Australian Government

Department of Agriculture, Fisheries and Forestry

Mr Keith Johnson
Managing Director
Commercial Diving Services Pty Ltd Australia
PO Box 126
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Dear Mr Johnson

Thank you for providing us with a presentation at the Department on 12 January 2009 on the Hull Surface Treatment (HST) technology that Commercial Diving Services Pty Ltd is proposing to apply to the cruise vessel Pacific Dawn in the port of Sydney. While it is not possible for the department to specifically endorse the HST system I have provided some comments below on our assessment of the biofouling risks managed by the system.

As we understood from your presentation, the HST is only to be used for managing primary biofouling on the Pacific Dawn and is proposed to be applied to both vertical sides port and starboard to the bilge keel, to the lower turn at Fore and Aft of bilge keels, and also over all sea chest gratings encountered.

The marine pest risk assessments that we have completed to date indicate that the introduced marine species most likely to represent a significant risk to Australia's marine environment and the industries that depend on it are tertiary biofouling species. By tertiary biofouling we mean sponges, ascidians, mussels, oysters, clams, gastropods, crabs, shrimps, seastars, sabellid worms and sea anemones. Assuming it is effective, the HST system as demonstrated in your presentation provides a mechanism to address primary biofouling. The treatment of primary biofouling in this way with the HST system would not present a biosecurity risk of concern to the Department.

However, in our view, the HST system would need to be applied in a regular manner commencing soon after a dry-docking to ensure that the biofouling on the vessel did not have the opportunity to exceed a primary level. We also note that your system does not attempt to address biofouling in niche areas (such as within sea chests, bow or stern thrusters, rudder hinges and bilge keels). These areas can accumulate significant biofouling and may pose a greater risk of harbouring tertiary biofouling. Vessel owners should consider specific action or the application of other biofouling control systems in these areas to ensure they remain free of biofouling.

We would welcome updates on the HST of the Pacific Dawn and if an opportunity arises, to see this technology being applied. We have consulted the Australian Quarantine and Inspection Service in preparing this response and they concur with the views expressed in this response. Please give me a call on 02 6272 4975 or email andrew.johnson@daff.gov.au if you have any further questions.

Yours sincerely

Andrew Johnson
Manager
Invasive Marine Species Program
29 January 2009

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27th February 2009

To whom it may concern,

Mr Keith Johnson of Commercial Diving Services Pty Ltd has requested my expert opinion surrounding whether his novel Hull Surface Treatment (HST) Technology poses a biosecurity and/or water quality risk through the introduction of biofouling pests and/or toxic biocides into the surrounding marine environment.

What qualifies me to provide this advice?

I have been researching the biosecurity risks associated with vessel biofouling for over 10 years. I began my interest in this area in 1996 by undertaking a Masters Degree in Applied Science with the Australian Maritime College, Tasmania where I investigated the biosecurity risks associated with biofouling on merchant vessels visiting northern Tasmania. In 1999, I joined Cawthron Institute in New Zealand as a Marine Biosecurity Scientist where I provided underpinning research for the development of policies and procedures for managing marine biofouling pests. Then in 2006 I joined the Australian Quarantine and Inspection Service as a Marine Pest Advisor to assist with the development of Australia's proposed Biofouling Management Requirements, including raising awareness of the issue through the International Maritime Organisation. It was during my pursuits for new environmentally-friendly technologies for mitigating the translocation of biofouling pests that I was first exposed to Mr Johnson's HST Technology during his visit to Canberra on 16 April 2008. I now work for Aquenal Pty Ltd in Hobart where I am responsible for managing marine pest related research and consultancy projects.

Biosecurity risk - biofouling pests

Removing and releasing biofouling into the marine environment through hull cleaning may facilitate the introduction of invasive marine pests. Hence, the Australian and New Zealand Environment and Conservation Council introduced a Code of Practice for antifouling and in-water hull cleaning and maintenance to discourage the practice (ANZECC 1997). However, these concerns largely surround the use of traditional rotational brush cleaning systems that are capable of removing high levels of biofouling (animal growth). Such high levels of biofouling are considered more likely to contain invasive biofouling pests, particularly in anomaly areas of vessels (e.g. bow thruster tunnels,

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underneath bilge keels, inside sea chests, and around rope guards, propellers and rudders) (Coutts 1999, Coutts and Taylor 2004; Coutts and Dodgshun 2007).

From my understanding, the HST uses thermal shock designed to treat only low levels of biofouling such as copper resistant algae that predominantly occur on the mainstream areas (i.e. flat-sides from the waterline to the turn of the bilge) of hulls that are responsible for causing significant hydrodynamic drag on vessels underway. While some vegetative stages of invasive marine algae can occur in these areas, they pose a low biosecurity risk relative to high levels of biofouling. However, the HST technology is capable of killing vegetative stages given the technology was originally based on treating juvenile stages of invasive marine alga (Wotten et al. 2004). More importantly, the HST does not clean or remove biofouling like rotational brush systems, but rather relies on thermal shock to kill the biofouling that remain attached to the hull until the vessel is underway. Therefore, in my opinion the HST is unlikely to pose a biosecurity risk because it: 1) treats low levels of biofouling that pose a relatively low biosecurity risk; 2) is capable of killing vegetative stage of invasive marine algae if present; and 3) sterilizes the hull surface without releasing defouled organisms into the surrounding environment.

Water quality – release of toxic biocides

Prior to the implementation of the ANZECC Code of Practice in 1997, it was common practice to remove unwanted biofouling while *in situ* using brushes. One study for example, demonstrated that approximately 95% of the total mass of copper biocides emitted into the marine environment over a four week period originated from the passive leaching, while only 5% originated from in-water hull cleaning (Schiff et al. 2004). However, in-water cleaning of antifouling coatings is known to significantly increase the release rate of toxic biocides beyond their normal leaching rates (e.g. Valkirs et al. 2003; Warnken et al. 2004). Conversely, the HST is unlikely to exacerbate the immediate release of biocides upon treatment because it does not clean, but sterilizes the hull surface. Furthermore, it is unlikely the biocides are able to be released from the treated surface until the dead algae is removed when the vessel is underway.

Overall, I sincerely believe the HST is a much needed environmentally-friendly solution for reducing the hydrodynamic drag on vessel hulls and greenhouse gas emissions, thus supporting Australia's commitments to the Kyoto Protocol.

Regards

Ashley Coutts - Senior Research Scientist - Marine Pests

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Effect of HST Treatment on surrounding harbour water

Brett Thompson
Ecowise NSW Laboratory Supervisor

Abstract
Ecowise Port Kembla supplied a sampling and analytical service to Commercial Diving Services (CDS) as an independent laboratory in relation to HST hull treatment procedures. The Port Kembla laboratory analysed samples taken by CDS and an Ecowise sampler in order to compare baseline concentrations of several stress indicators in Sydney Harbour with the concentrations found in water post HST treatment. It was found that the analysis was comparable and application of the HST treatment procedure did not have any observable affects on surrounding harbour water.

Introduction
A sampling and analysis scheme was undertaken to identify any changes to the surrounding harbour water as a direct result of HST treatment. The main environmental concerns identified by CDS and Ecowise were thermal shock; an increase in total suspended solids (TSS); eutrophication (excess nutrients e.g. nitrogen and phosphorus); and the leaching of biocides from the exterior antifouling paint of the hull.

The active biocide ingredients contained in the antifouling paint of the ship involved in the sampling scheme were cuprous oxide and zinc pyrithione. Copper (Cu) and zinc (Zn) were analysed in pre treatment and during treatment samples as representatives of the presence of the active ingredients. A significant increase in either metal would indicate leaching of the respective biocides.

Sampling location
Sampling location was kept consistent by sampling pre HST treatment harbour water and all HST treatments during sampling on the hull directly beneath lifeboat number 5 on the starboard deck of the “Pacific Dawn” at Darling Harbour in the Port of Sydney.

An Ecowise sampler accompanied the CDS team onto the harbour to collect independent samples. Samples were taken before HST treatment in order to establish a set of analysis representative of the surrounding harbour water. Duplicate samples were taken at the hull of the ship and approximately 30 meters perpendicular from the treatment site towards the middle of Darling Harbour.

Using an YSI multi-probe, temperature and pH were also recorded for the two sites, as well as at distances of approximately 20 meters, 15 meters, 10 meters and 5 meters from the hull.

Water directly influenced by the HST treatment was sampled by collecting duplicate samples of water directly above the device during operation. Although the path of the water would be influenced by harbour currents and harbour traffic, it was assumed that taking samples as close as possible to the device would give a worst case scenario for the affect of the treatment on surrounding harbour water.

Results and Discussion

Sample site	Cu (mg/L)	Zn (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)
Blank @ Hull 1	<0.01	<0.01	8	0.4	0.05
Blank @ Hull 2	<0.01	0.01	16	0.3	0.06
Blank @ 30m 1	<0.01	<0.01	31	0.2	0.05
Blank @ 30m 2	<0.01	<0.01	15	0.3	0.07
Process Water 1	<0.01	0.01	13	0.3	0.06
Process Water 2	<0.01	<0.01	15	0.3	0.07

Table 1 Analysis of Cu, Zn, TSS, TN and TP in harbour water before and during HST treatment.

The results in table 1 show that concentrations of Cu, Zn, TSS, TN and TP were comparable for both the surrounding harbour water and the water sampled during HST treatment.

Sample site	Temperature (°C)	pH
Baseline @ 0.5m	23.4	7.7
Baseline @ 5m	23.1	7.9
Baseline @ 10m	23.1	7.9
Baseline @ 15m	23.2	7.9
Baseline @ 20m	23.1	7.9
Baseline @ 30m	23.2	7.9
Process water 1	23.5	7.9
Process water 2	23.4	7.9

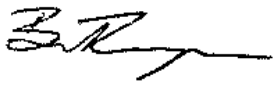
Table 2 Analysis of Temperature and pH in harbour water before and during HST treatment.

The results in table 2 show that temperatures and pH values were comparable between the surrounding harbour water and the water sampled during HST treatment.

Conclusion

This study was conducted by Ecowise to independently investigate the affects of HST treatment on chemical and physical properties of harbour water. Environmental issues such as thermal shock; an increase in total suspended solids (TSS); eutrophication; and the leaching of herbicides from the exterior paint of the hull were of main concern.

The results of field and laboratory analysis showed that concentrations and levels of the tested parameters in harbour water directly adjacent to HST treatment were not outside concentrations and levels of parameters expected in Darling Harbour water, within the Port of Sydney. Therefore no adverse effects of HST were identified by this study.



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