Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section Number: 11.31

Reference Number: 1

Title: Telephone communication between Ted Giese, Abrasive Engineering Society, and R. Marinshaw, Midwest Research Institute

Giese, Ted and R. Marinshaw

Abrasive Engineering Society

March 1993

AP-42 Section 11.30
Reference 1
Report Sect.
Reference

CONTACT REPORT--MRI Project No. 3612

From: Richard Marinshaw, Environmental Engineering Department

Date of Contact: March 1, 1993

Contacted by: Telephone

Company/Agency: Abrasive Engineering Society
108 Elliott Drive
Butler, Pennsylvania 16001

Telephone Number: (412) 282-6210

Person(s) Contacted/Title(s)

Ted Giese, Business Manager

CONTACT SUMMARY:

Mr. Giese was contacted for information on the production of abrasive materials and potential air emissions from abrasive grain processing and abrasive products manufacturing.

Mr. Giese stated that the Abrasive Engineering Society focuses on the use rather than the production of abrasive materials. Abrasive grain producers are represented by the Abrasive Grain Association, and bonded and coated abrasive products manufacturers are represented by the Grinding Wheel Institute and the Coated Abrasives Manufacturers' Institute, respectively. He noted that there are approximately 400 companies that produce abrasive materials.

Mr. Giese said that little information was available in the literature on the production of abrasives and there was even less information specific to emissions for the industry. The Society of Manufacturing Engineers, the American Society of Materials, and the American Society of Mechanical Engineers have published some information on abrasives, but, for the most part, these publications address only the use of abrasives. The only reference book he was aware of that described the manufacturing of abrasive products is The Grinding Wheel, by Kent, published by The Grinding Wheel Institute, Cleveland, Ohio, and Coated Abrasives, Modern Tool of Industry, published by the Coated Abrasives Manufacturing Institute, Cleveland, Ohio. Both of these books are out of print.

The abrasives industry is composed of several separate industries: abrasive grains, bonded abrasives, coated abrasives, and coated abrasive converters. The abrasive grain industry manufacture abrasive grains for use by the other abrasive industries to manufacture abrasive products. The bonded

abrasives industry is very diversified and includes the production of grinding stones and wheels, cutoff saws for masonry and metals, and other products. Coated abrasives manufacturers produce large rolls (5 to 6 feet wide by several thousand feet long) of abrasive-coated fabric or paper, known as jumbo rolls. Coated abrasive converter facilities manufacture belts and other products from jumbo rolls for use in metal polishing, removing burrs from metal surfaces, and finishing metal surfaces for subsequent processes such as painting or plating.

With regard to abrasive grains, the most commonly used abrasive materials for metalworking applications are aluminum oxides and silicon carbide. These synthetic materials account for as much as 80 to 90 percent of the total amount of abrasive grains produced domestically. Some aluminum oxide varieties are produced in electric arc furnaces, and silicon carbide is produced in an electric resistance furnace. Naturally occurring abrasive materials such as garnet and emery are rarely used in metalworking applications because it is very difficult to control the quality of naturally occurring abrasives. The majority of abrasive products are used in metalworking applications are synthetically produced aluminum oxides.

Emissions from the production of abrasive grains will vary with regard to the process and the constituents that are included in the grain. Aluminum oxide processing takes place in an electric are furnace and involves temperatures up to 2600 C° with raw materials of bauxite ore, silica, coke, iron borings, and a variety of minerals that include chromium oxide, cryolite, pyrite, and silane. There will be a variety of emissions from such processing as oxides and sulfides are heated. Production of silicon carbide is done in an open air pit and could produce some fugitive emissions. The production of silicon carbide involves processing silica sand and coke in a furnace known as an Acheson furnace with temperatures up to 2400 C°.

With regard to the production of abrasive products, there a vast number to consider. The production of bonded products is essentially a process similar to producing ceramics. Emissions generated in the production process may involve a small amount of dust generated by handling the loose abrasive, but careful control of sizes of abrasives particles limits the amount of fine particulate that can be entrained in the ambient air. However, for products made from finer grit sizes--less than No. 200 mesh--particulate emissions may be a significant problem. The main emissions from production of grinding wheels are generated during the curing of the bond structure for wheels. Heating ovens or kilns running at elevated temperatures produce various types of emissions depending upon the composition of the bond system. Vitrified products produce some emission as filler materials (moth balls or agricultural products such as walnut shells) included to provide voids in the wheel structure are vaporized. Curing resins or rubber that is used in some types of bond systems also produce emissions. Another small source of

emissions may be vaporization during curing of portions of the chloride- and sulfur-based materials that are included within the bonding structure as grinding aids.

Emission that may result from the production of coated abrasive products consist of gases from the curing of the resin bonds and adhesives used to coat and attach the abrasive grains to the fabric or paper backing. Emissions that come from conversion of large rolls of coated abrasives into smaller products such as sanding belts should be limited to volatilization of adhesives used to form joints in those products.

AES
abrasive engineering society

March 16, 1993

Richard Marinshaw, Environmental Engineering Department
Midwest Research Institute
401 Harrison Oaks Boulevard, Suite 350
Cary, NC 27513-2412

Dear Mr. Marinshaw:

I have made corrections and additions to the report you prepared from our telephone conversation on March 1, 1993. Please note the change in address. In our city Elliott Road is entirely different street.

Please call again if I can help you further.

Sincerely,

Ted Giese, Business Manager

108 Elliott Drive • Butler, PA 16001 • (412) 282-6210

CONTACT REPORT--MRI Project No. 3612

From: Richard Marinshaw, Environmental Engineering Department

Date of Contact: March 1, 1993

Contacted by: Telephone

Company/Agency: Abrasive Engineering Society
108 Elliott ~~Road~~ DRIVE
Butler, Pennsylvania 16001

Telephone Number: (412) 282-6210

Person(s) Contacted/Title(s)

Ted Giese, Business Manager

CONTACT SUMMARY:

Mr. Giese was contacted for information on the production of abrasive materials and potential air emissions from abrasive grain processing and abrasive products manufacturing.

Mr. Giese stated that the Abrasive Engineering Society focuses on the use rather than the production of abrasive materials. Abrasive grain producers are represented by the Abrasive Grain Association, and bonded and coated abrasive products manufacturers are represented by the Grinding Wheel Institute and the Coated Abrasives Manufacturers' Institute, respectively. He noted that there are approximately 400 companies that produce abrasive materials.

Mr. Giese said that little information was available in the literature on the production of abrasives and there was even less information on emissions from the industry. The Society of Materials Engineers and the American Society of Minerals have published some information on abrasives, but, for the most part, these publications address only the use of abrasives. The only reference book he was aware of that described the manufacturing of abrasive products is The Grinding Wheel, by Kent.

The most commonly used abrasive materials for metal applications are aluminum oxides and silicon carbide, both of which are produced using electric arc furnaces. The process of manufacturing these abrasive materials is similar to ceramic production. Naturally occurring abrasive materials such as garnet and emery generally are used only in nonmetal applications because it is very difficult to control the quality of naturally occurring abrasives. The majority of abrasive products are used in metal applications.

Regarding emissions from the production of abrasive materials and products, Mr. Giese said that the handling of loose abrasive materials generally is not a significant source of emissions. Because control of grain size is very important, there are few fines that can be emitted by materials handling. Resins and rubber, which are used in some applications for bonding, are potential sources of emissions. Coated abrasives require curing, which also could emit volatile organic compounds. In addition, at some facilities silicon carbide electric arc furnaces are not enclosed and could be significant sources of fugitive emissions. In his opinion, the use of loose abrasives blown by air or water presents the most concern with respect to air emissions from abrasives.

Mr. Giese said that little information was available in the literature on the production of abrasives and there was even less information specific to emissions for the industry. The Society of Manufacturing Engineers, the American Society of Materials, and the American Society of Mechanical Engineers have published information on abrasives, but, for the most part, these publications address on the use of abrasives. The only reference books he was aware of that described the manufacturing of abrasive products was the Grinding Wheel, by Kent published by the Grinding Wheel Institute, Cleveland, OH and Coated Abrasives Modern Tool of Industry published by the Coated Abrasives Manufacturing Institute, Cleveland OH. Both books are out of print.

The abrasives industry is composed of several separate industries: abrasive grains, bonded abrasives, coated abrasives, and coated abrasive converters.

With regard to the abrasive grains, the most commonly used abrasive materials for metalworking applications are aluminum oxide and silicon carbide. Some aluminum oxide varieties are produced in an electric arc furnace, and silicon carbide is produced in an electric resistance furnance. Naturally occurring abrasive materials such as garnet and emery are rarely used in metalworking applications because it is very difficult to control the quality of naturally occurring abrasives. The majority of abrasive products used in metalworking applications are synthetically produced aluminum oxides.

Emissions from the production of abrasive grains will vary with regard to the process and the consituents that are included in the grain. Aluminum oxide processing take place in an arc furnace and involves temperatures up to 2600°C with raw materials of bauxite ore, silica, coke, iron borings, and a variety of minerals that include chromium oxide, cryolite, pyrite, and silane. There will be a variety of emissions from such processing as oxides and sulfides are heated. Production of silicon carbide is done in the open air pit and could produce some fugitive emissions. The production of silicon carbide involves processing of silica sand and coke in a furnace known as a Acheson furnace with temperatures to 2400°C.

With regard to the production of abrasive products, there are a vast number to consider. The production of bonded products is essentially a process similar to producing ceramics. Emission produced in the production process may involve a small amount of dust generated by handling the loose abrasive, but careful control of sizes of abrasives particles limits the amount of fine particulate that could be available to become airborne. Finer grit sizes --less than 220 grit-- may be more of a problem. The main emissions from production of grinding wheels would be those produced in the curing of the bond structure for wheels. Heating ovens or kilns running at elevated temperatures will produce emissions depending upon the composition of the bond system. Vitrified products will produce some emission as filler materials -

- moth balls or agricultural products such as walnut shells--included to provide voids in the wheel structure are vaporized. Curing of resins or rubber that are used as some bond systems also will produce emissions. Another small source of emissions may be vaporization during curing of portions of the chloride- and sulfur-based materials that are included within the bonding structure as grinding aids.

Emissions that may result from production of coated abrasive products will be gases from the curing of the resin bonds and adhesives used to coat and attach the abrasive grains to the fabric or paper backing. Emissions that come from conversion of large rolls of coated abrasives into the many smaller products such a sanding belts should be limited to volatization of adhesives used to form the joints in those products.

MRI

MIDWEST RESEARCH INSTITUTI
Suite 35
401 Harrison Oaks Boulevar
Cary, North Carolina 27513-241
Telephone (919) 677-024
FAX (919) 677-006

March 8, 1993

Mr. Ted Giese
Business Manager
Abrasive Engineering Society
108 Elliot Road
Butler, Pennsylvania 16001

Dear Mr. Giese:

Thank you for the information you provided in a telephone conversation with me on March 1, 1993. Enclosed are two copies of a contact report summarizing the information discussed.

The information that you provided will be used in preparing a new section on abrasive products manufacturing for the publication Compilation of Air Pollutant Emission Factors, otherwise known as AP-42. To ensure the accuracy of the information, please review the enclosed report and mark any changes you believe are necessary to make the information accurate, complete, and nonconfidential. Return to me one copy that you have signed and dated, and retain one copy for your records. A final version of the report, incorporating any changes you request, will be placed in the background file for the AP-42 section. If we have not received a response from you by March 24, 1993, the report will be considered final and nonconfidential and will be placed in the project files that will be made available to the public.

Thank you for your review of this report. If you have any questions, please call me at (919) 677-0249, extension 5359.

Sincerely,

Richard Marinshaw
Environmental Engineer

Enclosures

CONTACT REPORT--MRI Project No. 3612

From: Richard Marinshaw, Environmental Engineering Department

Date of Contact: March 1, 1993

Contacted by: Telephone

Company/Agency: Abrasive Engineering Society
108 Elliot Road
Butler, Pennsylvania 16001

Telephone Number: (412) 282-6210

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Mr. Giese said that little information was available in the literature on the production of abrasives and there was even less information on emissions from the industry. The Society of Materials Engineers and the American Society of Minerals have published some information on abrasives, but, for the most part, these publications address only the use of abrasives. The only reference book he was aware of that described the manufacturing of abrasive products is The Grinding Wheel, by Kent.

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