

Cleaning becomes part of the family

Once a separate, labour-intensive function, carried out prior to loading a new cargo, tank cleaning has increasingly become an integral part of high-performance, automated cargo-handling operations

Cargo tank cleaning is a wide-ranging discipline, reflecting the many different types of tanker and the variety of bulk liquid cargoes carried by sea. Tank cleaning machines range from the high-capacity, programmable, single-nozzle units used to carry out crude oil washing (COW) operations on ULCCs and VLCCs, down to the twin-nozzle units fitted in the numerous small-volume tanks that make up the cargo tank complement of a sophisticated chemical parcel tanker.

The choice of tank cleaning equipment depends upon the customer's individual requirements. Critical factors influencing the choice include cleaning time, environmental legislation, cargo type and cleaning frequency. Essential for optimising the transport capabilities of a tanker, tank cleaning prevents cross-contamination of cargoes and reduces the levels of residues remaining on board.

Crude oil washers

Crude oil carriers can use either programmable single-nozzle or twin-nozzle tank cleaning machines, the former type being the most popular. Both types of machines are fixed. There are usually three or four crude oil washing (COW) machines per cargo tank in large crude oil tankers. Normally, these would be mounted at the top of the tank but, occasionally, especially if there is some horizontal structural members near the bottom of the tank creating access difficulties, it will be necessary to bottom-mount one of the machines.

By programming the cycle of a single-nozzle COW machine, it is possible to deliver a powerful jet of crude oil on all tank surfaces by means of a slow spiral motion. The horizontal and vertical movements programmed to provide a helical pattern can be adjusted according to the cleaning requirements, from intense washing to rapid rinse. By inputting ship information such as the general arrangement, midship section, bulkhead arrangements, longitudinal sections, horizontal stringers, steel structure in non-typical tanks and pumping and piping arrangements, a tank cleaning design study, including shadow diagrams, can be prepared prior to installation in order to optimise the process. Single-nozzle machines are usually turbine-driven and the location of the drive units on deck ensures that the system below deck is virtually maintenance-free.

Getting COW right

The crude oil washing plan is an integral part of a tanker's cargo discharge plan and is monitored throughout the unloading operation by means of stress, trim and draft calculations, usually carried out every hour. The COW plan needs to be approved by staff at the discharge terminal staff, and surveyors and inspectors may also ask to examine it.

Although COW machines are relatively maintenance-free, their performance must be continually monitored, not least through regular tank inspections, against the manufacturer's standards so that problems can be spotted as they arise. Checking of educators, by measuring the time taken to strip a given quantity of liquid from a cargo tank, is part of the process.

Because of the growing awareness of the importance of COW to integrated cargo-handling operations and improved ship economics, tanker owners and equipment suppliers are increasing pressure on shipbuilders to show more flexibility in specifying cleaning equipment configurations on the standard, 'off-the-shelf' ship designs they market.

Product and chemical tankers

Due to the hazardous and toxic vapours generated by most chemical and product cargoes, cleaning operations are carried out under closed conditions. Tank cleaning on these ships is facilitated by the smooth, flush cargo tank surfaces which are either coated or, in the case of many chemical tankers, constructed of stainless steel. The volatility of many of the cargoes, the cargo stripping capabilities of ship pumps and the layout of tank bottom suction arrangements are additional factors which contribute to the minimisation of cargo residues.

In the past chemical tankers and, to a certain extent, product tankers relied on sea water or fresh water cleaning using portable tank cleaning machines fixed to the end of flexible rubber hoses. Today, tank cleaning on such ships is carried out using fixed machines, operated from the cargo control room, an arrangement which is much less labour-intensive and ensures a fully enclosed procedure. While COW is carried out on crude carriers during cargo discharge, tank cleaning on chemical and product tankers is not commenced until the tank is empty.

Two leading brands united

One of the new leading names in tank cleaning machines is Gunclean Toftejorg AB, the result of a process that began in November 2000 with the merger of Toftejorg's marine division with the Gunclean interests of Consilium AB. Prior to that both Gunclean and Toftejorg served the tanker industry for more than 40 years with their own recognised brands of tank cleaning equipment, namely Gunclean single-nozzle machines for oil tankers and Toftejorg twin-nozzle machines for use on smaller tankers, including chemical tankers.

The amalgamation process was completed in May 2001 when Toftejorg A/S acquired Consilium AB's 50 per cent shareholding in Consilium Toftejorg AB to take full control of the company, now known as Gunclean Toftejorg. The transaction was part of the Toftejorg strategy of expanding and consolidating its diverse tank cleaning activities in the global marine, offshore and land-based industries.

Gunclean Toftejorg is a Swedish-registered company, with offices and production facilities in Gothenburg, Sweden and Ishøj, Denmark. The constituent parts of the group have supplied more than 120,000 machines to the marine and offshore sectors.

WashTrac monitoring from Saab

Cargo tank cleaning is a variable process in which the functions need to be altered as the procedure progresses for optimum results. Saab Marine Electronics and Scanjet cooperate to provide a tank cleaning monitoring system called WashTrac, which utilises a device fitted to the Scanjet tank cleaning machine to communicate with the Saab TankRadar gauge situated on the tank. A workstation displays the operating status of the cleaning machines, stop/start alarms, operation and pre-wash data, running times and service intervals. Sensors in the cleaning lines measure cleaning fluid pressure, temperature, fluid consumption and cost.

WashTrac prints out a record of the cleaning operation with start, stop and total running times for the cleaning machines. This record provides proof to port authorities that prewash operations have been correctly performed.

Polarmarine duo

As described in the March 2002 issue of Tanker Operator ("What's new in tankers?", p 11), Polarmarine of Hönö in Sweden is seeking to reinforce its position in both the oil and chemical tanker tank cleaning sectors with the introduction of two new tank cleaning machines. The PJ 120T-CPA is a development of the existing PJ 120T fixed, single-nozzle machine for use onboard oil tankers. The new machine has speed, angle and pitch control, in contrast to most deck-mounted, single-nozzle machines with which it is possible to control only two of these functions.

Tanker crews are able to preset the cleaning area of the PJ 120T-CPA to operate at any angle in the tank over the range 0-180°. For example, to ensure thorough cleaning of tank bottoms, the machine can be set to operate between 0 and 45°, with automatic reverse direction. Nozzle rotation speed can be adjusted within the 0.75-1.5 rpm range while the capacity of the PJ 120T-CPA is variable within the 60-150 tonnes per hour range. The control unit of the new nozzle can be retrofitted to replace control units on existing PJ 602 and PJ 120T models.

The new PJ 25T from Polarmarine is a non-programmable, stainless steel twin-nozzle machine which can either be fixed in the cargo tanks of chemical ships or used as a portable device.

Dasic champions twins

Dasic Marine Ltd of Romsey in the UK was a pioneer in the development of twin-nozzle cleaning machines for use on crude oil, product and chemical tankers over 30 years ago. Building on this base of knowledge, the company now offers a full range of tank cleaning machines and portable ventilation fans. The latter range includes the Jetfan 125 for use on the largest crude oil carriers and the Jetfan 65, a popular gas-freeing fan for use on smaller tankers. Amongst other uses, fans help maintain a too-lean atmosphere in the tanks of product tankers during cleaning operations, thus helping to minimise the flammability risk.

"Our large twin-nozzle machines have proven to be a very effective means of cleaning tanks on large crude carriers, including VLCCs, and oil companies such as Shell, Chevron and ExxonMobil continue to specify our Jetstream Model A machines for their newbuildings," states Duncan Marshall, sales manager at Dasic. "Twin nozzles are particularly effective on the new double-hull tankers as much of the tank support structure, including stiffeners, are located on the ballast tank side, leaving walls that are much flusher than in the past. Twin nozzles are more reliable and less labour-intensive than single nozzles, as there is no need to reprogram machines at mid-cycle."

Dasic markets its Junior Jetstream machine in tandem with its Layflat tank cleaning hose as the lightest combination available. In the chemical tanker sector the D4000, Junior Stainless Steel and Orbitor machines are on offer, the D4000 being for the largest ships of 40,000 dwt and above and the Orbitor aimed at the coastal chemical tanker sector involving ships up to 12-15,000 dwt. The Junior Stainless Steel is targeted at chemical ships of an intermediate size. The Orbitor is based on a new concept in which the nozzles on one side of the spherical head are offset by a backing plate.

Magnetic Butterworth

Butterworth, a venerable name in tank cleaning, has recently supplied its innovative Type M machine to Shell Deepwater Development for use on the newly constructed Na Nika oil and gas production platform. The new Butterworth machine is made of aliphatic polyketone and employs the worlds first magnetic drive coupling for use in a conventional-type, automated tank cleaning machine. Reflecting one of the benefits of using magnetic couplings, it is possible to design the gearbox on the Type M machine to reduce the seal requirements to only one area.