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Effect of conductivity on multipass testing as per ISO 4548-12:2017

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National foreword

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Foreword

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This document was prepared by Technical Committee ISO/TC 70, *Internal combustion engines* Subcommittee SC 7, *Tests for lubricating oil filters*.

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Introduction

ISO 4548-12:2000 and ISO 4548-12:2017 state that oil (MIL-PRF-5606, AIR 3520 and other suitable fluids) conductivity is to be set to "at least 1 000 pS/m" prior to conducting a lubricating oil filter, with a recommended level of "1 500 pS/m +/- 500 pS/m." Prior to the revision of ISO 4548-12:2000 (started in 2016), fluid conductivity had received increasing attention. Some labs reported issues with maintaining fluid conductivity during these tests and discussed the effects conductivity can have on filter capacity results. Testing showed the fluid conductivity can decrease during a test, which corresponded to an increase in filter capacity. A task force was established within ISO/TC70/SC7/WG2 to investigate this issue. Findings from this work are summarized in this document. The root cause of the fluid conductivity problem was not discovered and most labs did not report any issues with maintaining conductivity during ISO 4548-12 testing.

Experiments were conducted by one laboratory, oil was examined by two laboratories, and survey results were sent from nine laboratories. Three sets of experiments were conducted including testing with flat sheet samples and commercially available filters to examine the effect of fluid conductivity change. Fresh and aged oil were examined to see if any components of the fluid were depleted during normal use.

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TECHNICAL REPORT **ISO/TR 6307:2023**

Effect of conductivity on multipass testing as per ISO 4548-12:2017

1 Scope

This document outlines the importance of conductivity in multi-pass filter testing per ISO 4548-12. This information also applies to filters tested per other multi-pass filter test standards, such as ISO 16889 and ISO 19438. Filters tested according to each method can experience similar changes in performance during the fluid conductivity changes outlined within this document.

The objectives of this document are to clarify the following issues:

— Examine how conductivity affects filter capacity test results when filters are tested per ISO 4548-12:2017.

— Compare findings to ISO 4548-12:2017 operating parameters.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 4548-1, *Methods of test for full-flow lubricating oil filters for internal combustion engines — Part 1: Differential pressure/flow characteristics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4548-1 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Reference filter testing

This issue was first reported after a lab used “reference filters” to monitor the consistency of their multi-pass test system. These are typical production spin-on filters, but specifically manufactured to limit filter-to-filter variation. These reference filters are constructed with synthetic media and a media area of 3 039 cm^2. These filters are typically used as hydraulic/transmission oil filters on heavy-duty diesel engines for off-road equipment.

From 2012 to 2015, this lab gathered data from periodic testing of these reference filters per ISO 16889:2008 (Figure 1). Initial and final conductivity were logged during this testing. Test technicians noticed final conductivity would significantly drop during some tests, corresponding with a higher than expected capacity. Specific parameters of this testing are shown below.

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