APPLICATION NOTE

F&F-O-002-2014/A1

Oxidation Stability of Leather

Reference: **EURACHEM GUIDELINES**

Tested with **VELP Scientifica OXITEST Oxidation Stability Reactor** (Code F30900248)

VELP Scientifica, Italy Tel: +39 039 628 811 Fax: +39 039 628 8120 www.velp.com

OXIDATION STABILITY OF LEATHER

Introduction

"Lord God made leather clothing from animal skins for Adam and his wife"
Genesis 3:21

The production of leather goes back to prehistoric times, when primitive men soon realized that they could use the skin of animals hunted for food, in order to protect themselves from the weather. They used different treating methods that have remained largely unchanged for centuries, exposing it to the smoke or putting it in contact with water or leaves. Nowadays, the leather manufacture is usually divided into three processes: preparatory stages, tanning and crusting. During the process of tanning, fat is dissolved from the animal skin. These small quantities of oil, known as fat liquors, make a significant difference to the handle, i.e. the fullness, softness and flexibility, among other factors.

Oxidation Stability in Leather

This work is aimed to evaluate the effect of adding an antioxidant treatment on leather, comparing the oxidation stability of leather with and without the addition of antioxidant agent. OXITEST is able to determine the oxidation stability of various sample types, directly on the whole sample, without any fat separation.

OXITEST Principle

OXITEST speeds up the oxidation process because of the two accelerating factors, temperature and oxygen pressure, according to the most common applications.
The instrument measures the absolute pressure change inside the two chambers, monitoring the oxygen uptake by reactive components in the sample and automatically generates an IP value.

IP Definition: IP stands for Induction Period and it is the time required to reach the starting point of oxidation, corresponding to either a level of detectable rancidity or a sudden change in the rate of oxidation. The longer the Induction Period, the higher the stability against oxidation over time.

Sample

Leather sample 1: without antioxidant treatment

Leather sample 2: with antioxidant treatment

Equipment and Chemicals

- Analytical balance, 3 decimals
- Silicone grease
- Oxygen, purity grade 5.0

Sample Preparation

Store the samples at room temperature.
In order to homogenize the sample, cut leather tissues in small pieces (5x5 mm) and put 10 grams of sample directly on the surface of the titanium sample holder, by using a spatula.
In each reaction chamber (A and B), place one spacer and 2 sample holders containing the sample for a total of 20 g, leather pieces in each oxidation chamber.

Analysis Procedure

Grease the O-rings with silicon grease and set them in their position. Close the chambers with the titanium covers and turn the discharge valves in open position. Set the following conditions on the OXISoft™ software:
Temperature: 80 °C
Oxygen Pressure: 6 bars
When the temperature set is reached inside the chambers, close the discharge valves and start loading oxygen.
Data acquisition is automatically started by the software.

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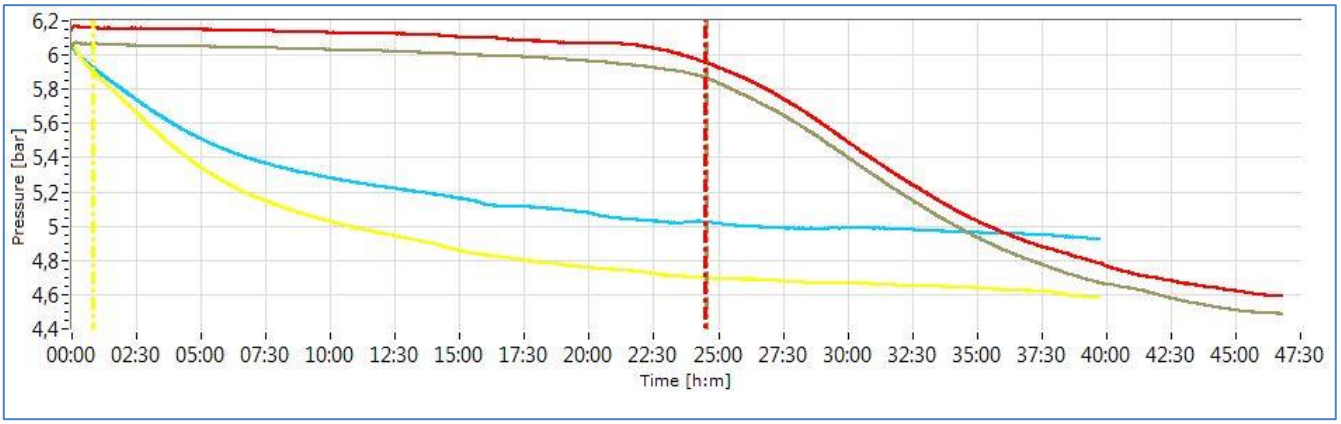
Typical Results on Leather

Each sample has been monitored two times. At the end of the oxidation tests, the IP of every run is calculated by the software OXISoft™.

It is possible to elaborate the oxidation curves obtained for each kind of leather.

Sample	Weight (g)	Set Point (bars)	Set Point (°C)	IP (hh:mm)	Line
Leather 1	20.012	6.00	80.0	00:49	
Leather 1	20.005	6.00	80.0	00:49	
Leather 2	20.010	6.00	80.0	24:28	
Leather 2	20.004	6.00	80.0	24:33	



Repeatability Test

With OXISoft™, it is possible to create a repeatability test for each analysis, in order to obtain the average, standard deviation and relative standard deviation of the results.
For repeatability test, it is necessary to analyze the same quantity of the sample in duplicate or more, at the same values of temperature and pressure. In the table below the results are summarized:

Sample	IP average (hh:mm)	SD (hh:mm)	RSD %
Leather 1	00:49	0:00	0.0
Leather 2	24:30	0:03	0.2

RSD value must be < 5% in order to obtain good results.

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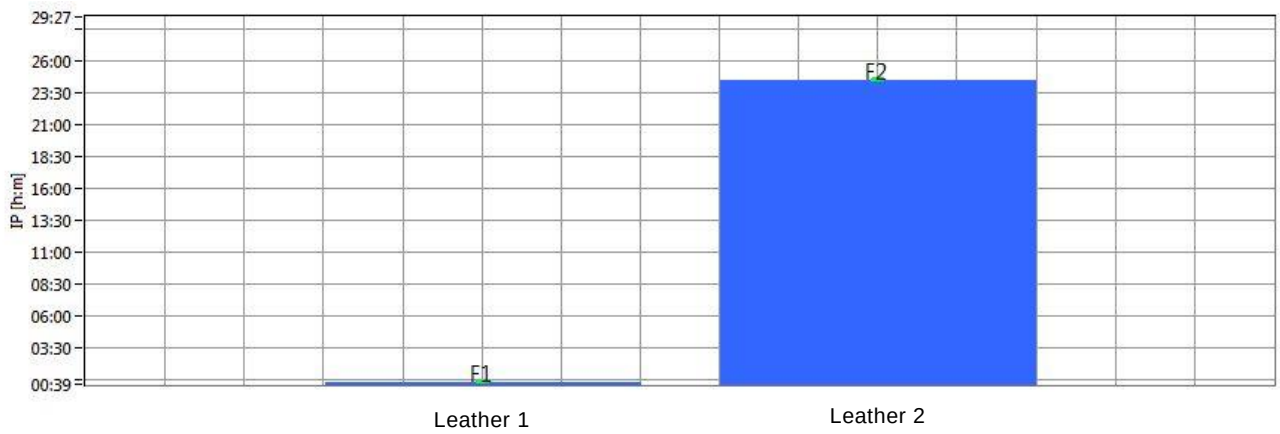
Formula Comparison

With OXISoft™, it is also possible to easily compare the obtained IP values, of different formulations but tested at the same condition, and identify the most stable one.



Conclusion

The results obtained by OXISoft™ and the formula comparison function clearly discriminate the leather tissues resistance to oxidation: Leather 1 (without antioxidant treatment) has a shorter IP value, hence a lower oxidation stability. In conclusion, the use of antioxidant agent increases the oxidation stability of leather tissue.

Benefits of OXITEST are:

- Test is made directly on the whole sample
- No need for preliminary fat separation of the sample
- Resistant titanium chamber
- Time saving analysis, if compared to the traditional methods
- Especially designed for R&D, Product Development and Quality Control labs
- Many investigations available through the software OXISoft™:
  1. Repeatability test: a series of tests run on the same sample or standard to verify its IP period, to calculate accuracy and repeatability of the data
  2. Freshness test: to verify the quality of different lots, for example of the same raw material, and compare them, for the evaluation of raw materials and suppliers.
  3. Formula comparison: to identify the most stable formula of a finished product, under the same conditions; and for the evaluation of the effectiveness of antioxidant treatments.
  4. Packaging comparison: for testing which packaging maintains the product in the freshest condition, and for the evaluation of the adequacy of storage conditions.
  5. IP during ageing: to obtain a graph of the decrease of the product IP during the shelf-life period
  6. Estimated shelf life: to have a prediction of oxidation stability during the shelf life.

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