Project Management

### Available Service Options

- Licence and Permit Assistance
- Foundation Design & Construction
- Complete Installation Package
- Equipment Delivery to Site
- Full Equipment Installation
- Utilities Design and Supply
- Tanker fill & Weighbridge systems
- Noise abatement systems
- Startup & Commissioning of System
- Plant Operation & Safety Training
- Ongoing Operation & Maintenance

## Site Supply

### Site Services Required

The following will be required from FCA to Turnkey

- Packaged Liquefier plant installation
- Required electrical power & cooling water supplies
- Phone lines (x2)
- Supply feed GAN / Air at 9 bar a
- Instrument Air Supply
- Start-up & commissioning of PL system
- Plant operation and safety training

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