



B121 An Examination of Aromatic Content in Various Medium Range Ignitable Liquids

Julia A. Dolan, MS, Bureau of Alcohol, Tobacco and Firearms, Forensic Science Laboratory - Washington, 1401 Research Boulevard, Rockville, MD*

Upon completion of this presentation, the attendee will be able to recognize the variations existing among medium-range ignitable liquids, understand the potential effects of sample preparation on these types of products, and illustrate the necessity of examining the aromatic content when classifying these types of ignitable liquids.

In this study the compositions of a variety of medium-range (C_8 – C_{13}) ignitable liquids were examined with regard to their relative proportions of aromatic and aliphatic content, as represented through the use of extracted ion profiles (EIPs) and the affect that aromatic content has on their classification. Classification of a product as an isoparaffinic product, naphthenic/paraffinic product or as a normal alkane product requires that, in addition to other specific criteria, there be virtually no aromatic compounds present. Conversely, classification of a liquid as an aromatic product requires that there be virtually no aliphatic components; the liquid is entirely comprised of aromatic compounds. These types of products are also distinctive in pattern, leading to a relatively unambiguous classification. The presence and relative amount of aromatic components becomes critical in differentiating the classes of distillates and dearomatized distillates. The criteria for identification of a distillate, as stated in ASTM 1618 includes "AROMATICS: Always present in medium and heavy distillates; less abundant than alkane;" whereas, the criteria for identification as a dearomatized distillate states "AROMATICS: Not present in significant amounts." Adding to the significance of the amount of aromatics in medium range products is the existence of commercially manufactured blends of aromatic products with medium range distillate-type products. It was hypothesized that there would be three distinct ranges of aromatic contribution and therefore, three distinct ways of classifying these types of products. These categories could be described as: medium petroleum distillates, dearomatized medium petroleum distillates, and medium-range petroleum products with an added aromatic component.

Numerous medium range ignitable liquids were analyzed via gas chromatography-mass spectrometry. A semi-quantitative examination of the data from these liquids was conducted, utilizing extracted ion profiling (EIP), focusing on the relative proportion of aromatic compounds to aliphatic compounds. In addition, the effect of adsorption-based sample preparation methods on the aromatic:aliphatic ratio was also examined. The results of the data analysis show that the tested medium range products exhibit a broad range of compositions with respect to the proportion of aromatic compounds relative to the major aliphatic compounds present. The relative proportion of aromatic compounds was shown to be a very significant factor in classifying these types of liquids. It was concluded that there is not a clear demarcation or natural break separating these three classes of products. Rather, the aromatic concentration amongst various products represents a continuum, not three distinct ranges. An approach for classifying these products is suggested based upon a semi-quantitative examination of aromatic content with respect to aliphatic content.

This study demonstrates the importance of examining the relative proportion of aromatic compounds to aliphatic compounds in the classification of medium range ignitable liquids. It also suggests guidelines for differentiating medium range distillate products from dearomatized products, and from blended products. Future work will focus on the effects of adsorption based extraction methods had on the recovery of aromatics with respect to aliphatics, and how competitive adsorption may alter the expected results.

Fire Debris Analysis, Petroleum Products, Aromatic Content