

Assessment of the Wear Aspects of the Boundary Lubrication Properties via a Newly Designed Ball-on-Cylinder Lubrication Evaluator (BOCLE)

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Overview

Wear caused by friction between interfaces is a constant problem in an engine. Excess wear in the engine can permanently shorten the lifespan of the engine's components. One of the ways to reduce wear is by using fuel with a high degree of lubricity in the engine. Utilizing instrumentation, such as Koehler Instrument Company's K94190 lubricity tester, has proven to assist in measuring the degree of lubricity.

How Our Instrument Works

The K94190 instrument is a fully automatic test system that can measure degree of lubricity of fuel quickly and accurately. The instrument is programmed to run in accordance with ASTM D5001 method.



1 The parts of the K94190 instrument should be assemble according to the instructions on the operation manual. 50 mL of fuel is added into the fuel bath.



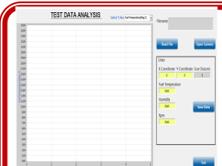
2 Enter all the trial or fuel information. Then enter the desired testing speed, testing time, and fuel temperature.



3 After start the testing cycle, wait for humidity and temperature to stabilize. In addition, fuel will be conditioned for 15 minutes before loading to the testing position.



4 The test will last for 30 minutes and can be ended anytime by clicking on the "cycle stop" button. The instrument must go to its default setting prior to another test.



5 After the test is done, the file can be read and analyze. The test scar on the ball can be analyze after plug in the instrument to an external microscope using USB hub and click on "open camera".



What is the ASTM D5001 Method?

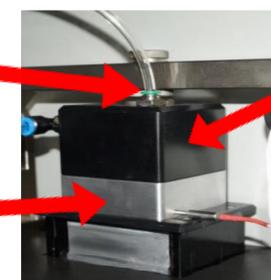
The ASTM D5001 test method that utilizes a ball-on-cylinder lubricity evaluator (BOCLE) to test the lubricity of aviation turbine fuel. To perform ASTM D5001, fuel is poured into a test reservoir under 10% humidity. Next, a cylindrical steel ring is partially immersed in the fuel reservoir with a non-rotating steel ball applying force on its outer surface. The fuel is in constant contact with the ball/ring interface while the ring rotates at a constant speed. The lubricity of the fuel can be determined after measuring the wear scar generated on the test ball.

Preparation

The surface of the test ball and test ring must be cleaned prior to the testing. Pour the fuel inside the fuel bath and raise the height of the fuel bath so that test ring is partially immersed in the fuel. Put on the fuel bath cover and insert the ball holder with the testing ball inside.

Ball Holder

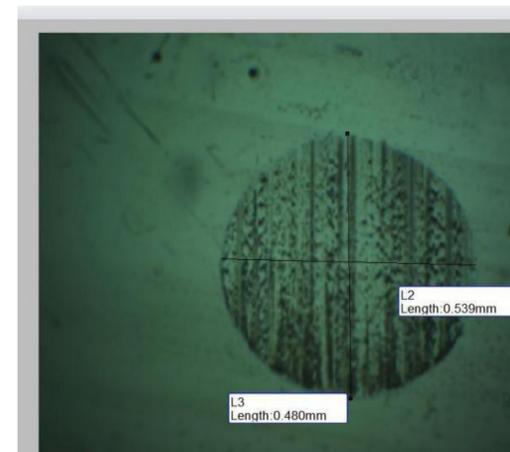
Fuel Bath



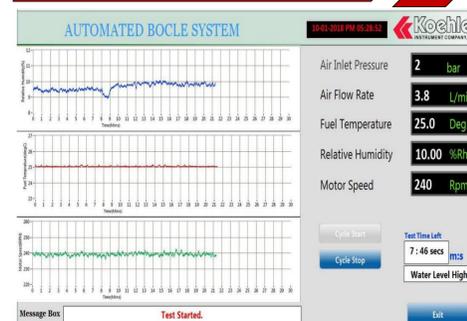
Cover

Data Analysis

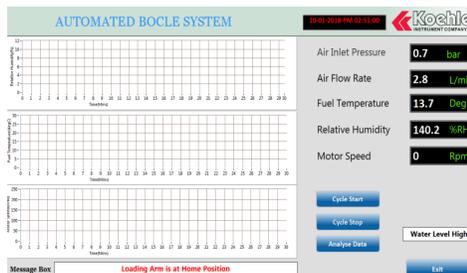
The test ball after performing ASTM D5001 can be looked under a microscope. Then the diameter of the scar on the ball can be measured to determine the degree of lubricity of the fuel.



Test Window



Default Setting Screen



Conclusion

The K94190 instrument shows highly accurate and consistent results. It is user friendly in which rotating speed, testing time, and fuel temperature can all be adjusted on the touching screen. In addition, the K94190 instrument will automatically control the humidity of air and test sequence to minimize the operator errors. These features save time in performing lubricity testing.