



Industry Guide

Automobile and Transportation Equipment

The automobile industry is America's largest manufacturing industry. According to a 2001 report, the industry directly employs 1.4 million Americans and another 2.1 million U.S. workers are employed indirectly by suppliers and other industry-related businesses. The hazards employees face vary with the types of facilities and the production processes in place where they work. Those hazards may include:

Chemical agents

└ such as silica-containing dusts, acid mists, carbon monoxide, metal fumes, metal working fluid aerosols, isocyanates, and organic vapors

Biological agents

└ such as bioaerosols

Physical agents

└ such as noise

This publication is designed to assist health and safety professionals in choosing the appropriate equipment and methodology to assess the major chemical agents found in the automotive industry. Contact SKC Inc. at 724-941-9701 or www.skcinc.com for equipment to evaluate biological and physical agents.

Silica-containing Dusts

In the automotive industry, the main exposure to silica-containing dusts occurs in foundry processes including finishing, shakeout-knockout, molding, core making, and melt department maintenance activities.⁽¹⁾ If crystalline silica enters the lung, fibrotic nodules and scarring can occur around the trapped silica particles. This fibrotic condition of the lung is called silicosis. If the nodules grow too large, breathing becomes difficult and death may result. Silicosis victims are also at high risk for developing active tuberculosis.

The National Institute of Occupational Safety and Health (NIOSH) recommends that crystalline silica levels not exceed 0.05 mg/m^3 as an eight-hour time-weighted average (TWA). The U.S. Occupational Safety and Health Administration's (OSHA) standard is determined by performing a calculation which takes into consideration the percentage of silicon dioxide (SiO_2) in the sample.

For respirable dust containing quartz, this calculation is as follows:

$$\frac{10 \text{ mg/m}^3}{\% \text{ SiO}_2 + 2}$$

For details on sampling crystalline silica, reference the following SKC publications:

SKC Chemical Fact Files®

Silica, Crystalline, Quartz, Respirable Dust

by OSHA Method ID 142

SKC Publication 1003

Silica, Crystalline by XRD

by NIOSH 7500

SKC Publication 1370

Acid Mists

Electroplating processes used to produce trim, hardware, and bumpers on automotive products can produce chromic acid and sulfuric acid mists. Specifically, exposures to acid mists can occur from the manual insertion and removal of components from open-surface tanks. Acid mists are corrosive to the skin and respiratory system and they have been associated with an increase in cancer.

In 2006, OSHA lowered the PEL for hexavalent chromium and issued a revised sampling and analytical method with special sampling requirements for chrome plating operations. The new OSHA standard for hexavalent chromium is 5.0 µg/m³ as an eight-hour TWA. OSHA has established an eight-hour TWA of 1 mg/m³ for sulfuric acid.

For details on sampling acid mists, reference the following SKC publications:

Chemical Fact Files

Chromic Acid and Chromates

by OSHA ID 215, Version 2

SKC Publication 1439

Sulfuric Acid

by OSHA ID 113

SKC Publication 1465

Inorganic Acids

by NIOSH 7903

SKC Publication 1016

Carbon Monoxide

Carbon monoxide gas is an atmospheric contaminant in foundry processes. Exposures can occur due to leaks from furnaces or gas pipelines, when performing furnace maintenance, and during upsets in process ventilation in the melt department. Carbon monoxide can cause asphyxiation by interfering with the oxygen-carrying capacity of blood.

OSHA established a PEL of 50 ppm for carbon monoxide as an eight-hour TWA.

For details on sampling carbon monoxide, reference the following SKC publications:

Carbon Monoxide

by OSHA ID 209

For details on sampling carbon monoxide using a direct-reading instrument, see www.skcinc.com.

Chemical Fact Files

Carbon Monoxide

by OSHA ID 210

SKC Publication 1021

Metal Fumes

Metal fumes can be generated during various automotive operations including melting and pouring operations in the foundry, welding in the fabrication area, and soldering and grinding of lead and tin alloys in the assembly areas. Metal fumes may produce inhalation fever or cause damage to specific target organs depending on the specific metal constituents. OSHA has set PELs for individual metals.

For details on sampling metal fumes, reference the following SKC publications:

Chemical Fact Files

Metal and Metalloid Particulates in Workplace Atmospheres

by OSHA ID 125G

SKC Publication 1371

Lead in Dust Wipes by Chemical Spot Test

by NIOSH 9105

For details on sampling lead on skin or surfaces, see www.skcinc.com for information on the SKC Full Disclosure Lead Wipes Cat. No. 550-001/002.

Metalworking Fluid Aerosols

Metalworking fluids are used in machining processes to cool and lubricate tools, remove metal chips, and provide corrosion protection. During use, aerosols from the metalworking fluids can become airborne and pose an exposure risk to workers. Possible health effects include respiratory disorders such as asthma and dermatitis from direct skin contact with the fluids. NIOSH has a recommended exposure limit for metalworking fluids of 0.5 mg/m³ as total particulate and 0.4 mg/m³ as thoracic particulate.

For details on sampling metalworking fluid aerosols, reference the following SKC publications:

Chemical Fact Files

Metalworking Fluids (MWF), Total Particulate

by NIOSH 5524
SKC Publication 1726

Metalworking Fluids (MWF), Thoracic Particulate

by NIOSH 5524
For details on sampling thoracic particulate, see www.skcinc.com for information on the SKC Parallel Particle Impactor (PPI) Cat. No. 225-381

Isocyanates

Sources of isocyanates in the auto industry include high-density polyurethane systems in body parts such as nose cones and low-density foams for seats and interior padding. Typical isocyanates found in the auto industry include TDI, MDI, and HDI. Chemical vapors or mists of these compounds can cause irritation, discomfort, and severe sensitization of the respiratory system.

For details on sampling isocyanates, reference the following SKC publications or see www.skcinc.com for information on the ISO-CHEK Coated Filter Sampling System Cat. No. 225-9023:

Chemical Fact Files

Diisocyanates

by OSHA 42
SKC Publication 1458

Isocyanates

by NIOSH 5521
SKC Publication 1459

Isocyanates

by NIOSH 5522
SKC Publication 1460

Organic Vapors

There are several sources of organic vapors in the auto industry including coremaking and core burn-off products, gunflashing, degreasing, and spray painting operations. Typical organic vapors in the auto industry include formaldehyde, styrene, methylene chloride, toluene, xylene, mineral spirits, naphtha, butyl and amyl acetate, and methyl alcohol. Toxic effects of these compounds vary, with some acting as irritants or causing narcosis and others having more serious, long-term effects.

For details on sampling organic vapors, reference the following SKC publications or see www.skcinc.com for information on active or passive sampling for specific organic vapors of concern:

Chemical Fact Files

Hydrocarbons, Aromatic

by NIOSH 1501
SKC Publication 1453

Hydrocarbons, Halogenated

by NIOSH 1003
SKC Publication 1454

References

⁽¹⁾ Jeanne Mager Stellman, *Encyclopedia of Occupational Health and Safety*, 4th Ed. Vol III, International Labor Organization, Geneva, 1998, pp. 91.2-91.8