



## Stability of Oils: What's in the Market?

### Introduction

Kemin offers customers the ability to analyze their fat and oil samples for oxidative parameters. These parameters allow estimations of the current degree of oxidation present and the potential for future oxidation. Over the years, a large variability in oxidative parameters has been noted in animal fats and vegetable oils.

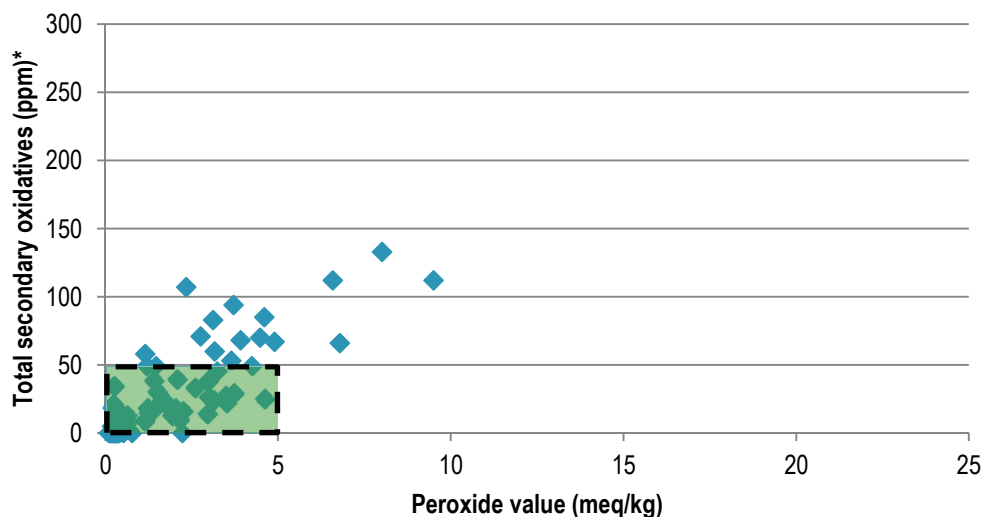
Oxidation occurs when unsaturated fatty acids are degraded and secondary products are formed, which can decrease animal performance<sup>1-4</sup>. Oxidation is initiated by the presence of oxygen, metal ions, heat, enzymes and light. The oxidation process degrades fatty acids and fat soluble vitamins leading to a reduction in energy and availability of important nutrients.

### Materials & Methods

A summary of samples analyzed by Kemin Customer Laboratory Services (CLS) from January 2010 through July 2014 was conducted. The summary includes 153 samples labeled as corn (95), generic 'oil' (27), soy (14), generic 'vegetable' (8), canola (8) and sunflower (1). Parameters measured included peroxide value, secondary oxidatives (hexanal + 2, 4-decadienal) and oxidative stability index (OSI). Not all samples were tested for all parameters in the summary. Samples treated with an antioxidant by Kemin CLS or labeled as containing an antioxidant, were not included in the data. Antioxidant inclusion was not tested to determine if any of the included samples contained an unknown antioxidant.

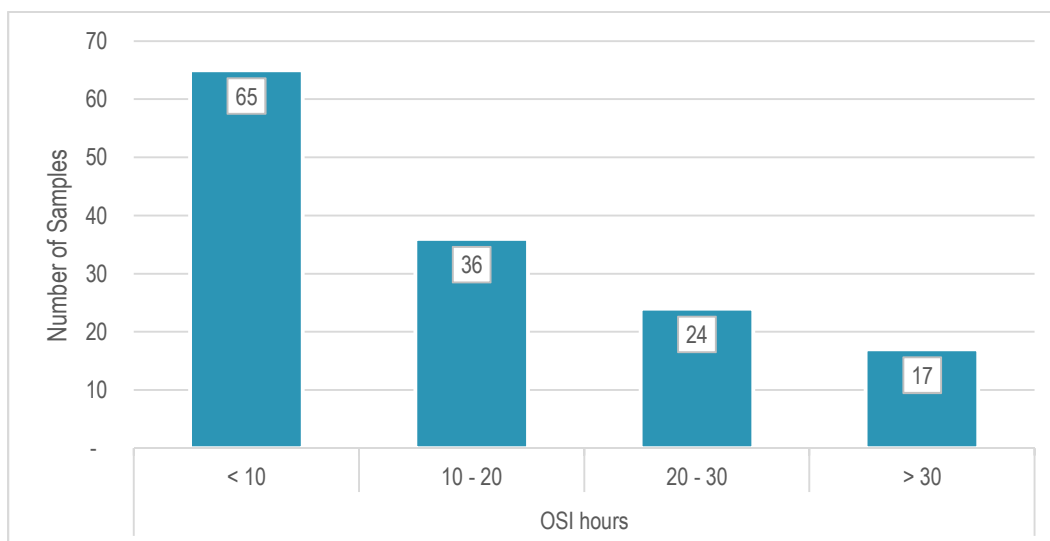
### Results

The variability of the current state of oxidation was measured as peroxide value and total secondary oxidatives (Figure 1). As oxidation takes place peroxides are formed and consumed. Secondary oxidatives form as peroxides break down and are consumed as oxidation takes place. As a general guideline, fats and oils should contain a peroxide value less than 5 meq/kg and a total secondary oxidative value less than 50 ppm<sup>5</sup>. This is indicated in Figure 1 by the shaded box. The average peroxide value and secondary oxidative value of the samples was 1.9 meq/kg and 32.5 ppm respectively. The maximum values of the samples were 37.8 meq/kg and 567.0 ppm and the minimum values were 0.1 meq/kg and 0.0 ppm (< Limit of Quantification).



**Figure 1.** Peroxide value and total secondary oxidatives value for vegetable oils analyzed by Kemin CLS from 2010 - 2014 (n=101)<sup>6</sup>. \*Two samples contained values greater than 300 ppm total secondary oxidatives.

The potential for oxidation (stability) of the oil was measured using OSI (Figure 2). A longer OSI time represents a delay in onset of oxidation and can be interpreted to represent a more stable product. The vegetable oil samples showed a large variability in OSI times with an average of 14.1 hours (maximum of 63.6 hours and a minimum of 0.1 hour). Of the samples tested, 46% had an OSI time of less than ten hours.



**Figure 2.** Number of samples initiating oxidation at different times, analyzed by oxidative stability index (OSI) at 100 °C (n=142)<sup>6</sup>.

## Conclusion

Samples of vegetable oils received and tested by Kemin CLS had a large variability in future potential for oxidation, as measured by OSI. On average, the samples had low levels of oxidative products. An antioxidant may be used to increase the stability of oils prone to oxidation. Reducing the variability of oils used for livestock feed may ultimately have a positive impact on livestock and poultry performance.

## References

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