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IEEE Recommended Practice for Field Testing Electric Submersible Pump Cable

IEEE Industry Applications Society

Sponsored by the
Petroleum and Chemical Industry Committee

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Abstract: Procedures and test voltage values for acceptance and maintenance testing of electric submersible pump (ESP) cable systems are presented. This recommended practice applies to cable systems rated 3 kV and 5 kV (phase to phase) and is intended only for this special-purpose cable. The intent is to provide uniform test procedures and guidelines for evaluation of the test results.

Keywords: cable ampacity, cable maintenance, cable testing, conductors, field testing, IEEE 1017™, submersible pump cable

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Introduction

This introduction is not part of IEEE Std 1017-2013, IEEE Recommended Practice for Field Testing Electric Submersible Pump Cable.

This recommended practice, under the jurisdiction of the Petroleum and Chemical Industry Committee of the IEEE Industry Applications Society, may be used by anyone desiring to do so and is presented as minimum criteria for installation and field testing of this class of submersible cable. It is not intended to restrict innovation or to limit development of improvements in cable design. Every effort has been made to assure the accuracy and reliability of the data contained herein. However, the committee makes no representation, warranty, or guarantee in connection with the publication of this recommended practice and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use, for any conflict, or for the infringement of any patent resulting from the use of this recommended practice.

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1. Overview

1.1 Background

Guidance for the field and maintenance testing of conventional power cable is available in IEEE Std 400™ [1]; however, that document is not an applicable guide in assessing the condition of electric submersible pump (ESP) cable. By adopting some principles set forth in IEEE Std 400 and applying others developed from field experience, this recommended practice for submersible cable testing will assist those persons with the responsibility of determining the dielectric condition of this type of cable.

This recommended practice proposes the use of direct current (dc) because of its advantages over alternating current (ac). These advantages are as follows:

a) Smaller test equipment may be used

b) It minimizes damage when a fault occurs, which aids in fault examination

c) Improved safety due to smaller charging current compared to conventional frequency testing

[1] Information on references can be found in Clause 2.

This recommended practice is for cables without a connecting motor-lead extension cable or surface connecting cable, and it is primarily for armored cables; however, unarmored cables can be tested by submersing them in water.

This recommended practice does not require that testing be performed, either at the time of installation or periodically thereafter, for acceptance or maintenance. It sets forth the consensus of currently known good practice in testing methods, with interpretation of results.

1.2 Scope

Procedures and test voltage values for acceptance and maintenance testing of ESP cable systems are presented. Installation and handling practices are also covered. This procedure applies to cable systems rated 3 kV and 5 kV (phase to phase).

1.3 Purpose

The purpose of this recommended practice is as follows:

a) Provide a guideline for performing leakage current test so it can be used as a cable quality tool

b) Provide guidelines for evaluation of the test results

c) Define terms that have a specific meaning to the recommended practice

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

API RP 11S6, Recommended Practice for Testing of Electric Submersible Pump Cable Systems.

API RP 500, Recommended Practice for Classification of Locations for Electrical Installation at Petroleum Facilities Classified as Class I, Division 1, and Division 2.

NFPA 70®, National Electrical Code® (NEC®).[2, 3]

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