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Polycyclic Aromatic Hydrocarbons

Hazard Awareness Bulletin
July 2022

Helping to reduce your exposure to Polycyclic Aromatic Hydrocarbons during metal production and fabrication.

What are Polycyclic Aromatic Hydrocarbons?

Polycyclic aromatic hydrocarbons (PAHs) are a large family of hundreds of different organic molecules, that feature a number of cyclic carbon rings. PAHs make up the largest portion of Coal Tar Pitch Volatiles (CTPVs).

PAHs are created by the incomplete combustion of organic materials and biofuels such as coal, wood and crops (including grass and forest fires); emissions from volcanic eruptions; released from various organic materials such as coal, coal tar pitch, aluminum smelting, crude oil, mineral oils, bitumens and tars, and industrial processes and applications that use these materials. Benzo[a]pyrene (BaP) is a five-membered PAH and is one of the most well-known and studied PAH. BaP can present a serious risk to human health and can be released by materials such as coal tar pitch in sufficient quantities to result in significant exposures. Other PAHs may present a more serious health risk but may be created in much smaller amounts. BaP is often used as an indicator for all PAHs, however it is just one of many that may present a health risk.

How can Polycyclic Aromatic Hydrocarbons affect me?

Workplace exposures to polycyclic aromatic hydrocarbons have been associated with a range of potential health effects – some can result from short-term acute exposures, others from long-term, repetitive, chronic exposures.

Potential acute health effects associated with metal production or fabrication

- Skin irritation (pitch burn) leading to photosensitivity
- Eye and upper respiratory tract irritation

Potential chronic health effects associated with metal production or fabrication

- Cancers of the lung, skin, bladder, and kidney
- Cardiovascular issues
- Possible fertility issues

Additional Information

The simplest PAH is naphthalene, consisting of a two-membered benzene ring. However, the most common PAHs are five and six-membered aromatic (benzene) rings. As PAHs are created or emitted from a thermal process, and as they generally have low vapor pressures, they enter the atmosphere as vapors, but most will then be absorbed onto or condense upon existing particles, or form particles themselves, although some may remain in the vapor phase.

When do workplace exposures occur?

Inhalation

Often the primary route of polycyclic aromatic hydrocarbons exposure is through inhaling dust and fumes from processes that use or burn organic materials. In metal production, aluminum smelting and coking ovens can result in significant exposure.

Dermal

The secondary route of exposure is through contact with the skin and eyes.

Ingestion

Workers can be exposed by the accidental ingestion of polycyclic aromatic hydrocarbons, for example workers eating, drinking, smoking, or biting their nails when their hands are contaminated.

Industries / Applications where workplace exposures may occur

Examples of metal production and fabrication applications, as well as other industries and processes in which individuals may be exposed to polycyclic aromatic hydrocarbons and Benzo[a]pyrene:

Iron and Steel

- Coke ovens
- Foundry processes (e.g. processing of steel and other alloys from coal additives in molding sand)

Aluminum

- Smelting – emissions from pots
- Graphite electrode production (e.g. anode production for the aluminum industry)

Fabrication

- Use of lubricating and cutting oils (e.g. in steel production)

Other applications

- Coal gasification plants
- Chimney sweeping
- Petroleum refineries (mainly exposed to naphthalene and its methyl derivatives)
- Impregnation of wood with creosotes (mainly exposed to naphthalene, phenanthrene, and fluorene)
- Handling of creosote-impregnated wood (e.g. railroad and utility workers, carpenters, mainly exposed to naphthalene, phenanthrene, and fluorene)
- Asphalt and pavement work
- Roofing
- Smokehouses (processing of meat and fish)
- Mechanics, bus garage workers, and machinists (from diesel & spark-ignition engine exhaust gases)
- Mining (from diesel engine exhaust gases)
- Coal fired power plants

Medical surveillance

Those who are, or are likely to be significantly exposed to polycyclic aromatic hydrocarbons, including coal tar pitch volatiles, may be required by national, state, or provincial regulations to undergo regular health checks and medical surveillance, including periodic physical examinations.

What can I do to help protect my workers?

Use appropriate controls

Employers need to conduct a risk assessment, including a determination of exposure levels compared to exposure limits to understand what control measures may be needed.

If required, controls from the hierarchy of controls should be implemented and their effectiveness measured. For example, local exhaust ventilation (LEV) can be a highly effective engineering control used in welding, grinding, and many other applications.

Get the equipment that you need

In addition to implementing other control measures, Personal Protective Equipment (PPE) such as Respiratory Protective Equipment (RPE) is commonly used to help reduce exposures and risks to workers.

Respiratory Protective Equipment (RPE) – air-purifying respirators

3M has a range of RPE that can help reduce your exposure to dusts, mists, metal fume, as well as gases and vapors commonly encountered in metal production and fabrication. These include disposable particulate respirators, reusable half- and full-facepiece respirators, and heavy-duty battery powered air-purifying respirators combined with a range of robust facepieces, headtops, and helmets.

Respiratory Protective Equipment (RPE) – supplied air respirators

3M also has a wide range of supplied air respirators, suitable for use in some of the most demanding work environments.

Other PPE

3M can also provide a wide range of other safety solutions including:

- Head, eye, and face protection
- Disposable and reusable ear plugs and ear muffs
- Protective Communication solutions
- Disposable protective coveralls
- Fall protection
- Confined space solutions

Find your respirator

Use our interactive disposable respirator selector to help you find a respirator that meets your protection needs.

Find your respirator

Use our respirator selection guide to help you find a respirator that meets your protection needs.

Find your respirator

Use our interactive powered & supplied air respirator selector to help you find a respirator that meets your protection needs.

View all 3M PPE Solutions

Training

A key component of an effective PPE program is training for both workers and those responsible for health and safety in the workplace.

For example, workers wearing PPE should be trained in and understand:

- How PPE works, what it does, and its limitations
- Inspection, maintenance, and cleaning of the PPE as well as identifying damaged PPE and knowing proper disposal
- Proper fitting and use of the PPE
- The nature of all hazardous substances present and the potential effects upon their health

Stay Informed

When selecting the appropriate protective equipment, local, state, provincial, or national regulations, laws, and guidelines need to be followed.

One of the tasks of the occupational safety and health specialist is to monitor constantly changing legal regulations, occupational exposure limits, etc.

Technical Help

At any time, you can get in touch with one of our PPE professionals for personalized help on the selection and use of 3M products. They can help you through the process of selecting suitable products based on your risk assessment, as well as helping you understand how to fit, use, and maintain your PPE – helping you to stay protected. In India, contact 3M Customer Care at 1-800-425-3030.

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