

Opportunities from Alternative Cementitious Materials

An Accelerated Technology Implementation Team works toward enhancing twenty-first century concrete construction by encouraging new, more sustainable cements

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A major impetus for change in cement technology stems from the concrete industry's sustainability goals and the associated demand for reductions in the collective environmental impacts of the production of concrete. These impacts include immediate effects such as greenhouse gas (GHG) emissions, extraction of virgin materials (including water), and energy consumption,¹ and they can be compounded by premature repair or replacement as the result of inadequate durability. Alternative cementitious materials (ACMs) have the potential to provide major reductions in these impacts.

ACM concretes can be produced with significantly lower GHG emissions and energy consumption than mixtures comprising portland cement. In some cases, the amount of water required in the concrete mixture is also significantly lower. Further, ACM concretes can exhibit improved durability—exemplified by reduced permeability, greater resistance to freezing and thawing, and enhanced resistance to high temperatures and chemicals²—resulting in increased service life.

Impetus for Change

ACI's Strategic Development Council (SDC) helps to identify and facilitate the application of Industry Critical Technologies (ICTs) throughout the concrete industry. ICTs include tools, materials, and procedures that SDC's Technology Management Committee has determined as having high potentials for positively affecting concrete industry competitiveness and enhancing the sustainability and/or quality features of concrete.

ICTs have strong and broad support from SDC members, from among whom a champion is identified. The champion, together with other interested SDC members, forms an Accelerated Technology Implementation (ATI) team to identify those barriers that are restraining or obstructing the

Purpose and Driving Forces

Because traditional construction materials are well understood and established in existing codes, specifications, and test methods, there is a natural, cultural resistance to the introduction of new materials. Although most ACMs are now permitted in building codes, including ACI 318-14,³ and are included in two ASTM standards: ASTM C1157/C1157M, "Standard Performance Specification for Hydraulic Cement," and ASTM C1600/C1600M, "Standard Specification for Rapid Hardening Hydraulic Cement," resistance is still evident in the common use of prescriptive specifications calling for portland cement concrete. The more widespread use of performance specifications based on an owner's requirements could allow more extensive application of ACM concrete.

The Strategic Development Council's Accelerated Technology Implementation (ATI) Team on ACMs is working to help the industry develop usable specification and design information to facilitate safe and reliable use of ACMs and thereby achieve inherent reductions in energy consumption and GHG

timely acceptance of the ICT within the construction industry at large. The ATI team develops strategies and tactics to remove the identified barriers, and these often include interacting with Standards Developing Organizations such as ACI.

The ATI Team on Alternative Cementitious Materials (ACMs) is developing a state-of-the-art report on ACMs, providing current information regarding binders other than portland cement. The ATI Team's goals include establishing a guideline or practice within ACI, thereby encouraging concrete industry practitioners to specify, formulate, and use ACMs to produce highly sustainable concrete mixtures with enhanced durability and increased service life.