Texas Commission on Environmental Quality

INTEROFFICE MEMORANDUM

To: Richard Hyde, P.E., Director
Air Permits Division

Date: September 1, 2006

Thru: Michael Honeycutt, Ph.D., Manager MH
Toxicology Section, Chief Engineer's Office

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Subject: Interim Silica Health Effects Screening Level

Conclusions

The current short-term Effects Screening Levels (ESL) for amorphous fused silica and most forms of crystalline silica are 0.5 $\mu g/m^3$. The exception is crystalline quartz, which currently has a long-term ESL of 1 $\mu g/m^3$. Corresponding long-term ESLs are currently 0.05 and 0.1 $\mu g/m^3$. The Toxicology Section recommends that a value of 10 $\mu g/m^3$ be applied as an interim short-term ESL to all forms of crystalline silica as well as amorphous fused silica until updated Effects Screening Levels are developed. Consequently, the Toxicology Section recommends that a value of 1 $\mu g/m^3$ be applied as an interim long-term ESL.

Background

Silica is a common name for silicon dioxide (SiO_2). Silica exists in two primary forms. One in which the atoms are arranged in a fixed geometric pattern, known as crystalline silica. The other, in which no spatial order of the atoms exists, is known as amorphous silica. Several polymorphic forms of crystalline silica exist, including quartz, cristobalite, and tridymite. Amorphous silica occurs naturally or is manufactured synthetically. Amorphous fused silica is contained in fly ash resulting from coal combustion.

Evaluation

The current short-term ESLsfor crystalline silica are based on Threshold Limit Values (TLV) published by the American Conference of Governmental Industrial Hygienists. The TLV of 0.05 mg/m^3 for crystalline silica species was set to protect against the chronic fibrotic lung disease, silicosis, in occupational workers. The current ESL for amorphous fused silica is based on the Recommended Exposure Limit (REL) of 0.05 mg/m^3 published by the National Institute for Occupational Safety and Health. Both occupational exposure values were divided by a safety factor of 100 and 1,000 to establish the current short-term and long-term ESLs, respectively. The resulting long-term ESLs for crystalline and amorphous fused silica (0.05 $\mu g/m^3$) are therefore quite conservative.

Recently, the California Office of Environmental Health Hazard Assessment performed benchmark analysis to determine a chronic inhalation exposure level that would be expected to protect the general public over a lifetime of exposure. Data from several studies resulted in a range of 3-10 $\mu g/m^3$. Based on these data and considering potential cumulative effects, the

Toxicology Section believes that a chronic interim value of 1 $\mu g/m^3$ would remain conservatively protective of human health. The Toxicology Section therefore recommends that this value be applied as an interim long-term ESL to all forms of crystalline silica as well as amorphous fused silica until the scientific literature can be reviewed more fully and an updated ESL is developed. Based on this recommended chronic value, the Toxicology Section also recommends that a value of 10 $\mu g/m^3$ be applied as an interim short-term ESL.

If you have any questions regarding this evaluation, please do not hesitate to contact me at 512-239-1336.