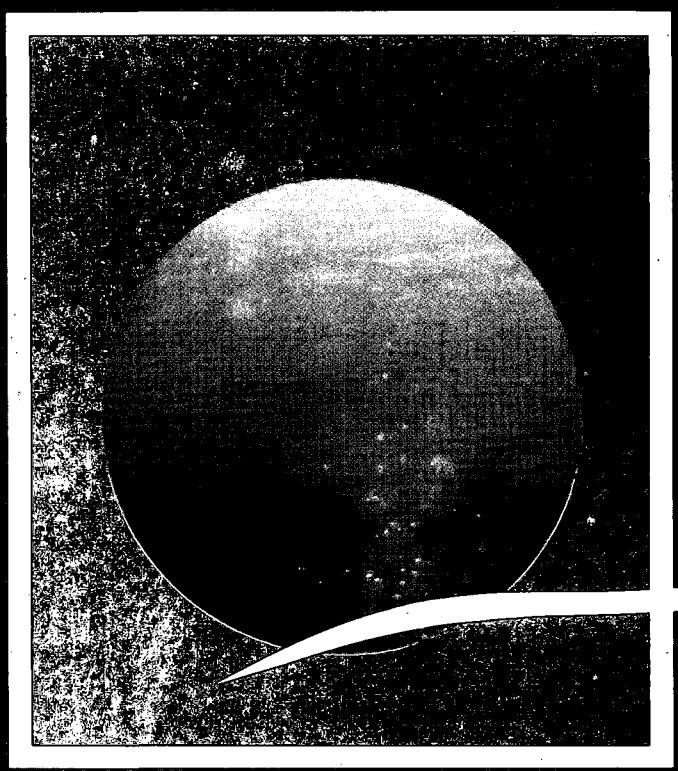
On-site checks for underwater video picture quality



THE MARINE TECHNOLOGY DIRECTORATE LIMITED

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For further details, contact:

The Director and Chief Executive
The Marine Technology Directorate Limited
19 Buckingham Street
London WC2N 6EF
Telephone 071-321 0674
Facsimile 071-930 4323

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19 Buckingham Street, London WC2N 6EF, UK Telephone 071-321 0674 Fax 071-930 4323

Foreword

The project leading to this procedures document was undertaken to establish a common standard for acceptable picture quality for underwater video.

The project was initiated by the Marine Technology Directorate Ltd as a multi-sponsor project and was funded by the ten oil companies listed below. The necessary investigations and development that led to the procedures were undertaken under contract to MTD Ltd by Marine Offshore Management Ltd by Mr M Clarke, Mr G Ledingham and Mr P Martin, with sub-contract work by Dr B Ray at The Robert Gordon University (formerly RGIT). The MTD Ltd project manager was Mr R W Barrett, who also chaired the project Steering Group.

The acceptance thresholds shown in Chapter 3 have been derived from a statistical analysis of assessments of picture quality made by a panel of viewers drawn from representatives of the project participants. In this part of the project, underwater scenes recorded using broadcast-quality equipment were degraded to successive measured levels, and the panel judged the acceptability of each example. Based on a test kit originally prepared by Shell, the procedures contained in this publication have been designed to enable equipment intended to be used for a specific underwater video task to be checked against the relevant acceptance thresholds derived in the project. During drafting, the procedures were tested on a wide selection of cameras at various underwater contractors and suppliers. They were also tested on an offshore contract by British Gas prior to their issue.

The following oil companies sponsored the development of the procedures:

Amoco (UK) Exploration Company
ARCO British Ltd
British Gas Exploration and Production Ltd
British Petroleum Development Ltd
Chevron UK Ltd
Elf UK plc
Marathon Oil Company
Phillips Petroleum Company UK Ltd
Shell UK Exploration and Production
Texaco Britain Ltd.

A Steering Group comprising representatives of the participants, MTD Ltd and the technical services contractors has provided a forum for dicussion during the project. The Steering Group comprised:

Mr R W Barrett	The Marine Technology Directorate Ltd
Mr P Blake	Texaco Britain Ltd
Mr R Bradley	Texaco Britain Ltd
Mr M Clarke	Marine Offshore Management Ltd
Mr D R Grady	Marathon Oil UK Ltd
Mr G Hogg	Shell UK Exploration and Production
Mr R Holt	BP Exploration
Mr B Jones	British Gas Exploration and Production Ltd
Mr R King	Phillips Petroleum Company Ltd
Mr I Mullen	Chevron UK Ltd
Mr A Newham	Marathon Oil UK Ltd
Dr B Ray	The Robert Gordon University
Mr J Robertson	Phillips Petroleum Company Ltd
Mr G Robinson	British Gas plc
Mr J K Smith	Amoco (UK) Exploration Co
Mr P Thiberge	Elf Aquitaine
Mr I Walls	BP Research Centre
Mr W Wells	ARCO British Ltd.

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1. Introduction

1.1 USES OF VIDEO UNDER WATER

Underwater video cameras with associated recording and viewing equipment are used extensively in offshore and marine engineering for observation and inspection tasks.

Different types of cameras are used, depending on the task to be performed. Table 1 indicates those used for the most common underwater video tasks. This table is important in the context of the picture quality tests and thresholds described in this publication because specific quality thresholds are appropriate for particular underwater tasks. The fundamental operating principle of the camera, on the other hand, is not relevant to picture quality testing, and so tube and CCD (charge coupled device) cameras are not separately itemised in the table. Whatever the operating principle of the camera, it should satisfy the picture quality requirements for its end use, not its camera type.

Table 1 *Cameras used for different underwater tasks*

Task	Wide-angle lens			Standard lens		
	Black & white	Colour	Intensified target	Black & white	Colour	Intensified target
Observation						
Drilling support	X			X	X	
Diver observation	X	X	X	X	X	X
ROV navigation			X			X
Construction observation	X	X		X	X	X
Inspection						
ROV general visual inspection	X	X		X	X	
ROV close visual inspection				X	X	
Diver general visual inspection	X	X		X	X	
Diver close visual inspection				X	X	
Specialist applications						
Arc welding monitoring	X	X		X	X	

Wide-angle lenses are capable of viewing over an angle greater than 90°.

Standard lenses are limited to viewing over an angle of up to 90°.

Intensified target cameras are used in low light level conditions and include SIT and ICCD cameras. They are usually fitted with wide-angle lenses but can have standard lenses.

Close visual inspection is the kind of inspection that normally involves prior cleaning of a surface.

General visual inspection normally involves no cleaning.

1.2 PURPOSE OF TESTING

Prior to the publication of this document, there has been no common, definitive, standard for acceptable quality of underwater video pictures. As a result, videos of a wide range of qualities have been produced for underwater inspection, and this obviously leads to confusion, on site and in the office, as to exactly what quality is acceptable and what is not. Because acquisition of underwater video is an expensive operation, there is a temptation to accept footage of marginal quality rather than incur the downtime and remobilisation costs of obtaining better quality. Also, with no recognised quality standard, video accepted by one organisation may not be accepted by another, so that underwater contractors have a plethora of perceived needs to aim for. Quality levels affect contractors' costs through the costs of technical support and of providing and maintaining video equipment.

To overcome these problems, this document describes tests to be used on site to check whether specific equipment will produce video of acceptable quality. It is hoped that these procedures will become an industry-wide standard and, by using them, subsea engineers will know exactly what minimum quality of video to specify and expect.

1.2.1 Scope and limitations

The tests described are designed for use on industrial video systems used in connection with:

- offshore inspection
- inspection of dock and harbour installations
- inspection of fresh water installations
- inspection of underwater structures and vessel hulls.