

BIOFOULING ISSUE, GLOBAL IMPLICATIONS AND SOLUTIONS LINKED TO OFFSHORE BUSINESS

J A González, H J G Polman, L C Venhuis, M C M Bruijs and G van Aerssen, DNV KEMA Energy & Sustainability, The Netherlands

SUMMARY

Biofouling is a problem well known to industries, manufacturers and researchers in various fields (i.e. heat transfer, marine engineering and power generation). During the last years, biofouling is also affecting to the offshore industries and its partners. The undesirable attachment of organisms to different kind of surfaces leads to significant impacts, both economic and operational. Some of them could be the loss of equipment's design parameters, the loss of total equipment efficiency, the increasing of unscheduled maintenances (i.e. dry dock unscheduled routines), and the impact over day rates associated to offshore industry. Besides that, there are other factors to take into account, like the environmental impact and the local government regulations. DNV KEMA Energy & Sustainability has developed and applied dedicated techniques, offering customized monitoring and antifouling solutions for clients around the world. The present article intends to describe a selection of these techniques and their potential application into offshore energy business.

1. INTRODUCTION

The appearance of biofouling in industrial processes, in which sea water is involved, is an inherent part of the daily operation. Sea water is a readily available resource; the main drawback is that biological organisms present in the bulk seawater, under certain working conditions cause biological layers (biofilm) and macrofouling populations in different working areas of the facility. The consequences of this occurrence is mainly reflected in losses of thermal performance of facilities, economic losses, inability to carry out proper maintenance practices, etc.

Marine and offshore environments are quite susceptible to be affected by biofouling. So, it could play an important role on the development and operation of the new types of renewable energy linked to marine and offshore renewable energy's exploitation. Concerning this topic, new energy initiatives linked to marine go together with classical marine and offshore applications related to goods transport and oil-gas resources exploitation.

It is important to recognise that biofouling is an important issue, resulting in significant economical and technological impacts. It is an important topic to consider in the development of the new renewable technologies linked to marine and offshore fields. The proper consecution of this objective will revert into well prepared alternatives, able to face the future challenges this type of industries will need in a short term.

The present paper intends to show the background of biofouling development. Besides that the economical implications over the equipments and industries are covered as well. A review of the most common methods of biofouling mitigation will be reviewed. Last but not

least, the DNV KEMA Energy & Sustainability monitoring and antifouling solutions will be showed and explained.

2. FOULING

2.1 DEFINITION

Fouling is the formation of deposits on the equipment surfaces. This type of deposition originates significantly decreases on the equipment performance and/or the operational lifetime of the equipment.

2.2 TYPES OF FOULING

The main types of fouling are as follows (Epstein, 1981) [1]:

- Biological Fouling: the settlement and growth of microorganisms (biofilm) and macroorganisms such as mussels, oysters, barnacles, etc.
- Chemical reaction fouling: concerning the deposits formed by chemical reaction in which the substratum (e.g. condenser tube) is not a reactant. Polymerization of petroleum refinery feedstocks is an important example of this type of fouling.
- Corrosion fouling: occurs when the substratum itself reacts with compounds in the liquid phase to produce a deposit.
- Freezing fouling: due to the solidification of a liquid or some of its higher melting point constituents on a cooled surface.
- Particulate fouling: accumulation on the equipment surface of finely divided solids suspended in the process fluid. Sedimentation fouling is an appropriate term if gravity is the primary mechanism for deposition.