

Comparative test to illustrate the effectiveness of EngineGuard Testing of vapour phase corrosion inhibiting oils

Prepared by P H Prince **Shield Technology**

The laboratory testing of oils containing vapour phase corrosion inhibitors presents certain problems since there is no internationally accepted standard or test procedure. American Mil Spec. MIL-L-46002 describes a method but reproducibility is poor and the tests are not sufficiently stringent to differentiate between effective products and those of lesser quality.

It is strongly recommended that VCI oils should be subjected to a practical test under the actual conditions of usage. However, it is recognised that for reasons of time and convenience this is not always possible. Accordingly, a simple test procedure has been developed to enable VCI oils to be tested using only inexpensive, readily available apparatus and materials. The Shield Technology test procedure outlined below is easily duplicated.

Test method

In the test, prepared steel specimens are subjected to 100% relative humidity. Controlled temperature cycling is used to induce the condensation of moisture on the surface of the steel specimen. The extent and progress of corrosion is observed visually.

Preparation of metal specimens

A 'bright' mild steel bar approximately 60mm long and 25mm diameter is drilled and tapped axially in one end of the bar in such a way that the bar can be easily attached to a glass jar with a screw lid (M6 is a suitable thread size). The surface of the steel bar is prepared according to DEF Stan. 2000 Method 25 or, as follows;

The bar is held in the chuck of a lathe or slow speed drill by means of a short length of threaded rod inserted into the tapped hole. While rotating the bar in the lathe/drill, the bar is abraded with a 'medium' (P60 Grit) emery cloth (Aluminium Oxide) to give a smooth, clean exposed surface. It is now *essential* that the surface is not touched at all. To aid removal from the lathe/drill, hold the bar with a lint free cloth or tissue. The bar can now be held using the mounting screw as a handle. The bar is then cleaned, first using a lint free cloth or tissue soaked in reagent grade toluene and then, once the toluene has evaporated fully, with reagent grade acetone. Both cleaning processes should continue until the cloth/tissues shows no further debris/staining. A final polish is given using a clean dry cloth or tissue.

Assembly of test apparatus.

Prior to assembly, 10ml of EngineGuard and 10ml of distilled water are placed in the glass test jar (Volume approx. 1 litre).

A small hole is drilled in the centre of the lid to accept a mounting screw for the metal specimen. A second 'breather' hole, approx 2 – 3 mm in diameter is drilled off centre. This allows the test jar to 'breathe' during test and thus simulate practical conditions.

Taking great care to handle the prepared metal specimen only with clean tissues, the bar is attached to the underside of the lid, which is then screwed into place on the jar. Label the test jars with the start date of the test.

Preparation of the control test apparatus

The preparation of the apparatus and specimen is identical except that only 10ml of distilled water is used in the jar.

Test Procedure

The test jar and control jar are allowed to stand for 12 to 16 hours (say overnight) and then warmed to 35°C for 8 hours. At the end of this time the jars are removed from the oven and allowed to stand for 16 hours at room temperature in a draught free area. The 35°C/room temp. cycle will generate condensation on the test pieces and is continued until substantial corrosion appears on the metal surfaces or until a significant difference between test pieces is evident.

A visual comparison and assessment is made and noted.

Additional notes:

1. Do NOT use chlorinated solvents to clean the test specimen surfaces prior to testing. Traces of acid from hydrolysis of the solvent can affect the results.
2. Ensure the jars are evenly spaced in the oven during the heating part of the cycle and in a draught free area when cooling. Uneven heating and cooling will result in variations in the rate and extent of moisture condensation on the specimens.
3. Tests should be set up in a well-ventilated area to avoid trapping of vapours within the test jars. Certain acid gases and other organic vapours can affect the results.
4. After five years there is no observable corrosion on the sample protected with EngineGuard. All other engine inhibiting fluids tested and the control specimen showed signs of corrosion within 3 to 4 weeks of the tests commencing and continued to deteriorate over time

Prepared by P.H. Prince
Shield Technology