

SYNERGIST® FORUM:

Two Views on the New Manganese TLV®

What Is the TLV's Role in Industrial Hygiene Practice?

Editor's note: In his article "An Order of Magnitude" in the August 2013 issue, Mike Harris argued in favor of adopting the new ACGIH® Threshold Limit Value (TLV®) of 0.02 mg/m³ (time-weighted average) for manganese in welding fume. Below, The Synergist presents additional information on this issue from Dan Chute and a response from Harris. The opinions expressed in these pages are the authors' and do not necessarily reflect those of AIHA® or The Synergist.

The New Manganese TLV Is Not a Call to Action

BY DAN CHUTE

I was pleased to see Mike Harris' article on the new 2013 manganese TLV. Based on a limited literature search and the information provided by ACGIH in the TLV documentation, the article recommended that employers and industrial hygienists embrace and apply this new TLV, accepting the premise that many cases of potential neurological harm may be prevented.

While the reduction of illness and injury is a noble goal, which Mr. Harris and I share, ACGIH reminds us in its Statement of Position Regarding the TLVs and BEIs (<http://bit.ly/acgih-position-statement>) that the 2013 TLV and documentation for Mn was never intended to provide a complete summary on the topic to use as a basis for action.

If you, as an industrial hygienist, are going to disregard the label warnings in the *TLV Guide* and present the new TLV for Mn to employers and business owners as a supportable basis to consider substantial and far-reaching changes to welding manufacturing methods, facility design, and possible work force reductions in your community, you should be ready to defend that action. As you stand at the front of a crowded

room, alone, facing the affected parties, expect to be asked a few basic questions:

1. Is this new standard the law?

No. It is neither a standard nor a regulation. The Policy Statement and Statement of Position published in the *TLV Guide* make that very clear. The TLV is considered a recommendation based upon an expression of scientific opinion by a volunteer committee with no authority expressed or implied.

2. Does this TLV represent the consensus of the industrial hygiene profession?

No. Membership on the TLV committee is restricted to employees of governmental organizations. The committee meets twice a year, and the identities of the primary authors of TLV documentation are not revealed. Health and safety professionals from other organizations, including private companies where the affected materials are produced or used in manufacturing or commerce, are excluded.

3. Does the TLV documentation provide a complete and balanced summary of the information known and available on this topic?

No. The TLV documentation does not claim to present the complete picture on this issue with any validation or rebuttal. It summarizes a series of illness

claims for others to sort out through further investigation and analysis.

In a study titled "Development of an Animal Model to Study the Potential Neurotoxic Effects Associated with Welding Fume Inhalation," published in 2006, NIOSH's James Antonini stated,

Depending on the welding process and the composition of the welding electrode, manganese may be present in different oxidation states and have different solubility properties. These differences may affect the biological responses to manganese after the inhalation of welding fumes. A causal association between neurological effects and the presence of manganese in welding fume has yet to be established. (<http://bit.ly/niosh-weldingstudy>)

The sidebar on page 32 lists several of the many references that support this conclusion.

In addition, published and peer-reviewed reports presented to the committee identified many weaknesses in the information presented in the documentation. These concerns include selection bias, where self-reported symptoms were presented by lawsuit plaintiffs, and reliance upon unproven testing and analytical methods, such as handwriting analysis, to reach conclusions of neurological impairment.

The TLV documentation for Mn does not claim to offer proof of causation linking Mn in welding fume with any neurological impairment. Responsible practitioners should not imply otherwise.

4. Does the TLV define air sampling methods to measure compliance?

No. There is no correlation between historical air monitoring data for total Mn and the specified particle-size fractions for inhalable or respirable Mn. Adding to the dilemma, there is no NIOSH- or OSHA-validated air sampling method provided to measure respirable or inhalable Mn. Consequently, the new TLV for Mn offers an end point that cannot be measured. Again, the ACGIH TLV Statement of Position clearly states that its recommendations are not required to be based upon validated test methods or measureable end points.

It is also important to recognize that the OSHA enforcement data shown in Figure 1 of Mr. Harris' article in the August *Synergist* should be considered as a highly selective "worst case" presenting exposures to total Mn that do not represent typical conditions. They provide no basis of comparison to the new TLV values. They are also shown to be, on average, at or below ten percent of the OSHA permissible exposure limit (PEL).

5. Did the TLV committee conduct new research to determine how this limit may be achieved?

No. The TLV Statement of Position is clear that these values are presented with no consideration for economic or technical feasibility. There is no demonstrated evidence that the new TLV is achievable or measureable (with validated methods) for production welding in manufacturing or construction. In practice, industrial hygienists are expected to be productive contributors to effective hazard control strategies. We need to offer constructive recommendations for action.

6. Since the OSHA PEL for Mn is forty years old, isn't the new TLV automatically better and more protective?

No. TLVs and PELs play very different roles. OSHA and NIOSH are required by law to fulfill duties defined under Section 6 of the Occupational Safety and Health Act to implement standards, where needed, to define requirements for employers to provide a workplace free of known and recognized hazards. Clearly, in the public forum, there has not been a demand or justification for such a sweeping revision for Mn. Plus, since the experts state that the scientific link between welding fume and movement disorders is not proven, there is no evidence that elimination of all welding—with Mn in fume exposures at zero—would eliminate one illness.

I have been an ACGIH member since 1980 and recognize that the TLVs have

historically held a place of deep reverence among the industrial hygiene profession. Ongoing use and application of the TLVs, however, needs to be accompanied by a clear understanding of their role as one piece in a much bigger picture.

Upon review, the 2013 TLV for Mn does not provide a call to action for welding processes, nor was it ever intended for that purpose. I hope that industrial hygienists will take the time to better understand and properly present the TLVs while continuing to improve the effectiveness of health and safety programs in meaningful ways.

And here's what I would tell welders: As I see it, progress is steadily moving towards a cleaner, more efficient work environment that will include changes to welding processes, equipment, and materials. Scientists continue to study welding fume and other chemical compounds to help us identify and control potential health hazards. In my role as an industrial hygienist, I participate in that process to measure, review new information, and make recommendations for you and me to have a safe place to work.

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Resources

- "A Cohort Study of Parkinson's Disease and Other Neurodegenerative Disorders in Danish Welders." *Journal of Occupational and Environmental Medicine* (May 2005).
- "Design, Construction, and Characterization of a Novel Robotic Welding Fume Generator and Inhalation Exposure System for Laboratory Animals." *Journal of Occupational and Environmental Hygiene* (April 2006).
- "Development of an Animal Model to Study the Potential Neurotoxic Effects Associated with Welding Fume Inhalation." *Neurotoxicology* (September 2006).
- "Employment as a Welder and Parkinson Disease among Heavy Equipment Manufacturing Workers." *Journal of Occupational and Environmental Medicine* (October 2006).
- "Environmental Risk Factors for Parkinson's Disease and Parkinsonism: The Geoparkinson Study." *Occupational and Environmental Medicine* (October 2007).
- "Health Effects of Welding." *Critical Reviews in Toxicology* (January 2003).
- "Health of Arc Welders in Steel Ship Construction : A Survey." U.S. Public Health Service (1947).
- "Parkinson's Disease and Other Basal Ganglia or Movement Disorders in a Large Nationwide Cohort of Swedish Welders." *Occupational and Environmental Medicine* (February 2006).
- "Searching for a Relationship between Manganese and Welding and Parkinson's Disease." *Neurology* (2005).
- "State-of-the-science Review: Does Manganese Exposure during Welding Pose a Neurological Risk?" *Journal of Toxicology and Environmental Health* (November-December 2007).