Attributes of Production Chemicals in Subsea Production Systems

API TECHNICAL REPORT 17TR6
FIRST EDITION, MARCH 2012

AMERICAN PETROLEUM INSTITUTE

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Upstream Segment

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Foreword

This document was generated, by means of the BASICS Joint Industry Project (JIP) in response to the continuing problem of blockages occurring in control and chemical injection fluid conduits incorporated in subsea production systems (SPSs). The JIP committee comprised a representative cross section of experienced industry personnel from engineering, manufacturing and operational organizations.

Shall: As used in a standard, “shall” denotes a minimum requirement in order to conform to the specification.

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Contents

Introduction

Production chemicals delivered to a subsea production system (SPS) via a chemical injection system can be complex formulations that have a wide range of chemical and physical properties. In service, the production chemicals can come into contact with other fluids, metallic and polymeric materials, and a range of physical conditions in respect of temperature and pressure. Inadequate specification can therefore result in failure to deliver a production chemical to the required production system location.

The intent of the BASICS JIP is to produce a Specification (Spec) standard for global industry use to address this problem. This document has been developed with the objective of minimizing the risk of a production chemical not being delivered at the required volumetric rate, due to inadequate specification of the production chemical delivery system, or formation of restrictions or blockages in that system.

To do this, the document specifies parameters that address manufacture, storage and transportation of the production chemical, as well as its deployment using the SPS chemical injection system. The document provides for two approaches, requiring that parameters be either:

1) measured and reconciled with SPS design and operation; or

2) meet or exceed acceptance criteria specified, either in this document or by manufacturers of production chemicals or equipment used to deliver production chemicals.

Attention is drawn to the fact that in addition to the assessment and testing specified in this document, project specific assessments and tests may be required, and these should be agreed between the purchaser and the production chemical supplier or equipment manufacturer, as appropriate.

This document takes into account, many aspects of conventional SPS design and operation and also some common aspects of SPS failure that can impact on the application of a production chemical in an SPS. It should be noted however that any SPS can have specific features that in the event of failure may result in a blockage or restriction. Such system specific features and failures are not addressed by this document.

This document is intended to be applicable to all subsea developments, irrespective of whether the development is in shallow or deep water. However, it should be recognized that the significance of a blockage or restriction can be significantly different for a deepwater development relative to a shallow water development. Consequently, more rigorous application of the verification program could be appropriate for a deepwater development.

Attributes of Production Chemicals in Subsea Production Systems

1 Scope

This document identifies and specifies the essential attributes of production chemicals intended to be introduced to subsea oil and gas production systems.

The document is intended for use by chemical suppliers to facilitate the provision of chemicals compatible with existing and intended subsea production systems (SPS) although it is envisaged that use of the document for specification purposes by the operators of such processes, will assist in ensuring the completeness of requests to supply.

The application of the document requires acceptance of the principle that it is the supplier's responsibility to ensure that the chemicals supplied are fit for purpose and safe to use, although it is acknowledged that this responsibility can only be fulfilled if specification of requirements is complete. To this end the document identifies essential information that only SPS designers and operators can provide but without knowledge of which, suppliers should not supply. In the requirements of this document, responsibility for obtaining these items of critical information is placed upon the supplier, in the expectation that designers and operators will respond with their ready provision.

The functional performance of production chemicals is outside the scope of this document.

The assessments and tests specified in this document are not intended to qualify materials for use in an SPS in respect of pressure containment, mechanical load, cyclic mechanical load, or other design parameters.

The chemical-chemical compatibility of production chemicals at their respective application concentrations is also outside the scope of this document as is the effect of any incompatibility on their respective functional performance.

Finally, this document does not consider the health, safety, or environmental (HS&E) implications of deploying a production chemical in an SPS.

NOTE Attention is drawn to the fact that the tests specified in this document can generate data and information about the effect of a chemical/material incompatibility on the integrity of a material used in a SPS, that could necessitate additional testing, outside the scope of this document. Such additional testing should however be undertaken in order to ensure that all possible mechanisms that could threaten the integrity of a production, transportation, or chemical injection system are fully evaluated.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification 17D/ISO 13628-4, *Subsea Wellhead and Christmas Tree Equipment*

ASTM D471 [1], *Standard Test Method for Rubber PropertyEffect of Liquids*

ASTM D543, *Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents*

ASTM D638, *Standard Test Method for Tensile Properties of Plastics*

ASTM D664, *Standard Test Method for Acid Number of Petroleum Products by Potentiometric Titration*

[1] ASTM International, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428, www.astm.org.

ASTM D1141, *Standard Practice for the Preparation of Substitute Ocean Water*

ASTM D1298, *Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*

ASTM D4289, *Standard Test Method for Elastomer Compatibility of Lubricating Greases and Fluids*

ASTM G1, *Standard Practice for Preparing, Cleaning, and Evaluating Corrosion Test Specimens*

ASTM G31, *Standard Practice for Laboratory Immersion Corrosion Testing of Metals*

ASTM G46, *Standard Guide for Examination and Evaluation of Pitting Corrosion*

ISO 3771 [2], *Petroleum products—Determination of base number—Perchloric acid potentiometric titration method*

ISO 6073, *Petroleum products—Prediction of the bulk moduli of petroleum fluids used in hydraulic fluid power systems*

ISO 10523, *Water quality—Determination of pH*

ISO 13628-5, *Petroleum and natural gas industries—Design and operation of subsea production systems—Part 5: Subsea umbilicals*

IP 160 [3], Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method

SAE AS4059 (2005) [4], *Aerospace fluid power—Cleanliness classification for hydraulic fluids*

3 Terms, Definitions, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1.1
attribute
Feature of a subsea production system that is fixed and inherent to the existence of the SPS.

NOTE Examples of SPS attributes are a material of construction or the volume of a vessel.

3.1.2
bacteriostat
Biological or chemical agent that prevents bacterial reproduction without killing or otherwise harming the bacteria.

3.1.3
barrier
Element forming part of a pressure-containing envelope which is designed to prevent unintentional flow of produced/injected fluids, particularly to the external environment.

[2] International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, www.iso.org.
[3] Energy Institute, 61 New Cavendish Street, London W1G 7AR, UK. www.energyinst.org
[4] Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096-0001, www.sae.org.