

and expect it to operate on a boat for a week at a time, under the hot sun when the boat is closed up during the week and where the number of flushes will far outnumber the very moderate usage aboard a plane and expect the same results. Remember, too, the airlines have long since provided full facilities for handling this distasteful task along with the many other routine services modern planes require.

To sum it all up, unless it is the desire of legislators to legislate boating completely out of business, except for the largest luxury yachts where space and money are no objects, the entire holding tank concept is just not feasible. Here too, on the largest yachts where self contained electrical power is almost unlimited, the incinerator type of toilet would meet the requirements of "no effluent—no pollution" provided the odor and ash problem can also be met.

The macerator-chlorinator type of device meets not only the small boat's problem, but the largest as well. The newest types have consistently demonstrated that they can reduce the bacteria content of sewage from countless billions in untreated sewage to zero to twenty coliform per 100 ml. (milliliters). Most health agencies state that 240 to 1000 coliform per 100 ml. is acceptable and most municipalities deem that a 5000 count is safe for swimming. In short, a well designed macerator-chlorinator is capable of producing an effluent that is less polluted than the water being pumped in to flush with, i.e. the water the boat is floating in.

To achieve this decontamination, sewage must be macerated so that no single particle is larger than $1/32''$. This means that to assure that this size is attained, the effluent must be ground even finer. Actually, nothing would be recognizable. Paper is reduced to individual fibers shorter than $1/32''$. The color is bleached by the chlorine to nearly white. Much has been said regarding the nutrients remaining, namely phosphates and nitrates. B.O.D. (Biochemical Oxygen Demand) has also erroneously been attributed to macerator-chlorinators. BOD is exerted when micro organisms in the receiving water decompose the waste material. In carrying out life processes the micro organisms utilize the oxygen resources of the water. There will be no nitrates or phosphates in the effluent that were not present in the water being pumped in to flush with. The main source of phosphates is that they are used as builders in detergents, and nitrates stem mainly from run-off from fields where they are used as agricultural fertilizers. It appears that a certain critical nitrate nitrogen to phosphate phosphorous ratio of about 1 to 15 is necessary to produce algae blooms. A macerator-chlorinator would not aggregate this condition. Because chlorine is also an algicide, how can algae thrive where the effluent must have an excess of residual active chlorine to be a bactericide?

We should therefore conclude that in as much as the macerator-chlorinator can do a much better job than the primary municipal sewage plant, there is no sense in delivering its effluent to a pumping station where it *may* be deposited in sewage lines and after municipal treatment be returned to the lakes more polluted than when it left the boat. As required by the NSF and also the ABYC standards, adequate "fail-safe" provisions must be incorporated into decontaminating devices so that they will not flush if they are not operating properly. It would really be much easier to "cheat" on a holding-tank!

STATEMENT BY E. S. TERWILLIGER, EXECUTIVE VICE PRESIDENT, YACHT SAFETY BUREAU, INC.

Mr. Chairman, members of the Subcommittee, it is an appreciated privilege to present this statement on the activities of the Yacht Safety Bureau, with particular reference to water pollution control devices for use aboard boats. For your understanding of those activities, it is important that you know what the Bureau is, what it does, and how it operates. For that, as well as brevity herein, a copy of a descriptive pamphlet, entitled "Testing for Safety Afloat" is attached as a part of this statement.

The paragraphs in quotation marks on Pages 1 and 2 of the pamphlet comprise the Bureau's complete Certificate of Incorporation. In few words, that charter defines the Bureau's program, stresses devotion to the public interest, emphasizes the marine environment, confines program scope to the product phase of marine safety, and sets forth the basic process for implementing the program. Further procedural guidance stems from a 1963 ruling of the Internal Revenue Service exempting the Bureau from Federal taxes as an organiza-