

# PCS Automated BOCLE System Feature Comparison

This document lists differences between the procedures followed when using the PCS Instruments Automated BOCLE compared to the existing BOCLE instrument when carrying out tests to ASTM D5001.

The test configuration is a ½ inch steel ball loaded against the outside of a steel cylinder. The ball is fixed and the cylinder rotates at 240 rev/min. The lower part of the cylinder dips into a bath containing the fuel under test. The fuel is maintained at 25°C (this implies that it may have to be heated or cooled as necessary). The fuel bath is enclosed by a cover and conditioned air at 25°C, 10% relative humidity is passed over the surface of the fuel, and a fraction is bubbled through the fuel for 15 minutes before the test starts. After the 15 minute conditioning period the ball is loaded against the cylinder with a load of 1kg and the fuel aeration stops. Conditioned air is still passed over the fuel. The test duration is 30 minutes and at the end of this time the resulting wear scar on the ball is measured.

The existing BOCLE tester (developed in the early 1980's) achieves the above conditions with a number of manual controls, some of which have to be continually monitored and adjusted during the test. The PCS Instruments ABS uses a built in microprocessor to control all of the test parameters. The test procedure is thus reduced to cleaning and assembling the test specimens and pressing the "Start" button on the front panel.

In short the existing BOCLE is a *manual* instrument. In contrast the PCS Instruments ABS is an *automatic* instrument. The operator presses one button to start the test cycle and no intervention is then required until the test is finished.

A point-by-point comparison of the two instruments is shown on the following sheet:

<b>ASTM D5001 Requirement</b>	<b>Existing BOCLE</b>	<b>PCS Instruments ABS</b>	<b>Benefit</b>
Conditioned air to be at 10% RH, 3.8 litres/min	Wet air, dry air and total airflow must all be set manually by operator	All airflow rates set by built in microprocessor.	No operator intervention or error
Fuel conditioning period to be 15 minutes	Operator manually sets a clockwork timer to time conditioning period. Horn sounds at end of conditioning period to tell operator to lower test ball onto ring	Conditioning period controlled by microprocessor which opens and closes aeration valve as necessary	No operator intervention or error
Airflow during fuel conditioning to be 0.5 litres/min into chamber and 3.3 litres/min into fuel	Airflow into fuel must be adjusted manually to required flow rate	Airflow into fuel controlled by factory set needle valve	No operator intervention or error. No adjustment necessary
Test duration to be 30 minutes	Operator lowers ball onto test ring at start of test period. Ball is automatically lifted at end of period. Operator must then stop motor and shut off air.	Microprocessor controls ball lowering onto test ring and raises ball at end of test. Also stops motor and shuts off air	No operator intervention or error. Reduced wear and tear on motor. No air wastage.
10% RH and 25°C to be maintained during 45 minute conditioning and test duration	Operator must check RH and temperature regularly during test and adjust as required	Built in microprocessor controls RH and temperature throughout test	Operator freed for other tasks.
Motor speed to be 240 rev/min	Motor speed adjusted by operator using control knob and digital display	Motor speed set and controlled by built in microprocessor	No operator intervention or error.
Reservoir temperature to be 25°C	Reservoir temperature controlled by manually set-up heat/cool circulating water bath. Water bath manually filled with hot or cold water as necessary	Reservoir temperature controlled by built in microprocessor using heating <i>and</i> cooling thermoelectric device as required	No water bath to be filled and emptied, no operator error