

petrotest®



# OXIDATION STABILITY

## PETROOXY

New Standards

ASTM D 7525

ASTM D 7545

RSSOT



PetroOXY

petrotest®

RUNNING BIODIESEL  
Main Test 140 °C  
Test 140 °C  
Main 0994 kPa  
Sub 09.9%  
19:24  
Biodiesel

RUN STOP

FUEL  
FAME  
DIESEL  
BIODIESEL  
OIL & GREASE  
FOOD & COSMETICS ETC.

MANUFACTURER SINCE 1873

WWW.PETROTEST.COM



### Rapid Small Scale Oxidation Test (RSSOT)

### A new Method for the Determination of the Oxidation Stability

Suitable for Diesel, Biodiesel, FAME, Gasoline, Grease, Oil, Food, Cosmetics etc.

The new "Rapid Small Scale Oxidation Test" (RSSOT) Methods were approved in Summer 2009:



#### ASTM D 7525 - for Gasoline

Covers the quantitative determination of the stability of gasoline (spark ignition fuel), including those containing alcohols or other oxygenates, under accelerated oxidation conditions.

#### ASTM D 7545 - for Diesel, Biodiesel & FAME

Covers the quantitative determination of the stability of Middle Distillate Fuel.

The measured induction period can be used as an indication of the oxidation and storage stability.

Compared to some other oxidation and storage stability test methods, this test method uses a small sample and gives a result in a short time period

#### Why testing Oxidation Stability?

- Sludge formations can ruin modern and sophisticated fuel injection systems by plugging of filters!
- Oil oxidation can scrap machinery!
- The oxidation of lubricants can affect for example the free movement of bearings!
- Oil & grease contained in foods are subject to oxidation also and may cause the products to perish!

The oxidation stability is covering two important ranges:

#### - Storage Stability

(which can be influenced by humidity, sunlight, microorganisms, temperature, oxygen in the air etc.) is an important parameter for strategic storage of large quantities and a value of the aging and the shelftime of natural oil and other products.

#### - Thermal Stability

can additionally generate "Gum" and "Solid Deposits" during storage. This may lead to filter plugging.

#### Economical Aspects and Advantages

The automatic PetroOXY-method performs a massive reduction of testing time. The handling & cleaning time per test is limited to approx. 5 min.

As a result of the improved repeatability, producers can reduce their costs, because now the concentration of valuable additives can be limited closer to the required level.

Further fast checks in case of suspicion and accidents are possible, as well as strategic and routine storage monitoring.

Results determined by the PetroOXY include all volatile & non-volatile oxidation products and thereby providing a complete analysis of the sample's oxidation stability.

In a small, hermetically sealed test chamber a 5 ml sample is heated together with oxygen.

This initiates a very fast, artificial aging process, which is displayed by a pressure drop in the system.

It was found that the time consumption to the pressure drop is directly related to the oxidation stability.

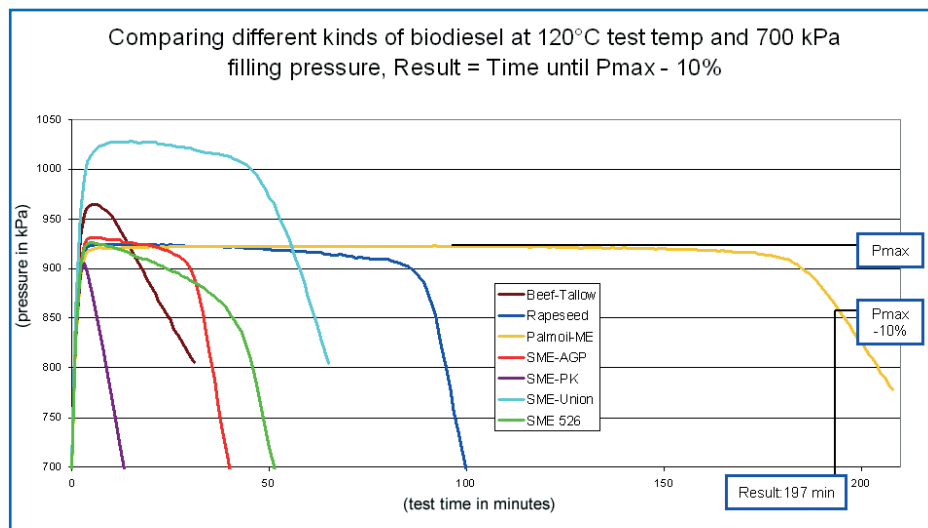
#### Compilation

For oxidation stability tests on various products there is a tool now available: The new PetroOXY method.

It is quick, economic and the results are well repeatable.

Compared with other methods good differentiations are possible.

Thanks to improved repeatability, cost reductions are possible by going closer to the limits of specifications.





13-3002

### PetroOXY Apparatus

Complies with the requirements of users regarding an improvement of the currently used manual oxidation stability tests:

- Small sample volume of 5 ml
- Short test time, normally less than 1 hour
- Improved user safety
- Automatic pressure detection system
- Automated oxygen charging & relief
- Automatic heating & re-cooling
- Easy handling even for less skilled users
- No complicated evaluation (as soon as the test is finished the result is displayed)
- Interface to transfer test data
- Easy cleaning after test run

### Re-Cooling Alternatives:

#### Metal Re-Cooling Block

The block must be stored in a separate freezer to boost the re-cooling of the chamber between two tests. Especially useful in a warm environment.

#### Active Re-Cooling Device

Uses semi-conductor Peltier cooling. It allows an automatic re-cooling to a defined temperature in the range of +17 to +24 °C. Fully self-contained and liquid-free it is a very easy and safe way of testing. Especially recommended for easy vaporizing fluids like gasoline.



13-3006



aluminum chamber with galvanic coating

### Test Cell Alternatives:

#### Aluminum Chamber with galvanic coating

High-graded aluminum is used to provide even and super fast heat transfer. The galvanic coating of the cell avoids catalytic effects.

Suitable for: **fuel, oil** and with a sample dish for **grease**. But not for water containing products.

#### Stainless Steel Chamber

High-graded stainless steel in dairy-product quality.

Suitable for: **water containing products** and **acid forming samples** in the food & cosmetic sector.



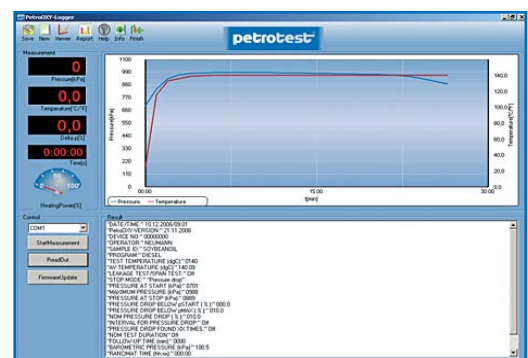
stainless steel chamber with PTFE-sample dish

### PetroOXY Logger-software

A programm for data acquisition and easy update, which is included in each PetroOXY.

- Features:**
- online data visualization of pressure and temperature curves during a test
  - data readout after a test
  - data storage in xml-format

It requires a PC with Windows®-plattform with >300 MB hard disk space, CD-ROM drive, mouse and 1 free serial port (RS232 or USB). (Configuration details upon request)



Software PetroOXY



### PetroOXY - Determination of the Oxidation Stability of Fuels (Gasoline, Diesel, Gasoil, Biodiesel & FAME, ), Grease & Oil



13-3002 & 13-3028

#### Product group: Fuels (Gasoline, Diesel, Gasoil, Biodiesel & FAME)

##### Current manual procedures:

##### Oxidation Stability by Induction Period - ASTM D 525 - IP 40 - ISO 7536

The induction period may be used as an indication of the tendency of motor gasoline to form gum in storage. It should be recognized, however, that its correlation with the formation of gum in storage may vary markedly under different storage conditions and with different gasolines.

##### Oxidation Stability of Distillate Fuel Oil - ASTM D 2274, ISO 12 205, ASTM D 5304

This test method provides a basis for the estimation of the storage stability of middle distillate fuels. But it is only possible to discriminate very good and relatively good fuels from very bad fuels. A more precise differentiation is not possible.

##### Oxidation Stability of Fatty Acid Methyl Esters - EN 14 112, EN 15 751

This method detects oxidation stability through conductivity. Utmost cleanliness is required and thus the cleaning process is found problematic. Also interpretation of results at least partially requires highly skilled experts.

##### Automatic procedures:

##### Oxidation Stability of Gasoline - ASTM D 7525

##### Oxidation Stability of Diesel, Biodiesel & FAME - ASTM D 7545

For the determination of the stability of fuels under accelerated oxidation conditions.

Compared to some other oxidation and storage stability test methods, this test method uses a small sample and gives a result in a short time period.

##### We recommend:

##### PetroOXY "Block Cooling" with Re-Cooling Block

- 13-3002 Power supply: 115/230 V, 50/60 Hz, EU-plug & -filling tube
- 13-3003 Power supply: 115/230 V, 50/60 Hz, US-plug & -filling tube

##### PetroOXY "Active Cool" with Peltier Re-Cooling

- 13-3006 Power supply: 115/230 V, 50/60 Hz, EU-plug & -filling tube
- 13-3007 Power supply: 115/230 V, 50/60 Hz, US-plug & -filling tube



for liquid samples

#### Product group: Grease

##### Current manual procedures:

##### Oxidation Stability of Lubricating Greases - ASTM D 942, DIN 51808, IP 142

This test method measures the net change in pressure resulting from consumption of oxygen by oxidation and gain in pressure due to formation of volatile oxidation by-products. This test method may be used for quality control to indicate batch-to-batch uniformity.

##### We recommend:

##### PetroOXY "Block Cooling" with Re-Cooling Block

- 13-3002 Power supply: 115/230 V, 50/60 Hz, EU-plug & -filling tube
- 13-3003 Power supply: 115/230 V, 50/60 Hz, US-plug & -filling tube

- 13-3028 **Sample Dish** (see Accessories)



with dish for pasty samples

#### Product group: Oil

##### Current manual procedures:

##### Oxidation Stability of Steam Turbine Oils by Rotating Pressure Vessel (RBOT) - ASTM D 2272, IP 229

The estimate of oxidation stability is useful in controlling the continuity of this property for batch acceptance of production lots having the same operation. This test method is also used to assess the remaining oxidation test life of in-service oils.

##### Oxidation Stability of Turbine Oils (TOST) - ASTM D 943, ISO 4263, etc.

This test method is widely used for specification purposes and is considered of value in estimating the oxidation stability of lubricants, like inhibited steam-turbine oils. It is also used for testing hydraulic oils and circulating oils having a specific gravity, less than that of water and containing rust and oxidation inhibitors.

##### We recommend:

##### PetroOXY "Block Cooling" with Re-Cooling Block

- 13-3002 Power supply: 115/230 V, 50/60 Hz, EU-plug & -filling tube
- 13-3003 Power supply: 115/230 V, 50/60 Hz, US-plug & -filling tube



re-cooling with block

## PetroOXY - Determination of the Oxidation Stability (Aging) of Food, Cosmetics and other Products

### Possible applications:

- **Vegetable oils and fats** (like margarine or seed oil etc.)
- **Animal oils and fats** (like butter, fish oil etc.)
- **Meltable foods** with a high fat content (like butter, cheese, lipstick etc.) can be analyzed without any further sample preparation.
- **Liquid or semi-liquid foods** (like mayonnaise, sauce, cream or lotion etc.) should be split to analyze the separated fat phase.
- **Solid, non-meltable foods** (like nuts, bacon, sausage etc.) the fat phase should be separated before analyzed.

### Product group: Natural Oils/Fats, Food & Cosmetics

To make a statement concerning the oxidation stability respectively the shelf life, the examined sample will be aged artificially under controlled test conditions.

By raising the temperature or oxygen pressure the period, until signs of spoiling appear, will be reduced from months/weeks to days/hours.

The determined induction time, so called induction period or Oxidation Stability Index, characterizes the resistance of oils and fats to oxidation.

The oxidation stability (induction period) is correlated to the shelf life of oils, i.e. until first signs of rancidity are recognized.

To describe the future development of aging the sample is stressed, under accelerated conditions, with heat and oxygen at elevated pressure. After the consumption of the antioxidants (which will be reduced faster due to the increased temperature), **volatile and non-volatile products** can be determined.

Compared to similar, already published instruments, the test conditions are more rigid. Therefore the scope of application is extended.

The PetroOXY offers an easy and safe method for the fast determination of the oxidation stability for sensitive oils and fats.

Suitable for the qualitative analysis of vegetable cooking oils and greases, further for vegetable grease used in cosmetics.

### Current manual procedure:

#### Oxidation Stability of Animal / Vegetable Fats and Oils - ISO 6886, EN 14 112

The determination of the oxidation stability of **natural oils and fats** through conductivity is a standard quality control method in the food industry. The oils and fats contained in food are also subject to oxidation, which leads to their spoilage.

As well as for determining the oxidation stability of **foods**, the PetroOXY can also be used for testing **cosmetics** or **cosmetic additives**.

### The suitable PetroOXY unit is:

#### PetroOXY "Stainless Steel"

Automatic Oxidation Stability Tester for Water Containing Products like Food, Cosmetics etc. with stainless steel chamber and PTFE Dish

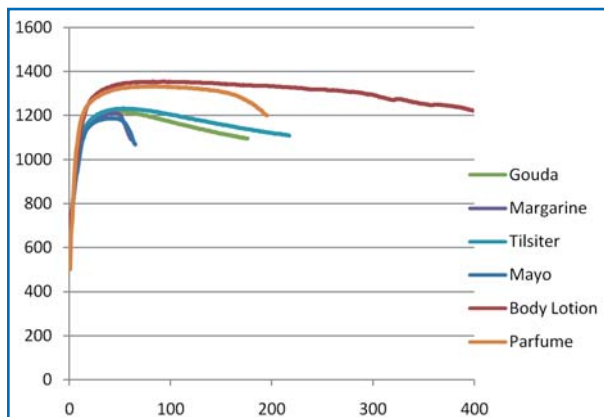
- 13-3008 Power supply : 115/230 V, 50/60 Hz, EU-plug & -filling tube
- 13-3009 Power supply : 115/230 V, 50/60 Hz, US-plug & -filling tube



13-3008



stainless steel chamber with PTFE-sample dish



comparison of food, cosmetics etc.





### Scope of Application

This is a new automatic method to evaluate the storage stability of liquid fuels (gasoline, diesel, FAME), grease oil or food and give a qualitative analysis before releasing a product from any production facility or storage.

### Summary of Method

#### ASTM D 7525 & ASTM D 7545 the new "Rapid Small Scale Oxidation Test" Methods

For a quantitative determination of the stability of fuels under accelerated oxidation conditions. Including those which contain alcohols or other oxygenates.

The measured induction period can be used as an indication of the oxidation and storage stability.

The PetroOXY test methods use, compared to some other oxidation and storage stability test methods, a small sample only and give good repeatable results in a short time period.



13-3002



13-3006



13-3008

### Oxidation Stability - PetroOXY Method (automatic)

**Gasoline Methods: ASTM D 7525**  
In correlation with: ASTM D 525, IP 40, ISO 7536

**Grease Methods:**  
In correlation with: ASTM D 942, DIN 51 808, IP 142

**FAME / Biodiesel Methods: ASTM D 7545**  
In correlation with: EN 14 112, EN 15 751

**Oil Methods:**  
In correlation with: ASTM D 943, ISO 4263  
ASTM D 2272, IP 229

**Diesel / Gasoil Methods: ASTM D 7545**  
In correlation with: ASTM D 2274, IP 388, ISO 12205  
ASTM D 5304

**Food & Cosmetics Methods:**  
In correlation with: ISO 6886, EN 14 112

### PetroOXY - Automatic Rapid Small Scale Oxidation Tester (RSSOT)

#### Features:

- Microprocessor controlled
- Results of 20 tests can be stored.
- Pressure and temperature are stored once per minute.
- A maximum of 16000 data-sets can be stored.
- Data can be exported to a PC.

#### Consisting of:

Automatic tester with microprocessor control, high-grade stainless steel housing with two-color powder coating, touch-key panel with large LC-display for pressure and temperature as well as simple display of the pressure curve membrane key pad for selection of desired program and parameters, control electronics with power supply, heating control with safety over-temperature shutoff, cool-down fan, sample cup for 5 ml standard sample, screw cap cover, safety and insulation cover, hose nipples, internal tubing, solenoid valves for automatic pressurization and pressure relief.

#### Supplied with:

- |                                               |                               |
|-----------------------------------------------|-------------------------------|
| 1 set seals                                   | 1 software PetroOXY           |
| 1 set cleaning tissues                        | 1 data transfer cable         |
| 1 oxygen filling line (max. 8 bar) EU/US-type | 1 USB adapter RS232           |
| 1 verification fluid set, 50 ml               | 1 RS232 adapter DS9/DS25 plug |

#### Technical Data:

- |                     |                                                    |
|---------------------|----------------------------------------------------|
| Test place          | : 1                                                |
| Test Cell           | : coated aluminum or stainless steel               |
| Working range       | : up to +200 °C                                    |
| Common test range   | : +120 °C to +150 °C or +120 °C to +200 °C         |
| Heater capacity     | : 500 W                                            |
| Re-Cooling Device   | : fan or metal block or Peltier element            |
| Temperature sensor  | : Pt-100                                           |
| Pressure sensor     | : 0 to 2000 kPa                                    |
| Interfaces          | : 1x RS-232 for Printer, 1x RS-232 for data export |
| Dimensions / Weight | : 24 x 40 x 26 cm (W x D x H), 11.2 kg             |
| Power supply        | : 115/230 V, 50/60 Hz, EU- or US-plug              |

PetroOXY - model	Automatic Rapid Small Scale Oxidation Tester (RSSOT)					
	Block-Cooling		Active Cool		Stainless Steel	
<b>Applications</b>						
Gasoline	X		X			
Diesel	X		X			
Oil & Grease	X		X			
Food					X	
<b>Order N°</b>	<b>13-3002</b>	<b>13-3003</b>	<b>13-3006</b>	<b>13-3007</b>	<b>13-3008</b>	<b>13-3009</b>
<b>Features</b>						
115/230 V, EU-plug	X		X		X	
115/230 V, US-plug		X		X		X
Temperature Range	up to +200 °C		up to +200 °C		up to +200 °C	
Re-Cooling	fan & block		active Peltier cooling		fan	
Test Cell	coated aluminum		coated aluminum		stainless steel	
Sample Dish					10 X	



## Options & Accessories

- 13-3026 Re-Cooling Block**  
for faster cool down of the test chamber between tests  
(must be chilled in a freezer until use)
- 13-3028 Dish, PTFE, pack of 1**
- 13-3035 Pressure Calibration Manometer with adapter**  
Technical Data:  
Digital pressure gage : 0 ... 10 bar  
Accuracy : 0.1% FSS typ  
Indication : kPa, bar, PSI
- 13-3037 Works Certificate "PetroOXY"**  
about pressure and temperature, with 5 test points each
- 13-3040 Temperature Calibration Set**  
Consisting of: precision thermometer, measuring chain with temperature sensor,  
lid and hood
- 13-3049 Service Set - PetroOXY**  
for test cell cleaning and leak detection  
Consisting of:  
- Lid with pressure port, to flush the system from the opposite direction  
- Tool kit for the tubing system (torque wrench and fork spanner (4 mm))  
- Leak detection spray (100 ml) to check the tubing system  
- Syringe (5 ml) with needle to inject the cleaning fluid (ethyl alcohol) into the test cell
- 13-3054 Bluetooth Set, for wireless connection from 1 instrument (with RS-232 interface) to 1 PC**



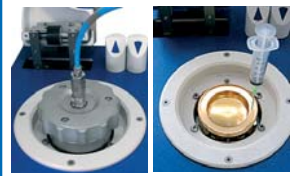
13-3028 (13-3029)



13-3035



13-3049



## Consumables

- 13-3022 Pipettes, 5 ml, graduated, made of plastic, pack of 100**
- 13-3025 Cleaning Tissue, pack of 100**

## Spares

- 13-3021 O-Ring Set, pack of 100**
- 13-3029 Dish, PTFE, pack of 10**
- 13-3034 Verification Fluid - PetroOXY**  
Consisting of:  
50 ml aluminum flask with diesel oil,  
2 pipettes (5 ml) and certificate
- 13-3030 Oxygen Tubing, EU-version**  
pressure reducing max. 8 bar
- 13-3031 Oxygen Tubing, US-version**  
pressure reducing max. 8 bar,  
1/4" NPT



13-3054



13-3022 (1 of 100)



13-3040

# MANUFACTURER OF PETROLEUM TEST EQUIPMENT SINCE 1873



PETROTEST BUILDING



DEVELOPMENT



PRODUCTION

ISO 9001  
CERTIFIED  
PROCESSES...

...CONSOLIDATED  
AT PETROTEST®!



QUALITY CONTROL



TRAINING



STORAGE

Presented by:

*We reserve the right of changes without prior notice.*

## petrotest®

98-1510 09/07