

Presentation PetroOXY for Bio-Diesel

For testing Bio-Diesel storage stability there is no satisfactory method available at this time.

Also storage stability of mixtures of Petro-Diesel and Bio-Diesel is unpredictable and does not have an established test method.

PetroOXY is a project to establish a new method for evaluation of the storage stability of liquid fuels and an automatic instrument to be made available to interested parties in the industry, in order to give

- **good repeatable results**
- **in a minimum of time with**
- **best possible user safety**

The method and the instrument is designed in a way not to exceed the average testing time of other test methods specified for releasing a fuel from any production facility or other storage.

The defined event is : **Oxystab = Elapsed Time till (Max-Pressure - 10 %)**

The **PetroOXY-Instrument**
is

- **a test chamber receiving a volume of 5 ml of sample, with**
- **a micro-processor controller**
- **automatic oxygen filling and relief device,**
- **automatic heating and re-cooling device**
- **automatic pressure detection system and**
- **an interface to transfer test data to a PC and**
- **a display to show the test result independently.**

The instrument is only 28 cm wide and up to four of these can be grouped in one single conventional fume-hood.

The **productivity** is up to **ten times better** than ASTM D 525 and between **two and five times better** than the Rancimat.

The instrument only needs supply of electric energy and Oxygen for filling and compressed air for cleaning.

Please see attached a PDF-File of a presentation that was given at the ASTM D 2 Meeting in Norfolk, Virginia Dec. 4th, 2005.

Page 2

Shows the ASTM D 525 Instrumentation and a typical diagram of a pressure curve with an oxidation event as specified by this method.

This is how and why Petrotest came to the PetroOXY project.

Petrotest has produced numerous instruments of these in different versions both liquid and metal block bath and as well in the special German-Safety-Version.

Page 3

Shows a PetroOXY apparatus and the three topics

- faster
- safer
- smaller

Pages 4 +5

Gives a brief explanation about the method and the instrumentation. Among other aspects the correlation to ASTM D 525 has to be proven.

Page 6

Gives an impression about typical Oxidation-Curves of different Bio-Diesel Samples.

At this time we want to thank Mr. David Forester for helping us obtaining these samples.

The test time to the defined Oxidation-Event regularly is less than 50 Minutes.

This is a dramatic reduction of testing and handling time compared with the conventional standardised Oxidation-Vessels acc. to ASTM D 525 and the Rancimat method.

Page 7

Gives an impression about the Oxidation-Stability of different US-Bio-Diesel Samples at different temperatures and with different test methods.

The x-axis of the graph is without dimension.

The y-axis of the graph shows the test time till the defined event in logarithmic division.

The following test methods were used :

- Ranzimat ISO 14 112
- Oxidation-Vessel ASTM D 525 / ISO 7536
- PetroOXY at different test temperatures

Between the Oxidation-Vessel and the PetroOXY there can be seen a tight trend, while the Ranzimat with the first two samples shows a different behaviour .

For the PetroOXY-Method for Bio-Diesel we would recommend a test temperature of +120°C, as this allows a good discrimination of stable and un-stable samples.

Also the 120°C Test-Temperature seems to be a good compromise between economic aspects the necessity of differentiation of good and bad fuels.

Better fuels could even be tested at +130°C with an even lower time consumption.

Page 8

Shows first results concerning repeatability of Beef Tallow.

We have used a temperature of +100°C only as the sample was the least stable in our program.

All curves are of a very similar shape and all are very close together.

Page 9

Shows the data of 3 times 10 tests of the same Beef Tallow sample in three different instruments but all run by the same user.

This means that the data about reproducibility are not really complying with requirements for an inter-laboratory test evaluation, but at least it gives a first impression about the potential.

PetroOXY	has	r = 6 % and R = 7.4 %
ASTM D 525	has	r = 5 % and R = 10 %
Ranzimat	has	r = > 15 % and R = > 25 %.

It is to be mentioned that the three different PetroOXY-Instruments are of a different development status and we are going to bring the other 2 to the same level as soon as we have obtained the necessary components.

Page 10

Shows first results concerning repeatability of Palm Oil Bio-Diesel.

We have used a temperature of +140°C as the sample was the most stable in our program and we wanted to demonstrate how temperature can dramatically influence the test duration.

All curves are of a very similar shape and all are very close together.

Page 11

Shows the data of 3 times 10 tests of the same Palm Oil Bio-Diesel sample in three different instruments but all run by the same user.

This means that the data about reproducibility are not really complying with requirements for an inter-laboratory test evaluation, but at least it gives a first impression about the potential.

PetroOXY	has	r = 3 % and R = 6 %
ASTM D 525	has	r = 5 % and R = 10 %
Ranzimat	has	r = > 15 % and R = > 25 %.

Page 12

Shows the time consumption of different related methods concerning test-time and handling-time and the data about Repeatability (r) and Reproducibility (R).

Page 13

Shows **trend** data about **correlation** between the Rancimat vs. the ASTM D 525. Unfortunately we only had 6 USA-Samples available and one European Rapeseed sample.

We would be glad if interested parties could help us obtaining more samples for our test program.

Page 14

Shows **trend** data about **correlation** between the Rancimat vs. the PetroOXY.

Page 15

Shows **trend** data about **correlation** between the ASTM D 525 vs. the PetroOXY.

We should be glad to have your requests and we also offer to hand out related basic data of the above tests for your further evaluation.

Should you be interested in orientation-measurements of your samples, we will be glad to run these for you.

We only would need suitable quantities of sample material from you.

Three members of the Petrotest-Staff are best familiar with this project :

Bernhard	Handschuck	Tel.: ..49-33 708-56 432
Andrea	Neumann	Tel.: ..49-33 708-56 433
Thomas	Jebens	Tel.: ..49-33 708-56 350

We should be glad to have your comments and requests.

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