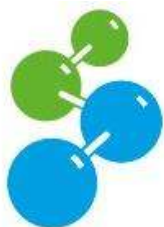




MEMBRANE

NITROGEN GENERATOR



MVS
ENGINEERING PVT. LTD.

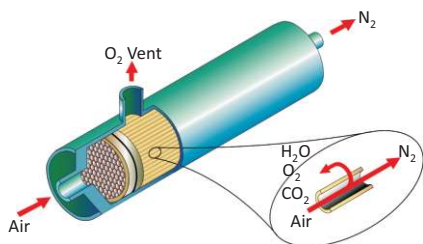
ZEN SERIES

MEMBRANE NITROGEN GENERATORS



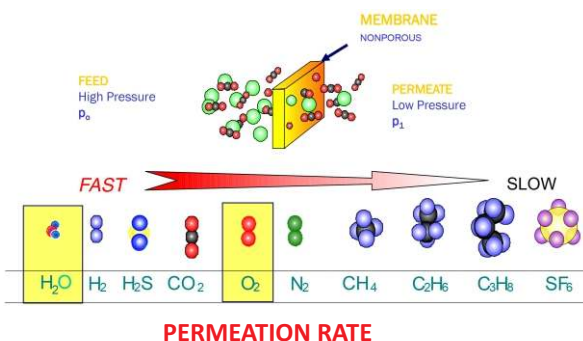
Membrane Technology

The Membrane has cylindrical bundle of hollow fiber membranes made from polymer fiber material. Compressed air enters at one end and flows to opposite end.



It is really that simple !

Gas separation takes place through fiber wall. Fast gases such as Oxygen, CO₂, and water vapor quickly permeate through fiber wall and exit at atmospheric pressure through the vent port.



Air Liquide MEDAL Membranes

MVS Engineering is a system integrator and Nitrogen Plant manufacturer using Air Liquide **MEDAL** membranes. Air Liquide is the global leader in advanced technology methods to purify and produce gases for a wide range of applications. Located in USA, MEDAL was created in 1988.

MEDAL's high performance, hollow fiber membrane modules offer unmatched performance per module volume.

Membrane Nitrogen Generator Benefits

Ready to Use

- > Shipped ready for installation
- > Designed for reliability and rapid deployment

Fast Start

- > System start-up almost instantaneous

Cost Savings

- > Low operating expenses
- > Negligible maintenance costs
- > Easy to operate and maintain

World-class Design

- > Standard features include Oxygen purity monitor, integrated feed air preheater
- > Space saving design for a smaller footprint

Convenient and safe

- > ZEN-Series systems eliminate safety hazards associated with traditional gas supplies such as cylinders / liquid tanks

Long Life

- > Systems typically have a life of 10-years or more

Did you know: Mission Critical Systems Use Membranes!

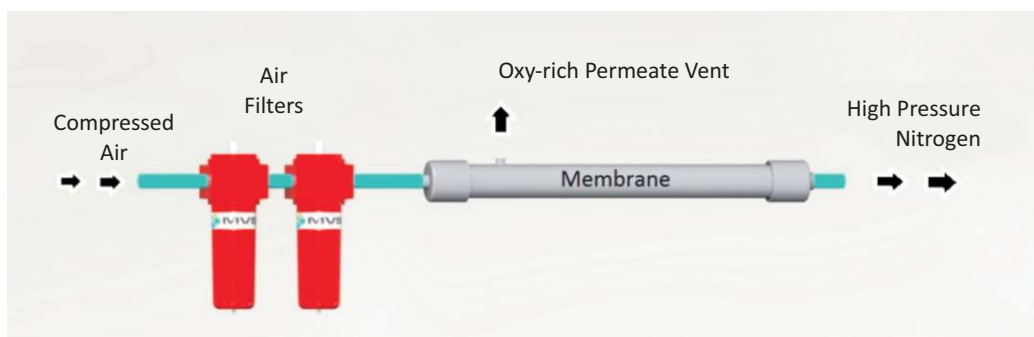
Air Liquide is the leader in the field of aircraft fuel tank inerting via membrane based OBIGGS (On Board Inert Gas Generator System). This emerging market takes advantage of the inherent strengths of Air Liquide's membrane technology.

Air Liquide has the most extensive list of OBIGGS systems provided to the aircraft industry. MEDAL has provided OBIGGS modules for fighter jets, cargo aircraft and helicopters.

OBIGGS systems prevent ignition of fuel tank vapors by providing inert gas generated on board the aircraft. OBIGGS generated nitrogen enriched air blankets the aircraft fuel tank and displaces the flammable fuel/air mixture. Vulnerability to lightning, static discharge, is greatly reduced by OBIGGS.



MEMBRANE SYSTEMS:



Membrane Nitrogen Generation Flow Scheme

Air Pre-Filter Required

Feed Compressed Air should be very clean and dust-free.

Therefore, multistage air filters are provided in compressed air line.

Air Pressure & Pressure drop

Compressed Air is used as feed at 7 to 25 barg pressure.

Pressure drop is less than 1 bar. Hence, Nitrogen is available at high pressure directly.

Nitrogen Turn-down range

Membrane units can be operated at any capacity from 5% to 100% Nitrogen flow.

Lower the Nitrogen production, higher will be Nitrogen purity from the same Membrane Unit.

Start-up Time

Start-up time is only **2-minutes** to start getting Nitrogen at the desired purity and flow rate. This is truly beneficial, since the Nitrogen Generator can be easily stopped when your process does not require Nitrogen, thereby giving you big energy savings.



NITROGEN CHARACTERISTICS & TECHNOLOGY SELECTION

Nitrogen Purity

95% to 99.5% purity Nitrogen is easily produced. Higher the Nitrogen purity, more number of Membranes are needed and so more is the cost of Nitrogen generator. 99.999% N_2 purity is also feasible but cost becomes very high.

Nitrogen Capacity

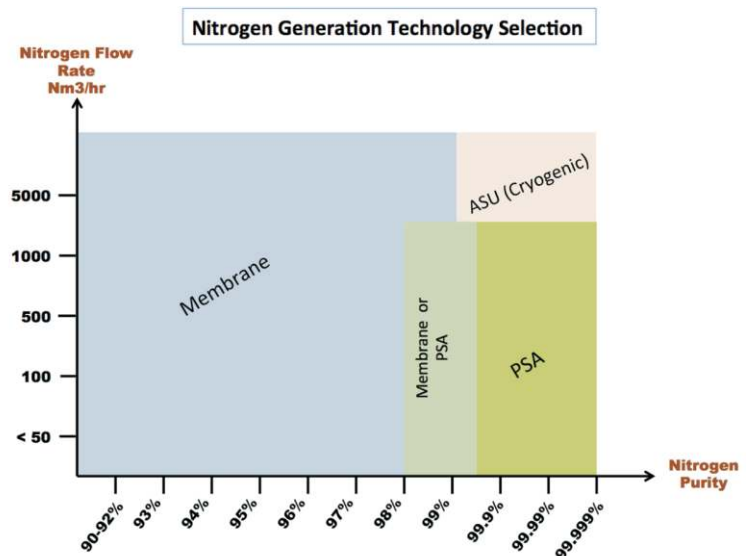
Nitrogen generators are manufactured as per your flow requirements. We manufacture generators with flow as low as 0.5 Nm^3/hr . Upper limit is as per your requirement.

Nitrogen Dew Point

Moisture is also filtered out through Membranes and therefore, Nitrogen is very dry with Dew point of around (-) 65°C or better.

Nitrogen Pressure

Nitrogen is produced at 6 to 24 bar pressure directly without using Nitrogen booster Compressor.



Membrane Technology: Operational Factors

Feed Air Pressure

Zen-Series Nitrogen Generators are capable of operating at different air pressures.

Higher the feed compressed air pressure, higher the productivity of the membranes, i.e., higher Nitrogen production.

Zen-Series Nitrogen Generators can operate at air inlet pressures ranging from 6 bar g to 25 bar g.

Feed Air Temperature

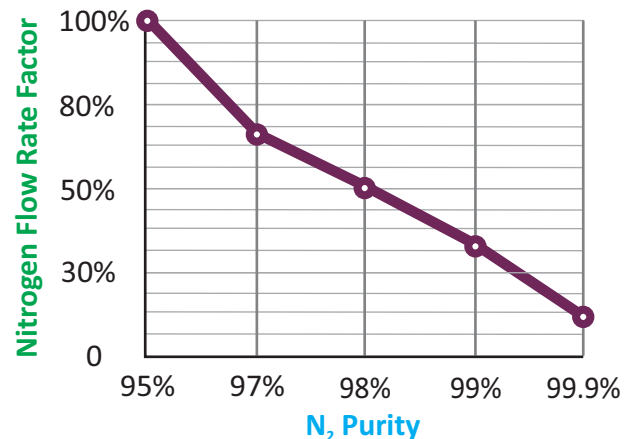
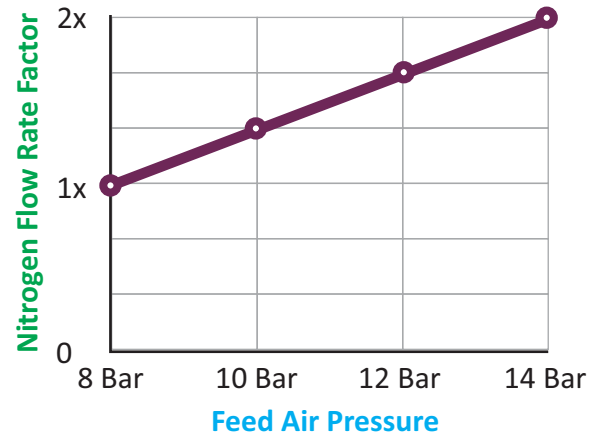
Zen-Series Nitrogen Generators can be fed compressed air with temperatures ranging from as low as 10°C and as high as 55°C. The optimum temperature for operation is around 50°C. Our systems has an integrated air pre-heater to get optimum Nitrogen flow.

Nitrogen Purity

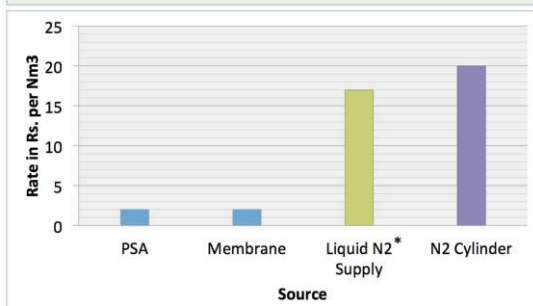
Nitrogen production using membranes technology has a direct correlation between Nitrogen production rate and Nitrogen purity.

Zen-Series Nitrogen Generators can provide Nitrogen gas of purity ranging from 95% to 99.5%. Higher the Nitrogen purity, lower is the Nitrogen gas quantity produced. Hence, same membrane gas generator can be used at lower capacity giving higher purity output.

Most economical Nitrogen purity is 95% with higher Nitrogen flow. The same membrane gas generator can also produce Nitrogen up to 99.9% but Nitrogen flow is reduced.



Comparative Cost of Nitrogen



* Liquid N₂ supply is done in volume as liters
1 liter N₂ = 0.7 m³ N₂ gas

Cost of Nitrogen

- Cost of Nitrogen production on site Nitrogen generator is only **Rs. 2/- per Nm³**

It is **much** costlier to source Nitrogen from external sources such as Liquid Nitrogen supply or through Cylinders

Product Range



ZEN Series-1

- Flow up to **20 Nm³/hr**
- Purity from 0.1% to 7% residual Oxygen
- Nitrogen delivery pressure up to 24 bar g
- All quick-connect fittings for easy installation

ZEN Series-2

- Flow up to **100 Nm³/hr**
- Purity from 0.1% to 7% residual Oxygen
- Nitrogen delivery pressure up to 24 bar g
- Three-side openable for easy serviceability



C-ZEN Containerized Units

- Systems housed in 20' or 40' sea - worthy container
- Air compressor can also be integrated inside or separate container
- Container can be insulated and climate controlled (optional)

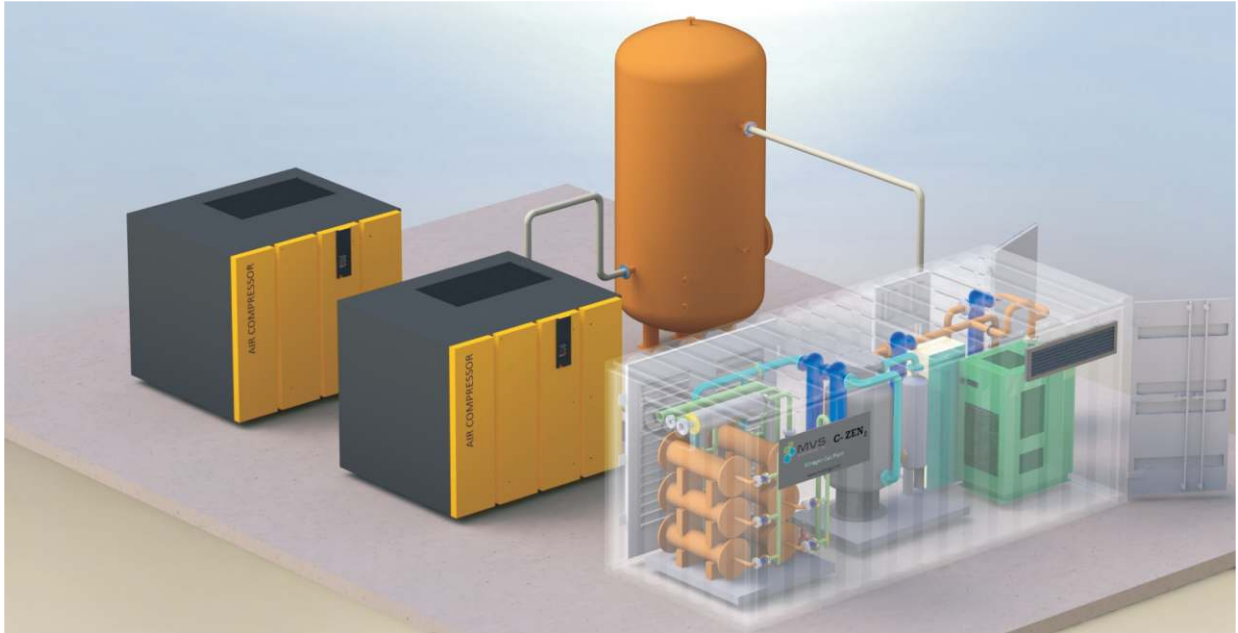
I-ZEN Industrial Units

- Tailor-made as per customer site
- Skid design for easy transportation, ease of handling and installation
- Customer only needs to provide sun and rain protection
- Customer can provide compressed air or purchase air compressor from us



Containerized Installations

Increasing number of customers are opting for containerized installations to avoid civil costs associated with constructing a building and also to allow for quick installation at the site. MVS Engineering has supplied several such units worldwide for both fixed and mobile sites.



Site installed C-Zen with Air compressors and Air receiver tank

Thoughtfully Designed Containerized Plants



Easy access to Air compressor through full door



Window to allow HMI readings without entering container

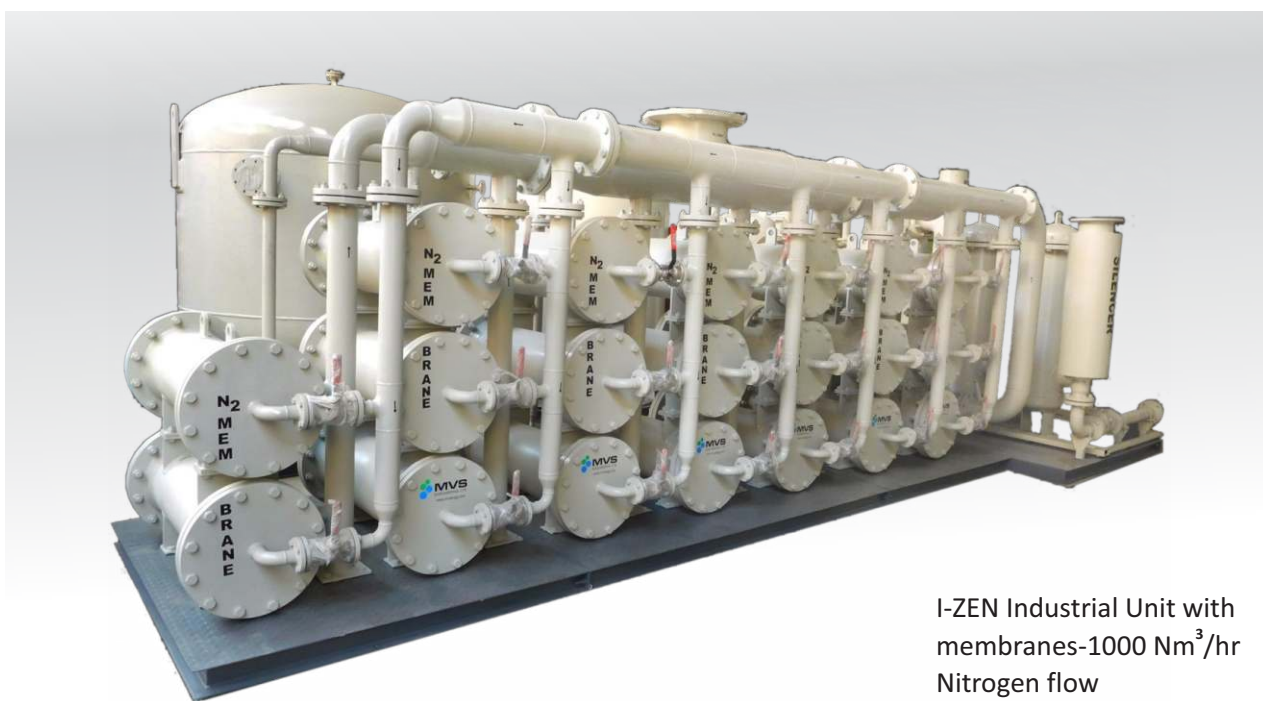


Louvered doors for full membrane access and fresh air intake

ZEN Series-1 Unit
with touch screen
HMI-15 Nm³/hr
Nitrogen flow



ZEN Series-2 Unit with touch screen
HMI-55 Nm³/hr Nitrogen flow



I-ZEN Industrial Unit with
membranes-1000 Nm³/hr
Nitrogen flow



Lab ZEN Unit for LCMS application



I-ZEN Industrial
Unit with
touch screen
HMI -300
Nm³/hr
Nitrogen flow



C-ZEN Containerized Units with integrated compressor. 300 Nm³/hr Nitrogen flow for Petrochemical Tanks and Oil Field application



I-ZEN Industrial Unit with integrated compressor. Nitrogen membranes - 50 Nm³/hr Nitrogen flow



ZEN-SERIES Standard Features & Options

Scalability

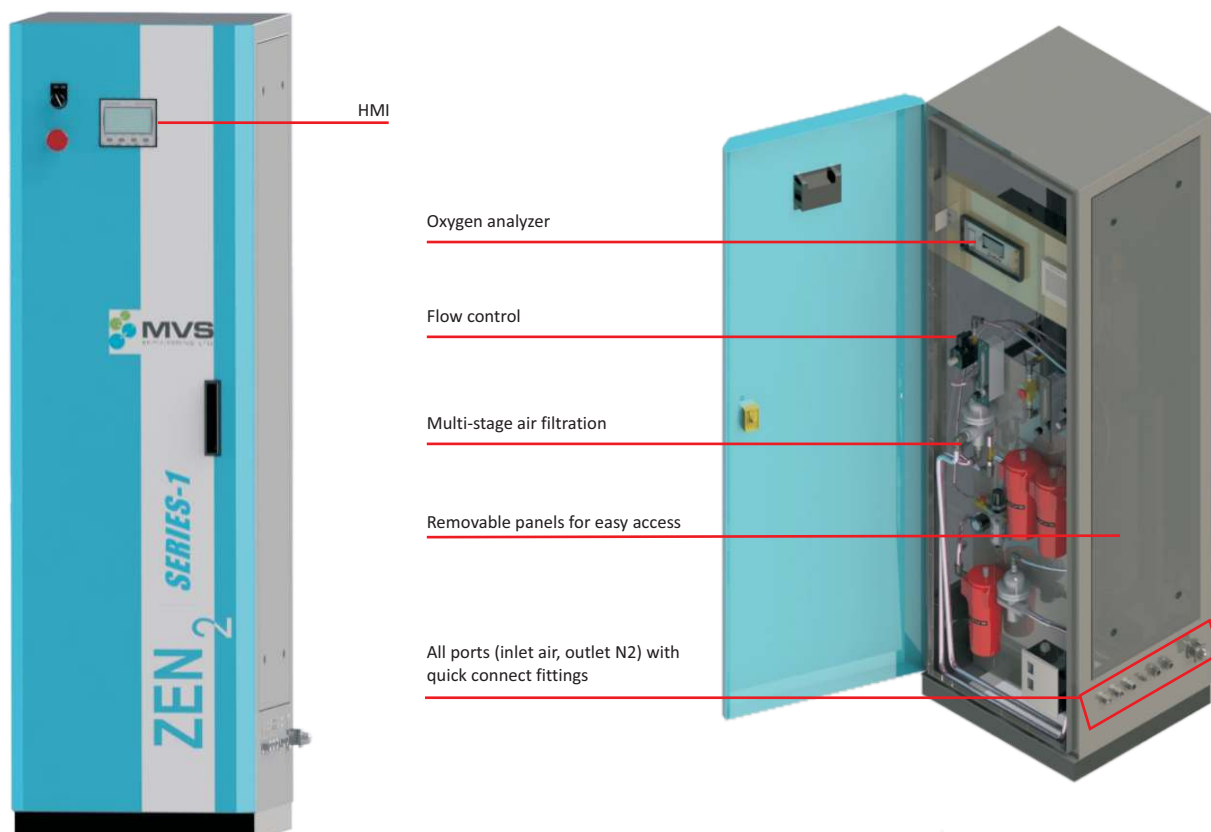
Most customers demand scalable units and ZEN Series provides that flexibility from the ground-up. As customer needs change, the ZEN-Series can be scaled up by simply adding more membranes very easily.

Standard Options

- **Air Pre-filtration** - We provide multi-stage air filtration to ensure system longevity
- **Moisture separator** - Our systems have built-in moisture separation to reduce workload and improved efficiency of the membranes
- **Flow control** - We include N2 flow meters for precision flow control

Configurable Options

- **HMI** - Touch screen display provided for easy interface with the unit (optional)
- **Oxygen Analyzer** - Oxygen analyzer provided for purity monitoring and system performance
- **Flow Control** - Customers can opt for analogue (standard) or digital flow measurement (optional) and control
- **Tropicalisation** - We provide IP rated panels for customers requiring unit operation in harsh or outdoor environments
- **Nitrogen Booster Compressor** - For customers requiring yet higher pressure, we provide Nitrogen booster compressors as an add-on option



Technical Summary

ZEN Series - 1

Flow rates from 0.5 Nm³/hr to 20 Nm³/hr
Nitrogen pressure up to 24 Barg

ZEN Series - 2

Flow rates from 25 Nm³/hr to 100 Nm³/hr
Nitrogen pressure up to 24 Barg

I-ZEN Industrial N₂ Plants

Skid mounted industrial Nitrogen plants designed as per your flow, purity and pressure requirement

C-ZEN Containerized N₂

We offer very large capacity Membrane Nitrogen plants in containerized configuration for easy mobility and with options such as air compressor, diesel power options, booster compressors.

Features

- ✓ Negligible Maintenance
- ✓ No moving parts
- ✓ Long system life
- ✓ Integrated HMI
- ✓ Integrated Oxygen purity analyzer
- ✓ Very compact cabinets
- ✓ Easy installation and startup in less than 1-day



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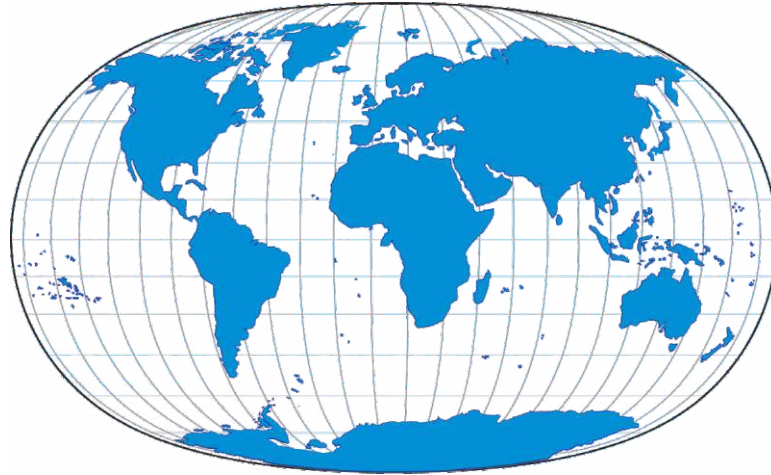
42 Years Experience
in manufacturing Gas
Generators



Strong Team
of 150 Employees with
large experience



Collaborations and Partnerships
with worlds leaders in Gas
Generation field.



Large Inventory
of components for short
delivery time



Service Support
We are only a phone call away for
full diagnostic support and any
assistance required



Experienced R&D Team
which keeps innovating &
refining the technology and
reduce costs



Nitrogen plant with Diesel generator & Air compressor on single-skid



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Email: sales@mvsengg.com, Website: www.mvsengg.com