



## The Effect of RENDOX® CQ on Oxidized Soybean Oil

### INTRODUCTION

Oxidation effects on lipid quality can be a major factor in the reduction of livestock and poultry feed quality. Lipid oxidation is an irreversible, naturally occurring process where fatty acids are attacked by free radicals and oxygen is absorbed. Initiated when fat is exposed to oxygen, metal ions, heat, enzymes and light, this process results in a conversion of fatty acids into harmful byproducts including peroxides and aldehydes. Oxidation dramatically affects the quality of fats and oils, which has been shown to have direct impact on animal health and performance.

RENDOX® CQ is a liquid antioxidant blend designed to protect oils from autoxidation deterioration. Lipid sources treated with RENDOX CQ have been shown to have delayed onset of oxidation. A study was conducted to evaluate the effect of a thermal process on soybean oil oxidation when treated with or without RENDOX CQ.

### MATERIALS AND METHODS

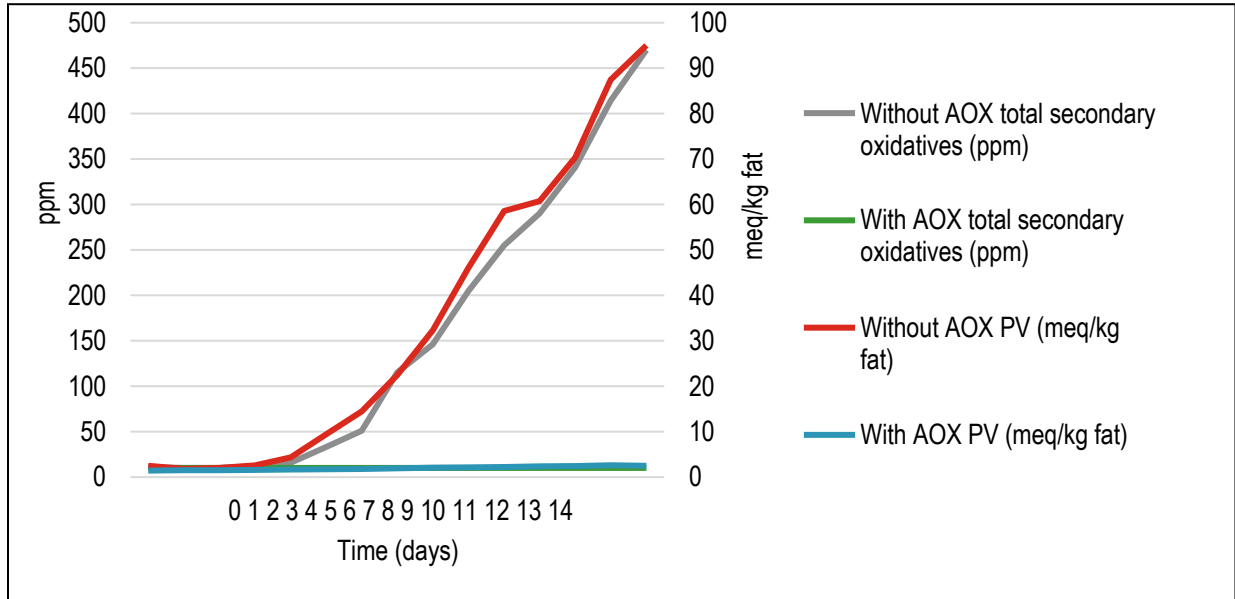
120 soybean oil samples were collected and divided into three subgroups. Within the subgroups, half of the samples were untreated and served as the control, while the other half of the samples were treated with RENDOX CQ at a rate of 2 lbs per ton. Each of the sample subgroups were then exposed to one of three temperature conditions for a specific duration of time. Samples were then analyzed for peroxide value and secondary oxidative compounds (hexanal and 2,4-decadienal).

**Table 1.** Soybean oil sample groups and temperature exposure conditions.

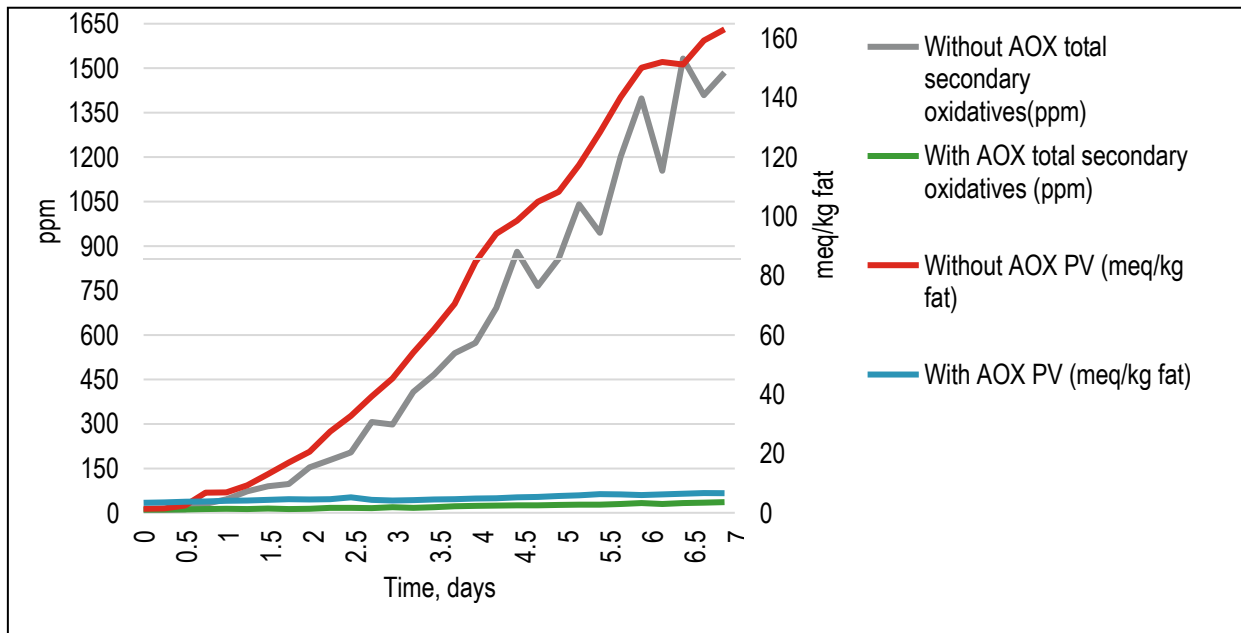
Group	Total Samples	Temperature	Days Exposed to Temperature Conditions	Evaluation Schedule
Group 1	30 (15 untreated/15 treated)	45°C / 113°F	14 days	Every 24 hours
Group 2	64 (32 untreated/32 treated)	65°C / 149°F	7 days	Every 6 hours
Group 3	26 (13 untreated/13 treated)	90°C / 194°F	3 days	Every 6 hours

### RESULTS AND DISCUSSION

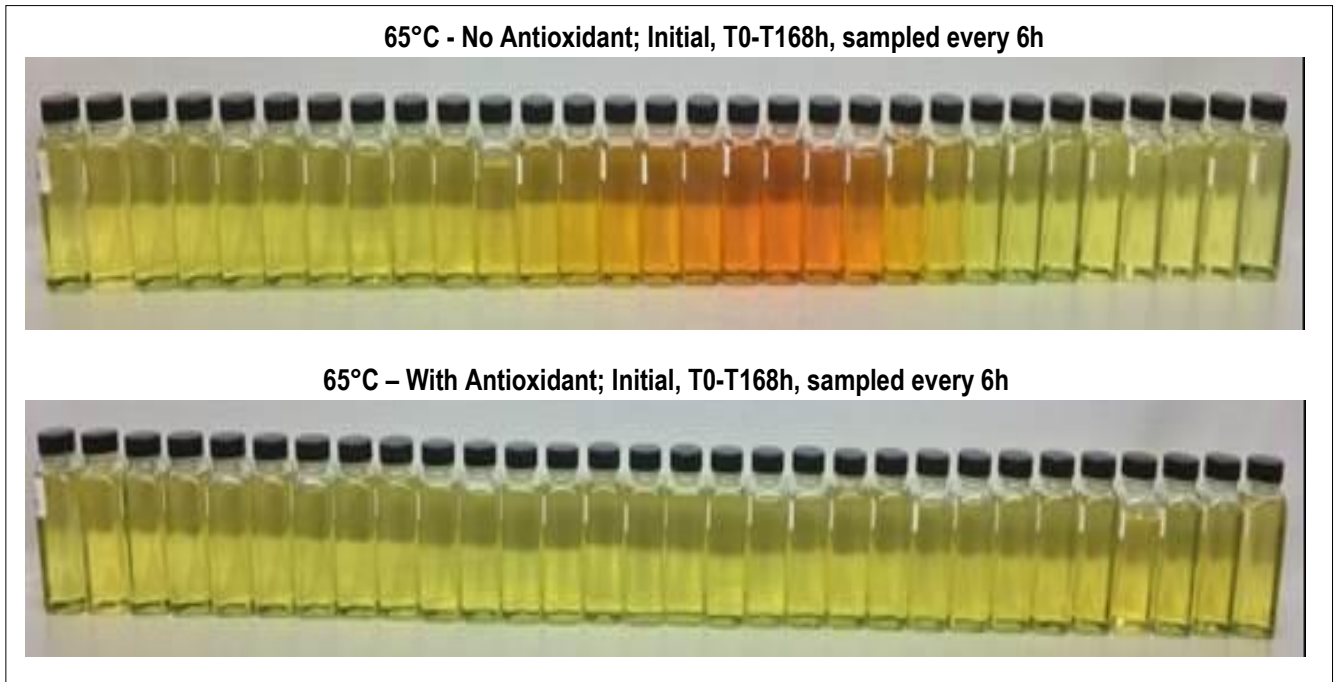
As indicated by the results below, RENDOX CQ was able to prevent significant oxidation of the soybean oil during long-term exposure (14d) at 45°C, whereas the untreated soybean oil had peroxide levels of 10 meq/kg and secondary oxidatives at > 50 ppm at day 6. Thresholds for both levels were 5 meq/kg and 50 ppm respectively. The RENDOX CQ-treated soybean oil exposed to 65°C was also able to maintain the secondary oxidatives below 50 ppm for the duration of the thermal process (7d) and peroxide values > 5 meq/kg for 4.5d. However, the soybean oil without antioxidant treatment reached peroxide levels > 5 meq/kg at 0.75d of the thermal process and secondary oxidatives levels > 50 ppm at 1.25d of the thermal process. Finally, the RENDOX CQ-treated soybean oil at 90°C maintained the peroxide levels < 5 meq/kg for 12h (0.5d) of the thermal process and secondary oxidatives below 50 ppm for 24h (1d) of the thermal process, whereas the oil without antioxidant treatment reached peroxide levels > 5 meq/kg at 6h of the thermal process and secondary oxidatives levels > 50 ppm in less than an hour of the thermal process. Results of the present study show the protective effect that RENDOX CQ can provide to soybean oil during thermal processes at 45, 65 and 90°C.



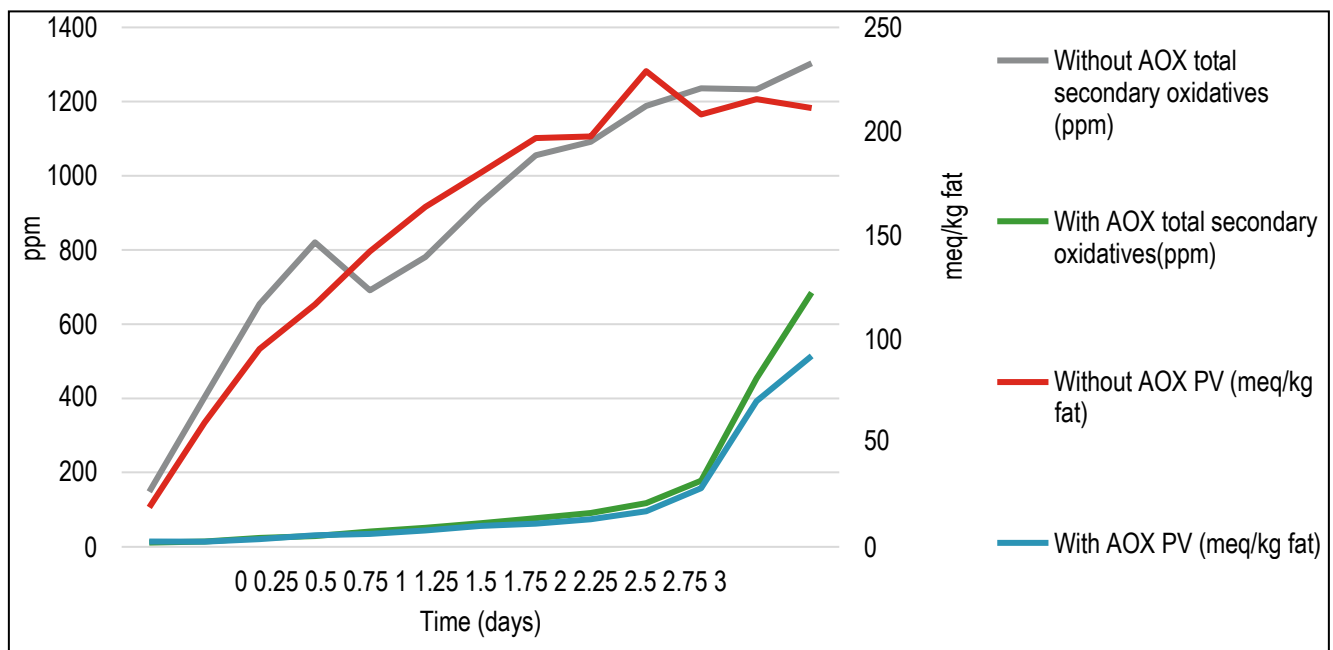
**Figure 1.** Effect of thermal process at 45°C (113°F) on soybean oil oxidation with and without antioxidant.



**Figure 2.** Effect of thermal process at 65°C (149°F) on soybean oil oxidation with and without antioxidant.



**Figure 3.** Visual effect of thermal process at 65°C (149°F) on soybean oil oxidation with and without antioxidant.



**Figure 4.** Effect of thermal process at 90°C (194°F) on soybean oil oxidation with and without antioxidant.



## CONCLUSIONS

Protecting your soybean oil from lipid oxidation is the first step to protecting your animals' health and your business' profits. Lipid oxidation can lead to the destruction of fat-soluble vitamins; reduction in the digestibility of fat and energy content in feed; decrease in feed palatability and consumption; increase in exposure to productivity-reducing toxic compounds; and free radicals and negative impacts on gut health.

Lipid quality solutions start with the purchasing of quality soybean oil. However, high-quality soybean oil can easily be negatively impacted due to handling and storage conditions. Time of storage, application of heat and the mixing of different lipid sources all have direct implications on the production of toxic compounds. Antioxidants like RENDOX CQ work to stabilize the lipid source and maintain feed quality by delaying oxidation. Antioxidants accomplish this by sacrificing themselves to quench the free radicals before the fat or vitamin molecules can be attacked.

Through years of research, Kemin understands not all lipid sources are the same. Soybean oil, corn oil, poultry fat, choice white grease, etc., each have a unique fatty acid profile, which require different formulations and oxidation control solutions. When treating ingredients, identifying the correct antioxidant for your application can be the difference between success and failure. To protect your lipid source from negative oxidation effects on quality, an antioxidant system should be used. An antioxidant system should contain a combination of the following:

- Synergistic blend of antioxidants to absorb free radicals before they destroy fatty acids
- Metal chelators to bind metal ions, which may promote free radical oxidation
- Oil-based carriers to better mix with fat molecules

RENDOX CQ is a liquid antioxidant system specifically designed to treat and stabilize vegetable-based lipid sources, including soybean and corn oil.

## REFERENCES

1. Kemin Internal Document 17-01659.