c. The flow through treatment system treats wastewater to acceptable limits and discharges the effluent into receiving waters. The Pall-Trinity Biological Treatment System is the only example of this type currently authorized.

7-17. Marine Sanitation Device Systems Descriptions

1. *Collection Holding and Transfer System*

a. CHT systems have been installed on the majority of Navy ships. The systems are designed to operate in three modes; in restricted waters, sewage is collected and stored in holding tanks while gray water is discharged overboard via diverter valves; at sea, all sewage and gray water, including any stored in the holding tanks, is diverted or discharged overboard; and in port, sewage and gray water are collected in holding tanks and discharged into a sanitary sewer or ship waste off-load barge (SWOB).

b. The CHT system is composed of three fictional elements:

(1) The collection element consisting of soil drains (from toilets and urinals), gray waters drains (from showers, laundries, and galleys) and diverter valves which direct the wastewater over the side or to the holding tanks.

(2) The holding element, consisting of tanks, retains sewage during transit of restricted waters for eventual disposal. These tanks are normally sized for a 12-hour holding period depending on individual ship constraints. Holding tanks of 2,000 gallon (Figure 7-13) capacity and over are designed with comminutors to macerate solids passing into the tanks and an aeration system to prevent sludge from settling and becoming anaerobic. Smaller tanks, on the other hand, (Figure 7-14) incorporate strainers which prevent solids from entering tanks.

(3) The transfer element includes sewage pumps, overboard and deck connection discharge piping and associated diverter valves and check valves. Each tank is equipped with two sewage pumps which are connected in parallel to discharge sewage and gray water to a receiving facility, SWOB, or directly overboard.

c. The CHT system can be operated in a manual mode in which the pumps are actuated independent of the level of wastewater in the holding tanks or in a fully automatic mode. When operating in a manual mode, an option is available which will deactivate the pumps automatically when the low liquid level of the tanks reaches approximately 10% of the tank volume in order to maintain pump suction. In the fully automatic mode, the following functions are accomplished:

(1) Duty pump alternation.

(2) The low liquid level stops the pump when the level reaches approximately 10% of its capacity in order to keep the pumps primed.

(3) At 30% liquid level, a sensor signals the duty pump to activate.

(4) At 60% liquid level, a sensor signals the standby pump to activate.

(5) At 80% liquid level, a visual and audible high level alarm is activated.

2. *GATX Evaporative Toilet System*

a. This system is a modular system suitable for small vessels. It is designed to operate in two modes. In restricted waters, the volume of wastewater generated is minimized by a reduction in flushing medium using CVF water closets and urinals. In restricted waters, the liquid portion of the wastewater is vaporized leaving a concentrated sludge residue which can be stored for

approximately two weeks, if required. In unrestricted waters, wastewater can be diverted overboard, and pier side it may be discharged directly into a shore receiving facility.

b. The GATX System (Figures 7-15 and 7-16) is comprised of CVF urinals and water closets, macerator/transfer (M/T) pumps, a stream jacketed evaporator with electrical heaters, an odor treatment system, sludge pump, system controls, and associated plumbing.

c. Bodily wastes enter the system through the CFV urinals and water closets and are fed directly to the M/T pump where they are reduced to a slurry. The slurry is either pumped directly overboard or to the evaporator tank. The evaporator tank is team heated to 2300 F causing the liquid portion of the wastewater to vaporize. The remaining sludge accumulates at the bottom of the tank until it can be discharged into a port receiving facility or into unrestricted waters. The evaporator tank is designed to accommodate approximately two weeks' accumulation of sludge.

d. The vapor treatment system eliminates the malodors caused by the vaporization of wastewater. This is accomplished when the vapors are heated to 500° F and passed through a catalyst where the malodorous components of the vapor are oxidized and thus destroyed.

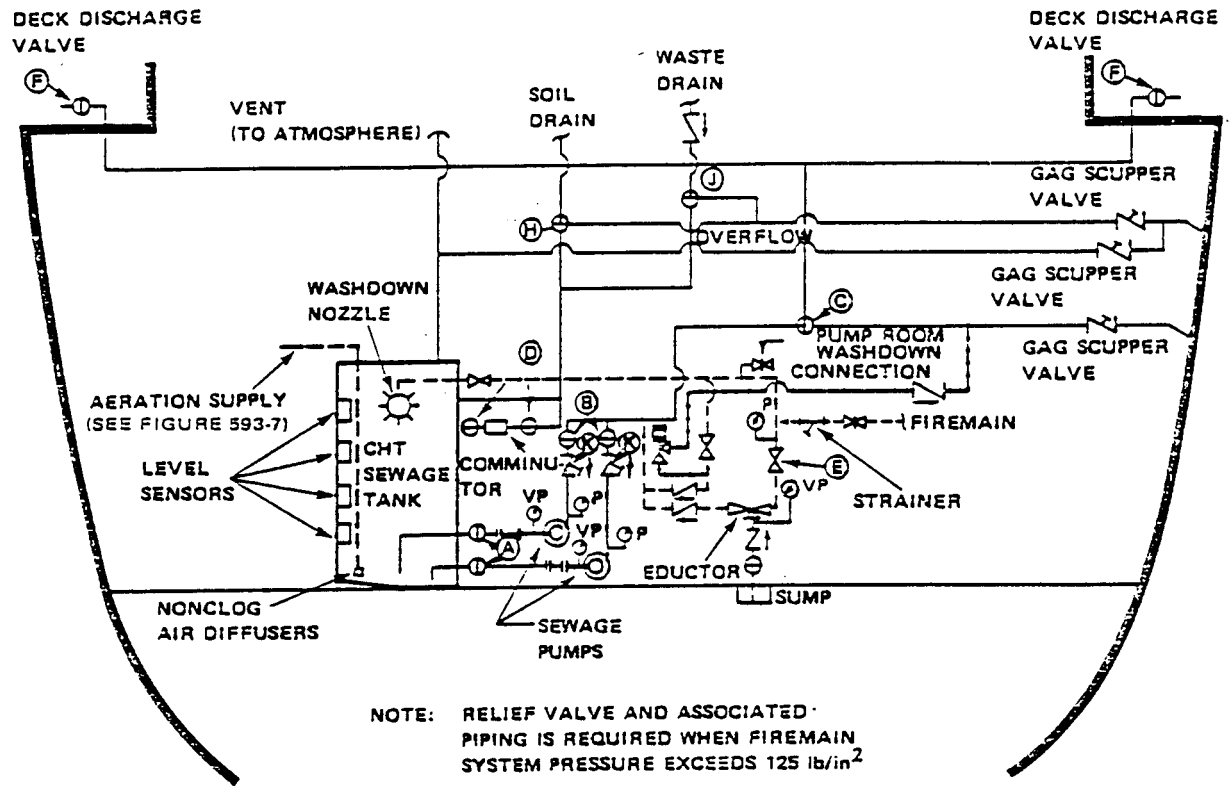
3. *JERED Vacu-Burn Treatment System*

a. The JERED Vacu-Burn System (Figure 7-17) is installed aboard ships of the DD 963 and DDG 993 class. The system employs CVF water closets and urinals, a vacuum collection tank (VCT), grinder pump, overboard discharge pump, incinerator feed pump, two vacuum pumps (or a fire main powered eductor for vacuum generation), a vortex incinerator and associated plumbing and controls.

b. Soil waters are introduced into the system via CVF water closets and urinals. The wastes are transported to the 240-gallon vacuum collection tanks under negative pressure of 14 to 20 inches of mercury. The negative pressure is maintained by two vacuum pumps or a fire main powered eductor. Upon reaching the VCT, the wastes are passed through a grinder pump which macerates the waste to 1/4 inch or less size particles.

c. There are four level sensors in the vacuum collection tank. The low level sensor deactivates the overboard incinerator and grinder pumps when the wastewater level drops below the 40-gallon level. The grinder pump will activate above this level. A sensor located at the 100-gallon level activates the incinerator feed pump, or the overboard discharge pump, whichever mode is selected. A high level alarm is positioned at the 175-gallon level which activates an alarm at the control panel. The warning signal indicates that there may be a casualty malfunction. A very high level alarm is located at the 200-gallon level. In addition to sending alarm signals, this sensor deactivates the wastewater collection system by deenergizing the vacuum pumps or fire main eductor. The system cannot be reactivated until the malfunction has been corrected and the wastewater level drops below the 200 gallon level.

d. During operation in restricted waters, the wastewater is incinerated at approximately 2,0000 F in a vortex incinerator. The resulting sterile ash is removed when the incinerator cools down and is disposed of as solid waste. Each incinerator is capable of treating 4,000 pounds of sewage per day.



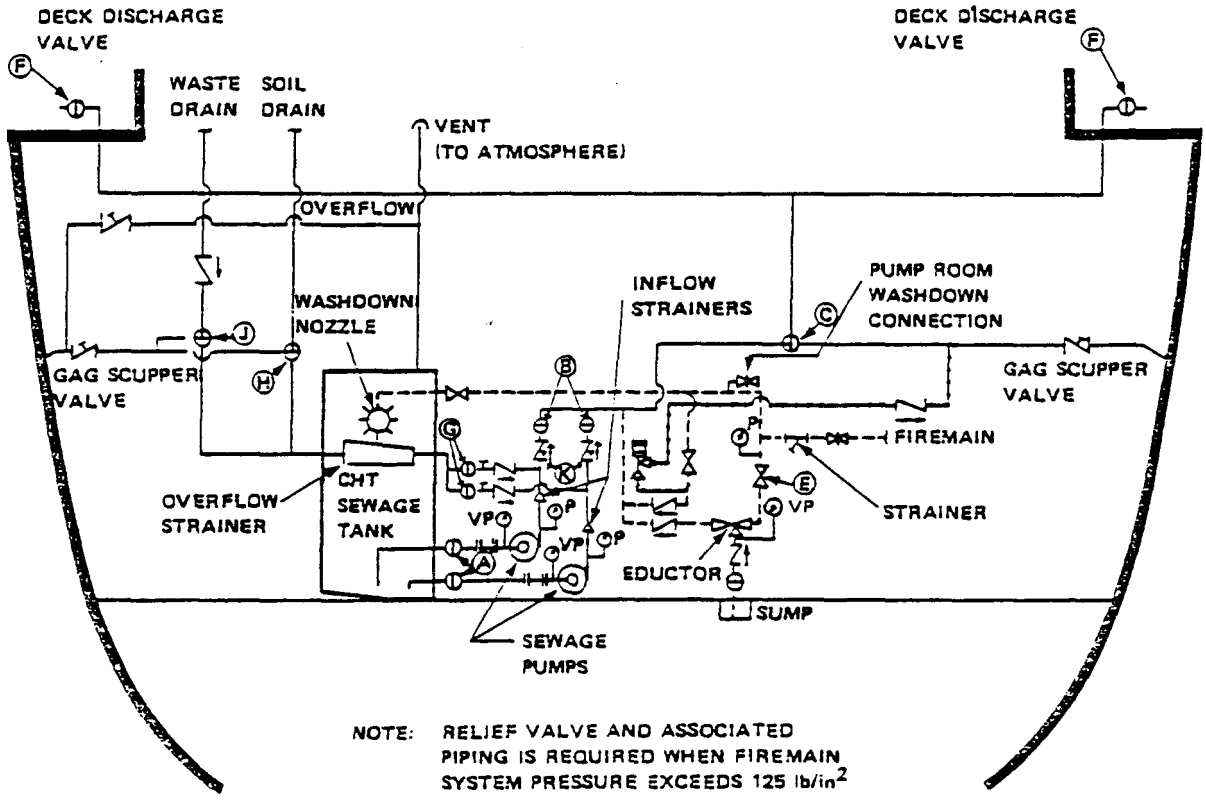
LEGEND:

- Ⓐ PUMP SUCTION VALVE
- Ⓑ PUMP DISCHARGE VALVE
- Ⓒ PUMP DISCHARGE DIVERTER VALVE
- Ⓓ COMMINUTOR ISOLATION VALVE
- Ⓔ EDUCTOR SUPPLY VALVE
- Ⓕ DECK DISCHARGE VALVE
- Ⓗ SOIL DRAIN DIVERTER VALVE
- Ⓙ WASTE DRAIN DIVERTER VALVE
- Ⓚ PUMP DISCHARGE CHECK VALVE

SYMBOLS KEY:

- SWING CHECK VALVE
- SWING CHECK VALVE (WITH HOLD-OPEN DEVICE)
- GATE VALVE
- P PRESSURE GAUGE
- VP VACUUM PRESSURE GAUGE
- SPOOL PIECE
- 3 WAY VALVE
- STRAINER
- GAG SCUPPER VALVE
- PLUG OR BALL VALVE
- GLOBE VALVE
- RELIEF VALVE

Figure 7-13. Comminutor type CHT System.



LEGEND

- Ⓐ PUMP SUCTION VALVE
- Ⓑ PUMP DISCHARGE VALVE
- Ⓒ PUMP DISCHARGE DIVERTER VALVE
- Ⓔ EDUCTOR SUPPLY VALVE
- Ⓕ DECK DISCHARGE VALVE
- Ⓖ INFLOW STOP VALVE
- Ⓗ SOIL DRAIN DIVERTER VALVE
- Ⓙ WASTE DRAIN DIVERTER VALVE
- Ⓚ PUMP DISCHARGE CHECK VALVE

SYMBOLS KEY:

- SWING CHECK VALVE
- SWING CHECK VALVE (WITH HOLD-OPEN DEVICE)
- GATE VALVE
- P PRESSURE GAUGE
- VP VACUUM PRESSURE GAUGE
- SPOOL PIECE
- 3 WAY VALVE
- STRAINER
- GAG SCUPPER VALVE
- PLUG OR BALL VALVE
- STRAINER FLUSHING CONNECTION
- GLOBE VALVE
- INFLOW STRAINER
- RELIEF VALVE

Figure 7-14. Strainer Type CHT System

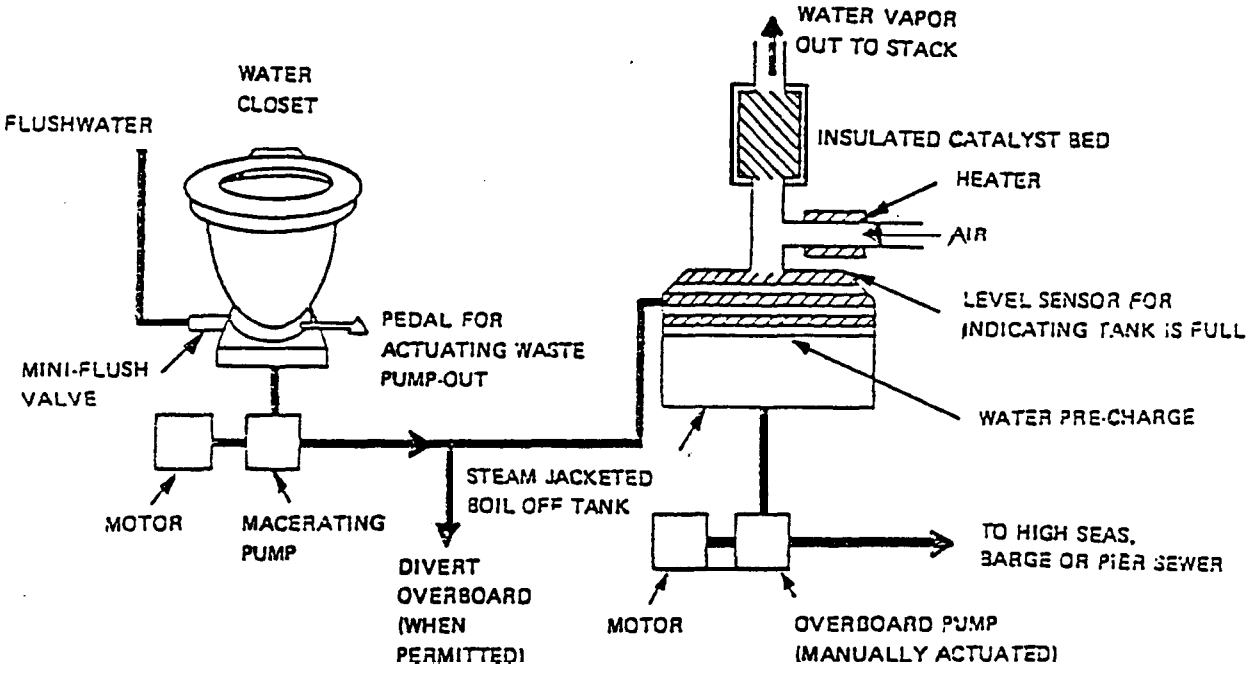


Figure 7-15. GATX Evaporative Toilet System

e. In unrestricted waters, wastewater is discharged directly overboard. In port, the wastes are incinerated or discharged directly into a shore collection facility or SWOB.

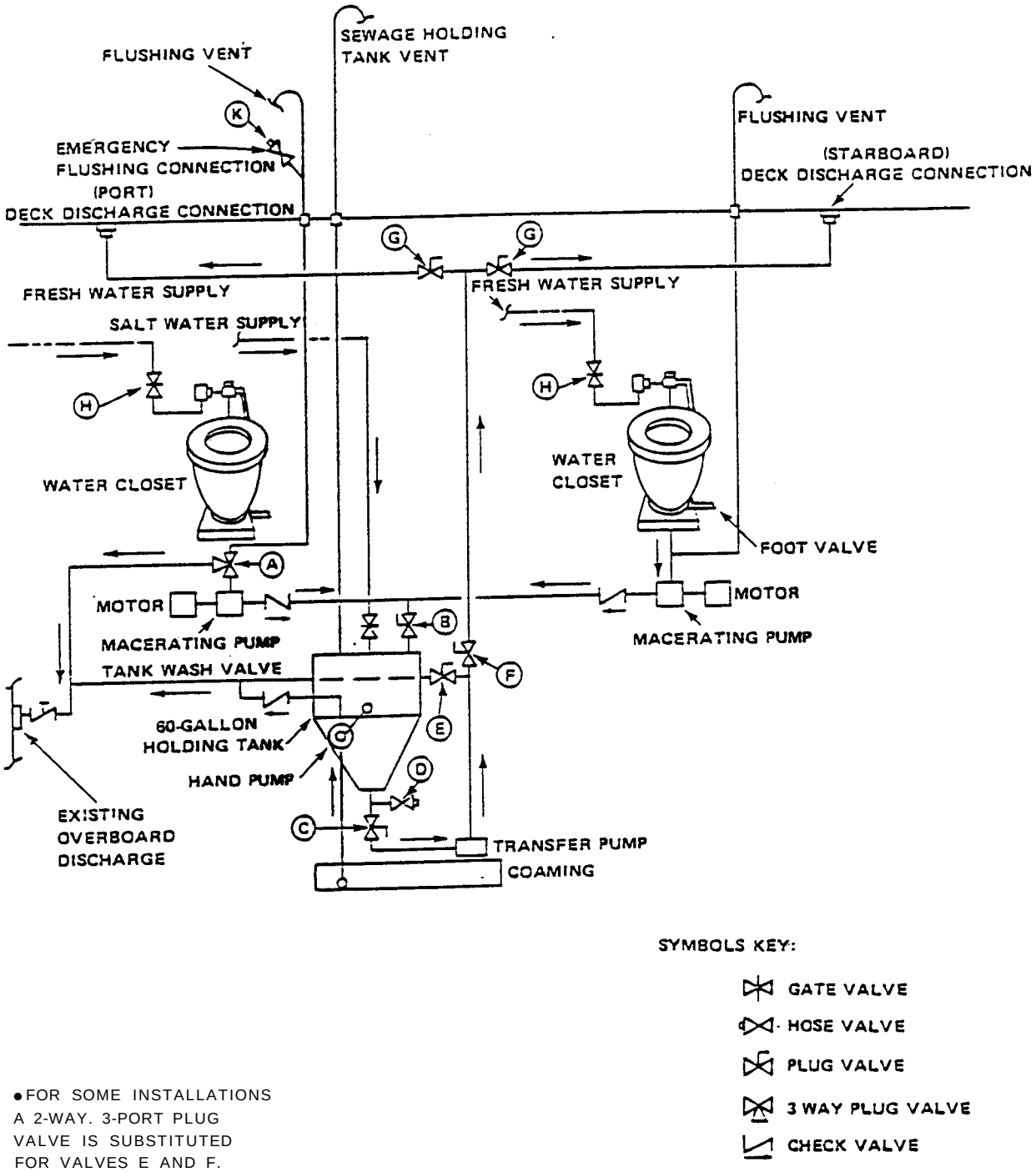
4. *KOEHLER-DAYTON (KD) Recirculating Flush System*

a. The Koehler-Dayton Recirculating Flush System is designed for small craft and ships whose mission requires extensive operations within the restricted zone.

b. This system consists of a recirculating flush toilet with a 20-gallon holding tank (KD unit), an electrical or manual recirculating pump, 30-gallon storage tank, and a macerator/transfer (M/T) pump for discharging both holding tanks, plus associated plumbing and controls.

c. The KD unit is initially charged with 4 gallons of fresh water to which is added 4 ounces of chemical-containing deodorizers, coloring and wetting agents, a biocide, and, in the event of freezing temperatures, antifreeze. Whenever the unit holding tank is drained into the 30-gallon storage tank or discharged overboard, the unit must be recharged with flushing medium.

d. Wastes are carried to the 20-gallon unit holding tank in the recirculating flush medium. The flushing medium is pumped from the unit holding tank through a filter or baffle device, where the solids are removed, and back to the toilet bowl for reuse. The 20-gallon unit holding tank is designed to accommodate approximately 160 uses before it must be emptied; however, the manufacturer recommends the unit be drained into



• FOR SOME INSTALLATIONS A 2-WAY. 3-PORT PLUG VALVE IS SUBSTITUTED FOR VALVES E AND F.

Figure 7-16. GATX MK2 System

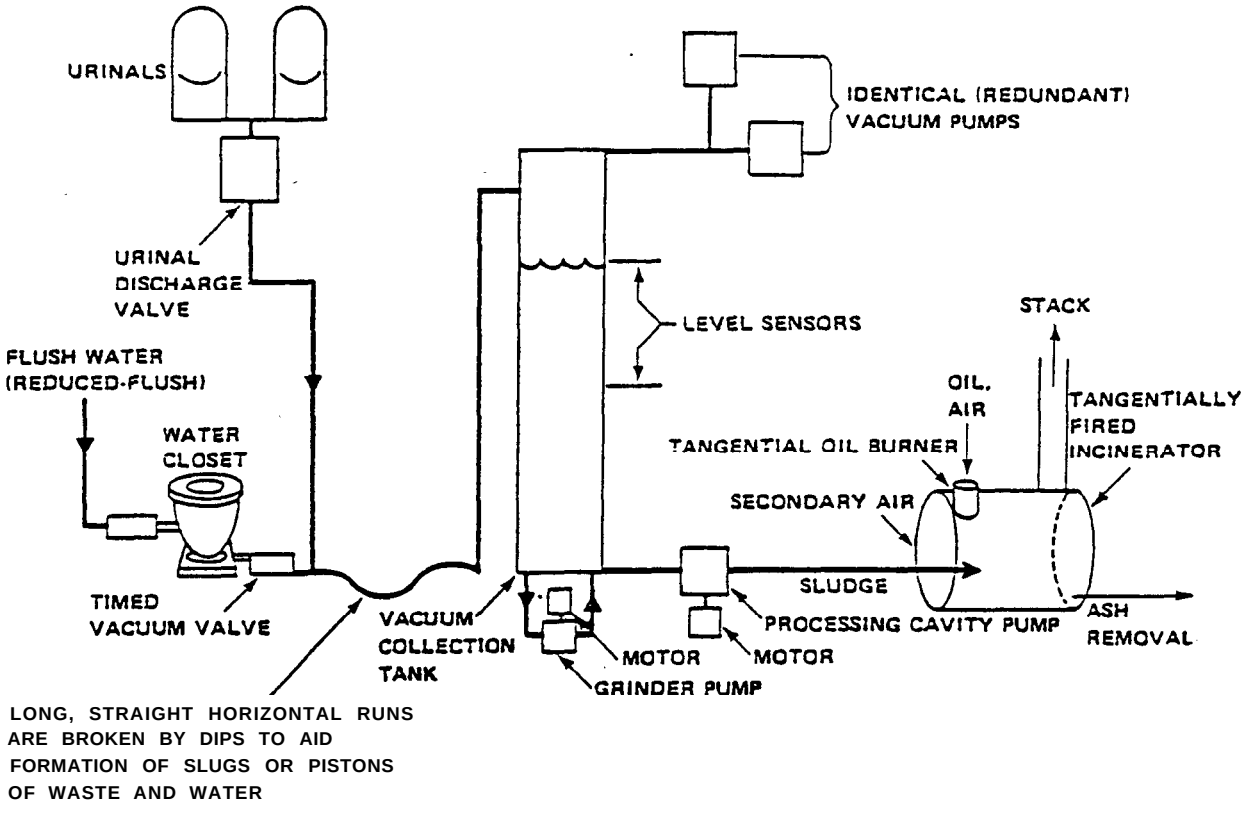


Figure 7-17. JERED Vacuum Collection and Incineration System

the storage tank or overboard as appropriate at two-day intervals, regardless of the number of usages, to assure odor-free operation.

e. The 30-gallon storage tank extends the amount of time the system can operate in restricted waters. When in port, the contents of the storage tank are discharged into the port receiving facility. In unrestricted waters the wastes are discharged directly overboard.

5. *Pall-Trinity Biological Treatment System*

a. The Pall-Trinity System (Figure 7-18) is a thermally accelerated, extended aeration activated sludge sewage treatment system on board LHA 1 class ships. It works on a principle similar to that described in Article 7-9.2b.

b. This system is comprised of FVF water closets and urinals, an influent box, bar screen, comminutor, aeration tank, aeration tank heater, air supply, sedimentation tank, sludge return lines, surface skimmer, effluent discharge pumps, chemical feed system, and associated plumbing and controls.

c. Sewage enters the treatment plant from FVF toilets and urinals through the influent box. From there, sewage passes through the comminutor into the aeration

tank. In the event the comminutor becomes clogged, sewage enters the aeration tank through the bar screen. Sewage is decomposed in the aeration tank by aerobic bacteria in an environment rich in oxygen and maintained between 85°F and 105° F by the aeration tank heater. The effluent leaving the aeration tank enters the sedimentation tank where sludge settles to the bottom and is conveyed back to the aeration tank by the sludge return lines for further treatment. When the sludge accumulation in the sedimentation tank reaches 40% of the tank capacity, it is pumped out and discharged overboard in unrestricted waters or to a shore receiving facility. The scum, which forms at the top of the sedimentation tank, is removed by the surface skimmer and returned to the aeration tank. The clarified effluent from the sedimentation tank enters the effluent holding tank where chlorine is added to disinfect the treated wastewater before it is discharged overboard.

7-18. Inspection of Marine Sanitation Device:

1. *Labeling and Color Coding*

a. On the interior of the ship, MSD valve handles and operating levers (excluding handwheels of gauge valves located on gaugeboards) must be color coded gold (Paint Chip 17043). Exterior deck discharge stations must be painted the same color as the surrounding structure.

b. Deck discharge stations must be clearly labeled to include hose handling procedures and sanitary health precautions as described in GENSPECS 593.

2. MSD components must be regularly inspected for leaks by appropriate engineering personnel responsible for the compartment in which the MSD components are located. These inspections should include the following:

a. Soil and waste drains, discharge lines, flanges, joints, access plates, and clean out plugs.

b. Gate and ball valves

c. Plug valves

d. Comminutors and motors

e. Automatic pump starters

f. Sewage pumps, including housings and seals

g. Tank penetrations and manholes

h. Air compressors

i. Drip pans

j. When operating in “port” mode, include sewage transfer hoses and riser connections

3. The “paper towel” test can be used to pinpoint small leaks from pumps, comminutors and pressurized sections of the piping system. This test entails opening a paper towel and holding it suspended 2 to 3 inches from the units for several minutes while they are operating. The source of even the finest spray can be detected by the paper towel becoming spotted or wet.

4. The ventilation system installed in the MSD room must be inspected and the space sump (if present) must be checked for sewage accumulation.

5. All leaks, spills or other sources of contamination observed during these inspections or at any time must be promptly reported to the executive officer, engineering officer/ damage control officer, and the senior medical department representative. Appropriate action must be taken to arrest the leak and properly clean and, when appropriate, disinfect the contaminated area as described in Article 7-20.