


FRONTLINE

&


VENTURIE AS



PRESS FOLDER

WWW.FRONTLINE.BM

WWW.VENTURIE.COM

Complementary information about the project

Frontline has, in co-operation with the Norwegian company Venturie AS, been working intensively in order to find a technological and commercial solution to the emission problem in relation to the transport of crude oil. In the course of the work, the firm has formulated the following requirements:

1. 100% reclaiming of the gases emitted during transport.
2. The technology must be profitable both to social and business economy.
3. The product must satisfy the requirements of the international fleet.
4. The technology must be implemented in the existing systems on the oil cargo ships.

Together the firms have built the world's largest database on gas emission from crude oil cargo ships. The data are collected from more than 70 oil cargo ships transporting internationally. This database will be further analysed and strengthened in the future.

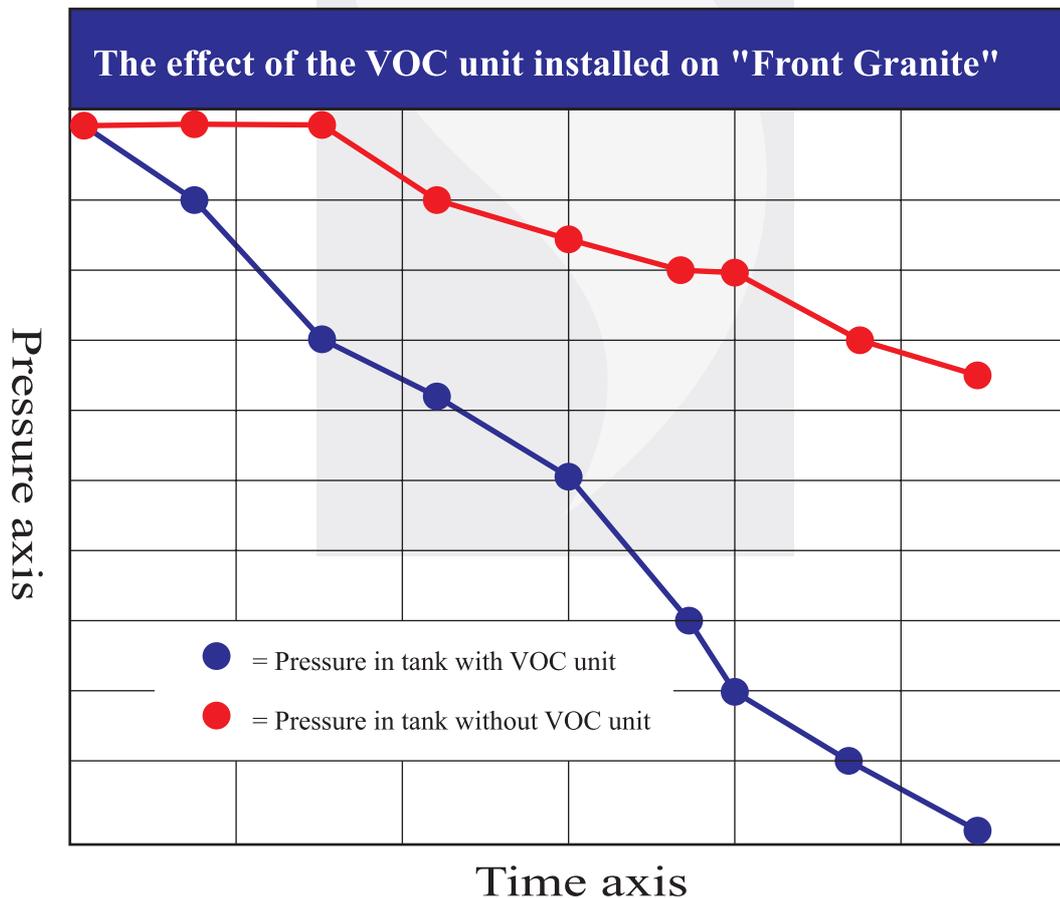
The technology uses the existing piping and makes use of what is already installed on the ship. This lowers the cost to a minimum.

Frontline is operating a fleet where the safety and environment requirements are important. The firm finds it natural to pursue a technology that strengthens that profile. The philosophy of the firm is that in order to ensure the implementation of environmental technology, it should be commercialised. The firm also believes that each branch involved in a problem should take its share to solve the problem.

Test result

Frontline and Venturie AS are now ready to present the result from the pilot unit that beyond doubt indicates that we are close to meet the four main criteria listed above.

The curve below shows the effect of the VOC unit measured against cargo tanks without the system installed. The curves are in accordance with the theoretical calculations. The measurements have been made on the oil cargo ship "Front Granite". The curves prove a pressure reduction in the tank with the pilot system compared to tanks without the pilot system.



The pressure reduction occurring in the cargo tanks equipped with the VOC unit is considerable. This means that the pressure is not increasing, and the emission of VOC is avoided. The reason why the pressure is reduced is that the gas is absorbed in the oil. The planned effect is achieved, and the oil may be transported without emissions. The valuable, lighter components in the oil are present when unloading the cargo, which also means economical benefits.

In addition to the positive results from the testing on "Front Granite", practical solutions has been tried out in order to obtain information to commercialise the product.

Further progress

The firms expect that the commercialising phase will be finished by the end of 2001. The remaining of the year will be used to run more tests. On the basis of these tests the final designing criteria will be clarified and a complete commercialised solution will be ready for the market early in 2002.

Further testing will give us the answer to the problems that need to be worked out on emission during loading of the crude oil cargo ships. Based on preliminary scientific considerations and the present results of the testing of the VOC unit, it is likely that the problems concerning loading may find a solution in using our technology combined with changes made in the routines at the facilities of the operators.

If our technology is being implemented in the crude oil cargo ships, the shipping business has taken its responsibility. After that, it is up to the remaining of the business to do their part.

VOC contra nmVOC

The reason why methane and nmVOC is treated as separate issues cannot be defended when discussing a total strategy on how to solve the emission problem. This has been done in order to look at the problems in relation to the various treaties. Methane is a greenhouse gas that contributes to global heating. This gas is therefore discussed in the Kyoto-protocol. The nmVOC is a term used on volatile organic

components that are contributing to the creation of ground level ozone, and is treated in the ECE-convention in the Gothenburg- protocol. The protocols and conventions are however focusing on the damaging effects of the various emissions.

It is important to keep in mind that the problem cannot be divided in methane and nmVOC when dealing with the areas responsible of emitting gases. Both methane and nmVOC are treated together under the term "volatile organic compounds" (VOC). The emission that takes place during the extraction and the transportation of crude oil is known as VOC. The emitted gases are a mixture of methane and nmVOC that always occurs when handling crude oil or oil products.

The problem must be solved as a whole, regardless to the fact that the problems are described in different protocols.

Regulations through signed protocols

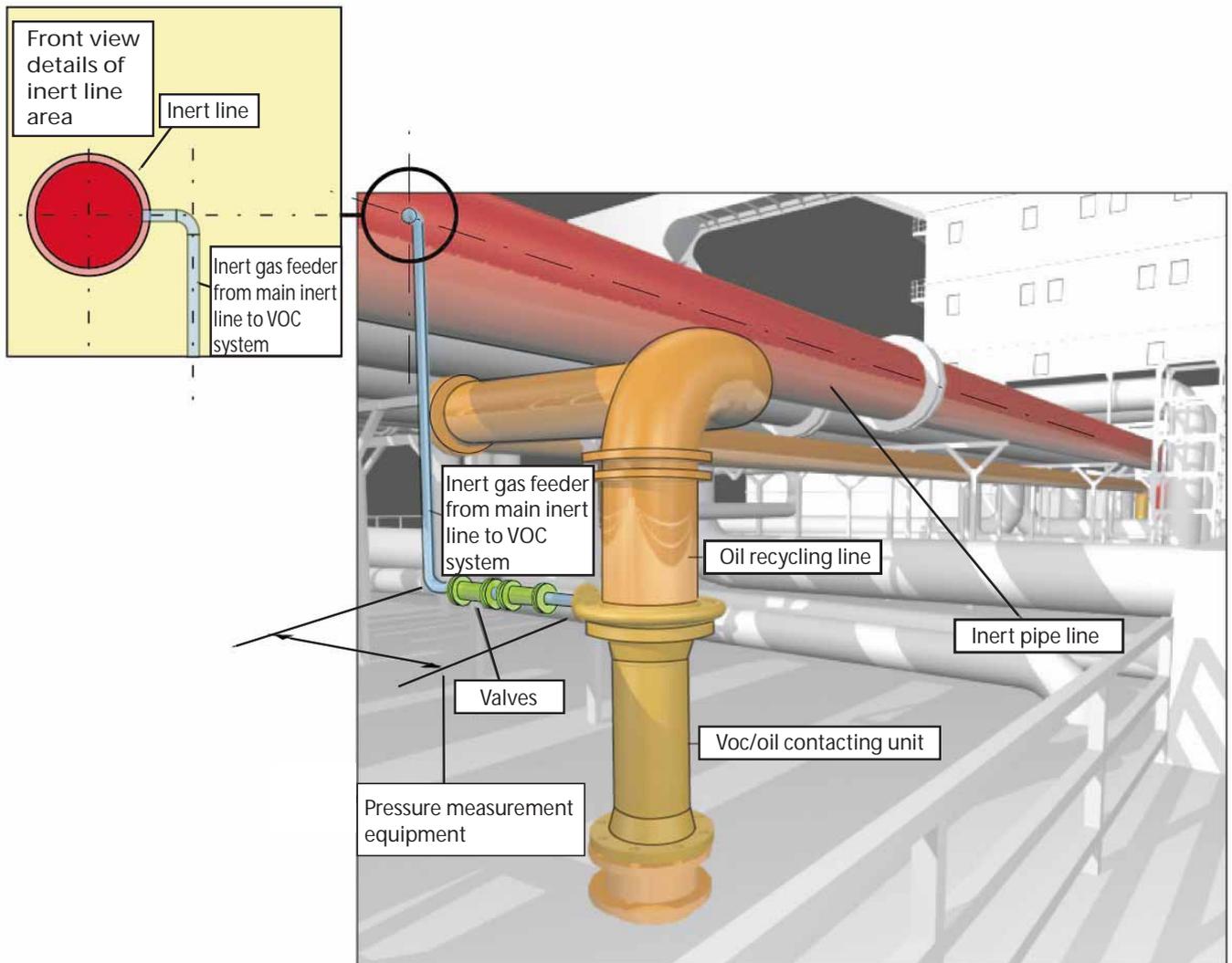
The greenhouse gas convention

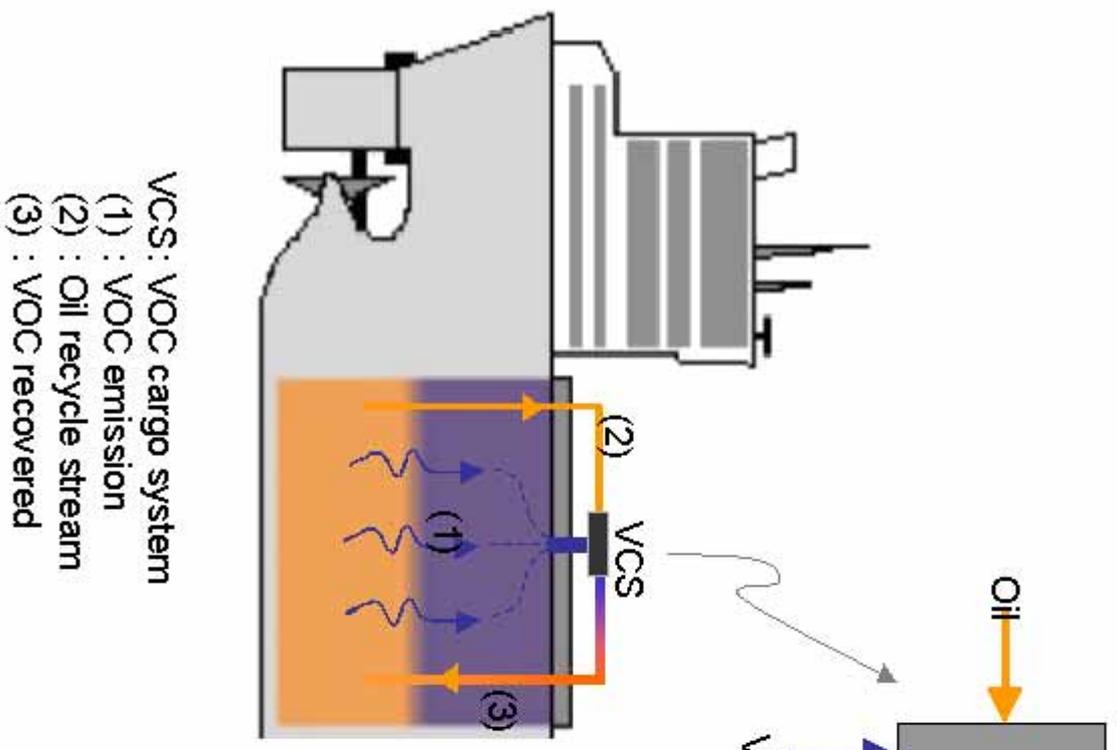
On the international level work has been done to reduce the emission of gases affecting the environment. Through the Climate Convention of 1992 in Rio, the goal is to reduce emission of greenhouse gases, including methane. The latest protocol in this convention is the Kyoto-protocol. The foundation of an agreement on reducing greenhouse gases was negotiated in Bonn in 2001. Norway has together with most industrial countries accepted this agreement. <http://www.unfccc.org>

ECE-convention

The UN ECE-convention treats the pollution of air and environment. This convention also treats pollution occurring across national borders. Since the start in 1979, eight protocols have been worked out. The latest protocol, the Gothenburg-protocol of 1999 on long-range transboundary air pollution, sets out to reduce among others nmVOC with 30% in relation to the level in 1989. The European Union and 22 other countries, including Norway, have signed this protocol. <http://www.unece.org/env/lrta>

VOC cargo system (VCS)





VCS: VOC cargo system

- (1) : VOC emission
- (2) : Oil recycle stream
- (3) : VOC recovered

Function

- Oil/VOC contacting through advanced bubble generator(s)
- 60-70 times more efficient than conventional gas-liquid contactors.
- VOC recovery at low pressures
- 40-50kW power consumption



Supplementary information

Ministry of Petroleum and Energy

Here you will find an overview on the fields operated on the Norwegian shelf with deeper information on production, costs, structure of ownership and more. It also contains information on the fields presently under construction and expected building of installations in the near future, including the piping.

<http://odin.dep.no/oed/engelsk/026031-150004/index-dok000-b-n-a.html>

In relation to emission to the atmosphere in the oil industry, chapter 10 in the electronic document is recommended.

<http://odin.dep.no/oed/engelsk/p10002017/p10002019/026031-990010/index-dok000-b-n-a.html>

Norwegian Pollution Control Authority (Statens Forurensningstilsyn)

The SFT has a large database on the emission of climate gases and on the rules and regulations. It also has several publications on the various areas.

<http://www.sft.no/english/>

<http://www.sft.no/english/publications/get.cfm?1=1&kat=106&sprak=en>

Ministry of the Environment (Miljøverndepartementet)

Ministry of the Environment is supplementing the Norwegian Pollution Control Authority with information on emission and on rules and regulations. Political debates and other political information are made available through the Ministry of the Environment.

<http://odin.dep.no/md/engelsk/index-b-n-a.html>

<http://www.environment.no/>

Statistics Norway (Statistisk sentralbyrå)

Information on statistic material, databases on emission and spill, commitments and calculations. Scientific reports and publications given by Statistics Norway or in co-operation with Statistics Norway may be found here, both on environmental issues and regarding the oil industry.

<http://www.ssb.no/english/>

<http://www.ssb.no/english/subjects/01/>

http://www.ssb.no/english/subjects/01/sa_nrm/