



INERT GAS SYSTEMS



The Aalborg Industries Group has over 40 years of experience with all types of inert gas system installations for the tanker industry. Inert gas is also known as inactive gas. Below: Inert gas system from the Netherlands delivered in 1982 for a LNG tanker built at Mitsubishi Heavy Industries, Japan.

Introduction

Aalborg Industries are the world's market leader in supplying maritime inert gas systems (IGS). Through continuous innovation and development, Aalborg Industries have set the industry standard for inert gas generators and systems for the tanker industry for decades and have supplied more than 3,700 inert gas systems.

The inert gas systems product centre of the Aalborg Industries Group is located in Nijmegen, the Netherlands. Due to Aalborg Industries' engineering know-how together with a wide product range and services, we can combine various systems and services into a complete, integrated turnkey package with the best environmental solution.

History

As a consequence of developing some of the first inert gas systems on oil tankers, Aalborg Industries have the practical and technological background to advise customers on the most suitable, efficient inert gas system / inert gas generator configuration for each particular ship type. We have at our disposal a dedicated inert gas sys-

tems engineering & sales team delivering custom-built systems for Floating Production Systems in the offshore market segment as well.




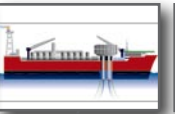
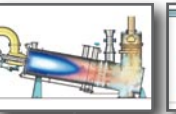
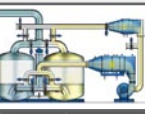
Lifetime commitment

Buying from Aalborg Industries secures our lifetime commitment to the products delivered. After delivery, our customers enjoy the security of our professional Global After Sales service support for spare parts supplies and in case operational problems or refurbishment needs occur.

With Aalborg Industries companies located in 14 countries around the world, we are always close to our customers in order to ensure maximum up-time and After Sales support to their equipment.

Aalborg Industries have a large dedicated service team in The Netherlands, Japan, Korea, Singapore, China and Brazil who commission new installations and provide support to the large installed base of AALBORG INDUSTRIES™ and SMIT GAS™ inert gas systems with service/engineering support and spare parts supply.



					
1967	1970s	1971	1974	1984	1988
Smit Ovens, The Netherlands, delivered its first maritime inert gas system to the fishmeal ship MIV "Willem Barentsz". Willem Smit established the Smit companies in 1913.	Aalborg Industries KK (formerly Gadelius), Japan, became inert gas generator representatives for Smit Ovens in Japan, Taiwan and Korea.	First inert gas system delivered for a LNG tanker.	First inert gas system delivered for the offshore market (FPSO).	The first Combinert (combined inert gas generator and flue gas inert gas system) developed.	Own design of refrigerant cooling and adsorption drying system for LNG/LPG.

Tanker shipping safety with inert gas systems



Why Aalborg Industries' IGS?

By applying trendsetting technologies, Aalborg Industries offers our customers a very high quality inert gas. Also, within the Aalborg Industries Group, the combination of our boilers' low-oxygen flue gas as input for our flue gas type inert gas systems guarantees the best possible solutions for our customers.

A fire needs heat, fuel and oxygen to develop. Eliminating one of the three elements will stop or prevent a fire. Thus, adding inert gas with an oxygen content below 8% to the atmosphere in the ships' (cargo) tanks prevents fires. One of the international laws to secure tanker safety is the 1978 Protocol to the "International Convention for the Safety of Life at Sea" (SOLAS) which stipulates that inert gas systems be installed on all new tankers over 20,000 dwt.

Advantages for shipyards

- Fast and accurate configuration engineering
- Short delivery times of approval drawings
- Reduced commissioning time
- Local commissioning support

Advantages for shipowners

- High quality soot free inert gas
- User-friendly operation
- Easy inspection and maintenance
- Low total life cycle cost
- Worldwide network for service & spares
- 24-hour customer assistance
- In-house training center
- Over 40 years experience in inert gas systems
- Reliability and durability
- Global After Sales support network

Top: SMIT GAS™ inert gas generator installation on the chemical/oil product tanker "British Courtesy".

Left: Inert gas generator for offshore vessel (FPSO).

Below: In 2006, Aalborg Industries introduced its upgraded inert gas system for crude oil tankers along with a solution to improve sulphur and soot wash-out of flue gasses.

1990 First nitrogen generator delivered.

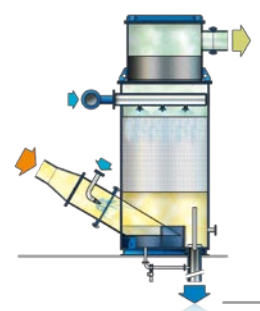
1994 Own design of inert gas compressor launched.

2005 Introduction of own design of water chiller.

2006 Smit Gas Systems BV acquired by Aalborg Industries AIS, Denmark. New company name: Aalborg Industries Inert Gas Systems BV.

2008 Dedicated inert gas systems service team established in South Korea.

2008 Development of environmentally friendly solutions such as a flue gas scrubber.







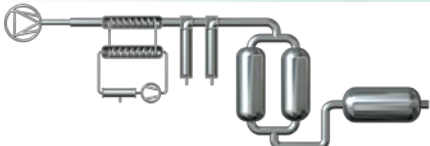

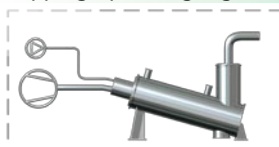

Product range



Aalborg Industries' inert gas system engineers in The Netherlands and Japan manage the process from product design until shop testing and commissioning.

Below: Portinert, a containerized inert gas generator unit designed for temporary inert gas supply.



Type	SMIT GAS™ and AALBORG INDUSTRIES™ inert gas systems	Capacity m³	Design	Pressure bar(g)	Typical oxygen content
	Saturated inert gas generator, low pressure				
FU		■ 1,000 - 20,000	■ Combustion	■ 0.15	■ 2 - 4
	Dry inert gas generator, low pressure				
BUFD		■ 1,500 - 25,000	■ Combustion + drying	■ 0.3 - 0.4	■ 0.5 - 1
	Dry inert gas generator, high pressure, low CO ₂				
BUCD/S		■ 300 - 3,000	■ Combustion + drying	■ 6	■ 0.1 - 0.5
	Dry nitrogen (N ₂) generator (membrane)				
MEM		■ 800 - 5,000	■ Air separation (membrane)	■ 10	■ 0.1 - 5
	Dry nitrogen (N ₂) generator (adsorption)				
PSA		■ 200 - 2,000	■ Air separation (PSA)	■ 8	■ 0.1 - 5
	Sat. inert gas low system, low pressure, flue gas system				
FIN		■ 3,000 - 30,000	■ Flue gas cleaning	■ 0.1	■ N.A.
	Topping-up inert gas generator				
TU		■ 500	■ Combustion	■ 0.15	■ 2 - 4
	Combinert™ - combined inert gas generator & inert gas system (flue gas)				
FGIN		■ 1,000 - 20,000	■ Combustion + flue gas cleaning	■ 0.12	■ 2 - 4



Oxygen content %	Fuel type	Fuel atomizing	Dew point °C	Recommended for installation on (tanker) ship types:						
				Gas			Crude oil	Product	Chemical	FPS
				LNG	LPG	Other				
<ul style="list-style-type: none"> ■ DMB ■ DMC ■ Fuel gas 	<ul style="list-style-type: none"> ■ Air 	<ul style="list-style-type: none"> ■ Saturated 					●	●	●	●
<ul style="list-style-type: none"> ■ DMX ■ DMA ■ DMB 	<ul style="list-style-type: none"> ■ Air/steam 	<ul style="list-style-type: none"> ■ -45/-65 	●	●	●					
<ul style="list-style-type: none"> ■ DMX ■ DMA 	<ul style="list-style-type: none"> ■ Air 	<ul style="list-style-type: none"> ■ -40/-50 		●	●				●	
<ul style="list-style-type: none"> ■ N.A. 	<ul style="list-style-type: none"> ■ N.A. 	<ul style="list-style-type: none"> ■ -65 						●	●	●
<ul style="list-style-type: none"> ■ N.A. 	<ul style="list-style-type: none"> ■ N.A. 	<ul style="list-style-type: none"> ■ -50 						●	●	●
<ul style="list-style-type: none"> ■ Boiler (HFO) 	<ul style="list-style-type: none"> ■ N.A. 	<ul style="list-style-type: none"> ■ Saturated 					●	●		●
<ul style="list-style-type: none"> ■ DMB ■ DMC 	<ul style="list-style-type: none"> ■ Air 	<ul style="list-style-type: none"> ■ Saturated 					●	●		
<ul style="list-style-type: none"> ■ Boiler (HFO) ■ DMB ■ DMC 	<ul style="list-style-type: none"> ■ Air 	<ul style="list-style-type: none"> ■ Saturated 					●	●		●



Above: Scrubber for Aalborg Industries™ flue gas type inert gas system.

← The products and systems shown on pages 4-5 are a selection from our comprehensive inert gas systems product range. Customized solutions are available upon request.

Below: Washing tower of an inert gas generator for an LNG carrier.





Top: Inert gas generator.

Above: In Aalborg Industries' Nijmegen test centre, the inert gas systems are tested before delivery to the customer.

Below: The fire triangle. Taking away one of the three components (e.g. replacing oxygen by inert gas) will stop or prevent the risk of fire or explosion.

Protecting the environment

Trendsetting products & environmental concerns

Besides combustion systems, and the obvious safety aspects of inert gas systems, Aalborg Industries' product development policy is to develop new solutions with a minimum carbon footprint.

Cooling system:

Aalborg Industries recently developed a cooling system for LNG carriers. The system uses a mere 10% of the usual quantity of Freon compared to our previous model and is configurable with all systems using the new and environmental friendly Freon.

Reduction of emissions:

Aalborg Industries strives to reduce emissions when a burner is part of the inert gas system. An obvious solution is to ensure that the minimum amount of fuel is used during operation. Furthermore, we optimize the re-use of energy in fluids and gases in order to increase the overall thermal efficiency of the vessel.

Aalborg Industries constantly develop our product portfolio to comply with both

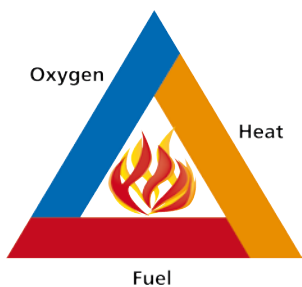
present and future regulations and environmental legislation at large. When designing products, we emphasize reducing emissions and focus on obtaining the ultimate plant safety to achieve the lowest possible environmental impact.

Combustion preventing fire

At the heart of almost every inert gas installation delivered by Aalborg Industries is the unique Ultramizing® combustion system, assuring low oxygen level inert gas without any soot formation even at partial load conditions.

Oil is atomized in an ultra-fine dispersion pattern, using the combustion air for atomization. The system utilizes a highly-efficient, two-stage, oil/air mixing technique which results in an oxygen depleted inert gas without any soot formation. The bluish, transparent oil flame is characteristic for the Ultramizing® combustion system.

Aside from safe combustion, the Ultramizing® burner design meets our strict requirement for low emissions, besides excellent operation during its entire lifecycle.



Global presence



R & D efforts

The backbone of our company is our engineering and product development. We have in-house know-how and resources to meet the day-to-day requirements for quotations and order handling and a steady product portfolio development. For special development projects we have a mutually beneficial cooperation with universities, classification societies and other knowledge centres to supplement our own technological capabilities and cover all analytical aspects.

Quality and production

Inert gas systems are supplied as complete systems with optional auxiliaries like fans, fuel pump, deck water seal and P/V breaker. All components are engineered by Aalborg Industries and manufactured at either an Aalborg Industries production facility or an approved supplier that meets our strict QA/QC standards, thereby safeguarding our high product quality.

Global After Sales

From the time we carry out commissioning of new inert gas systems and train the

future operators in daily maintenance and safety features, Aalborg Industries maintain close contact with shipowners and operators worldwide.

Our Global After Sales organization provides professional support and complete service wherever and whenever you need it. Aalborg Industries supply OEM spare parts and carry out inspections, service, repairs, retrofits and upgrades on our inert gas systems.

Maintenance contracts

Aalborg Industries have service and maintenance contracts with a number of customers. We have fully trained and licensed personnel and advanced testing equipment to go on board to help secure a safe and economical operation.

Training

In Nijmegen, The Netherlands, we offer in-house training for groups of up to 12 people at a time. We can also provide training onboard or at other customer specified locations.

Through continuous innovation and development, our inert gas systems have set the industry standard for many years. System safety is achieved by professional training of operators at the Nijmegen training centre.





MARINE BOILERS & HEAT EXCHANGERS

THERMAL FLUID SYSTEMS

INERT GAS SYSTEMS

FLOATING PRODUCTION SYSTEMS

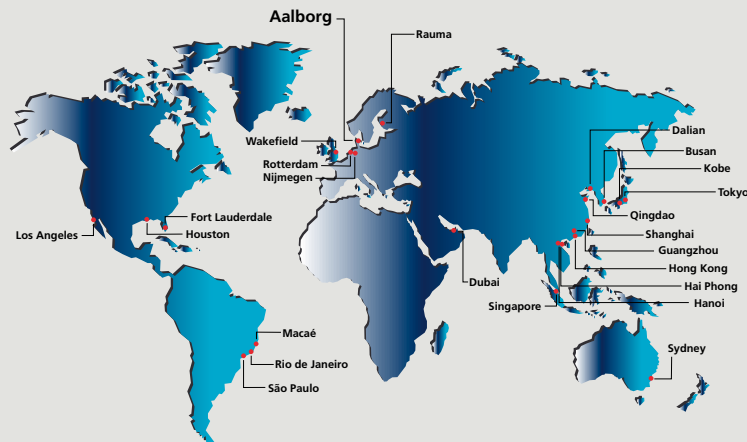
GLOBAL AFTER SALES

INDUSTRIAL BOILERS

Your Preferred Partner

Aalborg Industries' mission is, on the basis of world leading technology within our defined core business, to provide our customers with reliable, innovative and optimal steam, heat and safety solutions that are environmentally friendly and ensure the lowest life cycle cost.

Aalborg Industries' vision is to become the Preferred Partner to all our customers and business relations.



CONTACT US:

Netherlands: +31 24 352 3100 • **Japan:** +81 78 271 5720
Brazil: +55 24 2233 9963 • **China:** +86 21 6146 2077
Denmark: +45 99 30 40 00 • **Korea:** +82 51 703 6162
Singapore: +65 6261 9898 • **UAE:** +971 4 3241 061
USA: +1 954 435 5999 • **Vietnam:** +84 4 936 28 32

inertgas@aalborg-industries.com
www.aalborg-industries.com