



**SURFACE
VEHICLE
RECOMMENDED
PRACTICE**



J1165 MAY2012

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Superseding J1165 MAR1986

Reporting Cleanliness Levels of Hydraulic Fluids

RATIONALE

This document is no longer needed as industry standard is now ISO4406. No further work should be done on this document.

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Foreword—This Reaffirmed Document has not changed other than to put it into the new SAE Technical Standards Board Format.

1. Scope—This SAE Recommended Practice has been formulated to advance and endorse the use of the ISO (International Organization for Standardization) Solid Contaminant Code as the universal means for expressing the level of particulate contaminant in hydraulic fluid and for specifying acceptable limits of cleanliness. Worldwide approval was gained for this coding system because it provides a simple, unmistakable, meaningful, and consistent means of communication between suppliers and users. The code applies to all types of hydraulic (liquid) fluids used in fluid power and control systems as applied to self-propelled machines as referenced in J1116.

1.1 Purpose—The purpose of this recommended practice is to provide a practical and uniform method for graphically representing the contamination level of a fluid and assigning its proper ISO Cleanliness Code. Although the approval code is explicit and offers no opportunity for misinterpretation, flexibility in application is provided to satisfy the customs of the cooperating nations. This recommended practice is intended to facilitate the use of the ISO code and encourage its promulgation throughout the industry.

2. References

2.1 Applicable Publication—The following publication forms a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATION—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J1116, Categories of Off-Road Self-Propelled Work Machines

3. Background—Many attempts have been made to devise an ideal means for ranking the contamination level of hydraulic fluids with respect to the particle size population. The most notable of these are the disavowed SAE, ASTM, and AIA Levels, NAS 1638, and MIL-STD-1246A. Since these methods were predicated on the existence of fixed contaminant distributions, they are no better than using the two fundamental characteristics of the contaminant - the gravimetric level and the particle concentration of a specified distribution per unit volume of fluid. The cleanliness level spectrum covered by the various methods is reflected in Table 1. Basically all of the methods assume a fixed particle size distribution (roughly corresponding to that of ACFTD) except the ISO Solid Contamination Code.

The approved coding system is based on the fact that a step ratio of two for particle concentration is adequate both to differentiate between two significantly different systems and also to allow for reasonable differences in measurement. Range numbers are used to identify each step in particle population throughout the spectrum of levels. To allow measurements to be taken from differing fluid volumes, the numbers of particles counted above 5 and 15 μm respectively are normalized on either a one milliliter or 100 milliliter basis and reported in terms of pairs of range numbers. Thus, a theoretically infinite number of range pairs is available to describe the contamination level of a fluid.

The ISO Solid Contaminant Code is assigned on the basis of the number of particles per unit volume greater than 5 and 15 μm in size. These two sizes were selected because it was felt that the concentration at the smaller size would give an accurate assessment of the silting condition of the fluid, while the population of the particles greater than 15 μm would reflect the prevalence of wear catalysts. Thus, the particle size distribution by the ISO coding system is described by a 5 μm range number and a 15 μm range number (with the two numbers separated by a solidus).