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Response to Public Comments for Nickel (CAS No. 7440-02-0) and Nickel Subsulfide (CAS No. 12035-72-2)

Summary:

Based on public comments, the Air Quality Division (AQD) has reviewed the basis for the Initial Risk Screening Level (IRSL) and Secondary Risk Screening Level (SRSL) for nickel. Based on this review, the new IRSL and SRSL for nickel are 0.0058 µg/m³ and 0.058 µg/m³ with annual averaging times, respectively. These replace the previous IRSL and SRSL for nickel of 0.0042 µg/m³ and 0.042 µg/m³. The IRSL and SRSL for nickel subsulfide were not changed.

Background:

Revisions to the Air Pollution Control Rules[1] were promulgated December 22, 2016. Subsequently, the Michigan Department of Environmental Quality (MDEQ), Air Quality Division (AQD) published toxic air contaminant screening levels and their basis as required by Rule 230(1). Pursuant to Rule 230(2), the AQD solicited and received public comments on these screening levels for 60 days: February 14 through April 14, 2017. The AQD must respond to these comments within 180 days; the latest date for response is October 11, 2017.

[1] Air Pollution Control Rules in Michigan Administrative Code promulgated pursuant to Article II Pollution Control, Part 55 (Sections 324.5501-324.5542), Air Pollution Control, of the Natural Resources And Environmental Protection Act, 1994.PA 451, as amended (NREPA).

Comments and Responses:

Comment:
Foundry furnaces do not reach high enough temperatures for nickel to vaporize and form a nickel oxide emission. Specialized foundry operations can reach temperatures that volatilize nickel as elemental nickel, but not nickel compounds.

Response:
Other than nickel subsulfide, which has its own screening level, the screening levels for nickel apply only to the nickel portion of the compounds emitted to the ambient air. The amount of nickel released during any particular process is not specifically addressed when the screening level for a substance is derived. The quantity and type of emissions of nickel are typically addressed by AQD permit engineers during the review of Permit to Install (PTI) applications. The information provided by the commenters that was specific to nickel process emissions was forwarded to the AQD Permit Section for their information; however, a response regarding which processes emit nickel, including the amount and type of nickel emission estimates, is not part of the screening level public comment process as described under Rule 230(2).

Comment:
Several commenters stated that it is inappropriate to base the IRSL and SRSL on the U.S. Environmental Protection Agency's (EPA's) Unit Risk Estimate (URE) for nickel, because EPA (1987) derived the URE for nickel from studies where exposures were to nickel refinery dust containing high concentrations of nickel subsulfide (also called sulfidic nickel). There are no nickel refineries in Michigan, and the foundries and ferroalloy operations that emit nickel contain very small amounts of sulfidic nickel, if any. It was suggested that the Texas Commission on Environmental Quality's (TCEQ's) URE for nickel and nickel compounds is more appropriate.

Response:
AQD agrees that foundries and ferroalloy processes in Michigan may contain nickel subsulfide in relatively smaller quantities. The AQD agrees that sulfidic nickel is the most potent carcinogenic species of nickel compounds and that some of the epidemiology studies EPA used to derive the URE for nickel have high exposure concentrations to sulfidic nickel. Comparing EPA's published UREs for nickel subsulfide and nickel indicates that nickel subsulfide has a cancer potency that is two times higher than that for nickel: 4.8E-4 vs 2.4E-4 per µg/m³ for nickel subsulfide and nickel, respectively. TCEQ derived a URE of 1.7E-4 per µg/m³ for nickel from studies that have lower exposure concentrations of nickel subsulfide, and which more closely represent exposures to nickel from industrial processes in Michigan. Consequently, AQD is adopting the TCEQ URE of 1.74E-4 per µg/m³ for nickel as it is more appropriate than the EPA URE for nickel. Based on the URE derived by TCEQ, the new MDEQ AQD IRSL and SRSL for nickel are 0.0058 µg/m³ and 0.058 µg/m³ with annual averaging times, respectively.

Comment:
It was stated that typical nickel emissions, like nickel oxide and nickel silicate oxides, "have lower (or no) carcinogenic potency".

Response:
TCEQ states that evidence for the carcinogenicity of nickel oxide is judged as sufficient, to which the AQD concurs. As for the emissions of nickel silicate oxides, this reviewer is not aware of information on nickel silicate oxide being emitted from Michigan's industrial processes, and the only epidemiologic evaluation of a nickel refiner with nickel silicate oxide showed that the risk of respiratory tract cancers was not significantly elevated in the nickel-exposed workers (TCEQ, 2011). If nickel silicate oxide emissions are evaluated in an air permit application these emissions should be evaluated on a case-by-case basis and a new screening level might be derived based on the most current scientific data available.

Comment:
The totality of the data supports a "Practical" threshold for nickel cancer risk assessment.

Response:
The AQD reviewed the information relevant to a potential "threshold" mode of action (MOA) for nickel and found that there is not enough data to support a threshold MOA, or a practical threshold. This conclusion is supported by a thorough discussion by the Toxicology Division (TD) of the TCEQ (2011). TCEQ concludes:

> As the available relevant data are limited, the carcinogenic MOA for nickel is yet to be fully elucidated. Therefore, the TD uses linear low-dose extrapolation to calculate unit risk factors (URFs) as a conservative default assumption.

Comment:
Different threshold screening levels should be developed for each specific nickel compound.

Response:
Initial Threshold Screening Levels (ITSLs) are typically developed for protection of non-cancer health effects. Options for deriving an ITSL for specific nickel compounds include using the American Conference of Governmental and Industrial Hygienists (ACGIH) threshold limit values (TLVs) or the California Office of Environmental Health Hazard Assessment (OEHHA) reference exposure levels (RELs). See Tables 1 and 2 for potential ITSLs for nickel.

Table 1. Potential Nickel ITSLs derived from ACGIH TLVs

Nickel Compound	TLV-TWA	Resultant Potential ITSL (TLV÷100)[2]	Averaging Time
Elemental Nickel	1.5 mg/m³	15 µg/m³	8-hr
Soluble inorganic compounds	0.1 mg/m³	1 µg/m³	8-hr
Insoluble inorganic compounds	0.2 mg/m³	2 µg/m³	8-hr
Nickel subsulfide	0.1 mg/m³	1 µg/m³	8-hr

Table 2. Potential Nickel ITSLs Derived from California OEHHA RELs

Nickel Compound	REL[3]	Averaging Time
Nickel & nickel compounds (except nickel oxide for chronic inhalation exposures) (Inhalation concentrations as µg Ni/m³)	0.2 µg/m³	1-hr
	0.06 µg/m³	8-hr
	0.014 µg/m³	annual
Nickel oxide (CAS No. 1313-99-1) (Inhalation concentration as µg Ni/m³)	0.2 µg/m³	annual

The AQD could derive ITSLs for nickel compounds; however, protection of carcinogenic risks of nickel exposure via the IRSL and SRSL also appears to provide sufficient protection from non-cancer health effects.

Comment:
The Initial Risk Screening Level (IRSL) with annual averaging time should not be used for evaluating the acceptability of short-term estimates of exposure.

Response:
The IRSL and SRSL values for nickel are associated with an annual averaging time. The AQD agrees that short-term emissions or ambient air exposures to nickel should not be evaluated using screening levels with an annual averaging time, unless the emissions are averaged over a 12 month period or the air exposure is representative of an annual average. Shorter duration or intermittent emissions may be addressed with intermittent averaging as per Rule 227(2), coupled with the available screening levels and averaging time.

[2] Pursuant to Rule 232(1)(c).
[3] OEHHA RELs can be adopted as ITSLs with or without adjustments, depending on types and values of uncertainty factors use to calculate the REL.

Comment:
New rules in reporting nickel on safety data sheets identify small nickel sources that were not regulated in the past. Because of the low screening level, small sources of nickel will not be able to use the Rule 290 exemption.

Response:
The commenter is correct that Rule 290 cannot be used for an exemption of a PTI because nickel is carcinogenic and has an IRSL lower than 0.04 µg/m³ (see specific language of Rule 290). However, Rule 291, a new air pollution control rule promulgated December 20, 2016, might allow for a PTI exemption, if certain conditions are met. Rule 291(2)(b) states:

The combined potential emission of all toxic air contaminants with screening levels greater than or equal to 0.005 micrograms per cubic meter and less than 0.04 micrograms per cubic meter shall not exceed 0.06 tons per year.

Since the new IRSL is greater than 0.005 µg/m³ certain industrial processes that emit nickel might qualify for this exemption.

Comment:
Industrial and governmental agencies should share information on emission factors.

Response:
AQD agrees that industrial and governmental agencies should share information on emission factors. The recent rule revisions requiring posting of screening levels and their basis, with a formal public comment process, is a significant improvement in information sharing and transparency.

Comment:
Installation of control devices should not be required when potential health risks of nickel emissions do not exist.

Response:
AQD PTI legal requirements include emission control technology requirements and health-based requirements. Under these legal requirements, the applicability of emission control technology requirement is not contingent on a demonstrated level of health risk. Additionally, the decision to apply or not apply an emission control device is dependent on many factors including the quantity and type of nickel emissions and the potential impact to public health. Site specific considerations are taken into account when determining impacts, including stack height, how far way the property line is, and the proximity to sensitive receptors such as found in a residential area. The AQD does not agree that potential health risks of nickel emissions do not exit. The screening

levels reflect the best available science indicating that exposures to these substances can cause cancer at low levels of exposure.

Summary and Conclusions:

MDEQ reviewed the published derivation of the URE for nickel compounds. We found that the TCEQ URE for nickel compounds was more appropriate for evaluating cancer risk from Michigan industrial sources of nickel compounds than using EPA's URE for nickel refinery dust. Therefore, using the TCEQ's URE of 1.74E-4 per µg/m³ for nickel and nickel compounds, the IRSL and SRSL for nickel compounds (as nickel) are changing to 0.0058 µg/m³ and 0.058 µg/m³ (annual averaging time), respectively. These new screening levels replace the previous IRSL and SRSL for nickel of 0.0042 µg/m³ and 0.042 µg/m³. The IRSL and SRSL for nickel subsulfide were not changed.

The primary AQD reviewer for these comments was Mike Depa, AQD Toxics Unit. The secondary (peer) reviewer was Robert Sills, AQD Toxics Unit Supervisor.

References:

EPA. 1987. Nickel refinery dust; no CASRN. Integrated Risk Information System (IRIS), Chemical Assessment Summary. National Center for Environmental Assessment. U.S. Environmental Protection Agency.
https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0272_summary.pdf

TCEQ. 2011. Nickel and Inorganic Nickel Compounds. Development Support Document. Final, June 01, 2011. Accessible 2013. Prepared by: Darrell D. McCant, B.S.; Joseph T. Haney, Jr., M.S.; Roberta L. Grant, Ph.D.; Toxicology Division. Chief Engineer's Office. Texas Commission on Environmental Quality. 109 pgs.
http://www.tceq.texas.gov/assets/public/implementation/tox/dsd/final/june11/nickel_&_compounds.pdf