

Office of Environmental Health Hazard Assessment (OEHHA)

Staff Evaluation of PuriNO_xTM
Generation 1 (PG1) & 2 (PG2)
Diesel Fuels & Additive Packages

April 30, 2004





Presentation Summary

- Program Background
- Data Evaluation:
 - Combustion Emissions
 - Toxicity
 - Fate & Transport
- Major Concerns
- Conclusions
- Recommendations

Multi-Media Reformulated Fuels Assessment Program: OEHHA



- Integrated Risk Assessment Section (IRAS)
 - Multi-Media (Air, Soil & Water)
 - Human Health & Environmental Impacts
- Responsibilities Include
 - Screening Level MM Assessment Review
 - MM-Methodology & MM-Guidance Development
 - Primary Evaluations & Report Preparation
 - Recommendations For / Against Full Assessments



Fundamental Premise

- Functional Comparison Assessment:
 - *Proposed Fuel vs Baseline Fuel*
- Baseline = CARB Diesel
- Adverse Impacts Being Those Significantly Greater Than Ones ID'd for Baseline Fuel



Assessment Categories

- Post-Combustion Emissions
 - Screening Risk Assessment
- Toxicity of Additive Components in *Native Unblended Fuel Additive*
 - In-House Review of Each Chemical
 - USEPA Tier II Testing
- Fate & Transport of Add. Components
 - **Mobility** in air, soil & groundwater
 - **Potential Partitioning & Persistence**
 - **To Address Toxicity & Hazard**



Data Sources for PG1/PG2 Post-Combustion Emissions



- PuriNO_xTM I: Final Report using CARB protocols, prepared for Lubrizol Corporation by Southwest Research Institute, Dec 2000
- PuriNO_xTM I: Report, USEPA Additive Program, prepared by Southwest Research Institute, June 2000 (USEPA Tier 1 data)
- PuriNO_xTM II: Report using CARB protocols, prepared by Southwest Research Institute, Nov 2001

Post-Combustion Emissions Evaluation for Gen 1 & 2



| | PG1% | PG2% |
|-------------------|---------|-------|
| • PM | ↓ 33-62 | ↓ 48 |
| • NO _x | ↓ 9-14 | ↓ 11 |
| • PAH | ↓ 11-21 | -- |
| • CO | ↓ 11-46 | ↑ 6 |
| • THC | ↑ 51 | ↑ 128 |
| • SOF | ↑ 19 | ↑ 128 |



- ↑ Hydrocarbons include benzene, butadiene, acetaldehyde, formaldehyde

Screening Risk Assessment for Carcinogenic Substances



- Post-Combustion Emissions, Input Data:
Contaminant Release & Ambient Levels from South Coast Air Quality Management District
- Results: Upper Bound Lifetime Cancer Risk:
Risk attributable to substitution of PuriNO_xTM I or II for 10% of Heavy-Duty On-Road Diesel
- Risk = Less Than 10^{-6} , for benzene, 1,3-butadiene, acetaldehyde & formaldehyde

Screening Risk Assessment for Non-Cancer Chronic Effects



- Input Data: Same Post Combustion Data
- Screening Model Output: Compares air concentration to chronic REL and estimates upper-bound percentage change attributable to substitution of PG1 or PG2 for 10% of heavy-duty on-road diesel.
- Concern for Formaldehyde: Estimated increase is less than 1.2%, but current levels exceed the REL at some sites in SCAQMD.
- There may be a small increase in irritation of eyes and lungs from this increase.

Post-Combustion Toxicity Study USEPA Tier 2 Fuels Additives



- Groups of male & female rats were exposed for 90 days to PG1 exhaust.
- There were no concurrent control groups exposed to low-sulfur diesel exhaust.
- While some mild-to-moderate adverse effects were evident, program staff can not make any conclusions concerning relative impacts due to the absence of data on concurrent control rats.

Toxicity Evaluation: Additive Chemicals Summary



- Results:
 - No Components Were Found to be Significantly More Toxic Than Diesel Fuel
 - Toxicity Test Data on High-Molecular-Weight Components Were Not Available
 - The intermediate-molecular-weight component of PG1 is acutely toxic to fish and invertebrates
 - High-Molecular-Weight Components May Accumulate in Aquatic Sediments & Organisms
- Recommendations:
 - Support Additional Limited Studies



Major Concerns

- Absence of Data on Nitrosamine Levels in PuriNO_xTM Diesel Combustion Emissions, a Concern.
- The High-Molecular-Weight Components of PuriNO_xTM fuels may accumulate & persist in aquatic organisms & sediments.
- Data are not adequate to assess what, if any, risks these might pose to humans or to the environment.

General Conclusions

- PM & NO_x: Significantly Decreased in PuriNO_xTM emissions.
 - Certain Toxic Air Contaminants are Increased Significantly in PuriNO_xTM Emissions.
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- Overall: Benefit From the Reduction of PM & NO_x Appears to Outweigh the Risk From Increases in Toxic Air Contaminants.



Specific Conclusion

- OEHHA scientists conclude that the use of PuriNO_xTM reformulated fuels may reduce illness & death due to pulmonary diseases, including lung cancer in adults & asthma in children, caused by substances in diesel exhaust.



Recommendations

- OEHHA supports recommendations for environmental persistence & toxicity testing made by the State Water Resources Control Board.
- OEHHA recommends that measurement of nitrosamines in combustion emissions from PuriNO_xTM fuel be required.



Thank You For Your Attention

OEHHA Multi-Media Reformulated
Fuels Assessment Program
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