

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 16, 2001

TO: File for naphtha (petroleum) hydrodesulfurized heavy (64742-82-1)

FROM: Marco Bianchi, Toxics Unit, Air Quality Division

SUBJECT: Initial Threshold Screening Level

The Initial Threshold Screening Level (ITSL) for naphtha (petroleum) hydrodesulfurized heavy, also known as VARSOL 40 is $14 \mu\text{g}/\text{m}^3$ based on an annual averaging time. The Air Quality Division (AQD) staff initially evaluated this compound in 1999 and approved a permissible ambient impact (PAI) of $1 \mu\text{g}/\text{m}^3$ (8-hour averaging) for American Bumper permit #277-99 (see December 8, 1999 memo for naphtha (petroleum) hydrodesulfurized heavy). Recently, Exxon Mobil Chemical Company submitted additional toxicologic information on VARSOL 40 for re-evaluation of the PAI. This toxicological assessment consisted of a number of study abstracts totaling two pages of material. Although these abstracts were very brief, a review of this information provided a complete enough assessment to set a screening level for this compound.

According to the study abstracts provided by ExxonMobil, VARSOL 40 is a complex mixture of aliphatic, alicyclic, and aromatic hydrocarbons with a typical boiling range of 150-200°C and a typical aromatic content of 7-23 percent. In the subchronic inhalation abstract, rats (number and sex of animals was not mentioned) were exposed by inhalation to 100 and 300 ppm VARSOL 40 vapors 6 hours/day, 5 days/week for 12 weeks. No treatment-related mortality occurred and body weights of treated animals were comparable to control values. Kidney weights were elevated in male rats at both doses. Histologic findings were limited to the kidneys of male rats and were indicative of light hydrocarbon nephropathy. These kidney effects resulted from the accumulation of $\alpha_{2\text{U}}$ -globulin, a protein located in the proximal tubule. Since $\alpha_{2\text{U}}$ -globulin is specific to the male rat, kidney effects resulting from this protein are not considered biologically relevant to humans. Blood urea nitrogen was elevated in male rats at 100 and 300 ppm, and some hematological parameters were significantly different from controls. No mention was made as to what specific hematological parameters were affected and if they had occurred at both dose levels.

Supporting abstracts included a reproductive/developmental evaluation and a mutagenicity test. In the reproductive/developmental evaluation, pregnant female rats (number unknown) were exposed to 100 or 300 ppm for 6 hours/day from days 6 to 15 of gestation. There was no evidence of maternal or fetal toxicity, nor any malformation at either dose level. In a dominant lethal study, male rats were exposed 6 hours/day, 5 days/week to 100 and 300 ppm VARSOL 40 vapors for 8 weeks. Following treatment, the exposed males were mated with unexposed females. There was no treatment-related effect on fertility, implantation or fetal death rates at either dose. In addition, no pathological effects on testicular tissue were observed in treated males.

Toxicologic information provided in the ExxonMobil abstracts can be used to set an ITSL, but with a low to medium confidence level. Only two dose groups were used in each of the studies.

Greater insight into the toxicity of this compound could have been obtained if more dose groups or different exposure concentrations would have been used. For the subchronic study, there was uncertainty due to not knowing how many animals were tested. It also wasn't known if both sexes were used, or just one sex. Based on these uncertainties, the 12-week study will not be used to set an inhalation reference concentration (RfC). Instead, an ITSL will be derived from a modified 7-day inhalation study according to Rule 232(l)(d). The concentration of 100 ppm will be established as a lowest-observable-adverse-effect-level (LOAEL) from the subchronic study. This is because it was unclear whether hematological effects occurred at 100 or 300 ppm.

The ITSL was derived as follows:

Conversion of ppm to mg/m³

MW of naphtha (petroleum) hydrodesulfurized heavy = 141 g/mole

$$\frac{\text{ppm} \times \text{MW}}{24.45} = \frac{100 \times 141}{24.45} = 577 \text{ mg/m}^3$$

LOAEL = 100 ppm

LOAEL (100 ppm) = 577 mg/m³

Uncertainly factors

10 = uncertainty factor; changed from 35 to 10 because principle study was 12 weeks long rather than 7 days.

10 = uncertainty factor to account for using an LOAEL for a 12-week exposure period to estimate an LOAEL for a lifetime study.

100 = uncertainty factor to account for specie differences and human population sensitivities.

$$\text{ITSL} = \frac{\text{LOAEL}}{35 \times 100 \times 10} \times \frac{\text{hours exposed/day}}{24 \text{ hours/day}}$$

$$\text{ITSL} = \frac{577 \text{ mg/m}^3}{10 \times 100 \times 10} \times \frac{6 \text{ hours/day}}{24 \text{ hours/day}} = 0.0144 \text{ mg/m}^3$$

Conversion of mg/m³ to µg/m³

$$\text{ITSL} = 0.0144 \text{ mg/m}^3 \times \frac{1000 \text{ µg}}{1 \text{ mg}} = 14 \text{ µg/m}^3$$

The ITSL for naphtha (petroleum) hydrodesulfurized heavy (or VARSOL 40) = 14 µg/m³ based on an annual averaging.

References:

ExxonMobil Chemical. 1997. Toxicological Assessment for VARSOL fluids Material Safety Data Sheet. Exxon Mobil Chemical Company.

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