

Response to EPA's Hazard Characterization of the Gas Oil Category
The American Petroleum Institute Petroleum HPV Testing Group
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The following comments are in response to EPA's Hazard Characterization (HC) for the Gas Oil Category (U.S. EPA, 2011). This Category was sponsored by the American Petroleum Institute (API) Petroleum HPV Testing Group (Testing Group) as part of EPA's HPV Chemical Challenge Program (www.petroleumhpv.org).

Below is EPA's generic table of content for many of the HPV Hazard Characterizations they have prepared. The Testing Group's comments are found on the page numbers indicated below.

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Summary

The Testing Group's October 24, 2012 Category Assessment Document (CAD) and Robust Summaries provide sufficient information to address all the SIDS requirements for the Gas Oils Category. Unfortunately this information was submitted to EPA after the HC for this Category was written.

The EPA hazard characterization for several Petroleum HPV Categories including Gas Oils, refers to the category members as complex mixtures when in fact they are UVCB substances (HC page 3, 4, 5).

Substances on the US TSCA Inventory are divided into two classes for ease of identification (EPA 1995). Class 1 substances are those single compounds composed of molecules with particular atoms arranged in a definite, known structure. However, many commercial substances that are subject to TSCA are not Class 1 substances, because they have unknown or variable compositions or are composed of a complex combination of different molecules. These are designated Class 2 substances. Class 2 includes substances that have no definite molecular formula representation and either partial structural diagrams or no structural diagrams. These are the "UVCB" substances (Unknown or Variable compositions, Complex reaction products and Biological materials). An example of this kind of substance is given below.

CAS Number: 64741-43-1

CAS Name: Gas oils (petroleum), straight-run

CAS Definition: A complex combination of hydrocarbons produced by the distillation of crude oil. It consists of hydrocarbons having carbon numbers predominantly in the range of C11 through C25 and boiling in the range of approximately 205 degrees C to 400 degrees C (401 degrees F to 752 degrees F).

Petroleum substances are subject to nomenclature rules developed jointly by the U.S. EPA and the American Petroleum Institute (EPA, 1995b). In that guidance document, EPA adopts the definitions of petroleum process stream terms provided in API's published reference document Petroleum Stream Terms Included in the Chemical Substance Inventory under TSCA (1983, reprinted in 1985). The Stream Terms definitions include the CAS definition and registry number, the source of the substance and process (i.e., last refining step), short name, indication of carbon number, and indication of distillation range (or other appropriate characteristic). Therefore all members of the Gas Oils Category are UVCB substances, not mixtures, under EPA's nomenclature guidance.

Category Justification

The Testing Group believes the Gas Oil Category is a continuum of similar substances and the human health hazards of this category are associated with the presence of polycyclic aromatic compounds (PACs). This knowledge coupled with existing and new testing data contained in the October 24, 2012 CAD and Robust Summaries should satisfy all the HPV requirements for human health hazard data. The Testing Group no longer believes that sub-categories are necessary for this group of substances. The environmental fate and effects of the Gas Oils Category are primarily determined by the carbon range (and subsequent limits on water solubility). This knowledge coupled with existing and new testing data contained in the October

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24, 2012 CAD and Robust Summaries should satisfy all the HPV requirements for environmental hazard data.

The Testing Group described a modeling approach for assessing the repeat-dose, NAL:developmental, and gentox endpoints of substances in this Category. However, EPA did not acknowledge the utility of the statistical models used to evaluate untested samples. In the original Test Plan for Gas Oils, a relationship between mammalian toxicity and the polycyclic aromatic compound (PAC) content of the substances in that category was asserted or implied. To study this relationship, toxicology studies and analytical reports on high-boiling petroleum substances (HBPS) like [name] were collected from the Testing Group's member companies and analyzed in order to address two key questions: 1) Are there quantitative relationships between PAC content of petroleum substances and their critical effects as identified in repeat-dose, developmental, bacterial genotoxicity, and reproductive toxicity studies, and 2) can the critical effects/levels of untested petroleum substances be predicted from their PAC content? The assessment by the Testing Group showed (a) that the toxicological effects of high boiling petroleum-derived substances (i.e., final boiling points > 650 °F) were associated with PAC content, (b) that subchronic effects associated with PAC content included liver enlargement, thymic weight reductions, reduced hematological parameters, and developmental effects including reduced live-births and birth-weight, and (c) that the effects of these high boiling petroleum-derived substances could be predicted from PAC contents using predictive statistical models for several repeat-dose and developmental toxicity endpoints. The models used the weight percent of each of the aromatic ring classes (the "PAC profile") as the independent variable. The effects found to be associated with the PAC profile are consistent with those reported for a number of individual PAHs and PAC-containing materials. A predictive model for bacterial mutagenesis was also developed. The Testing Group had the results of its model building exercise reviewed through an expert peer consultation process (TERA, 2008). The Testing Group has followed up the peer consultation with additional testing and analysis and has several detailed manuscripts in-press (Murray et al., 2013; Nicolich et al., 2013; Roth et al., 2013; McKee et al., 2013).

EPA requested additional information on the Gas Oils Category including the percentages of the heteroatom-containing compounds and 3 to 7-ring polyaromatic compounds (PACs) for each substance in the category, and chemical structures and percentages of the additives used in the substances comprising the Distillate Fuel subcategory. In response to those requests;

1. The October 24, 2012 CAD provides extensive new data on the aromatic and PAC content of most Category members (Table 4, 5 and D-1), and also provides a new detailed chemical analysis of two samples representing a high and a low aromatic substance (Appendix C).
2. The small amount of sulfur, nitrogen, and oxygen (heteroatoms) in Gas Oil substances is not relevant information for predicting human health or environmental effects. The DMSO extraction in the analytical method used to build the PAC statistical models limits the presence of polar molecules. Any toxicity of heteroatom constituents in the DMSO extract are accounted for in the testing results and PAC statistical models. The MOA for aquatic toxicity is non-polar narcosis and the small amount of heteroatoms constituents in the substance are not a factor.
3. EPA requires registration of all fuel additives used in diesel fuel under Clean Air Act regulations. EPA's Office of Transportation and Air Quality has all the proprietary and non-proprietary data on chemical structures and the amount of those additives used in the USA. See, <http://www.epa.gov/otaq/fuels/registrationfuels/index.htm> The data

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requested by EPA on distillate fuel additives is outside the scope of the HPV program and is already available to EPA should they need it.

Appendix

EPA does not provide the proper Chemical Abstract Services (CAS) Name and Definition for the substances in the Gas Oils Category. Please see Appendix A of the Testing Group's October 24, 2012 CAD for a complete description of the Category members.

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References cited in this response to EPA's HC for the Gas Oils Category

McKee, R.H., Schreiner, C., Nicolich, M.J., and Gray, T. (2013) Genetic toxicity of HPV petroleum streams containing polycyclic aromatic compounds. Regulatory Toxicology and Pharmacology. Accepted for publication.

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Toxic Substances Control Act Inventory Representation for Chemical Substances of Unknown or Variable Composition, Complex Reaction Products and Biological Materials: UVCB Substances (March 29, 1995a); available from <http://www.epa.gov/oppt/newchemicals/pubs/uvcb.txt>

Toxic Substances Control Act Inventory Representation for Certain Chemical Substances containing Varying Carbon Chain Lengths (Alkyl Ranges Using the Cx-y Notation) (March 29, 1995b); available from: <http://www.epa.gov/oppt/newchemicals/pubs/alkyl-rg.txt>

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