

# N<sub>2</sub> Membrane+

## Nitrogen Production Systems for Offshore



Where you are.  
Where you need to be.  
We are here too.



# OVERVIEW

**AIR LIQUIDE OIL AND GAS SERVICES** is dedicated to the supply of products and services to customers in the offshore oil & gas market. Headquartered in Aberdeen, with global operations in more than 90% of offshore supply bases, it provides a comprehensive range of gases and supply equipment, from containers to nitrogen generation systems. Air Liquide supports oil & gas customers with flexibility, adaptability and innovative solutions to meet the demands of the offshore market.

## PROVEN QUALITY AND SAFETY

Across your global business, Air Liquide Oil & Gas Services is committed to providing you with the best products and services that you can rely on. At Air Liquide, we ensure full compliance with the highest offshore quality and safety standards to meet zero accident target.

### Targeting Zero Accident

The safety of employees and contractors is a priority for both supplier and client. All international safety and quality standards are strictly implemented and are further enhanced by Air Liquide's mandatory safety Industrial Management System (IMS).

### Industrial Risk Management

Air Liquide has developed a fully integrated quality system with special focus on safety, respect of the environment and reliability. Our Industrial Management System (IMS) is inspired from best practices of TQM and 6\* Sigma and is our method to ensure Air Liquide operates in a way that:

- Focuses on safety or production operations and distribution
- Maintains compliance with regulations
- Respects the Air Liquide Group manufacturing procedures
- Provides reliability of our production processes

*Our concern is the  
Safety of all individuals  
who work for or come  
in contact with  
Air Liquide.*



### Product Quality, Safety and Control

Gases are transported and delivered in cylinders, quads, liquid containers or produced on-site via nitrogen production units. Gases and equipment are transported and delivered in line with all current legislations and best working practices to ensure safe conditions every time. All products are continuously analyzed during manufacturing and controlled before delivery, including:

- Inspection and maintenance of the cylinders
- Respect of local and international regulations (ISO, DNV, ABS), ATEX upon request
- Respect of Air Liquide Group specifications
- Systematic product material safety data sheets





# APPLICATIONS

Air Liquide Offshore offer covers six main activities to support offshore industries: Construction and Maintenance, Subsea works, Well services, Support services and Living quarters, On board analysis and Process control, and On-site nitrogen generation.

## OIL AND GAS

Today, offshore upstream operations are supplied either via cylinders, quads, liquid containers or membranes for their continuous nitrogen stream supply on-site. Increasing remote activities and offshore fields are driving the demand towards more membranes on board the vessels or platforms. In addition to being an on-demand, low maintenance, and reliable source of nitrogen, on-site membrane-based nitrogen reduces pressure on the supply chain. Air Liquide Oil & Gas Services membranes are some of the highest performing membranes in the industry and are in service on oil and gas platforms worldwide.

### APPLICATIONS INCLUDE:

- Inerting on board (Platforms, FPU's...)
- Pipelines / Well Servicing
- Commissioning / Decommissioning Jobs
- Underbalanced Drilling
- Enhanced Oil Recovery / Coiled tubing / Gas lifting
- Blanketing



## MARITIME

Global energy resourcing depends on flexible, deployable nitrogen generators. The marine LNG, chemical support vessels as well as tankers require clean and dry inert gas to maintain a safe environment, and ensure the product quality of their cargo. Air Liquide membrane-based nitrogen generators offer an alternative to traditional methods of generating inert gases, and are used by world-class OEMs who supply the maritime industry.

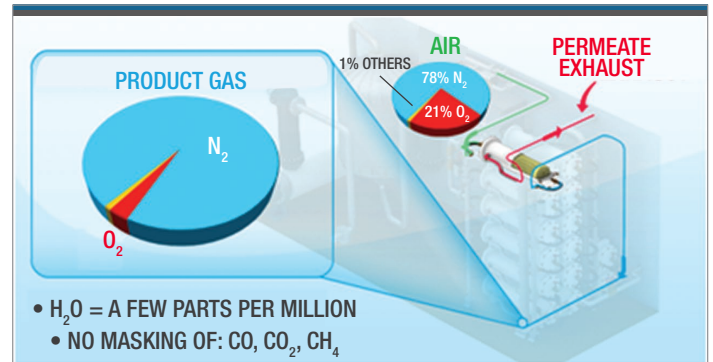
### APPLICATIONS INCLUDE:

- Inerting tanks and piping systems on board  
(LNG and chemical tankers)
- Purging and blanketing of storage tanks



# HOW IT WORKS

Nitrogen Production Units (NPU) take untreated compressed air and convert it into nitrogen at purities from 95% - 99.9%. This untreated air goes through a selection of filtration methods (coalescing, moisture and carbon) to remove hydrocarbons (oils), moisture and particulates. After this filtration, the air passes through the hollow fiber membranes where the molecules are separated. The nitrogen flows through the membrane fibers from one end to the other, and the other gases dissipate through the sides of the hollow fiber membrane to form what is called permeate gases (waste). All systems are ergonomically designed to allow safe operation and maintenance.



## INSIDE THE MEMBRANE MODULE

Air Liquide MEDAL™ technology are asymmetric hollow fibers comprised of a core which is optimized for mechanical strength and a sheath optimized for gas separation. A 12-inch module contains 0.5-1.0 million fibers, which laid end-to-end, would stretch for 750 miles. Membrane modules may contain over 1 million individual hollow fibers that are formed in cross flow and counterflow designs, allowing for flexibility in meeting all pressure drop and performance constraints. Bundles are designed with high performance fibers to allow operations at elevated temperatures and extreme pressures. This allows for higher membrane productivity, fewer membranes and lower system CAPEX.



## OUR MEMBRANE TECHNOLOGY



Air Liquide's membrane technology delivers uncompromising performance within a compact design. By utilizing a proven polymer blend and advanced hollow fiber technology, the unit generates an optimal balance of flux and selectivity for on-site nitrogen supply.

# PRODUCT OFFERING



## NITROGEN PRODUCTION SYSTEMS

### AIR LIQUIDE OFFERS A WIDE RANGE OF NITROGEN PRODUCTION SYSTEMS TO SUIT ALL APPLICATIONS

- Fixed installations are either standard systems or customized to suit customer needs
- Portable units are containerized to meet offshore DNV 2.7-1 standards
- Purities from 95% - 99.9%
- Flow rate from 10 Nm<sup>3</sup> / hr up to 4,700 Nm<sup>3</sup> / hr on standard systems, flow rate unlimited on custom designed systems
- Operating pressure up to 24 barg (350 psig)
- Designed as simple plug and play systems where only compressed air and electrical power is required
- Choice of hazardous (Class I / ATEX) or non hazardous zone systems
- Choice of system with and without compressors - Air Liquide supplies a range of compressors which are fully integrated into the nitrogen system

## BENEFITS

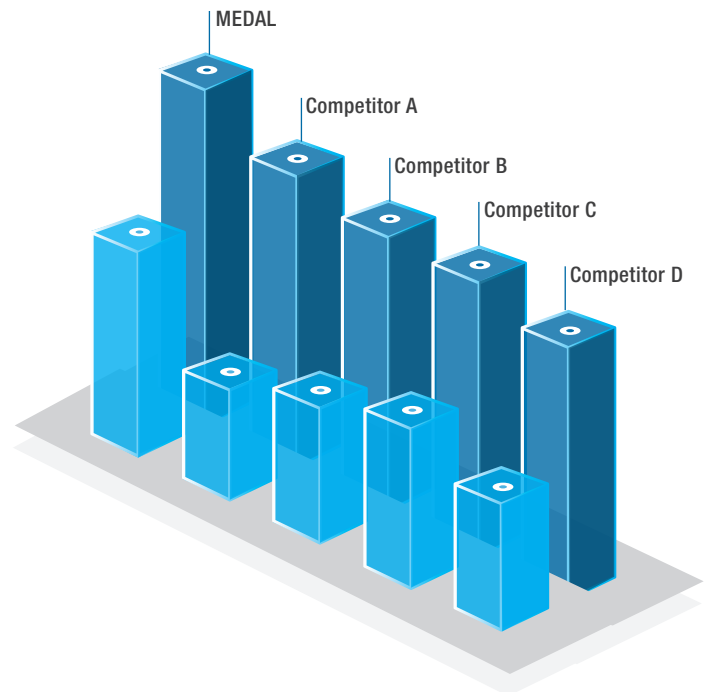
- High reliability
- Meet offshore standards
- Enhanced safety systems (intrinsic safe system)
- Resistant to marine environment
- Easy operating system
- Easy maintenance system
- Rig safe or ATEX as an option

## PERFORMANCE

The graph to the right displays the productivity and selectivity of various Air Liquide membrane offerings as compared to those of primary competitors.

## SERVICES

- Support for installation of equipment
- Support for commissioning of full system
- Preventive maintenance - Labor and spare parts
- Technical assistance support
- Telemonitoring of performances
- Uptime guarantee



### MEDAL MEMBRANE PERFORMANCE

■ Flux/Productivity ■ Selectivity

# CONTACT US

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