Guidelines for the assessment of ageing and life extension of non-metallic components in the offshore oil and gas industry, volume 2: composite equipment and repairs

energy institute

GUIDELINES FOR THE ASSESSMENT OF AGEING AND LIFE EXTENSION OF NON-METALLIC COMPONENTS IN THE OFFSHORE OIL AND GAS INDUSTRY, VOLUME 2: COMPOSITE EQUIPMENT AND REPAIRS

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FOREWORD

The intention of this publication is to provide guidance for the assessment of ageing and life extension of non-metallic components in the offshore oil and gas industry.

The aim is to capture industry good practice, knowledge and learning on these elements of non-metallics. The expectation is that this new guidance will proactively provide support for assessment of ageing and life extension of non-metallic composite materials used offshore in pressure containing or structural applications in the offshore oil and gas industry.

Experience gained mainly within the UK Continental Shelf (UKCS) operations has been collated and reviewed. However, experience gained elsewhere throughout the world has also contributed and therefore this report is also useful for companies operating in other regions.

Although it is anticipated that following this publication will assist those involved in the management of composite repairs, the information contained in this publication is provided as guidance only. While every reasonable care has been taken to ensure the accuracy of its contents, the EI, and the technical representatives listed in the acknowledgements, cannot accept any responsibility for any action taken, or not taken, on the basis of this information. The EI shall not be liable to any person for any loss or damage which may arise from the use of any of the information contained in any of its publications.

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Suggested revisions are invited and should be submitted to the Technical Department, Energy Institute, 61 New Cavendish Street, London, W1G 7AR.

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1 INTRODUCTION

1.1 BACKGROUND

There is limited advice available regarding the management of ageing and degradation, and the subsequent life assessment of composite components in the offshore industry. With non-metallic materials becoming more prevalent in industry, there is a need to understand the risks to materials' performance and potential damage mechanisms.

The aim of this document is to capture industry good practice, knowledge and learning on these elements of composite materials. The expectation is that this new guidance will proactively (collaboratively, as an industry) provide a starting point for assessment of ageing and life extension of non-metallic composite materials used offshore in pressure containing or structural applications in the offshore oil and gas industry, specifically composite equipment and repairs. There is much work still to be done to be able to accurately quantify ageing and life extension for composites, and it is expected that this document will be developed as more experience is gained in these areas in the industry.

Experience gained mainly within UKCS operations has been collated and reviewed. However, experience gained elsewhere throughout the world has also contributed and therefore this report is also useful for companies operating in other regions.

The guidelines were developed purely from the results of existing research, commercial project findings, and operational experience summarised and shared during the consultation.

This document may be read in conjunction with the recently produced EI document *Guidance on management of engineered composite repairs: End user good practice guidance*, which has documented agreed good practice regarding the use of composite repairs on damaged containment equipment, following a number of unexpected failures due to poor installation, deficient design, inadequate specification and unsuitable application.

1.2 SCOPE

This document is concerned with the ageing, degradation and failure mechanisms of composites in offshore environments – whether they be subsea, in the splash zone, buried, or atmospheric/ topside. Internal and external environmental effects are considered where applicable.

The configurations of interest include:

– composite pipe and liners;
– composite handrails, gratings, stairways (although there is limited experience in these areas, therefore this is an area for future expansion of the guidance), and
– repairs to metallic pipe/pressure containing equipment and tanks and/or structures, noting EI *Guidance on management of engineered composite repairs: End user good practice guidance*.

Excluded from consideration are:

– composite repairs on composite pipe;
– composite rotating and reciprocating equipment;
– composite subcomponents of complex equipment, e.g. flow meters, turbines, and
– downhole and drilling equipment.