

MPU ASH AS A POTENTIAL SOURCE FOR CONSTRUCTION MATERIALS

By Tarun R. Naik and Rudolph N. Kraus

Report No. CBU-2001-14

Executive Summary

TITLE: MPU Ash as a Potential Source for Construction Materials

SOURCE: UWM-CBU Report No. CBU-2001-01, REP-421, 2001

BACKGROUND/PURPOSE: To conduct physical, chemical, mineralogical, and microstructural tests for determining properties of three sources of typical Manitowoc Public Utilities (MPU) ashes (Combined MPU #5 and #7 Bottom Ash, MPU #8 Bottom Ash, and MPU #8 Fly Ash) to evaluate their potential options for beneficial reuse. The three sources were also selected for evaluation per WI-DNR Chapter NR 538 requirements. The three ash sources were selected based upon their diverse character (such as color, texture, type of collection system/process, etc.) in consultation with Mr. Raymond F. Sturzl, Manitowoc Public Utilities. These three ash sources were specifically identified for characterization before their possible use in a new type of concrete called DPC (Defined-Performance Concrete).

OBJECTIVE: The primary objective of this project was to recommend alternatives to the normal practice of landfilling by evaluating potential reuse/recycle applications for these materials, especially in cement-based, durable, construction materials.

CONCLUSIONS: MPU's ashes have considerable potential for many applications. However, the performance of these ashes needs to be established for individual applications. Evaluation of the MPU ashes conducted per the requirements of WI-DNR Chapter NR 538 indicates that the combined MPU #5 and #7 bottom ash materials meets the requirements of a NR 538 Category 2 material, while the MPU #8 fly ash and MPU #8 bottom ash meets Category 4 requirements. The following are some of the high-volume applications that would require further evaluation before their use in actual construction projects. These applications could consume all of the ashes currently being produced by Manitowoc Public Utilities. Flowable Materials have up to 1200 psi compressive strength, have flowing-mud type of consistency and fluidity, contain very little portland cement and a lot of water, and consist mostly of ash or similar materials. It is believed that concrete Bricks, Blocks, and Paving Stones could also be made with the ashes evaluated. Additionally the MPU #8 fly ash should be useful for replacement of clay in clay bricks manufacturing. The test data collected also indicate that the MPU ashes can be used as a partial replacement of aggregates and/or cement in Structural-grade Concrete. It is also concluded that there is a potential for high-value use of the MPU #8 fly ash in manufacturing Blended Cements. Soil stabilization or site remediation is another significant potential use of the MPU ashes tested. Paving applications, such as Roller Compacted Concrete for parking lots and access roadways, would also be a high-value use of MPU ashes tested. Based upon the this initial testing performed for the project, these applications have the potential to be a significant source of revenue for MPU. A further evaluation is very strongly recommended. Probability of success is very high.

RECOMMENDATIONS: Further evaluation is recommended, starting with lab-scale production and testing of ash use in the above mentioned applications. Cost/benefit analysis and marketing studies should be undertaken; and a long-term evaluation program for these products should be started. This includes the development of ash specifications for high-potential, high-value, applications such as DPC (Defined-Performance Concrete).