AWES

Advanced Well Equipment
Standards Group

AWES Recommended Practice For Elastomers

AWES Recommended Practice: 3362_66

OTM Networks

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Thanks to the following companies for their contributions to this document:

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1. Foreword

AWES (Advanced Well Equipment Standardization) is a global industry workgroup formed under the guidance of OTM Consulting. Invitation to this group has been extended to members of various branches of the oil and gas industry including oil and gas exploration and production companies, service companies and materials vendors.

The main task of this technical committee is to prepare an international recommended practice based on the statement of requirements of the end users of said elastomers. This committee and the resultant recommended practice will not be designed to hamper innovation of equipment developed by suppliers/manufacturers. Instead, the focus has been dedicated to standardizing the qualification testing criteria of said equipment as per mutually agreeable conditions.

This document is only valid if it has been verified to be the latest revision.

2. Introduction

This recommended practice has been developed by users/purchasers and suppliers/manufacturers of elastomers that are intended for use in the oil and gas industries as well as other applicable applications. This recommended practice is intended to provide requirements and information to both parties regarding qualification testing performed on the device to validate the functional specification.

Users of this recommended practice should be aware that requirements above those outlined in this recommended practice may be needed for individual applications.

This recommended practice is not intended to inhibit a supplier/manufacturer from offering, or the user/purchaser from accepting, alternative equipment or engineering solutions. This may be particularly applicable where there is innovative or developing technology. Where an alternative is offered, the supplier/manufacturer should identify any variations from this recommended practice.

3. Scope

This document provides a guideline for elastomer selection and qualification. Relevant industry specifications and general practices are referenced with recommended test parameters for various applications.

4. Technical Information

4.1 Background For Elastomer, Rubber, and Compounds

The terms elastomer, rubber, and compound are used interchangeably in practice, though distinct definitions are given in ISO 1382:2020. They all require an initially amorphous assembly of long polymer chains which, after substantial deformation on short timescales, return roughly to their original shape. Over longer timescales, an *elastomer* exhibits permanent deformation due to plastic flow of molecular chains. On the other hand, a *rubber* is a thermoset material that has chemical crosslinks between polymer chains to impose long-term dimensional stability. A *compound* refers to one or more rubbers mixed with all the ingredients necessary to form a finished product. It can be as simple as one base elastomer and one crosslinking agent, but today even the most basic unfilled compounds have at least 5 ingredients, with perhaps 8 to 15 being typical in filled compounds. Throughout this document, the terms introduced in this section assume that the material is crosslinked unless otherwise specified.

4.2 Common Oilfield Elastomers

In the oil and gas industry, rubber products come in a wide range of materials and configurations. They are commonly employed as sealing materials because they readily deform into surface imperfections to restrict leak paths. Rubber products can be notoriously difficult to design. For material selection, numerous parameters must be considered such as pressure, temperature, and fluid compatibility. Oilfield rubbers are subjected to complex tribological conditions, geometric variations as loads change, and evolution of mechanical properties with time and temperature. Downhole fluids are harsh and diverse, ranging from acids to bases which may be in aqueous or oil suspensions. Thermal, mechanical, and chemical aging are present, and these can contribute to product failures. Thus, it is useful to have guidelines for material selection in different operational environments that may be encountered.

Within elastomers, there are many classes and grades. The scope of this specification is to focus on elastomers generally called rubbers and classified in ASTM D1418. ASTM D2000 is a standard created in attempts to minimize the variations of properties from multiple vendors in order to provide a level of consistency in performance for elastomeric products. There are various line call outs relating to physical and chemical attributes with specification limits which must be met. Chemical structures have many variations, examples of which are shown throughout this section.