FILTERSAFE PROVIDES HIGH PERFORMING FILTRATION FOR CONOCOPHILLIPS

AS PART OF THE DE NORA BALPURE® BWMS

Filtersafe Case Study

BACKGROUND

ConocoPhillips, Alaska's largest crude oil producer and the largest owner of exploration leases, operates the Polar Tankers Fleet which is comprised of a series of vessels traveling between Alaska and San Francisco.

This west coast route has particularly challenging conditions due to widely ranging water quality, including high sediment waters in San Francisco Bay.

ConocoPhillips recognized the need for high performing ballast water management system (BWMS) filters to ensure regulatory compliance and operational efficiency. In 2015, the company invested in independent testing to assess and choose the right BWMS filter for the fleet's operational route. The testing was used to inform the selection of a BWMS filter for the owner's entire fleet.

INDUSTRY

Marine

APPLICATION

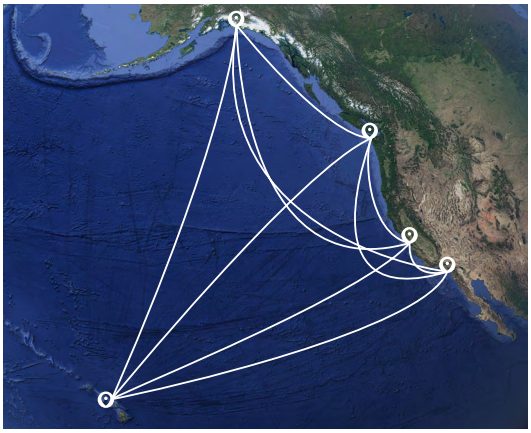
High performing BWMS

FILTERSAFE

- 30 years filtration experience
- 3,000+ installations
- 10µm upwads & 50-6,840 m^3/hr.
- Modular filter technology

After testing, ConocoPhillips selected the De Nora BALPURE® BWMS and Filtersafe's filter model BS-300-T. The filter is designed to perform under high sediment loads in poor water quality areas and has a flow rate of 750 m^3/hr. Due to the enormous size of the ships in the fleet, it was decided that in addition to the 2 BS-300-T filters, that 2 additional BS-1204H filters should be added.

Filtration Degree	40 µm
Number of Installations	5
Total Installed Treatment Capacity	37,500 m^3/hr (7,500 m^3/hr per ship)
Total Models Installed	10 of BS300 + 10 of BS1204 (2 of each per ship)
Screens	904L stainless steel
Client	De Nora
End User	Polar Tankers, ConocoPhillips



ConocoPhillips Polar Tankers operational route

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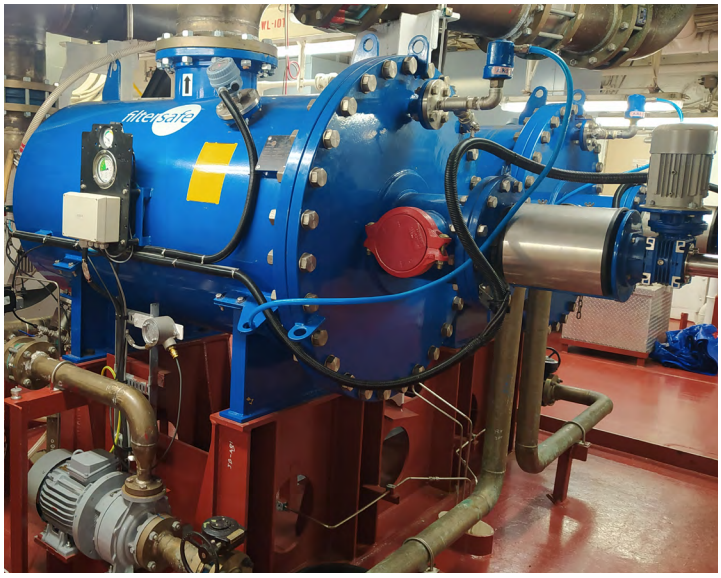
UNIQUE CHALLENGES



Most BWMS testing is theoretical and doesn't reflect the significantly more challenging conditions faced at sea, where sediment-rich waters can cause BWMS to significantly slow down and even clog. If a filter does clog, then the BWMS could be forced to shut down, hamstringing the ballasting process and costing shipowners money.

In most filter systems, the outlet pressure creates the force necessary to clean the filter. If you maintain an outlet pressure, the cleaning force is maintained. The problem with this is that in a real-life scenario, the more a filter clogs, the lower the outlet pressure. Filtersafe offers its own testing procedures where the team simulate real life scenarios which include not regulating the outlet pressure to see the impact on performance. Using this enhanced test allows us to demonstrate the value of our cleaning mechanism to achieve higher efficiencies in non-standard installations.

FILTERSAFE SOLUTION

Most filters build a "cake" i.e. an uncleanable part of the filter created over time as a result of a decrease in water pressure in the filter system. For the filter to return to optimum performance levels, the filter must be manually cleaned. In contrast to most filters, Filtersafe's solutions are the only technology available to the global shipping industry today which is self-restoring.

This means the filters have no uncleanable areas and are able to remove even the toughest build-up, with the filter returning to its original clean state after every heavy use in less than three minutes. For example, in the Shanghai Test our filter fully recovered from an unimaginable TSS load of 2,450 ppm in 182 seconds.

Filtersafe has an exclusive, upgradeable cleaning mechanism that can be modified even after installation to improve cleaning efficiency. This means the filter can be configured according to the vessel's trading waters and then changed as those trade routes are altered over the life of the ship.

This is significant as it removes the limitations that ballast water management systems (BWMS) have traditionally placed on ships, allowing vessels to move between low and high sediment routes, such as the tankers navigating around high sediment areas of San Francisco, without being prohibited by filter performance.

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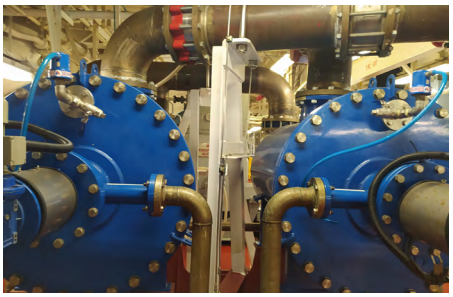
RESULTS

The filter operated under various conditions for several months, estimating hundreds of hours of operation. The results of the tests demonstrated flow rates varying between 400-750 m^3/hr. These rates were recorded during testing and varied according to inlet pressure levels and sediment loads, which reached as high as 400 Nephelometric Turbidity Units (NTU) (TSS 350- 400mg/l). The filter performed very well during high sediment loads, especially at known locations such as the Shell Terminal in San Francisco Bay and the ports of Anacortes and Valerio in Washington, recovering quickly from the high dirt load conditions. In addition, the filter operated without the need for manual interference throughout the duration of the test.

Ship Name	Ship Built	Filters	Flow Rate	BWMS Status
Polar Adventure	2004	BS300-T x2 BS1204-H x2 For Each Ship	750 m^3/hr x2 3000 m^3/hr x2 **Max Flow Rate per Ship: 7,500 m^3/hr**	Installed 2019
Polar Discovery	2003			Installed 2021
Polar Enterprise	2006			Installed 2021
Polar Endeavor	2001			Planned Installation 2022
Polar Resolution	2002			



Following the successful installation and the test results on board the pilot Polar vessel transporting fuels regularly between Alaska and other major energy producing ports along the North American West Coast, ConocoPhillips decided to install Filtersafe filters on the entire Polar fleet.

Following the initial test, five crude oil tankers now installed with Filtersafe's filters - Polar Endeavour, Polar Enterprise, Polar Resolution, Polar Adventure and Polar Discovery – have each been equipped with two BS300 filters (standard flow rate 750 m^3/hr) and two 1204 filters (standard flow rate 3000 m^3/hr each = installed total 7,500 m^3/hr). Each vessel was assessed according to its ballasting needs to ensure the right filters and flow rates were chosen. Filtersafe also worked with a leading class society, the American Bureau of Shipping (ABS), to complete a successful remote pressure test survey to certify the filters ahead of installation to ensure the highest standards for ConocoPhillips.

For more information about Filtersafe's filters, please click here.

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