MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

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INTEROFFICE COMMUNICATION

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TO: File for 1,2-Propylenimine (CAS #75-55-8)

FROM: Doreen Lehner, Toxics Unit, Air Quality Division

DATE: February 11, 2013

SUBJECT: Screening Level for 1,2-Propylenimine (CAS #75-55-8)

The initial threshold screening level (ITSL) for 1,2-propylenimine (CAS #75-55-8) is 5 µg/m^3 with an 8-hour averaging time.

1,2-Propylenimine (also known as 2-methylaziridine and propylenimine) has a molecular weight of 57.09, it is a highly reactive alkylating agent. It is a flammable, clear, oily, fuming liquid with a strong ammonical odor, and it is a known ozone precursor. 1,2-Propylenimine is used as an organic chemical intermediate in the manufacture of paper, textile, rubber, and pharmaceutical chemicals, and in the production of latex surface-coating resins to improve adhesion (ACGIH, 2012).

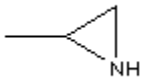

Figure 1. Structure of 1,2-Propylenimine

A literature review was conducted to determine an initial threshold screening level (ITSL) for 1,2-propylenimine. The following references and databases were searched to derive the above screening levels: CCD, United States Environmental Protection Agency (US EPA) Integrated Risk Information System (IRIS), National Institute for Occupational Safety and Health (NIOSH), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values and Biological Exposure Indices (TLV/BEI) 2012 guide, National Toxicology Program (NTP) Study Database, International Agency for Research on Cancer (IARC), Acute Database, Chemical Abstract Service (CAS) Online (searched 2/7/13), National Library of Medicine (NLM)-online, EPA Aggregated

Computational Toxicology Resource (ACToR) Database, US EPA TSCATS database, and Hazardous Substances Data Bank (HSDB).

There were several studies on 1,2-propylenimine in animals. One study by Weisburger et al., 1981, involved two dosage groups in Charles River CD male and female rats. Twenty-six animals sex/dose group were orally administered by gavage in water, initially at 12.5 and 25 mg/kg body weight twice a week for 58 weeks or 27 weeks. The association with mortality with dose was highly significant; the deaths among treated animals were so numerous that at week 20 dosing was halted. At week 22 dosing was lowered to 10 and 20 mg/kg body weight twice a week for 58 weeks for low dose and 27 weeks for the high dose. There were two groups of rats, one of 16 males and 16 females and one of 26 males and 26 females, used as matched and pooled controls respectively. Survival at 52 weeks among male and female rats, respectively was 42% and 12%, in the 10 mg/kg dosage group and 12% and 8% respectively in the 20 mg/kg dosage group. At the 17th week of the study posterior paralysis appeared in the high-dose males and later in high-dose females. This flaccid paralysis, which caused the animals to lie prostrate in the bedding, may have led to the high incidence of foreign-body pneumonia (18 at low and 36 at high dose) from inhalation of litter particles.

At 51 weeks the mean weights of the surviving high-dose groups were considerably less than those of the matched controls, even though administration of the high dose was stopped at the 28th week (Weisburger et al., 1981). Propylenimine “was clearly administered at toxic doses; the numbers of treated animals that survived those doses beyond 52 weeks were inadequate for an assessment of the compound’s potential for inducing late-appearing tumors. Nevertheless, 81% of the low-dose and 38% of the high-dose females had mammary adenocarcinomas, incidences highly significantly different from those in the matched controls. The inversion of incidence and dose appeared to be due to the higher early mortality in the high-dose group” (Weisburger et al., 1981). Though the Weisburger et al., (1981) study shows definite effects for exposure to propylenimine, it is not appropriate to use for determining a cancer risk assessment.

ACGIH has an occupational exposure limit for propylenimine. The threshold limit value – time weighted average (TLV-TWA) is 0.2 ppm (0.5 mg/m^3) with a TLV basis listed as upper respiratory tract irritation; kidney damage and a skin notation was added based on a low dermal rabbit LD50. ACGIH also lists propylenimine with an A3 notation, which is a confirmed animal carcinogen with unknown relevance to humans. Data on propylenimine is limited, but the effects are similar to, but less potent than, those seen with the homolog ethyleneimine. The TLV is based on ethyleneimine as propylenimine has the same acute toxic effects namely irritation of the skin, eye, and upper respiratory tract, as well as nausea, vomiting, headache, dizziness, and shortness of breath.

Derivation of the ITSL

The ITSL will be based on the ACGIH TLV-TWA of 0.2 ppm (0.5 mg/m^3). Based on Rule 232(1)(c) (APCR, 2012), the ITSL can be determined from an occupational exposure level (OEL) by using the following equation:

$$ITSL = \frac{OEL}{100} = \frac{0.5\ mg/m^3}{100} = 0.005\ mg/m^3 = 5\ \mu g/m^3$$

According to Rule 232(2)(a) (APCR, 2012), the averaging time is 8 hours. The initial threshold screening level for 1,2-propylenimine is 5 µg/m^3 based on an 8-hour averaging time.

References:

ACGIH. 2012. TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH Worldwide Signature Publications.

APCR. 2013. Air Pollution Control Rules, Promulgated pursuant to Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, Michigan Department of Environmental Quality. 1994, Act 451, as amended (NREPA).

Weisburger E.K., Ulland B.M., Nam J.m., Gart J.J., and Weisburger J.H. 1981. Carcinogenicity Tests of Certain Environmental and Industrial Chemicals. J Natl Cancer Inst. 67(1):75-88.

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