GESAMP
Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection

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Agenda item 7

NEW AND EMERGING ISSUES:
BY-PRODUCTS OF DISCHARGED DISINFECTION AND ANTI-FOULING AGENTS

Note by Mr. Jan Linders, Chairman of GESAMP Ballast Water Working Group (BWWG)

Introduction

1 During GESAMP 37 the question was raised as to whether the total amount of substances, including Total Residual Oxidants, (TRO) and disinfection by-products introduced into the coastal seas and oceans could pose a danger to the marine environment, (refer Report of GESAMP 37, paragraph 7.6, below). When active species such as chlorine interact with organic matter in seawater, a range of halogenated by-products can be produced. This paper discusses the possible cumulative effects of such substances and poses the question whether this is an emerging issue deserving more consideration than it has received to date.

> *"7.6 One member of GESAMP noted the rapid expansion of coastal energy generating stations, industrial cooling units and desalination plants in many developing countries, most of which rely on electrolytic chlorination to prevent fouling. Attention was drawn to substances of concern such as Total Residual Oxidants (TRO) as well as halogenated disinfection by-products, which occur when chlorine interacts with organic matter. It was pointed out that GESAMP's WG 34 was in possession of a growing body of data on the composition and concentrations of chlorination by-products such as halomethanes, e.g. bromoform and haloacetic acids as well as standardized environmental hazard data, which might be of use to other organizations when assessing the potential environmental impact of electrolytic antifouling systems. Recommended standards for Total Residual Oxidants (TRO) differ nationally and regionally; the World Bank discharge standard being 0.2 mg/L but which allows up to 2mg/L for shorter periods within 24h….."*

2 At GESAMP 38, having deferred the matter to GESAMP 39 due to lack of time, decided to consider this further under Scoping Activities, in particular environmental quality standards. The initiative to submit this paper under GESAMP's New and Emerging Issues agenda item was taken following comments made by GESAMP members during the peer review of recent WG 34 Reports (Ballast Water Working Group). It is considered that to understand the potential impact of disinfection by-products, other major sources than just shipping should be examined, e.g. coastal power plants and desalination plants using seawater for cooling and electrolysis to produce chlorine for anti-fouling purposes.

Aim of the investigation

3 The aim of the investigation could be that based on data available in the scientific literature on disinfection by-products (DBP), ballast water management systems (BWMS) and industrial cooling units and desalination plants, an overview may be prepared on the scope and relative importance of the introduction of these substances to the marine environment.

Approach

4 There are several ways chlorination related chemicals may be introduced into the marine environment:

- Industrial cooling units;
- Desalination plants; and
- Ballast water management systems.

5 Each of these emission routes would need to be further analyzed with respect to the amounts and environmental significance, especially with respect to the natural production of DBP-related chemicals, the most important of which is bromoform. Some useful information in DBP is given below. Industrial cooling units and desalination plants use chlorine concentration between 0.1 and 0.5 mg Cl2/L, incidentally up to 0.7 mg Cl2/L and generally produce bromoform concentrations in the order of 15 µg/L. According to Grimvall and de Leer (1995), the annual production of a number of organohalogens is:

Substance	Amount naturally produced
chloromethane	5.000.000 t
bromomethane	300.000 t
iodomethane	300.000 t to 1.200.000 t
chloroform	90.000 t to 360.000 t
bromoform	500.000 t to 1.000.000 t
iodoform	Not detectable in sea water

6 Typical water flows for large power plants are 0.02 – 0.034 m3/s/MWth. Consumption of water varies between 0.5 m3/h/MWth for an open hybrid tower and up to 86 m3/h/MWth for an open once-through system.

Results

7 The result of the study would be a comparison between the different sources of chlorination related chemicals in marine waters. As the emission of these chemicals coming from ballast water management systems is a rather new potential threat to the marine environment it would be interesting to conclude on the relevant importance of these sources.

Timing

8 The project could be completed in about 2 years as a rough estimation of run through time. The real working time needed should be estimated much smaller, maybe 8 to 10 weeks.

Action requested of GESAMP

9 GESAMP 39 is requested to examine the proposal and conclude on the relevance and if considered relevant to form a project group, a term of reference and a planning.

References:

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