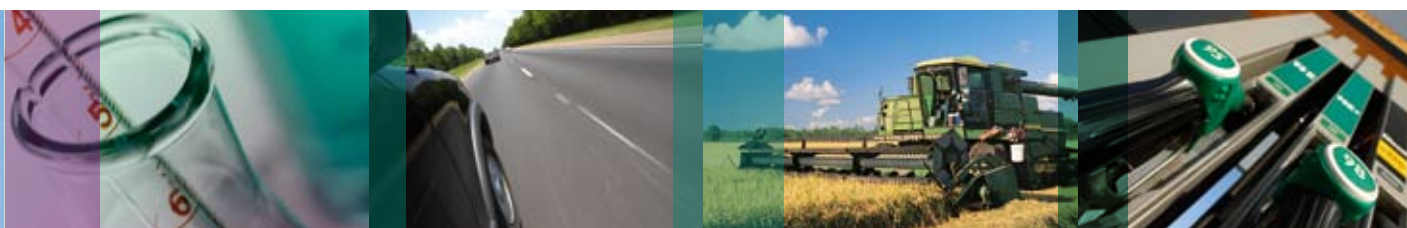


ETHANOX[®] fuel antioxidants

Enhance performance and stability in all kinds of fuels



 ALBEMARLE[®]

ETHANOX antioxidants ensure optimal stability

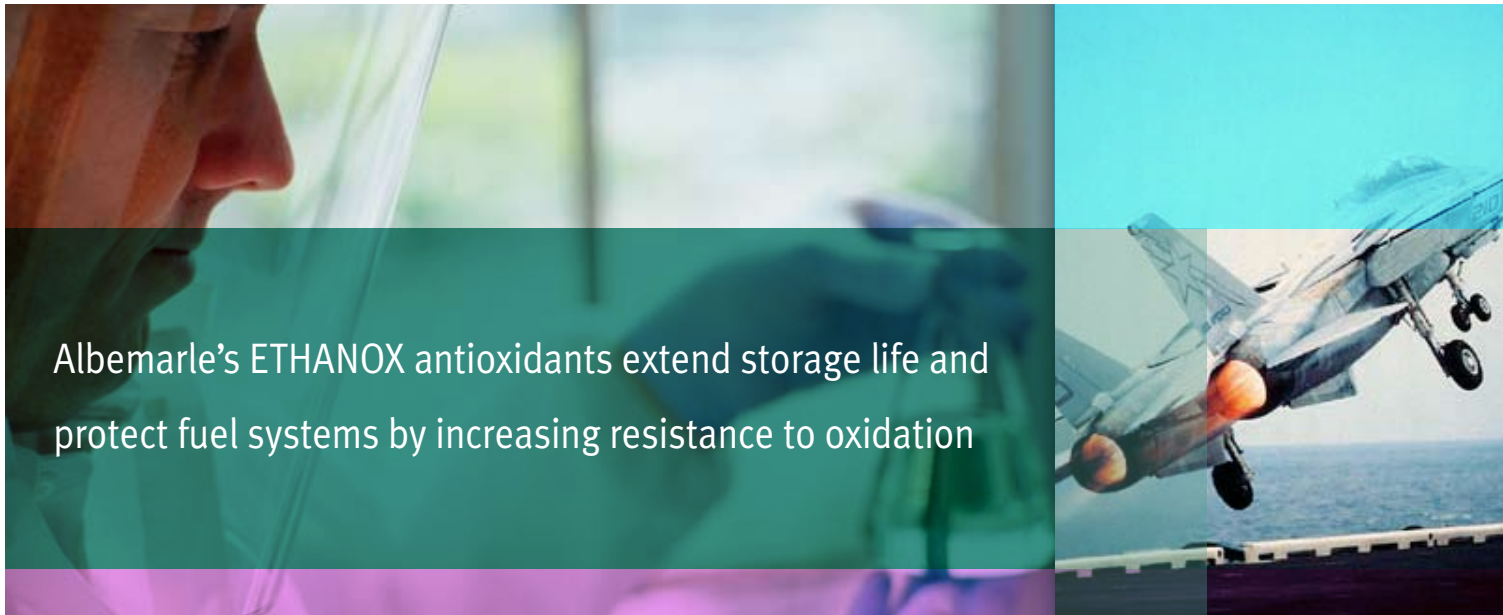
Albemarle's broad antioxidant line includes products tailored for countless applications, both civilian and military. These products meet some of the world's most stringent OEM requirements, ASTM specifications and Mil Specs. We make antioxidants for virtually every petroleum-based fuel in use today, from aviation gasoline and turbine fuels to diesel oil and generator fuel. Dependable ETHANOX products are also available in synergistic blends and dilutions to suit virtually every need, whether you are a refiner or a formulator.

Fuel stabilization with ETHANOX antioxidants

Albemarle's ETHANOX antioxidants extend storage life and protect fuel systems by increasing resistance to oxidation. They help control gum formation and meet stringent government regulations and OEM standards.

ETHANOX 4733 fuel antioxidant controls the formation of gum and peroxides without contributing to induction system deposits. It also meets leading military specifications for aviation fuel. It is available as a neat liquid and in several dilutions for convenient refinery storage and handling.

ETHANOX 4720 amine fuel antioxidant inhibits gum formation and lowers the mercaptan content in gasoline blending streams and fully blended gasoline.



Albemarle's ETHANOX antioxidants extend storage life and protect fuel systems by increasing resistance to oxidation

Fuel blenders guide to Albemarle antioxidants

Product name	Description	Composition and properties				Applications				
		Activity	Composition	Pour (PP) or Freezing (FP) Point, deg C	Flash point, deg C	Gasoline (motor and aviation)	Gasoline (motor)	Turbine fuels (aviation)	Fuel oil (Diesel)	Electrical insulating oils
Phenolics										
ETHANOX 4701	Hindered phenolic	100	-	36 (FP)	110 (PMCC)	■	■	■	■	■
ETHANOX 4733	Low melting ETHANOX 4701 (mixed-butylphenols)	100	-	17 (FP)	106 (PMCC)	■	■	■	■	
ETHANOX 4735	Low melting ETHANOX 4701 (mixed-butylphenols)	100	-	29 (FP)	106 (PMCC)	■	■	■	■	
ETHANOX 4701J	ETHANOX 4701 dilution in toluene	75	-	-30 (PP)	26 (PMCC)	■	■	■		
ETHANOX 4737	ETHANOX 4733 dilution in high flash solvent	70	-	-45 (PP)	102 (PMCC)	■	■	■	■	
ETHANOX 4745	ETHANOX 4733 dilution in high flash solvent	50	-	-45 (PP)	102 (PMCC)	■	■	■	■	
ETHANOX 4775	ETHANOX 4733 dilution in toluene	90	-	-40 (PP)	9 (TCC)	■	■	■		
ETHANOX 4776	ETHANOX 4733 dilution in toluene	80	-	2 (FP)	10 (TCC)	■	■	■		
ETHANOX 4778	ETHANOX 4733 dilution in toluene	60	-	-12 (FP)	7 (TCC)	■	■	■		
ETHANOX BHT	2, 6-di-tert-butyl-4-methylphenol	100	-	69 (FP)	127 (PMCC)	■	■	■	■	■
Amines										
ETHANOX 4720	Phenylenediamine	100	-	14 (FP)	143 (TCC)	■	■			
Metal chelators										
ETHANOX 4705	N, N'-disalicylidene propylenediamine	50	-	-68 (PP)	22 (TCC)	■	■	■	■	
Antioxidant blends										
ETHANOX 4740	ETHANOX 4733/ETHANOX 4720 blend	100	50/50	-14 (FP)	94 (PMCC)	■	■			
ETHANOX 4741	ETHANOX 4733/ETHANOX 4720 blend	100	25/75	1 (FP)	126 (PMCC)	■	■			

“We make antioxidants for virtually every petroleum-based fuel in use today, from aviation gasoline and turbine fuels to diesel oil and generator fuel”



Recommended treat rate		Fuel oils	Turbine fuel (aviation)														Gasoline (motor and aviation)			Electrical insul. oil
ptb	mg/L	MIL-F-16884J	MIL-DTL-25524E	MIL-DTL-38219D	MIL-DTL-5624T	MIL-DTL-83133E	MIL-P-25576C	MIL-P-87107C	MIL-PRF-7024E	DEF STAN 91-91	DEF STAN 91-88 (DERD 2454)	DEF STAN 91-87	DEF STAN 91-86	ASTM D 6615	ASTM D 1655	DEF STAN 91-90 (DERD 2485)	ASTM D 910	ASTM D 6227	ASTM D 3487	
6.0–35.0	17.1–99.8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
6.0–35.0	17.1–99.8	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	
6.0–35.0	17.1–99.8	■	■		■	■			■	■	■	■	■	■	■	■	■	■	■	
8.0–45.0	22.8–133.0	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
8.6–50.0	24.5–142.5	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	
12.0–70.0	34.2–199.5	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	
6.7–39.0	19.1–111.2	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	
7.5–44.0	21.4–125.4	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	
10.0–58.3	28.5–166.2	■	■	■	■	■			■	■	■	■	■	■	■	■	■	■	■	
6.0–35.0	17.1–99.8	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
6.0–35.0	17.1–99.8						■										■	■		
0.5–2.0	1.4–5.7	■	■	■	■	■	■			■	■	■	■	■	■				■	
6.0–35.0	17.1–99.8																■	■		
6.0–35.0	17.1–99.8																■	■		

Military-qualified products and ASTM approvals



Antioxidant blends

Albemarle offers ETHANOX fuel antioxidants in a variety of blends and dilutions, from blends of phenolic and aminic antioxidants and sweetening agents for gasolines, to blends of antioxidants and metal deactivators. ETHANOX 4737 fuel antioxidant is a dilution of ETHANOX 4733 fuel antioxidant in a high-flash aromatic solvent. ETHANOX 4775 and 4776 fuel antioxidants are dilutions of ETHANOX 4733 fuel antioxidant in toluene. They provide all benefits of the full-strength product, but may be used where low-temperature handling is required. The combination of phenolic and aminic antioxidants, such as in ETHANOX 4740, offers interesting stabilization synergies, see Figure 1.

Pyrolysis gasoline stabilization

Pyrolysis gasoline (pygas) is a complex mixture of hydrocarbon (typically C₅-C₉+) resulting from the high-temperature cracking of a combination of light gases (e.g., ethane, propane, butane) and heavier streams (condensate, naphtha, gas oil). Pygas is of significant importance to the production of BTX (benzene, toluene, xylene). This process usually yields a fuel stream that can be sent to the gasoline pool. However, both the pygas and the gasoline stream are very unstable owing to the rather high concentration of aromatics and olefins. Albemarle's ETHANOX 4740 is particularly effective in the stabilization of this type of gasoline stream.

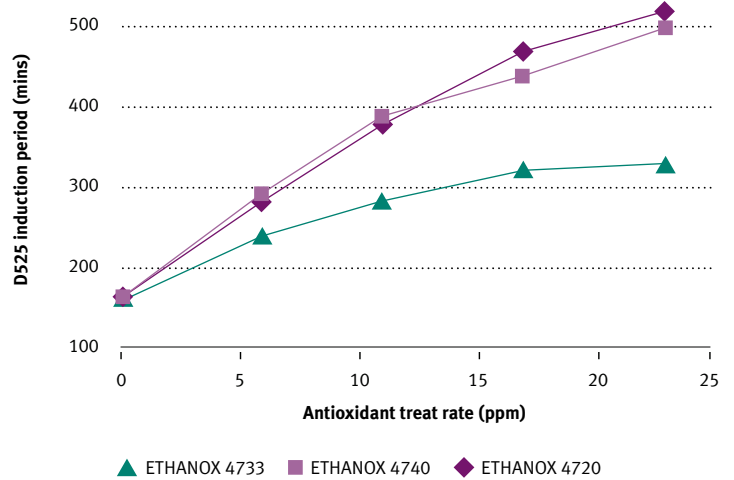


Figure 1: Illustration of the synergies observed by the combination of aminic and phenolics antioxidants (ETHANOX 4720: aminic, ETHANOX 4733: phenolics, ETHANOX 4740: blend).



We are confident that we can meet your requirements for high-quality products and services, now and in the future. If you require more information, please contact one of our regional offices.

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Issue: November 2006
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