Summary Report 101-1

Status of By-Product Fines in the United States

Problem Statement

The stockpiling and disposal of fines produced as a result of aggregate crushing and production operations are some of the major problems facing the aggregate industry today. Most of the construction specifications used today limit the proportions of fine materials passing the #200 sieve (less than 75 microns) to 7 or 8% or less. Aggregate production typically results in much higher percentages of such fine materials, which do not have widespread uses.

There is a need to document the types and locations of these by-product fines, make this information available to users and the aggregates industry, and identify and develop new potential uses for these fines. Additionally, research efforts should put greater emphasis on minus #200 fines, as opposed to minus 3/8" fines, as these seem to be more difficult to market.

Objectives

International Center for Aggregates Research (ICAR) researchers conducted Study ICAR/101, *Determining Uses for By-Product Fines* in cooperation with the Aggregates Foundation for Technology, Research, and Education (AFTRE). The objectives of the study were to:

- identify the scope and diversity of marketing by-product fines;
- develop a technically and economically based protocol to identify potential uses;
- establish an advisory team to assist the industry in identifying and developing markets for fines;
- prepare guidelines for fines uses and recommendations for long-term objectives; and
- provide data to assist in a long-term marketing strategy for the industry.

Following a review of pertinent literature and the organization of a Fines Expert Task Group, researchers developed a database to assist in quantifying the magnitude of the fines problem. The database will also provide background information for developing successful marketing strategies for fines. Researchers developed an information booklet for industry members to complete. The booklet assisted in collecting information on fines production methods and totals, marketing volumes, and stockpile totals for the database.

The objectives of the fines database are to:

- provide summary statistics to characterize and quantify the available fines by region;
- select a prioritized list of fines problems to address and solve;
- match potential high-volume uses and available products by region;
- form the basis for expanding the work plan to marketing aspects; and
- help develop marketing tools for each use.

Findings

The response to the information booklet was good. Researchers mailed 670 booklets and received 154 responses, representing a 23.5 percent response rate. The responses represented 154 companies covering 362 plants in the United States. In addition to estimates of total fines production and the amount currently in stockpile, responses to the information booklet provided researchers with industry data on current markets and potential uses for fines. Responses also provided information on production methods and factors that inhibit the marketing and use of fines on a large scale.

The industry markets nearly 80% of minus 3/8" fines produced. Marketing sources include asphalt uses, aggregate-related uses, environmental applications, manufactured sand production, concrete pipe manufacturing, and other uses such as industrial fillers and in the paint industry. Only 23% of minus #200 fines produced each year reach the market since most construction specifications in use today limit the proportions of fine materials.

At current production rates, the aggregate industry stockpiles nearly 180 million tons of by-product fines each year. It is estimated that there are currently 300-325 million tons of minus 3/8" fines and 400 million tons of minus #200 fines in stockpiles in the United States. Officials believe that the amount of stockpiles will increase in the near future if the industry makes no serious efforts to market these fines.

Researchers also found that the industry uses a majority of minus 3/8" fines for asphalt-related purposes such as slurry seal aggregates and mineral filler. Other markets include agriculture-related uses such as aglime, fertilizer filler, soil remineralization, and livestock feed. Additional uses include anti-skid abrasives, block mixers, and road base/subbase aggregate products.

Among the current uses for minus #200 fines, fill/landfill cover materials, road base/subbase materials, and recreational uses such as golf courses and ball fields were the most widely reported. Very few of the industry respondents to the information booklet reported using minus #200 fines for asphalt-related or agriculture-related applications.

Through the literature review, and from responses to the information booklet, researchers identified a number of potential uses for both types of fines. Some of the most viable potential uses for minus 3/8" fines include ready-mix flowable fills, cement-treated subbases, and low cost masonry uses. Other possible uses include pipe bedding, mineral fillers, and road bases. Researchers also found that possible uses for minus #200 fines include ready-mix flowable fills, solid waste landfills, agricultural uses such as aglime, top soil amendments, and fertilizer fillers, and reclamation fills.

Researchers found that information about the quantities, characteristics, and properties of fines, and specifications and regulations limiting the proportions of fines in pavement mixtures were major factors inhibiting the marketing and use of fines on a large scale. Additionally, a lack of awareness on the part of both the industry and potential customers hindered marketing efforts. Other factors that have a negative effect on marketing fines included problems with the handling of the product and the costs associated with processing and transporting fines.

Recommendations

The database developed through this study will lead the aggregates industry to a more focused approach in identifying possible new uses for both minus 3/8" and minus #200 fines. Researchers suggest that further research efforts focus heavily on minus #200 fines, as they seem to be more difficult to market.

The study highlights three possible uses for minus 3/8" fines for further study: ready-mix flowable fills, cement-treated subbases, and low cost masonry uses. Priority study areas for minus #200 fines are ready-mix flowable fills, and solid waste landfills.

Researchers suggest that a major research study be undertaken to determine the exact locations of stockpiled fines. They suggest developing a map, based on a geographic information system (GIS), to help market fines to potential customers. Researchers also suggest the development of a map for each state to make it easier for customers to locate the nearest source for these materials.

Researchers recommend that information developed through this study be combined with a comprehensive market survey and research on various uses to develop an effective marketing strategy. An effective strategy will help solve the economic and environmental problems associated with the handling and disposal of fines.

The information in this summary is detailed in ICAR research report 101-1, An Investigation of the Status of By-Product Fines in the United States, *by W.R. Hudson, D. Little, A.M. Razmi, V. Anderson, and A. Weissmann. The contents of this summary do not necessarily reflect the official views of AFTRE or ICAR.*