June 1, 2002

U.S. Department of Transportation
Docket Management Facility
Docket # USCG 2001-10486 – 14
400 7th Street SW
Room PL-401
Washington D.C. 20590-0001

Gentlemen:

Nutech O3, Inc. (Nutech) developed technology that has successfully treated contaminated ballast water on a 135,000 Dead Weight Ton (DWT), 869 foot oil tanker. This technology involves sparging ozone into water carried in the ship's ballast tanks. Nutech's equipment has been subjected to nearly two years of exceptionally rigorous, at-sea testing. The test protocol and the testing were conducted by independent research scientists from the Smithsonian Institution's Environmental Research Center, the U.S. Department of the Interior's Fish & Wildlife Service, and scientists and engineers from the University of North Carolina, the University of Washington, Western Washington University, ENSR International, Petrochemical Resources Alaska, the Northeast Technical Services Company and BP Exploration (Alaska).

Nutech hereby responds to the questions posed by the U.S. Coast Guard in its Advanced Notice of Proposed Rulemaking (ANPRM), of March 4, 2002, Docket # 2001-10486. These responses are based upon the results obtained during the above referenced testing program.

Q. 1 What goal should the Coast Guard adopt for the treatment of ballast water?

Current independent studies indicate that, on average, a deep ocean exchange of ballast water results in an initial removal of only 64 percent of unwanted micro-organisms. The referenced testing program conclusively demonstrated that a significant portion of the bacteria and other micro-organisms that are not disposed of during deep ocean exchanges of ballast water reproduce during the remainder of the voyage. Moreover, Coast Guard regulations authorize a ship's captain to refuse to exchange ballast water if he determines that at-sea conditions make it too dangerous to conduct a ballast water discharge and re-ballast. Therefore, a significant percentage of vessels that are otherwise required to conduct discharges fail to do so.

The tests conducted on the effect of ozone in treating contaminated ballast water produced verified test results. These results proved that ozone killed, on average, more than 95 percent of the unwanted micro-organisms. Ozonation of ballast water produces substantially better results, in terms of improved water quality, than does any deep ocean exchange. Additional data is contained in the Report excerpts and Chart I of that Report appended to these Comments.

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Moreover, since these test results may readily be duplicated, Nutech supports the adoption of these independent test results in establishing the required performance and certification standards for ballast water treatment equipment. Therefore, to be certified as an acceptable treatment technology, any technology must produce results that eliminate a substantially higher percentage of unwanted organisms than the 64 percent of the organisms theoretically removed during a deep ocean exchange.

Q. 2 What standard, if any, should the Coast Guard adopt as an interim standard for ballast water treatment equipment?

Since existing technology has now been demonstrated to eliminate the unwanted micro-organisms that are the principal source of ballast water contamination, an interim standard is not required. Final standards ought to be adopted based upon the attached test results.

A 2001 Report, prepared for the Northeast Midwest Institute, by Royal Hasknoing (a Netherlands environmental consulting firm) concluded that the single most important reason for the failure of ballast water treatment technology to be brought to the market is the absence of definitive, widely applicable, treatment and performance standards for such equipment.

Q. 3 Provide information of the effectiveness of current technologies.

Please refer to the referenced Report excerpts Chart showing the effectiveness of sparging ozone into contaminated ballast water.

Q. 4 How should the Coast Guard measure the effectiveness of any given technology and how should cost benefit or cost effectiveness of an adopted standard be calculated?

The overall value of any regulations that implement the mandates of the National Invasive Species Act (NISA) should be judged by the extent to which any technology improves the quality of the discharged ballast water versus the quality of exchanged ballast water. As discussed in response to Question 1, both the Coast Guard, and other independent researchers have concluded that ballast water exchanges are ineffective in controlling the environmental problems created by invasive species. Such exchanges must be regarded only as an interim "solution" until effective technology is approved. The International Maritime Organization has adopted the identical position on this issue.

In adopting performance standards, appropriate allowance must be made for the fact that many effective treatment technologies may result in minor changes in the chemical content of treated ballast water. As a key provision of any regulations, federal and state regulatory authorities must allow for chemical variances in water quality so long as the treated water no longer contains more than the mandated levels of micro-organisms.

The overall decrease in the quantity of non-indigenous species in the treated ballast water must be accepted as the controlling factor in this regulatory process.

Unrealistic demands for "a theoretically perfect solution" must not become an ideological barrier to the adoption of many good solutions to the world-wide health, environmental and economic problems caused by contaminated ballast water.

These regulations should focus primarily on the removal of micro-organisms including bacteria, phytoplankton and zooplankton from ballast water since this is where emerging technologies are the most effective. Moreover, ozonation kills larval stages of species such as mitten crabs. In a deep ocean exchange, it is probable that some mitten crab larvae will remain in the unexchanged ballast water and survive after being discharged in-port. They will the mature and damage local water supplies and infrastructure. Currently available mechanical technologies, including filtration, appear to be adequate to remove larger, mature creatures such as mitten crabs from contaminated water.

Various research studies have estimated the *annual cost* to the U.S. economy caused by the discharge of contaminated ballast water to be in the billions of dollars. The overall cost of retro-fitting all of the ships, in excess of 1,000 DWT, in the U.S. fleet, would approximate one year's cost of continuing to discharge contaminated ballast water in the navigable waters of the United States.

The Coast Guard should, therefore, adopt performance and certification standards for *all* ballast water treatment technologies. The adopted standards should not preclude the use of any technology that brings the discharged ballast water to the required standard. Finally, any new regulations must clearly preempt all conflicting state or local regulations governing the discharge of ballast water. To do otherwise would create a substantial, and unjustified, burden on inter-state commerce. Conflicting state or local regulations would also create an insurmountable economic burden making it financially impossible, and technologically impractical, for ship owners to comply with conflicting treatment standards.

Q. 5 What impact would any proposed standard have on small businesses that own vessels?

The economic impact on owners and operators of small and medium size cargo freighters will not be significant because the cost of retro-fitting (or initially installing) ballast water treatment equipment on these vessels will vary with the size of the ship. Moreover, data obtained from the shipping industry, cited in the Battelle Institute-Cawthron Institute Report showed that deep ocean exchanges of ballast water cost the ship's owner between $16,000 and $80,000 per exchange. That Report, which was prepared for the New Zealand Ministry of Fisheries, in 1998, and which is cited by the Coast Guard in this ANPRM, demonstrates that the use of ballast water treatment technologies will, over a reasonable time period, pay for themselves and result in substantial cost savings for the ship's owner.

Q. 6 What is the potential environmental impact of the suggested goals or standards?

The proposed performance standards, based upon the attached test data, will dramatically improve the water quality of all affected harbors, bays and rivers at a relatively low cost to the regulated community and to consumers and small businesses otherwise affected by them. Since ballast water is discharged in every port in the United States, the reduction of that water's contamination level from an average of 36 percent (exchanged and untreated) to 5 percent (treated) will mark a significant improvement in the quality of the discharged ballast water.

Recommendation

Based on the foregoing, it is Nutech's overall recommendation that the U.S. Coast Guard immediately commence Notice and Comment Rulemaking with the stated objective of promulgating final ballast water treatment rules prior to December 31, 2002.

Respectfully submitted,

Jack H. Robinson
Chairman & CEO

Attachment:
Test Results Showing
Impact of Ozone on
Contaminated Ballast Water

Effectiveness of Ozone in Treating Contaminated Ballast Water

Tables 1.1 and 1.2 summarize the efficiency of kill for the different organisms, for the different experiments and time of ozonation at the time of sampling. The percent kill is compared to the 64 % exchange efficiency (i.e., percent removal) as measured for the *Tonsina* above. The percent removal for each group is indicated, followed by an indication of whether percent removal (i.e., kill) of that particular organism was greater than (pass), or was less than (fail) ballast water exchange.

The results indicate that:

1. 99.9 % of the culturable bacteria were killed.

2. In separate experiments, not shown in Tables 1.1 and 1.2, no bacterial re-growth was observed after 30 days storage in the dark in the laboratory.

3. Up to 99 % of the zooplankton were killed or near death using the ozone process.

4. Between 92 – 100 % of the phytoplankton were killed using the ozone process (except for diatoms, for which results were inconclusive).

5. Sheepshead minnows appeared somewhat more resistant to the ozone treatment, but in the latter two tests when both dead and near-dead organisms percentages were combined, 98 and 100 % treatment was achieved.

6. Mysid shrimp were effectively removed in one experiment where 78 % were killed or near dead.

7. The benthic organisms studied (shore crabs, amphipods) were not effectively killed or rendered moribund by the ozonation process.

8. These results were consistent with experiments conducted using known numbers and species of marine organisms suspended in the ballast water tanks in mesh cages.

Table 1.1. Ozone **mortality** compared to 64 % *S/T Tonsina* ballast water exchange efficiency. The percent removal is followed by an indication of whether removal of that particular organism was better than ballast water exchange (pass), or was not as good as exchange (fail).

Experiment Number (Sample Time)	Suspended Organisms						Benthic Organisms	
	Bacteria	Zooplankton	Phytoplankton		Sheepshead Minnow	Mysid Shrimp	Amphipods	Shore Crabs
			Dinoflagellates	Microflagellates				
Exp. 1 (5 hrs)	>99.9 % pass	67 % pass	N/A	N/A	2% fail	30 % fail	0 % N/C[1]	0 % N/C
Exp. 2 (5 hrs)	>99.9 % pass	43 % fail	94 % pass	92 % pass	N/A	N/A	N/C	N/C
Exp. 2 (10 hrs)	>99.9 % pass	82 % pass	N/A	N/A	8 % fail	77 % pass	15% N/C	10 % N/C
Exp. 3 (5 hrs)	>99.9% pass	85 % pass	100 % pass	97 % pass	N/A	N/A	N/A	N/A
Exp. 3 (10 hrs)	>99.9% pass	94 % pass	N/A	N/A	100 % pass	69 % pass	7% N/C	0 % N/C

[1] N/C = No comparison possible (i.e., benthic organisms not sampled during ballast water exchanges)

Table 1.2. Ozone mortality + moribund compared to 64 % S/T Tonsina ballast water exchange efficiency. The percent removal is followed by an indication of whether removal of that particular organism was better than ballast water exchange (pass), or was not as good as exchange (fail).

Experiment Number (Sample Time)	Suspended Organisms						Benthic Organisms	
	Bacteria	Zooplankton	Phytoplankton		Sheepshead Minnow	Mysid Shrimp	Amphipods	Shore Crabs
			Dinoflagellates	Microflagellates				
Exp. 1 (5 hrs)	>99.9 % pass	79 % pass	N/A	N/A	47 % fail	45 % fail	3 % N/C	0 % N/C
Exp. 2 (5 hrs)	>99.9 % pass	71 % pass	94 % pass	92 % pass	N/A	N/A	N/A	N/A
Exp. 2 (10 hrs)	>99.9 % pass	87 % pass	N/A	N/A	98 % pass	54 % fail	20 % N/C	10 % N/C
Exp. 3 (5 hrs)	>99.9 % pass	95% pass	100 % pass	97 % pass	N/A	N/A	N/A	N/A
Exp. 3 (10 hrs)	>99.9 % pass	99% pass	N/A	N/A	100 % pass	78 % pass	21 % N/C	0 % N/C

[1] N/C = No comparison possible (i.e., benthic organisms not sampled during ballast water exchanges)