

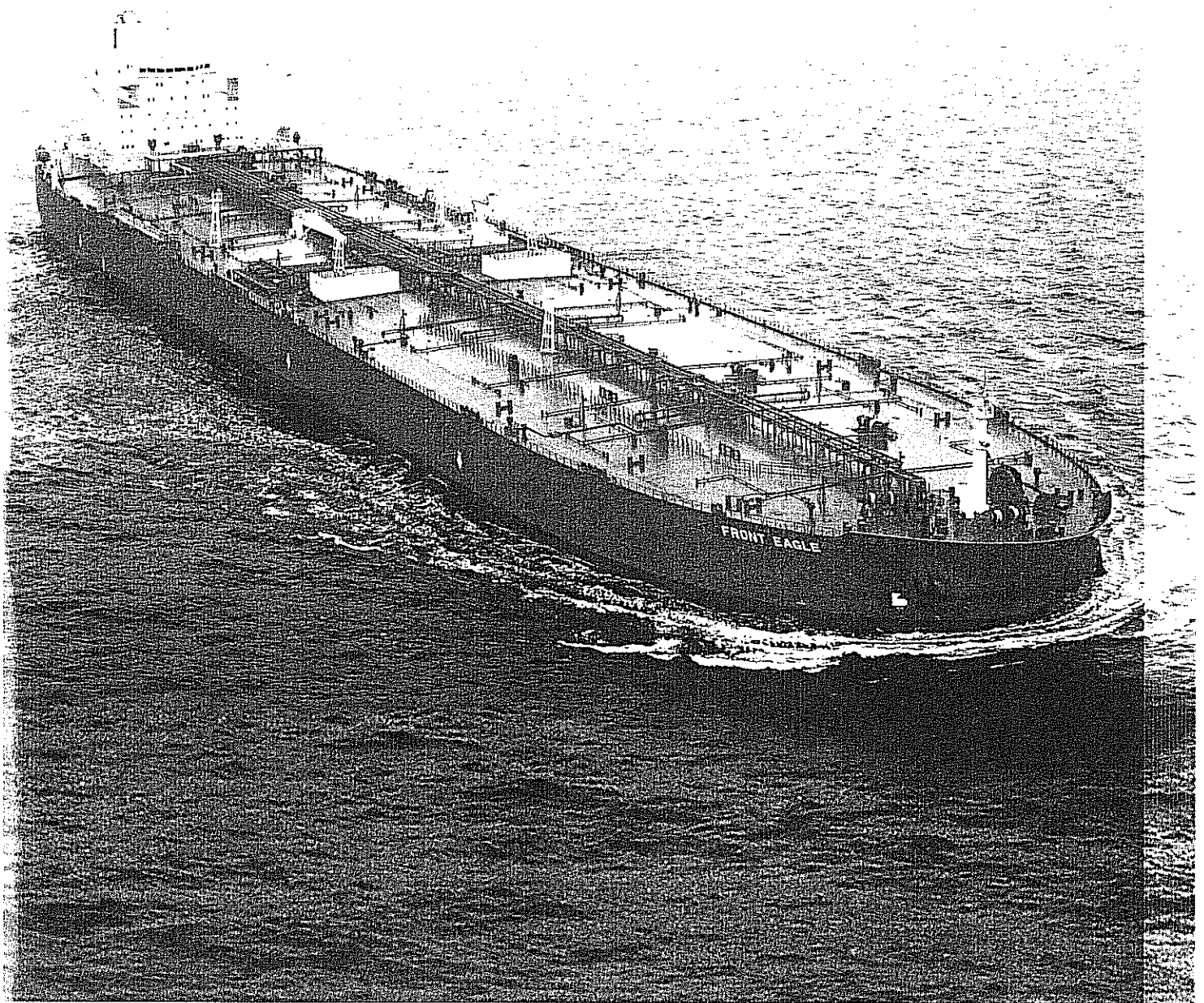
Oily Water Separators: 30 Years Experience and No Consensus

Rik van Hemmen

**Summer 2005
Cleaner Seas**

CLEANER SEAS

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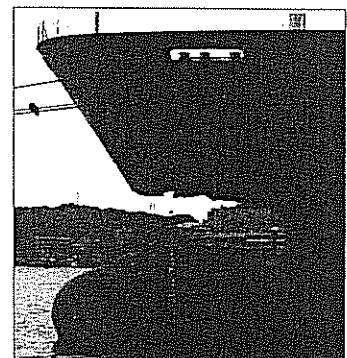
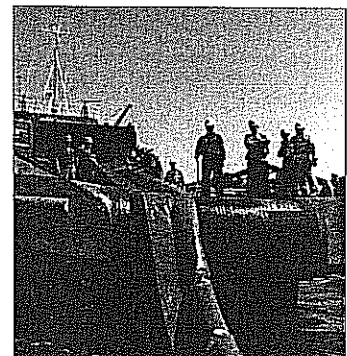
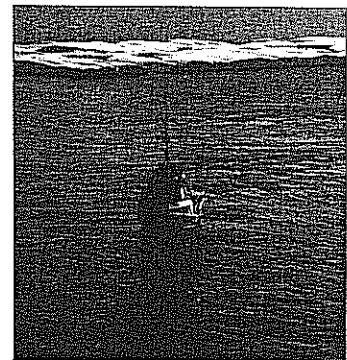
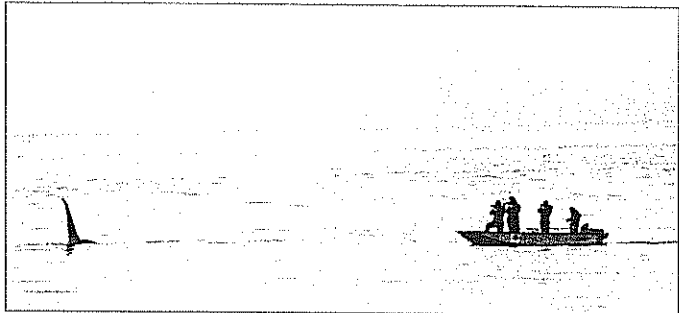
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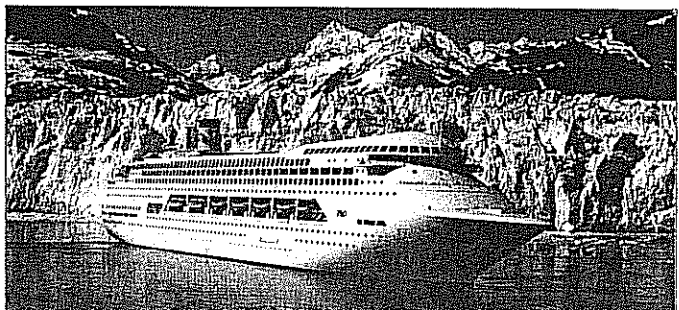


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OILY WATER SEPARATORS:

30 YEARS EXPERIENCE AND NO CONSENSUS

THE SOCIETY OF NAVAL ARCHITECTS AND MARINE ENGINEERS STARTS A NEW APPROACH.

Oily Water Separators (OWS) have been used aboard ships for over 30 years and today are a regulatory reality. The international requirements for Oily Water Separators are promulgated under the various MARPOL conventions and aim to prevent discharge of oil to the sea and requires ship's crews to keep track of oil movements within the ship and to shore through the Oil Record Book (ORB).

At present just about every ocean going vessel is required to ensure that it does not discharge bilge water containing oil at more than 15 parts per million clean water. This requirement has been adapted into most flag state regulations and as such the presence of Oily Water Separation systems aboard large commercial vessels is the norm.

From a regulatory point of view, OWS systems are the vanguard of a host of novel systems that have been and will be installed on ships in the near future. Some of those systems are garbage processing systems, tank cleaning systems, ballast water treatment and exchange systems, exhaust emission control systems, incinerators, closed loading systems and sewage systems. The main novelty of these systems is that, rather than make the ship more efficient, these systems, from a shipowner and crew point of view, actually make the ship less efficient.

The benefit of these systems is for the public, and, consequently, shipowners and crews have been directed to install and operate these systems for the benefit of the public. This is not an entirely unfair burden, and if all shipowners and crews participate to the fullest possible extent, there is no competitive disadvantage since any additional costs will be passed on to the shippers and, on the next level, to the public.

At the same time, the shipowners have not paid any particular attention to the design of these systems and for the

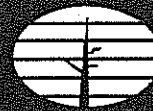
most part have simply taken an attitude that can be best described as: "Tell us what you want and we'll put it on board and we'll have the crew operate it". In many cases the systems were retrofitted and since an efficient system does not give an owner a real competitive advantage, very little thought has gone into the design of these systems.

Ship's crews have had even less participation in the process and they have had to accept whatever equipment is put aboard and simply operate it to a level that is acceptable to the shipowner. If a crewmember discovered that a system did not work, they could tell the owner that the system did not work, and the owner would give them half a promise to do something about it at the next drydocking, or the owner could make a mental note to make sure he'll get rid of a "difficult" engineer. Often engineers, being engineers, would make changes to the system that would be poorly documented aboard the vessel and that, in turn, would result in further changes and fixes by subsequent engine room crews.

For many years it was assumed that this approach would prevent and reduce oil discharge to the sea, but as far as this author knows, no systematic analysis of this assumption has ever been performed.

Martin, Ottaway, van Hemmen & Dolan often is requested to have one of its consultants attend aboard a vessel that is under investigation by regulatory authorities. During those investigations it has been found that it is nearly impossible to determine whether an OWS system is being properly operated and maintained.

Any surveyor asked to survey one of these systems could only conclude that it looked like an OWS system and that all the pieces were there and that therefore it probably was an OWS system, but that no further conclusions could be drawn.



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This was a problem for all surveyors and inspectors and quite quickly government inspectors started to wonder if any separating actually took place aboard ships. Especially in the last few years, the United States Coast Guard and other port state control agencies have been paying closer attention to the use and misuse of this equipment. Based on their review of this issue they cannot be blamed for assuming that most OWS systems do not work and that owners and crew are pumping massive amounts of dirty bilges overboard.

It would be nice to say that the various port state control entities have concluded that only "substandard" owners and crews are pumping oily bilges overboard, but a simple review of the operators who have admitted to wrong doing with regard to OWS operation clearly shows that the issue is not limited to only substandard operators. Does this mean that criminal behavior with regard to OWS operations is standard in the shipping industry? That question is more difficult to answer and most certainly the newspapers do not tell the whole story.

Quite possibly the truth lies somewhere between extremes. Some owners could not care less how much oil goes over the side, and still they have crews aboard their ships who make every effort short of properly operating the OWS in preventing bilge oil from being discharged into the environment. At the same time there could be very conscientious owners who have provided the most expensive equipment to their crews and crews who simply could not care less whether they are pumping oil over the side or not.

As a middle ground it could be suggested that only a very small proportion of people are wanton polluters and most are doing the best they can with equipment (and systems) that, in the end, does not do the job.

There is no real proof of any of the above scenarios, but based on Martin, Ottaway, van Hemmen & Dolan's experience, the last option might best describe the norm in the industry.

In order to further study this matter, the United States Coast Guard established the Oily Water Separation Task Force and asked for public comment on OWS issues. The public comments that were obtained are listed on the Docket Management system (<http://dms.dot.gov>, search for Docket Number 10485). The United States Coast Guard never prepared a formal public summarization of the public comments, but the responses show the wide variety of concerns that are associated with OWS systems.

The following are some summaries of comments (On the docket they actually are in question and answer format):

Port Engineer:

*Decanting tanks are used prior to using the separator
The OWS becomes fouled with oil and will not operate
When properly calibrated the OCM will work under ideal circumstances. In typical service OCM will detect opacity other than oil and prohibit discharge.*

Overboard piping is modified to permit easy disassembly for cleaning since the USCG want to see the cleanliness of this pipe. In actual fact in normal operation this pipe will not be clean.

Often while in the tropics the M.E. air separators will produce more water than the OWS can process.

Do not run low PH water (stack soot in bilge water) through the OWS.

Chief Engineer (Passenger vessels, Cargo Ships, Tank Ships):

The problems that occur with handling bilge water are inadequate size holding tanks, incompetently designed and incompetently approved OWS.

We will use the OWS if we can make the piece of junk work. Whoever granted approval to these things should be in jail. They do not properly separate oil from real bilge water containing dirt, soap, chemicals, air bubbles etc.

The equipment, piping, tanks, etc. have been modified to attempt to send an influent to the OWS that it could handle. For the regulatory bodies to do their job, provide the seamen with a tool that is capable of doing its job in the real world

Chief Engineer (Great Lakes Vessel):

The Fram oily water system has always been trouble free.

*We stop the oil before it gets to the bilges
We avoid pumping heavily contaminated oil through the system. We manually pump the bilges to the dirty oil tank and use bilge pillow to soak up the free floating oil.*

Chief Engineer (submitted through company's port captain):

No real problems reported.

Engine room waste to be minimized by the use of good engineering practice to maximize safety, efficiency, etc.

Captain (submitted through company's port captain):

OWS is always used.

OWS rarely works to maker's specification. After 20 years I have never ever experienced one oil content meter that could be confidently relied on to be accurate.

Significant problems exist with the standard of English language used by IMO in setting out MARPOL Regs.

OWS are installed only because of regulatory requirements. Essentially though, no care is given to design or installation of such equipment in a manner that will provide truly effective operation.

Take a close and skeptical look at manufacturers designs, at type approval bodies and testing methods.

Vessel owner or operator:

What problems occur in handling of bilge water? Not much

The questionnaire can be summarized as: no further problems noted and ships have everything they need.

Senior vessel superintendent:

*We try to always place equipment in an open area so the operation of the unit and maintenance will not be restricted
People from the various companies need to talk with each other. We also need to share more information among our vessels and the shoreside folks.*

OWS manufacturer/consultant:

Present technology is problematic. The key is for Chief Engineers, boat owners, operators and regulators to become fully educated on the other possibilities and all work to achieve the greater good: adequately treated bilge water to prevent contamination to the marine environment.

Master/Chief engineer:

Every company has an environmental policy. What the employees understand is job retention. You do what needs to get done to make the ship run and help the company to remain profitable.

As can be seen there is no consensus, there never has been any further review of the responses, and regulatory enforcement has not been able to obtain any guidance from the comments provided by the public.

This article does not deal with the methods used by the US government to prosecute OWS operational offenders. However, while this author and Martin Ottaway van Hemmen & Dolan, Inc. fully and wholeheartedly support the USCG's efforts at reducing marine pollution, the data, science, engineering and logic used to prove foul play is at this stage not on solid ground. Unfortunately, this has resulted in enforcement methods that can only be described as a witch hunt in the most literal sense of the word.

At the same time, the marine community should welcome the USCG's involvement and experience in the OWS system debate as a partner in arriving at technically efficient and effective solutions.

Most of all, the international marine community should start a debate and perform an investigation into what technology and knowledge is available to provide ship's crews with OWS systems that are reliable, easy to operate and cost effective.

For too long a period of time, research and development has focused on actual OWS technology, but such technology is only a small component of a complete OWS system. Instead any investigation should just as much focus on waste oil disposal, piping, tank arrangements, training, human factors, recording methods and reward systems. As such, a systematic approach should be followed.

THE OWS SYSTEM

An Oily Water Separation system, as compared to OWS equipment, is a wide-ranging system that is not just confined to the vessel, but extends to regulatory organizations and port engineering staff and shore based support contractors. The objective of an OWS system is to separate the oil from bilge water, to pump the clean bilge water overboard and to allow for storage and disposal of the waste oil.

An OWS system includes the following components:

- Bilge water sources
- Bilge water contaminant sources
- Bilge water treatment, including the OWS
- Waste oil storage
- Waste oil disposal
- Oil Record Book (ORB)
- OWS system Operators (Human Factors)
- Regulatory enforcement agencies
- Waste oil receivers
- Economic factors

To a large extent the system is linear in sequence and the process roughly follows the order described above, but while linear, in practice, the system is wildly variable (chaotic), intermittent, and unstable.

When studied at even a superficial level, it has become apparent that this system is much more complex than any other systems that are operated by shipboard crews and the simple system diagrams provided in OWS equipment manuals fail to take these real life complexities into account. This complexity does not only exist on a technical level, but also on a human factors and a psychological level.

There are no textbooks, publications, guidelines, technical papers, or training courses that properly and thoroughly described these system components. Instead these components are tossed together aboard each ship design and the crew is left to sort out how to operate this system, and regulatory agencies are faced with having to interpret the operation of each of these unique systems on a completely individual basis. It therefore has become apparent that an entirely new approach is required. In order to assist the maritime community in resolving this problem, the Society of Naval Architects and Marine Engineers has started an Ad Hoc technical panel that has been tasked with sorting through all the options and to arrive at recommendations for systems that will make Oily Water Separation more user friendly, reliable, efficient and more transparent to all parties.

This panel is presently being formed and research tasks are being assigned to parties that have volunteered to assist in this effort.

SNAME AD HOC PANEL 14 OILY WATER SEPARATORS

Ad Hoc Panel 14 mission:

The Ad Hoc panel will be involved in the following sequence of tasks:

- To identify areas of study that will increase the overall efficiency of OWS systems
- To perform research in the selected areas of study
- To publish technical and procedural findings on OWS systems that will be of benefit to the maritime community at large

The ultimate goal of the panel is to provide guidance in a neutral setting on OWS design and operation that will provide vessel crews with OWS systems and equipment that will reward crews and operators who are committed to following the existing and emerging environmental laws and clearly identify crews and operators who are not committed to following existing and emerging environmental laws.

The tasks envisioned under this panel will be complex and far reaching and it this stage SNAME is combining and soliciting funding and resources to achieve the panel's mission.

Ad Hoc Panel Structure:

The panel itself will consist of the main panel that

sets the goals and main areas of research and sub-panels that perform specific tasks. At this stage the main panel will consist of the following:

- Panel chairman (appointed internally by the panel members)
- Director of the clearinghouse (central data location)
- Representatives of funding organizations (not to constitute a majority on the panel)
- Chairmen of the following SNAME (or other technical society) technical committees:
- Human Factors
- Ship design
- Ship machinery
- Repair and Conversion
- Ship operations
- Forensics
- Specific experts as approved by the technical committee chairmen

The main panel will form and appoint subpanels that will perform specific research tasks.

Suggested research tasks:

The main panel will be tasked with prioritizing areas of research and to determine funding needs for accomplishment of the various tasks. On a preliminary basis the following tasks are envisioned:

1. OWS system analysis

Collection of representative existing bilge handling piping/tankage and equipment system arrangements and diagrams, and evaluation of efficiency of the various arrangements based on crew interviews, crew questionnaires, oil record book analysis and equipment efficiency analysis

2. Human Factors Analysis

Onboard evaluation of crew interaction with OWS systems.

3. Development of crew training methodologies

Study of present OWS crew training methodologies and development of a standard curriculum.

4. Standardization

Study to determine whether there is a benefit in standardizing the OWS system arrangement for all commercial vessels, by designating a specific piping arrangement with specific terminology for all newly built commercial vessels that does not allow modification unless specifically approved

5. Cost impact for standardization of existing vessels

6. New technology evaluation

7. Drastically alternative systematic approaches

8. Present technology evaluation

9. Testing, inspection and forensic analysis of OWS systems aboard ships

SNAME is welcoming all and any assistance from regulatory agencies, international technical societies, equipment manufacturers, ship owners, educational institutions and seamen's benevolent organizations and interested parties are urged to contact this author at rhemmen@martinottaway.org or Dr. Alan Rowen, SNAME technical director, at arowen@sname.org with support, contributions or suggestions.