

OVERCOMING INERTIA TOWARDS NEW INERT GAS SYSTEMS



Frode Lauritzen ("Survitec Fire Solutions):
"Lighter and smaller in terms of engine room footprint"

Twin-bed dry inert gas generators have been the industry standard for years, but advances in drying technology mean that shipowners and shipyards have a genuine alternative, argues Frode Lauritzen*.

Innovation is a subject the maritime industry spends a lot of time talking about. With the multiple, challenges of regulatory compliance, operational efficiency and crew competence, the adoption of new technology and systems is often promoted as the answer to the industry's problems.

That may be true in part – and certainly when considering topics such as navigation, communications and operational efficiency – but when the subject is safety, the industry seems less able to take into account the reality of innovation.

This is despite fundamental changes that encourage it, such as the IMO's goal-based standards and the adoption by class societies of risk-based, probabilistic design approaches. However, as the entire industry is judged by its safety record and environmental performance, it is necessary to embrace new technologies.

Why inert gas systems?

Vessels carrying liquefied natural or petroleum gas – as well as crude and refined products – require by IMO regulation a system that generates inert gas to eliminate the potential risks of vapour explosion. Build up of vapour can occur both on the voyage and during cargo operations. Either way, the outcome can be devastating.

Dirty cargoes, including crude oil and crude oil products normally require inert gas to be produced by burning diesel oil in a dedicated inert gas generator or using the boiler exhaust as the source.

For LNG and LPG tankers, a dry inert gas generator is used to produce the gas needed to inert and dry the cargo tanks, cargo piping and machinery and purging of tanks. The inerting is achieved by purging with inert gas having an oxygen level below 1%. These systems need an additional cooler and dryer, compared with systems on traditional oil tankers which can use humid gas.

In addition, classification societies require that all tank inspections are carried out with a safe atmosphere where the oxygen level is increased to 21% before the inspection. This is achieved by operating the inert gas generator in fresh air mode to aerate cargo tanks. This can also be used for drying and aeration of the hold spaces.



Manufacture takes place in Kristiansand, Norway. Selling points include a short cycle time of around eight minutes, meaning 15-20 minutes are required from start up to delivery of inert gas to the tanks.

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MARITIME PROTECTION DRY INERT GAS GENERATOR

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Dual bed drawbacks

Traditional dry inert gas systems are generally dual bed systems. Dual bed dryers consist of two beds, or towers, filled with activated alumina adsorbent beads of between 4 and 8mm diameter, as well as process and regeneration heaters, cooler, blowers and valves to re-direct the airflow.

While one bed of desiccant supplies dry inert gas to flow through the drying vessel to the consumers, the other bed – with saturated desiccant – is regenerated, by forcing hot air through it.

When the regeneration is complete, the two beds run in parallel for short time before the process is reversed and the regenerated bed becomes the one supplying the dry inert gas and the first bed goes into the regeneration mode.

Many modern LNG/LPG vessels are still fitted with this type of twin-bed inert gas system despite their many disadvantages.

Assessing alternatives

In the last two decades, several major advances have been made to the drying technology used in inert gas generators and several types of dryers have been developed that overcome the disadvantages of dual bed dryers.

This is not to say that traditional technologies do not work – they do and have for many years – but that shipyards and shipowners continue to specify the old dual-bed technology suggests they are not aware of the new technologies available, or are content to put up with their inherent flaws.

Both shipowners and shipyards have preferred supplier and vendor lists. Shipowners will often look for a significant number of installation references before specifying new equipment. For some shipyards, as long as the suggested systems meet the required specifications and target price, then these are the systems they will specify.

New approaches

The key element in the system is the rotation adsorber which results in a very compact adsorption dryer with a constant dew point and inert gas temperature, with no variations during the inerting process. Adsorption rotor dryers – which feature desiccant rotor dehumidifiers – are far more efficient, more compact and require less maintenance than any previous dual bed desiccant dryer.

The rotor matrix is manufactured from alternate layers of corrugated sheets of silica gel and metal silicates, chemically bonded into a tissue of inorganic fibres in a honeycomb structure. As a result, the rotor has a small external surface compared with conventional system, but has also a large internal surface.

This, combined with the special microstructure of the silica gel material, ensures maximum contact area to give the rotor a very high capacity for absorbing water vapour. The rotor is driven by a gear-motor with a timing belt transmission. A belt tension device prevents belt slipping and overloading the rotor's motor.

The process of creating dry, clean and soot-free inert gas begins with

These include long start up time and very high energy usage, because the system needs to regenerate the bed which is not in use. This requires a large volume of gas and also has a long cycle time, which allows the heat of adsorption to dissipate from the desiccant material, wasting energy.

Spikes and deviations in temperature and dew point can occur during the bed changeover process, with additional risks of dust carry over. Twin bed systems have a large footprint, meaning they take up a large amount of space in the engine room.

Their complexity means they have relatively high lifecycle maintenance costs and a relatively short life time of between 6 and 8 years

In considering how to improve inert gas generator performance, increase operational efficiency and lower costs, Survitec looked at other, well proven, alternatives to assess technology that had not been previously considered in maritime applications.

The result is a system – marketed under the well-known Maritime Protection brand - that replaces traditional two bed adsorption dryer with a compact, rotating adsorption system. Dryers of this kind have been used for many years in other parts of industry for drying low pressure gases with great success, but Maritime Protection Inert Gas Systems are the first to have successfully adapted these for inerting purposes.

the combustion of gasoil supplied by the fuel oil pump with air provided by blowers. The gas produced by the inert gas generator is led into the cooler and dryer skid through an inlet box designed to produce a uniform bulk flow through the cooler.

The cooler reduces the humidity to a dew point of +5 °C before the inert gas is led into the rotating dryer. The cooling effect is provided through a glycol/water based system from a separate refrigeration plant. In the dryer, the dew point of the inert gas is lowered to the required specifications below -45 °C with oxygen content less than 1%.

The system comprises a series of compact modules, providing important savings in space and cost for the shipyard. It's a configuration increasingly preferred by shipowners too.

Installation is easier and less costly as the Maritime Protection DIGG system is 50% lighter and smaller in terms of engine room footprint compared with dual bed systems.

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The benefits in context

Maritime Protection inert gas systems are built in compliance with the IMO SOLAS Convention including its latest amendments and meet all Class and IMO guidelines in the demanding conditions of shipboard operation.

Ultimately, the big difference in how Survitec approaches inert gas production is to focus on overall production quality by improving the performance of critical components – in this case the dryer units.

As a result, its inert gas units are not just easier to install and operate, they offer easier maintenance and more efficient operations. Maintenance is effected through hinged burner front door allowing easy access. Filters, dryer rotor and other major components can be easily checked through inspection hatches.

With a short cycle time around eight minutes it takes only 15-20 minutes from start up to delivery of inert gas to the tanks; far more responsive than dual bed systems, which may need four to six hours to start-up, saving operating costs and consuming less fuel oil and energy.

The system is fully automatic meaning it can operate unattended with no manual adjustments required. An intuitive operator panel displays all process parameters and different modes of operation can be selected. The unique design of the combustion chamber means there is no need for a drain to the bilge as any oil spill from the burner nozzle remains in the combustion chamber.

Survitec's Maritime Protection IG systems have now been on the market for close to 10 years, and it has taken the industry a long time to recognise that the new solution could be adopted with minimal risk. The system has been delivered to more than 80 vessels and recent years have seen increased interest and increasing sales, during which time the company has become a fixture on the vendor list of shipyards keen to provide the most innovative solutions to their clients.

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About Survitec

Survitec is a global leader in survival and safety solutions to the marine, defence, aviation and offshore markets. Survitec has over 3,000 employees worldwide covering 8 manufacturing facilities, 15 offshore support centres and over 70 owned service stations. It is further supported by a network of over 500 3rd party service stations and distributors. Throughout its 160-year history, Survitec has remained at the forefront of innovation, design and application engineering and is the trusted name when it comes to critical safety and survival solutions.