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NIOSH To Study Several Substitute Abrasives

Mark F. Greskevitch, NIOSH

Project Goal

This paper describes the NIOSH project entitled "Evaluation of Substitutes for Silica Sand in Abrasive Blasting." The long-term goal of this project is to develop comparative health-related, economic, and technical data regarding silica sand and seven substitutes for silica sand which could help prevent silicosis and deaths from sandblasting.

Project Summary

Health-related, technical, and economic data will be collected and reported for silica sand and seven substitutes for silica sand in an abrasive blasting laboratory or enclosed booth and at selected field sites. A third report will be provided that compares the data from the laboratory to the field sites.

Abrasives To Be Studied

The eleven substitutes that will be studied along with silica sand in this project are: silica sand treated with a dust suppressant, garnet, staurolite, coal slag, copper slag, nickel slag, and steel grit. The selected abrasives must be the most representative of the abrasive blasting industry and appropriate for the abrasive blasting laboratory and the field sites that are selected for this study. The selection factors for each abrasive will include: manufacturer/distributor; trade name or brand; and grade and mesh.

Types of Data Collected

The health-related data that is studied will include: total dust; respirable crystalline silica dust; radioactivity; and the levels of several elements such as arsenic, beryllium, cadmium, chromium, lead, manganese, and nickel.
The technical and economic factors will include: profile; price per ton of delivered abrasive; recyclability and number of reuses; equipment cost; labor cost; cleaning rate in square feet per hour; disposal cost; and, finally, a total operating cost which incorporates all of these factors.

Experimental Design Factors

The substrate that is blasted will be commercial grade hot-rolled carbon steel bearing tight mill scale with no coating attached. This should reduce the influence that the substrate has on the data that is collected, so variation is health-related data can be attributed to the abrasives used in the study. The substrate will be cleaned to an SSPC-SP 10, "Near-White Blast." The degree of cleanliness of the substrate will be assessed with SSPC-VIS 1.

An initial study will be conducted to investigate factors that could influence the data. Some of these factors will include variations in substrate, inoperator method, and in containment. These factors will be monitored throughout the project.

Types of Samples Collected

The following types of samples will be collected and sent to the project officer at NIOSH: (1) pure bulk samples of each abrasive before blasting has commenced; (2) bulk samples of the abrasives that have been contaminated as a result of blasting on the substrate; (3) samples of airborne dust; and (4) a piece of the substrate that was blasted. The samples will be used by NIOSH for health-related research that requires freshly fractured abrasive blasting samples, contaminated samples, and samples that are representative of abrasive blasting work.

Laboratory Design

The controlled abrasive laboratory or enclosed booth will simulate an actual abrasive blasting operation. Environmental variables such as wind velocity and direction, temperature, and humidity will be controlled so that variations will be caused only by the abrasive that was used. An appropriate cleaning procedure will be used when changing from one abrasive to another to ensure that there will be no contamination of the test results for the next abrasive.

Field Site Selection and Design

The field site study will take place at actual work sites in which abrasive blasting is normally undertaken. The same factors that are used in the laboratory study will be used in the field site study. While the laboratory study has the advantage of greater control of environmental variables, the field site study should be more representative of actual abrasive blasting operations.

Reporting Results

A report will be provided which compares the data gathered from the laboratory study to the field site study. The contract for this project has been awarded and the laboratory study has begun. The laboratory report will be completed in September, 1996; results should be presented in a report at SSPC 96 in Charlotte in November. The field site study report will be completed by September 1997, and the comparative report will be completed by January 1998.

To Assist NIOSH

Although the laboratory study has begun, NIOSH encourages any comments and suggestions that may assist us in our effort to develop the comparative health, economic, and technical data regarding silica sand and seven substitutes for silica sand that have been described in this paper. Please contact the author at NIOSH in Morgantown, WV, at 304-285-5754, email MFG1@NIORDS1.EM.CDC.GOV, fax 304-285-5820.

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