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## RENDOX<sup>®</sup> CQ LIQUID EFFECTIVELY STABILIZES CORN OIL FROM ETHANOL PRODUCTION

A study was conducted to establish the efficacy and application rate for an antioxidant product to stabilize a corn oil co-product from the ethanol industry. Several samples of oil from various ethanol production facilities were obtained for assessment. Initial peroxide values indicated moderate oxidation was under way. Upon subjecting the samples to stressed conditions of oil stability index (OSI), test results indicated the onset of oxidation within 10-26 hours for the untreated control samples. A linear dose-response relationship was established using RENDOX<sup>®</sup> brand CQ Liquid Antioxidant as the antioxidant product of choice. The onset of oxidation was delayed by 5 hours for each 0.5 lb/ton increment of RENDOX CQ treatment. RENDOX CQ, at an application rate of 1 lb/ton, effectively delayed the onset of oxidation in all samples tested by, on average, approximately 10 hours. The data indicates RENDOX CQ can effectively stabilize corn oil from ethanol processing.

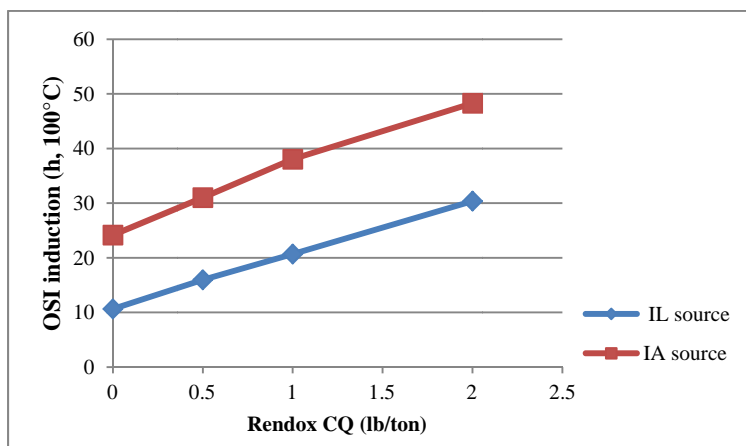
### Introduction

This study<sup>1</sup> was designed to establish the efficacy and dosage of RENDOX<sup>®</sup> brand CQ Liquid Antioxidant (RENDOX CQ) to stabilize co-product corn oil. In the past several years, ethanol production facilities have increasingly reduced the fat content of distiller's grains via removal of the corn oil during processing. This has resulted in the increased availability of corn oil as an additional co-product of the ethanol industry. Livestock and poultry producers are utilizing the co-product corn oil as an energy source in animal diets. As with other fat sources in livestock diets, oxidative stability is of concern to the end-user. Prior studies<sup>2,3</sup> have shown the effectiveness of antioxidant products containing tertiary butylhydroquinone (TBHQ) and citric acid to stabilize unsaturated oils such as corn, soy and canola. RENDOX CQ contains both of the components of interest and is recommended for use in rendered ingredients, fats and oils<sup>4</sup>.

### Materials and Methods

Thirteen (13) samples of co-product corn oil were obtained from ethanol production facilities Illinois, Indiana, Iowa, Kentucky, Michigan and Ohio. As an assessment of oil quality, all samples were analyzed for initial peroxide value (PV) in accordance with the FOX II method for peroxide quantitation<sup>5</sup>. Oxidative stability was determined via OSI<sup>6</sup>.

Two oil samples (IL #4 and IA #3, see Figure 1), deemed to be representative of typical corn oil from different ethanol processing plants, were treated with RENDOX CQ at 0, 0.5, 1.0 and 2.0 lb/ton. The samples were then analyzed in duplicate for onset of oxidation via the OSI (100°C).



**Figure 1. Delay in oxidation of two representative co-product corn oil sources due to treatment with RENDOX CQ at 0, 0.5, 1.0 and 2.0 lb/ton.**

Following the dose response study, the remaining 11 samples were treated with RENDOX CQ at a rate of 1.0 lb/ton. Duplicate treated and untreated (control) samples were subjected to accelerated oxidation via the OSI (100°C), and the time to induction was determined for each.

## Results

Treatment with RENDOX CQ delays the onset of oxidation in a linear dose-response relationship (Figure 1). For both oils tested, oxidation is delayed by approximately 5 hours for each 0.5 lb/ton of RENDOX CQ applied.

Initial PVs of the 13 corn oil samples submitted for evaluation ranged from 1.42 to 7.90, indicating the quality of the oil upon receipt to be acceptable for further evaluation (Table 1). Without treatment (control), time to induction in the OSI ranged from as long as 26 hours to as little as 10 hours, with an average of 19.7 hours. Treatment with RENDOX CQ at 1 lb/ton resulted in a delay of induction for all oils tested. The delay ranged from 5 to 14 hours. On average, treatment at 1 lb/ton delayed the onset of oxidation by 10 hours.

**Table 1. Initial quality assessment and stabilization of co-product corn oil samples.**

Sample Identification	Initial Peroxide Value (meg/kg Fat)	Average OSI Hours (100°C)		Stability Improvement (percentage)
		Control (n=2)	Treated* (n=2)	
IA #1	1.76	21.25	29.65	40%
IL #1	2.50	15.73	24.18	54%
IA #2	1.99	22.43	29.60	32%
IL #2	3.25	20.63	32.05	55%
IL #3	1.78	19.33	30.28	57%
KY #1	1.42	26.63	37.38	40%
IL #4	7.90	10.65	20.68	94%
IN #1	2.16	18.73	31.88	70%
MI #1	1.65	20.88	30.05	44%
IN #2	1.42	22.68	34.20	51%
IA #3	2.03	24.18	38.10	58%
IL #5	4.08	22.88	31.63	38%
OH #1	3.99	10.10	15.05	49%
<b>Average</b>	<b>2.76</b>	<b>19.70</b>	<b>29.59</b>	<b>50%</b>

\*Treated at 1.0 lb/ton with RENDOX CQ liquid

## Summary

Initial peroxide values (PV) indicated moderate oxidation took place in the co-product corn oil samples. Subjecting the samples to stressed conditions of OSI testing (100°C temperature and bubbling air flow) resulted in onset of oxidation within 10-26 hours (control samples). A linear dose-response relationship was established, whereby a delay in onset of oxidation of 5 hours was attributed to each 0.5 lb/ton increment of RENDOX CQ treatment. RENDOX CQ, at an application rate of 1 lb/ton, effectively delayed the onset of oxidation in all samples tested by, on average, approximately 10 hours. The data indicate that RENDOX CQ can effectively stabilize corn oil from ethanol processing.

## References

1. Impact of RENDOX<sup>®</sup> brand CQ on stabilization of corn oil from ethanol production. CLSFR-12-00127.
2. K. Noel and F. Brinkhaus. 1997. Comparative antioxidant efficacy of the antioxidants BHA, BHT, MTBHQ and ethoxyquin. WP-03-00243.
3. J. Randall. 2006. Efficacy of EN-HANCE antioxidants in oils. WP-06-00087.
4. RENDOX<sup>®</sup> brand CQ Liquid Antioxidant. SPEC-03-00252.
5. FOX II method for peroxide quantitation. MET-12-00001.
6. Method for determination of oxidation rate by the Oil Stability Index. 000-AMCLS-A10.
7. RENDOX<sup>®</sup> brand CQ liquid effectively stabilizes corn oil from ethanol production. SD-12-00023.