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Title: The Determination, Distribution, And Analysis Of Organic Nitrogen Compounds In Refined Fuels From A World-Wide Survey

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ABSTRACT

Previous research studies have implicated polar organic nitrogen compounds in fuel instability. Twenty-two middle distillate fuels were investigated for their organic nitrogen distribution to determine the problematic compound(s) of fuel instability and to find an inexpensive method to remove these compounds that is independent of the refining process. The organic nitrogen compounds were isolated by mild acid extraction followed by silica gel adsorption. Three extracts were obtained from each fuel sample: a basic nitrogen extract in methylene chloride (BNC); a non-basic nitrogen extract in methylene chloride (NBNC); and a non-basic nitrogen extract in methanol (NBNC). The major constituents of each extract were determined by high-resolution gas chromatography/mass spectrometry (GC/MS). After the compounds were identified for each fuel, the fuels were grouped by ASTM factors to determine if there were significantly more or less or one type of organic nitrogen compound present that could cause instability. Finally, an unstable fuel was treated separately with three different substances and filtered through a glass filter. The results of this study showed there was not a specific organic nitrogen compound responsible for instability, but an imbalance in

either the basic or non-basic organic nitrogen compounds that caused a shift in equilibrium resulting in sediment or gum formation. Filtering an unstable fuel with three different media showed that the organic nitrogen compounds could be removed. The least expensive method was activated clay with a cost of \$30 - \$50/pound. This method can be used as the fuel is being pumped into the storage tanks, and the activated clay can be reused after washing with methanol.