

The TOTOX Value and its Relationship with Food Oil Rancidity

Oils are fundamental ingredients in various food, but their quality and freshness can deteriorate over time due to oxidation, leading to an undesirable taste and potential health concerns. To assess the stability and freshness of food oils, one of the crucial parameters used is the TOTOX Value. This article explores the TOTOX Value, its connection to oil rancidity, and provides guidance on the threshold values that determine when an oil can be considered rancid.

Understanding the TOTOX Value

The TOTOX Value is a comprehensive indicator used to evaluate the stability of food oils. The term "TOTOX" represents the sum of two key parameters: Peroxide Value (PV) and Anisidine Value (AV).

The TOTOX value is calculated by the formula

$$\text{TOTOX} = \text{AV} + 2\text{PV}$$

Both of these measurements are pivotal in assessing the oxidative status and potential rancidity of oils.

1. Peroxide Value (PV):

The Peroxide Value quantifies the concentration of peroxides within the oil. Peroxides are intermediates formed during the oxidation process, primarily resulting from exposure to oxygen and light. Elevated peroxide values are indicative of an oil that has experienced oxidative conditions and may have become rancid.

2. Anisidine Value (AV):

The Anisidine Value is an indicator of the presence of oxidized compounds such as aldehydes and ketones in the oil. These substances develop as fatty acids degrade, contributing to the unpleasant taste and odor associated with rancid oils. A high Anisidine Value implies the presence of oxidized compounds and potential oil rancidity.

The Relationship Between TOTOX Value and Oil Rancidity

The TOTOX Value offers a comprehensive assessment of oil stability by considering both peroxide and anisidine values. When the TOTOX Value exceeds certain thresholds, it suggests that the oil has likely turned rancid and is no longer suitable for consumption.

Tracking Peroxide Value and Anisidine Value Trends

To better understand the concept, let's examine a graph depicting the typical trends of Peroxide Value and Anisidine Value over time for an oil. This graph (figure 1) highlights how both values tend to increase with time, indicating the progressive deterioration of the oil. In general, the lower the PV, the better the quality of the oil, however PV decreases as secondary oxidation products appear.

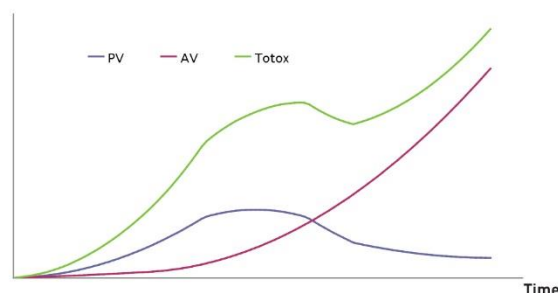


Figure 1 : The oxidation of oil over time as measured by peroxide value (PV), anisidine value (AV) and TOTOX value. Note: PV can decrease over time so AV and/or TOTOX calculation is needed to appreciate the whole oxidation story.

Reference Thresholds for TOTOX Value

Determining whether an oil has become rancid involves considering specific reference thresholds for the TOTOX Value. While these values can vary depending on the type of oil, here are general guidelines:

- **TOTOX Value below 10:** The oil is fresh and of high quality.
- **TOTOX Value between 10 and 20:** The oil is still acceptable but may exhibit early signs of oxidation.

- **TOTOX Value above 20:** The oil is rancid and should not be used for culinary purposes.

It's essential to note that these values are general guidelines and may differ based on the type of oil, storage conditions, and intended usage.

In conclusion, the TOTOX Value serves as a critical tool in assessing the freshness and quality of food oils. Regularly monitoring peroxide and anisidine values and calculating the TOTOX Value can help ensure that oils remain in optimal condition for culinary use. Proper storage in a cool, dark environment away from oxygen is crucial for preserving oil quality and preventing rancidity.

CDR FoodLab® system can analyze Peroxide value and p-Anisidine value (TOTOX Value) as well Free Fatty Acids, Iodine Value and Soaps on oil in a rapid and straight forward way. Thanks to the optimized methods and to the technology applied to a colorimetric principle, the analysis can be performed in few minutes and the results are immediately disposable, facilitating a proper conservation of the oil and the decision making inside the plant about the different batches.



Here is a short list of the **CDR FoodLab®** system advantages:

- Analyses are very quick and rely on an analysis method that is reference method compliant
- Analysis can be performed any time inside the plant, in great quantities
- CDR FoodLab® consent time saving and drastic cutback of analysis costs
- The simplicity and rapidity of the analysis method allow everyone to perform the tests with the analyzer
- CDR FoodLab® uses prefilled cuvettes and reagents that does not require an equipped chemical laboratory