

# CHAPTER 1- SILICA SUBSTITUTES

## **GENERAL COMMENTS FOR INSTRUCTORS:**

This chapter will provide the information for workers to learn about silica-free abrasive medias for abrasive blasting. Silica sand is an extremely dangerous health hazard that has caused illness and disease in many abrasive blasters.

The workers must come away from this section with a good understanding of how substitute medias work and why they may cost less than silica sand. They should understand the reasons why they should switch medias: health, elimination of silica dust, economic, and recycle/reuse options.

## **AUDIO VISUAL AIDS:**

- PowerPoint® Chapter 1
- Literature and non-silica abrasive samples presented by abrasives salesman.

## **APPENDICES:**

- Appendix I: Silica Substitutes for Abrasive Blasting
  - Appendix I-A: Silica Substitutes Brochure
  - Appendix I-B: Silica Substitutes Background Information
- Appendix II: Evaluation of Substitute Materials for Silica Sand in Abrasive Blasting - Phase 3 of a study commissioned by the Centers for Disease Control and Prevention (CDC) and the National Institute for Occupational Safety and Health (NIOSH).  
Internet Address: <http://www.cdc.gov/niosh/abrpt946.html>
- Appendix III: MIOSHA Occupational Health Standards for Silica
  - Appendix III-A: PART 590-Silica in General Industry
  - Appendix III-B: PART 690 Silica in Construction

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## SUBSTITUTE NON-SILICA ABRASIVE MEDIA

IF YOUR BUSINESS USES SILICA SAND AS AN ABRASIVE MEDIA, the best way to eliminate/minimize airborne crystalline silica is to not use it as an abrasive media.

There are several alternative non-silica abrasive media options available.

### ⇒ NON-SILICA MEDIA SUBSTITUTES - A NEW OPTION?

**No.** Non-silica substitutes have been around for decades. In 1950, Great Britain banned the use of silica in blasting operations and other European countries banned the use of silica sand as an abrasive media in 1966. European nations have been using non-silica abrasives successfully ever since.

There are many non-silica abrasive blasting substitutes you can use. They provide excellent results with a kick - many can be recycled and reused many times. Switching to non-silica abrasive blasting substitutes can completely eliminate the major source of silica in your shop. You will still need general safety and health programs, and successfully lowering the airborne levels of silica dusts to below the MIOSHA limits will be much easier even if you still blast on a silica-containing material.

Be careful though: The application of many of the non-silica abrasive media, when blasted at a high velocity, may result in the release of toxic dust that may be hazardous to you and your workers. For example:

- Silica sand (crystalline) can cause silicosis, lung cancer, and breathing problems in exposed workers.
- Coal slag and garnet sand may cause lung damage similar to silica sand.
- Copper slag, nickel slag, and glass (crushed or beads) also have the potential to cause lung damage.
- Slags can contain trace amounts of toxic metals (such as arsenic, beryllium, cadmium, chromium, lead, nickel, silver, titanium, and vanadium).

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Some less toxic abrasive blasting materials include:

- Plastic Bead Media
- Sponge
- Sodium Bicarbonate (Baking Soda)
- Ground Walnut Shells
- High Pressure Water
- Ground corn cob, and other biodegradable materials.

<b>Pros and Cons of Substituting a Non-Silica Abrasive</b>	
<b><u>PROS</u></b>	<b><u>CONS</u></b>
<ul style="list-style-type: none"> <li>• Gets <i>silica</i> out of the workplace before it can hurt you.</li> <li>• Minimizes silica exposure if substrate contains silica.</li> <li>• No silica exposure monitoring required if non-silica substrate.</li> </ul>	<ul style="list-style-type: none"> <li>• Greater “up-front” cost when purchasing raw material.</li> </ul>
<ul style="list-style-type: none"> <li>• You may be able to recycle and reuse the abrasive material several times.</li> </ul>	<ul style="list-style-type: none"> <li>• Equipment for recovery may have a substantial initial investment.</li> </ul>
<ul style="list-style-type: none"> <li>• Often more effective and faster than silica sand.</li> </ul>	<ul style="list-style-type: none"> <li>• Possibly too aggressive for some materials.</li> </ul>
<ul style="list-style-type: none"> <li>• Non-silica abrasives provide excellent profile results.</li> </ul>	<ul style="list-style-type: none"> <li>• Can’t use one media on all material. (i.e., steel shot on fiberglass boat hulls.)</li> </ul>
<ul style="list-style-type: none"> <li>• Can help you comply with other MIOSHA rules.</li> </ul>	NONE

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## THE IMPORTANCE OF HEALTH AND SAFETY PROGRAMS

An effective health and safety program makes all the difference in preventing injuries and illnesses in the workplace. The best health and safety program will involve every level of the organization and instill a safety culture that will reduce accidents for workers and improve the bottom line for managers. When health and safety are part of the organization and a way of life, everyone wins.

⇒ **General Industry:** YOU SHOULD develop your Health and Safety Program Using a “System” Approach to Safety and Health

A safety and health management system (SHMS) is your best defense against a workplace injury. An effective SHMS has five primary elements:

- Management Commitment
- Employee Involvement
- Workplace Analysis
- Hazard Prevention and Control
- Safety and Health Training

⇒ **Construction:** MIOSHA requires Construction firms to develop and implement an Accident Prevention Program (APP) – another name for a health and safety program.

An effective health and safety program includes provisions for the systematic identification, evaluation, and prevention or control of general workplace hazards, specific job hazards, and potential hazards, which may arise from foreseeable conditions. More about this in *Chapter 5 Minimizing Airborne Silica*.

## IF YOU BLAST WITH SILICA SAND OR YOU ARE BLASTING ON A SUBSTRATE CONTAINING SILICA, YOU MUST:

⇒ **Assess the exposure of each employee *who is or may reasonably be expected to be exposed to respirable crystalline silica at or above the action level (25 µg/m<sup>3</sup> as an 8-hour time weighted average (TWA)).***

If you or your workers are exposed to respirable crystalline silica **at or above the action level [25 µg/m<sup>3</sup> as an 8-hour time weighted average (TWA)]** you must perform further exposure monitoring. *See Chapter 4 Air Monitoring*

You can contact MIOSHA Consultation, Education and Training (CET) or an industrial hygienist for help in conducting air monitoring and/or determining exposures based upon calculations of composition of blast media and substrate.

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⇒ **You MUST develop a Written Silica Exposure Control Plan if the exposure monitoring results show workers are exposed to respirable crystalline silica at or above the action level (AL) 25  $\mu\text{g}/\text{m}^3$  calculated as an 8-hour time weighted average (TWA).**

You may develop a plan yourself, ask MIOSHA CET for assistance, or get help from an industrial hygienist/safety professional. *See Chapter 5, Minimizing Airborne Silica*

The written exposure control plan must contain at least the following elements:

- A description of tasks that may involve exposure to silica dust;
- A description of the engineering controls, work practices and respiratory protection used to limit employee exposure to silica dust for each task; and
- A description of the housekeeping measures used to limit employee exposure to silica dust.

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## **REFERENCES:**

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## Notes