MARITIME PROTECTION

DRY INERT GAS GENERATOR

Wilhelmsen Technical Solutions

SAFE TRANSPORTATION OF DANGEROUS CARGO

Vessels carrying liquefied gas need an inerting solution to prevent explosion on sea-voyage just before and after dry-docking. This can be achieved by keeping the oxygen level below 1% in the cargo area.

In addition, classification societies require that all tank inspections are carried out within a safe atmosphere. This is achieved by aeration operation where the oxygen level is increased up to 21%.

THE MARITIME PROTECTION DRY INERT GAS GENERATOR for liquefied gas carriers is a new concept based on a proven solution. It is a combination of the traditional inert gas generator based on combustion and a two stage dehumidification system including cooling and adsorption process, where the classical two bed adsorption dryer has been replaced with a compact rotating adsorption dryer. The dew point of the inert gas is lowered to the required specifications below minus 45degC with oxygen content less than 1%.

The Maritime Protection Inert Gas Systems are built in accordance with 1974 SOLAS Convention with latest amendments, and are fulfilling all of Class, IMO's guidelines and the demanding conditions of shipboard operation.

Vessel application

Dry Inert gas systems are commonly used on:

- LNG carriers
- LPG carriers
- FRSU
- FLNG

Combustible Inert gas is used to:

- Inerting and drying of cargo tanks, cargo piping and machinery
- Purging of tanks
- The dry inert gas generator in fresh air mode:
  - Used for aeration of cargo tanks before inspection
  - Drying and aeretion of hold space

Solution benefits

Advantages of the Maritime Protection Dry Inert gas generator include:

- Up to 50% reduction in weight and foot-print compared to conventional systems
- Continuous regeneration of dryer
- Modern design for easy installation and maintenance
- 100% automatic control, no manual adjustments required by operator
- Dew point below minus 45degC reached 20-40 minutes after start, decreasing to below minus 60-65degC
- Constant & uniform dew point during operation
- High grade steel (SST 904) used for the combustion chamber
- Mechanically simple and reliable centrifugal blowers due to low pressure drop in system
- MODBUS communication with IAS
- In dry air mode: no need of IG generator. Only cooler, dryer and dry gas blower in use

System description

The complete Dry Inert Gas Generator is made up of three sub systems

- Inert Gas Generator, utilising Maritime Protection's well proven inert gas generator
- Cooler and dryer skid with fin type cooler, and Maritime Protection's new concept – the rotating adsorption dryer
- Refrigeration plant, closed loop type, with no Freon transported into the cooler unit

The Maritime Protection Dry Inert gas generator produces clean and soot free inert gas by combustion of gas oil supplied by the fuel oil pump with air provided by blowers, in the combustion chamber of the inert gas generator. The gas is efficiently cooled in the scrubber tower and the saturated gas is dried in a two stage process:

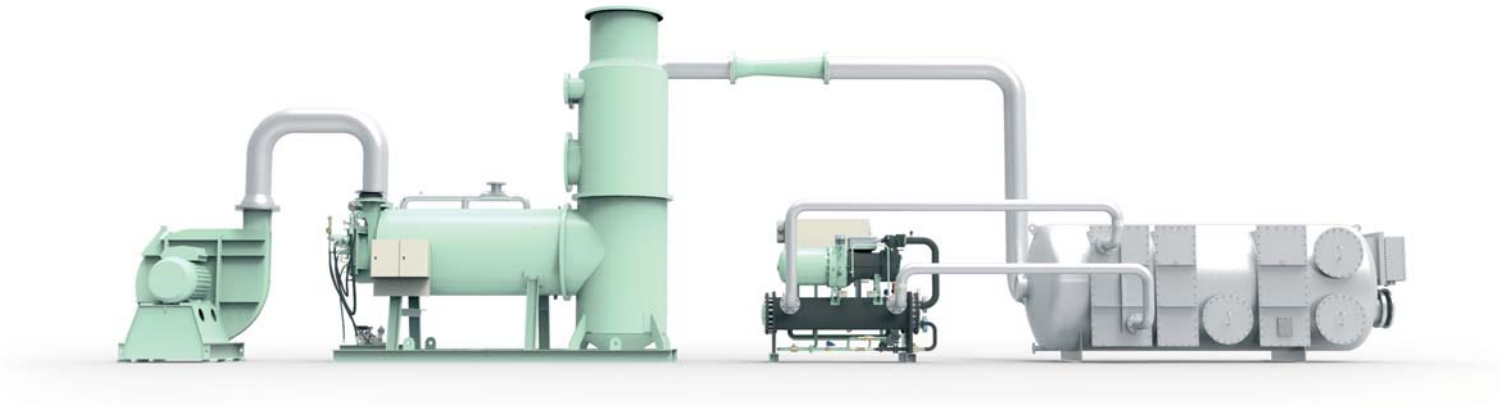
- A cooler compromising of a finned tube coil reduces the humidity to +5ºC dew point. The cooling effect in the cooler is provided through a glycol/ water circuit from a separate water chiller unit
- The final drying is achieved by a continuously rotating adsorption dryer, dew point below minus 45degC

OPERATION & MAINTENANCE

- Fully automatic, for unattended operation. No manual adjustments required
- All process parameters displayed on operator panel
- Modes of operation can be selected on operator panel, no manual changes when changing mode.
- Easy maintenance through:
- Hinged burner front door allowing easy access
- Filters, dryer rotor and other major components can be easily checked through inspection hatches

OPTIONS

- Multiple operator terminals
- Ethernet communication with IAS (modbus is standard)
- Electric or steam regeneration heater



SYSTEM CONFIGURATION WITH COMPACT COOLER AND ROTATING ADSORPTION DRYER

Rotating adsorption dryer
- far more efficient, more compact and require less maintenance than any previous old dual bed dryer.
- Constant regeneration (regenerating saturated desiccant in same rotational cycle)
- 20% of weight compared to "old conventional two bed" dryer

Utilizing the more maintenance friendly centrifugal blowers
- Virtually no maitenance
- Less noise and vibration

Closed loop cooling system provided through a glycol/water circuit from a separate water chiller unit
- Less posibility for leaks of Freon
- Requires less Freon/refrigerant

Rotating adsorption dryer -compact design

Technical specifications

Table based on 1% O_2 content by volume, discharge pressure 2500 mm WG and dew point -45°C.

DIGG model	Capacity [Nm^3/h]	Seawater consumption [m^3/h]	Fuel consumption [kg/h]	Power consumption [kW] (with el. reg heater)	Overall system weight [kg]
MPG - 700 - 084	900 - 2000	45 -180	42 - 170	38 - 181	7100
MPG - 800 - 104	2000 - 3200	180 - 290	185 - 269	181 - 238	8400
MPG - 900 - 124	3200 - 4500	290 - 405	269 - 379	246 - 330	9600
MPG - 1000 - 154	4500 - 5700	405 - 510	379 - 479	335 - 387	11200
MPG - 1100 - 154	5700 - 6800	510 - 615	479 - 572	387 - 456	12600
MPG - 1300 - 174	6800 - 9500	615 - 855	572 - 800	456 - 656	14800
MPG - 1300 - 194	9500 - 10500	855 - 945	800 - 883	656 - 692	16500
MPG - 1600 - 194	10500 - 12000	945 - 1080	883 - 1010	692 - 746	21000
MPG - 1600L - 224	12000 - 16000	1080 - 1395	1010 - 1295	746 - 932	23500
MPG - 1800 - 244	16000 - 18500	1395 - 1665	1295 - 1556	932 - 1131	26600
MPG - 1800 - 264	18500 - 21000	1665 - 1890	1556 - 1766	1131 - 1365	28200

Gas composition with marine gas oil (MGO)

CO < 100 ppmv	NO_X <1 00 ppmv	N_2 = Balance
SO_2 < 1ppmv	CO_2 approx. 14%	O_2: 0.5-1%
Soot content (bacharac): 0		

Service

Service and /or repairs can be carried out in a short notice, worldwide.

Aftersales

When spare parts or consumables are needed, our aftersales department is at your service 24 hours a day.

Contact us

E-mail: wts.safety@wilhelmsen.com
wts.spares.IG@wilhelmsen.com
wts.service.IG@wilhelmsen.com

MARITIME PROTECTION INERT GAS SOLUTIONS

COMBUSTIBLE SOLUTIONS

- Flue gas system
- Inert gas generator
- Flex-inert system
- Dry inert gas generator
- Dual fuel inert gas generator
- Flue-generator system
- Inert gas deck house modules

NITROGEN SOLUTIONS

- Nitrogen system
- Nitrogen cylinder central system
- Nitrogen membrane controlled and modified atmosphere system

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