

VOC MANAGEMENT PLAN

Chapter 13.6 – Specification for the COW machine

13.6 Specification for the COW Machine and washing system

1. Particulars of tank cleaning machines.

a) Type of machines on each tank.

Cargo Tank	No. and Type of Washing machine
No. 1,2,3,4 cargo oil tank (P&S)	Three (3) sets "SC90T2" type
No. 5 cargo oil tank (P&S)	Two (2) sets "SC90T2" type
No. 1 cargo oil tank (center)	Four (4) sets "SC90T2" type & Two (2) sets "SC45TW" type
No. 2,3,4,5 cargo oil tank (center)	Four (4) sets "SC90T2" type & One (1) set "SC45TW" type
Slop tank (P & S)	One (1) set "SC90T2" type & Four (4) sets "SC45TW" type

b) Particulars of machine.

Machine Parameter	SC90T2 type	SC45TW type
Operating pressure	8 kg/cm ²	8 kg/cm ²
Dia of nozzle	30 mm	2x18 mm
Rate of discharge	90M ³ /h	50 M ³ /h
Effective washing radius	36M	22 M
Gun pipe length	3.5M	Submerged
Nozzle operation angle	180° - 0° - 180°	360°
Manufacturer	Scanjet Marine AB in Sweden	

c) Note:

For the detail information of the tank cleaning machine, see the maker's final drawing, "OPERATING, SERVICE AND INSTRUCTION MANUAL".

VOC MANAGEMENT PLAN

Chapter 13.6 – Specification for the COW machine

2. Washing system

- a) The ship is provided with a separate 300A COW line and branched to each washing machine. Any cargo pumps can supply either cargo oil or seawater to washing main line through crossover line on cargo pump discharge in aft pump room.

The cargo tanks and slop tanks are fitted with tank cleaning machines as mentioned in the above table. The type SC90T2 is deck mounted programmable single nozzle type and the type SC45TW is submerged non-programmable twin nozzle type.

Both of these washing machines are manufactured by Scanjet in Sweden.

- b) The movement of the nozzle can be set to work between any angle from 00 to 180° (SC90T2) and bottom cleaning machine is set to work only at 360° (SC45TW - Non-programmable type).
- c) Both the SC90T2 and SC45TW tank-cleaning machines have integral drive units that are powered by the force of the washing fluids. The method of verification for rotation is sound patten for submerged machine.

The SCANJET SC90T2, fully programmable, single nozzle tank cleaning units are flange mounted on the tank top or deck. Movement of the nozzle is fully controlled by integrated turbine driven control units, via a central turning and lifting rod in the cleaning unit.

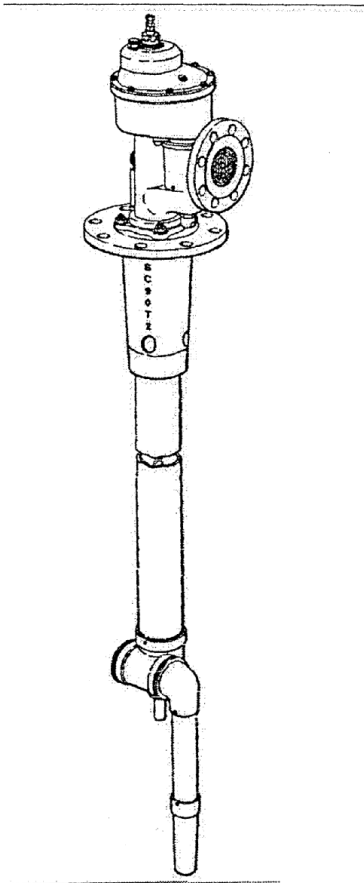
The nozzle movement is in principle a rotation in the horizontal plane, combined with a very slow vertical movement. This means that the nozzle performs helical patterns

With the two (2) adjustable stops, the nozzle can be programmed to wash between desired vertical angles. The nozzle can be preset to start in any vertical position by manual cranking.

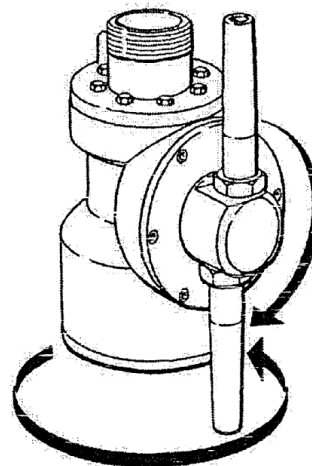
- d) The minimum line pressure for crude oil washing is 8 bars. Normal working pressure is 9 bars. During the washing process the maximum permissible tank oxygen level required for safe COW operation is 8 percent by volume.
- e) Crude oil washing must only be carried out when the oxygen level in the tank is less than 8 percent. This is the maximum permitted level.
- f) Diagram of the Tank cleaning machine

VOC MANAGEMENT PLAN
Chapter 13.6 – Specification for the COW machine

SC90T2



SC45TW



VOC MANAGEMENT PLAN

Chapter 13.6 – Specification for the COW machine



Page 5 (37)

SC 90T2-CRUDE-02

WORKING PRINCIPLE

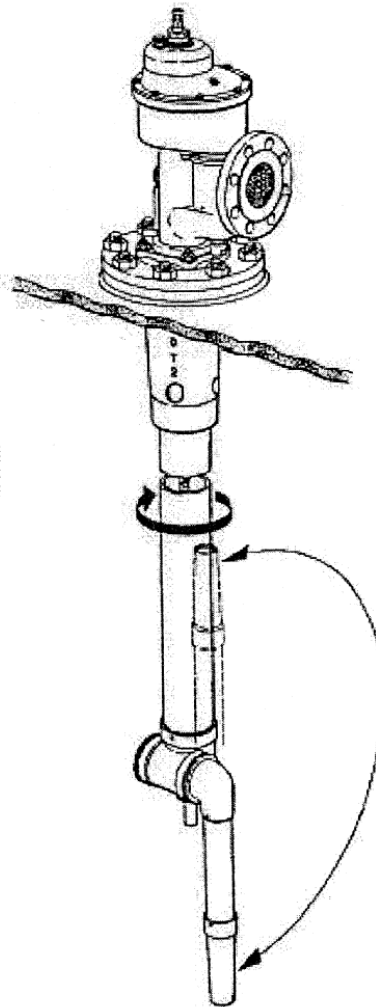
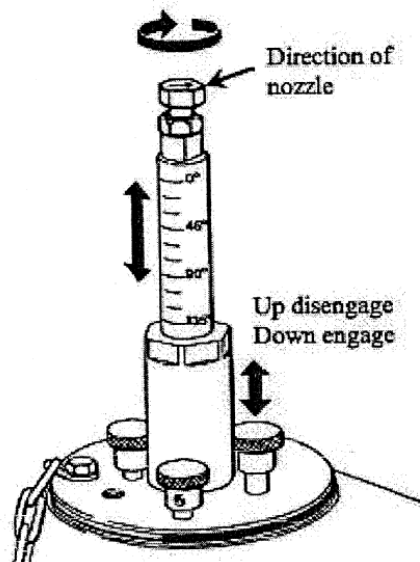
The cleaning media comes from the supply line onboard the vessel and enter into the inlet housing and passes the vertical turbine, which drives the driving unit.

The cleaning media continue through the main pipe to the nozzles and then out in the tank.

The driving unit will rotate the main pipe and elevate the nozzle and will hereby clean the tank in a spherical pattern. The rotation speed is controlled by the rotation speed of the turbine and could easily be set to desired speed.

The rotation of the main pipe and the elevation of nozzle are indicated on the scale on the lifting rod.

The elevation per revolution (Pitch) for the nozzle can be set to different pre-programmed values by means of push or pull the program knob. (See below).



SCANJET MARINE AB, P.O. Box 2, S-275 21 SJÖBO, Sweden
Telefax no. +46 (0)416 511 656, Telephone no. +46 (0)416 513 100

VOC MANAGEMENT PLAN

Chapter 13.6 – Specification for the COW machine

- g) The complete crude oil washing system has been inspected and approved by the administration and no alterations may be made to the system or any part of the system without the approval of the administration.

Cargo tanks shall be inspected after crude oil washing in accordance with the requirements of the revised specifications and met the required standards of cleanliness being essentially free of oil clingage and deposits.

The surface of the departure ballast shall be examined in accordance with the requirements of the revised specifications, and was found to be satisfactory.

- h) The procedure for computing the ratio of the volume of oil on top of the total departure ballast water to the volume of tanks that contains this water is described below:

Tank Number	Port, Starboard	Total tank volume (Cu.m)	Ullage of ballast water (measured to top of oil layer) (m)	Oil thickness (mm)	Volume of oil (cu.m)
X		Vx	Ux	tx	vx
	Total	V		Total	v

- Determine the thickness of the oil layer on the ballast water (tx).
 - Using the tank capacity tables:
 - Determine the aggregate volume (100%) of all tanks that contain departure ballast (V).
 - Determine the volume of the ballast water and oil layer in each tank from the ullage (Ux).
 - Determine the volume of ballast water in each tank from the ullage plus the thickness of the oil layer (Ux + tx).
 - Subtract the value obtained in (Ux + tx) from the value of (Ux) for each tank and add the resultant values together to obtain the total volume of oil (v).
 - The ratio of the volume of oil on top of the total departure ballast water to the total volume of tanks containing departure ballast water = v/V .
- i) There is no part of the crude oil washing system in the machinery space.