TANNAS CO.
LABORATORY INSTRUMENTS

Quantum®

Oxidation Tester

ASTM D2272, D2112, D4742, D7098, D942, IP229

Principle

Oxidation Stability: Test material, placed in a stainless steel pressure chamber, is exposed to oxygen at a specific test temperature and pressure. As the antioxidants are consumed, the sample reacts with the oxygen and the pressure drops.

History

Hot oil baths of varying sizes have long been used in the industry for running the Rotating Pressure Vessel Oxidation Test (RPVOT, formerly known as RBOT), the Thin-Film Oxygen Uptake test (TFOUT), and grease oxidation tests. These bath types expose the operator to hot oil fumes and odors, are prone to leak, need regular maintenance, and are generally messy and potentially hazardous to operate.

As laboratory facilities strive to improve their workplace conditions and encourage healthy environments, alternative approaches to running these tests are necessary.

Innovation

Tannas sets a higher standard by eliminating the hazards and mess of hot oil baths. The *Quantum®* Oxidation Tester is **the only non-liquid 'dry cylinder' heating system available** for running critical oxidation tests. Our technology is simple, clean, and efficient.

Features

- Front-loading, easily accessible pressure chamber.
- Small, bench-top footprint.
- Non-liquid 'Dry-Cylinder' sample heating — eliminates hot, hazardous, liquid bath mess and odor.
- Advanced research capabilities for other applications with the Sample Temperature Probe and Sample Extraction Device.
- Compatible with MS Windows® 10

ASTM D2272, D2112, IP229

RPVOT: Rotating Pressure Vessel Oxidation Test

ASTM D4742, D7098

TFOUT: Thin Film Oxygen Uptake Test

ASTM D942

Grease Oxidation Stability Test

Common Applications

- Steam Turbine Oils
- New & In-Service Oils
- Insulating Oils
- Gasoline Engine Oils
- Grease Oxidation Testing

- Simple venting of odors through tubing to scrubber or vent — does not require placement in hood.
- Rapid turn around in test capabilities due to independent sample testing — estimated to double productivity with multi-unit setup.

The software package for the *Quantum®* (with laptop) monitors and records up to four instruments at the same time or independently.

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RPVOT Test - ASTM D2272 & D2112

The Rotating Pressure Vessel Oxidation Test (RPVOT, formerly RBOT) uses an oxygen pressured vessel to evaluate the oxidation stability of new and in-service oils with water and a copper catalyst coil at 150°C for ASTM D2272 or 140°C for ASTM D2112.

An electrically heated, dry pressure chamber replaces the hot oil bath. The sample rotates axially at 100 RPM at an angle of 30° within the stationary pressure chamber by an internal magnetic drive motor.

The pressure chamber seals with a unique lid designed to fasten via three knurled thumb nuts. The *Quantum®* RPVOT enables testing proficiency due to independent sample analysis which increases productivity, especially with the multi-unit setup.

TFOUT Test - ASTM D4742 & D7098

The Thin Film Oxidation Uptake Test (TFOUT) evaluates the oxidation stability of lubricating oils used in gasoline engine service. The test operates by reacting an oil/catalyst mixture (available exclusively from Tannas Co.) at 160°C while pressurized with oxygen. The end-of-test is measured by the oxidation induction time resulting from the depletion of the antioxidant package. The TFOUT screens formulated oils prior to engine tests and is useful for quality control of oxidation stability of re-refined oils from batch to batch.

The primary adjustments to the *Quantum®* when performing the TFOUT test include a temperature setting of 160°C, a Tannas TFOUT Catalyst mixture in a small segmented dish, and a Chamber Volume Reducer.

Grease Oxidation - ASTM D942

The ASTM D942 test requires 20 grams of a grease in five glass dishes (4 grams each) to be stacked on a metal rack and oxidized in a pressure vessel heated to 99°C and filled with oxygen at 110 psi. The test continues for a selected period (100 to 500 hours) and the subsequent decrease in oxygen pressure, as a consequence of grease oxidation, is the test result.

The primary adjustments to the *Quantum®*, when performing ASTM D942, include a temperature of 99°C, grease filled glass dishes, a metal rack, and the use of a Chamber Volume Reducer.

The *Quantum®* Pivot Stand Assembly (right) includes the rotating rack system which pivots the testing chamber to a 90° vertical position per the ASTM D942 test method.

Sample Temperature Probe

One of the opportunities provided by the open-face, non-liquid bath design of the *Quantum®* is the ability to access the sample while under the test pressure and temperature. The Sample Temperature Probe Assembly, positioned on top or alongside the instrument, allows researchers access to monitor the sample temperature.

Interestingly, sample temperature may vary from sample-to-sample. The Sample Temperature Probe will detect exothermic reactions at the transition stage of oxidation, when rapid oxidation of the sample and the associated pressure drop is sharp. Exotherms have value in identifying and understanding the relationship between type, amount, and effectiveness of oxidation inhibitors during the oxidation process.

Sample Extraction Device

The convenient front-loading pressure chamber on the *Quantum®* allows easy access with the ability to extract small amounts of the sample during the test via our specialized Sample Extraction Device. Operators can extract a select amount of sample during the test for further analysis. The dry bath technique allows the operator to closely follow and monitor the process of oxidation with the use of different oxidation inhibitors. Only a fraction of a milliliter needs to be taken for analysis, given the sensitivity of modern analytical instruments such as the ICP, NMR and FTIR.

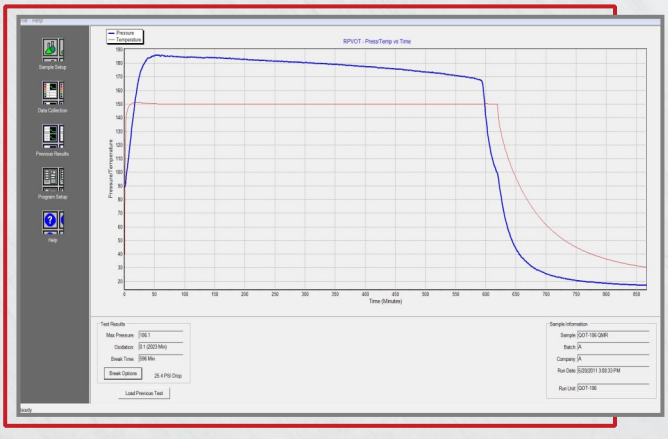
The Sample Extraction Device Assembly includes the Sample Extraction Probe, the Syringe Needle, the Syringe Valve Assembly, and the Seal Cap Assembly.

Automated Software Package

The software package for the *Quantum®* provides automated pressure, temperature monitoring, and endpoint detection for up to four independent *Quantum®* instruments.

End-of-test criteria can be selected by Time Duration, Pressure Drop, or Break Level. The software, with the included laptop, works with data acquisition and a USB interface enabling real-time display, storage of analysis data, and printable results.

The software enables the operator to select between RPVOT, TFOUT, and D942 Grease testing.



TANNAS CO.
LABORATORY INSTRUMENTS

ISO 9001:2015 QMS

Instrument & Parts

Quantum® Instrument:
200000: 120 VAC, 50/60 Hz Power
210000: 220 VAC, 50/60 Hz Power

ASTM D2272 & D2112 (RPVOT):
200853: RPVOT Sample Beaker
200651: Copper Catalyst Coils
200910: Magnetic Sample Cup w/ Spring Clip
200480: Magnetic Sample Cup Tester
200038: Sample Temperature Probe Assembly
200035: Sample Extraction Device Assembly
040028: QMR Reference Oil (D2272 only)
040027: QHR Reference Oil (D2272 only)

ASTM D4742 & D7098 (TFOUT):
200104: TFOUT Conversion Package
200106: TFOUT Segmented Glass Dish
010047: TFOUT Catalyst A Package
010049: TFOUT Catalyst B Package

ASTM D942 (Grease Oxidation):
200475: Grease Test Kit Assembly
200401: Grease Sample Dish

All applications:
200802: Automation Package for *Quantum*®
200916: Oxygen Regulator
200914: Certified Reference Oxygen Gauge
040045: VarClean Cleaner
200920: Laptop Computer
300195: Desktop Computer

Instrument Specifications

Dimensions	Bench-top: 20(w) x 38(d) x 33(h) cm | (8 x 15 x 13 inches)
Weight	~9 kg (20 lbs.)
Voltage	120 VAC, 12 amp. Max | 220-240 VAC, 7 amp. max.
Frequency	50/60 Hz
Heating Medium	'Dry Cylinder' heating system - no hot oil bath
Testing Capacity	Single position stainless steel pressure vessel Designed for multi-unit alignment, each independent
Test Parameter Capabilities	Temperature: 160° ± 0.1°C recommended max. Oxygen Charge: 100 ± 0.1 psi recommended max. Vessel Rotation: Variable speed control
Output	Continuous temperature & oxygen pressure readout - Digital USB to Laptop - Dsub9 to Analog strip-chart recording
Safety	Auto-Shutoff at end of test Current limiting fuses Over-pressure sensor & relief Over-temperature cutoff fuse CRN Approved & CE Marked
Shipping Weight & Dimensions	~26 kg (58 lbs.) approx. ~53 x 46 x 58 cm (21 x 18 x 23 inches) approx.

Additional TANNAS CO. Precision Laboratory Instruments

Tannas Foam *Air* Bath (TFAB®)
- ASTM D892, D6082, D1881, D7840, IP146
- Non-liquid bath
- 24°C to 150°C range

TBS 3000 HTHS Viscometer
- ASTM D4683, D6616, CEC L-36, IP370
- High-Temperature, High-Shear (HTHS)
- 80°C, 100°C, 150°C testing

Noack S2® Volatility Test
- ASTM D5800, Proc. D, CEC L-40
- Phosphorus Volatility
- non-Wood's metal heating system

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