

A more efficient COW

The CRUCOGSA research programme into the Physical Behaviour of Crude Oil Influencing its Carriage by Sea, which was carried out in the 1996-1999 period, revealed that there is much that can be done to tackle the problems of vapour emission control, cargo tank corrosion, accurate measurement of cargo volumes and cargo tank sludge buildup. Often, these shipboard problems are interrelated.

As a result of the basic CRUCOGSA work, which received widespread industry support, it was decided that some further, targeted research needed to be carried out. Among the spinoff projects is CRUCLEAN, an investigation into more effective crude oil washing (COW) to assist in minimising sludge buildup in the bottom of cargo tanks. Such an improvement would, in turn, help reduce the risk of corrosion, improve cargo outturns and obviate the need for expensive, manual cleaning out of the tanks in question.

The basic premise behind the CRUCLEAN research work, which the industry hopes to complete over the next year, is that the pressure at which the crude oil leaves the nozzle of the tank cleaning machine is too high. This, in turn, results in the generation of larger quantities of cargo vapour than need be the case. The loss of these volatile organic compounds (VOCs) through the venting system not only poses an environmental hazard and entails lost cargo revenues, it also makes the COW procedure more difficult.

The solvent effect

The VOCs given off from the cargo, whether during loading, the laden voyage or COW operations, are essentially the lighter end of the crude oil barrel. The higher the level of VOC emissions, the more the oil cargo will become progressively more viscous as the voyage progresses and the lower the output of the higher-value lighter ends when the crude oil is eventually refined.

From the point of view of COW operations, as the cargo is discharged, the presence of as great a volume of these lighter ends as possible is a good thing because these fractions act as a solvent and help to dissolve any sediments that may have built up. The CRUCLEAN project leaders believe the current high discharge pressures which COW machines are operated at is a holdover from the days when single-hull tankers prevailed. On single-hull tankers all the structural support members are placed on the inside of the tank, so COW wash pressures have to be high to create a splash effect in order to wash cargo oil clingage from hard-to-reach locations hidden behind structural support members.

Today, some 50 per cent of tankers are double-hull vessels and this percentage is growing by the day. On double-hull ships many of the structural support members are located on the external side of the cargo tank plating, in the ballast tanks. The relatively smooth, flush tank walls makes the tanks that much easier to clean than those in single-hull ships and reduces the need for the splash cleaning effect and high nozzle pressures.

Sequential testing

The plan with the initial phase of the CRUCLEAN research programme is to run a series of full-scale COW tests on a VLCC in drydock, varying nozzle diameters and crude oil delivery pressures over a specified range. The tests have entailed the installation of a new pump on the nominated VLCC.

The project also calls for the modification of a standard single-nozzle wash machine to provide a design that takes into account, and helps to ensure, an increased level of solvent in the crude oil wash medium compared to that which would normally be encountered.