

WASTEWATER TREATMENT SYSTEM ON BOARD OF THE BELGIAN LOGISTIC SUPPORT SHIP A960 GODETIA.

April 2002, on board of the logistic support ship A690 GODETIA, a wastewater treatment installation has been taken in operational use. This proof of biotechnology illustrates how operational usability and respect for the maritime environment can complete each other perfectly.

May 26th 2002, BNS Godetia sails into national waters, towards her home port. Her mission within the framework of MCMFORNORTH has finished. The 90 crewmembers have worked and lived the past 48 days on board of this ship. Together, they have produced about 700,000 litres of waste water in this period, which comes from washing machines, showers (grey water), and toilets (black water) on board.

For a considerable period of time, the international community and public opinion have been sensitive about the possible threat the shipping industry forms for the maritime environment. International consultation, coordinated by the International Maritime Organisation (IMO), sanctioned an international accepted law, better known as the MARPOL Convention. A first version was already accepted in 1973, which was revised in 1977 and still forms the basis for the future.

So, the MARPOL Convention came about in cold war period. Logically, NAVO-members and others took a stand for an exception on the "strict" MARPOL Convention to protect the operational usability of their marine units. The exception was accepted and is written in article 3 of the MARPOL Convention. However, the international context has been revised severely in the mean time and nowadays we seldom speak of war threat in front of our national coasts.

Still, the public opinion in most Western countries is that their national Navy serves as an example concerning sustainability of the environment. The environmental legislation has become more and



more strict. Some zones, like the North Sea and the Mediterranean Sea, have become "special zones" with even higher demands on environmental protection. In short, the time that navies could invoke article 3 to back out of national and international environmental legislation are history!

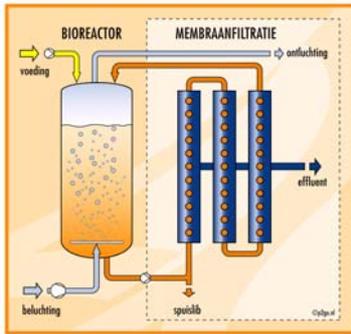
De NATO partners were not indifferent to this trend and set up "Special Working Group 12" (SWG/12), which in the meantime has grown into an international group of experts in mostly technical matters.

In addition, end of the 90' the notion that something had to happen grew with the staff of the Belgian Navy. Unloading of domestic detritus and sanitary effluent in foreign ports did not only bring high costs, the access of these ports threatened to become limited to "environmental friendly" ships. The Navy is aware of her example function. Her vision is

focused on maximum respect for the regional, national and international environmental legislation applicable to the shipping industry. For several years, investments have been made in the modernisation of the fleet through several programmes, so ships can be developed in an environmental friendly way in the future.

For this reason the Navy decided to buy a water treatment system for the processing of sanitary effluent on board of the "BNS Godetia". Technical specifications aim on a system based on advanced biotechnology. The core of the system would exist out of a "bioreactor" on the one side and an "ultra-filtration unit" on the other side. Also, the quality requirements for the treated water were described closely. In any case, the water had to satisfy the MARPOL legislation so that discharge would be possible, taking in account a worldwide operational usability of the unit. In

contract was closed with the Dutch firm Triqua, for purchase and installation of such a system.



Figuur 1 Principle outline membrane bioreactor.

Membrane bioreactor

The combination of a bioreactor with membrane technology is an innovative technology that is being used more and more. The membrane bioreactor technology offers certain advantages regarding space saving and the biological process is particularly efficient. In contrast to more conventional systems, chemicals are not being used. Figure 1 shows a schematic overview of the membrane bioreactor. Two important elements can be distinguished: the bioreactor and external membranes.

Effluent coming directly of the user is being collected in a tank. From this collection tank the effluent is going through a first filter, after which the filtered water is being pumped to the bioreactor. In this bioreactor the effluent is being mixed intensively with bacteria (biomass). The biological process is based on the dissimilation properties of these bacteria. The oxygen that bacteria need to begin dissimilation of organic substances, is being added to the bioreactor through a ventilation system.

The mixture of treated water and bacteria is constantly sent through the membranes. Because the pores are ideally adjusted to the size of bacteria they can be perfectly separated from purified water.

In the original set up the effluent was sent over board and bacteria flowed back to the bioreactor.



Figuur 2 – Membrane filtration

Seawater as kill-joy

Since several years, ultra-membrane filtration and bioreactor technology have been put to the test by the firm Triqua. Even so, the installation on board of a marine unit was a new challenge. Installation of the system on board went quickly, amongst others because of devotion of the workshops in Zeebrugge and the technical crew on board. Without a doubt there was a good understanding which made it possible to seek solutions for occurring problems. End of 2001, the project team ran up against the insuperable problem of seawater in the system. On board, toilets were still flushed with seawater, while the membranes were not suitable for this. Engineers of the Navy worked in close cooperation with the firm Triqua to set the project straight and find a solution for the problem. In one way or another seawater had to be kept out of the system. Meanwhile, laboratory tests had shown that the quality of the effluent was excellent.



Eventually, the idea came to re-use the effluent for flushing toilets to avoid seawater in the system. Beginning of 2002 rebuilding of the installation was started on board. Tests in April showed how good the choice of recirculation of the effluent had been. Results of the purified water were good and the process was stable.

The future.....

Although the installation has been taken in operational use, this does not settle the matter. Together, material controllers, board technicians and the After-sale & Services department of Triqua are thinking on furthermore improving the reliability of the installation. The coarse filter takes a lot of space and is once in a while responsible for unpleasant odour; but also on other points improvements are possible. However, the practice has shown that the biological process is efficient and reliable. Tests by an independent laboratory has lead to an official certificate, so everybody can agree that the quality of the effluent satisfies the MARPOL convention. At this moment, GODETIA is the most environmental friendly ship of our fleet.