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## **Paints and varnishes — Modelling of biocide release rate from antifouling paints by mass-balance calculation**

*Peintures et vernis — Modélisation du taux de lixiviation des biocides contenus dans les peintures antisalissures par calcul du bilan massique*



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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

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## Introduction

The actual release rate of biocides from antifouling paints on ships' hulls into the environment will depend on many factors, such as ship operating schedules, length of service, berthing conditions, paint condition, as well as the temperature, salinity, pH, pollutants and biological community in a particular area. However, based on knowledge of the composition of the paint and its specified lifetime and application thickness, an estimate of the mean biocide release rate from an antifouling paint over its specified lifetime can be obtained by the mass-balance calculation method described in this International Standard. The calculation also allows an estimate to be obtained of the cumulative mass of biocide released over the first 14 days, and also the total mass of biocide released over the specified lifetime.

This method is intended to provide estimates of the amount of biocide released into the environment that are more suitable for use in environmental risk assessments than the results of laboratory-based test methods, such as ISO 15181 (all parts)<sup>[1]</sup>, ASTM D6442<sup>[2]</sup> and ASTM D6903<sup>[3]</sup>. Biocide release rate data is a key input to the environmental risk assessment process for antifouling products, and so it is vital that the estimated biocide release rate that is used be both accurate and representative of the release rate to the environment in the relevant scenario and risk assessment case. In comparison with *in situ* biocide release rate values obtained by either direct or indirect measurements of the organotin and copper release rate from ships' hulls and from measurements made on panels exposed in harbours, all available data indicate that the results obtained using this calculation method overestimate the release rates of biocides under environmentally relevant in-service conditions. Published results demonstrate that the results of this calculation method are generally higher than direct *in situ* measurements of copper release rate from the hulls of harboured ships by a factor of about 4 or more for several commercial antifouling coatings<sup>[4]</sup>. A similar relationship is expected to be found for other biocides. Where the results of this calculation method are used in the process of generating environmental risk assessments, producing environmental loading estimates or for regulatory purposes, it is most strongly recommended that the relationship between calculated release rates and actual environmental inputs be taken into account to allow the most accurate and representative estimate of the biocide release rate from antifouling coatings under real-life conditions to be obtained. This can be accomplished through the application of appropriate correction factors<sup>[4]</sup>.