

APPLICATION OF ULTRASONIC METHOD FOR QUALITY CONTROL OF FLY ASH POLYMER CONCRETES

Andrzej Garbacz^{*} Arkadiusz Lutomirski[†] Joanna J. Sokołowska^{**}

[†] Department of Building Materials Engineering (DoBME)
Warsaw University of Technology
Al. Armii Ludowej 16, 00-637 Warsaw, Poland
e-mail: a.garbacz@il.pw.edu.pl, web page: <http://www.kimb.il.pw.edu.pl>

[†] Department of Building Materials Engineering (DoBME)
Warsaw University of Technology
Al. Armii Ludowej 16, 00-637 Warsaw, Poland
e-mail: alumirski@o2.pl, web page: <http://www.kimb.il.pw.edu.pl>

^{**} Department of Building Materials Engineering (DoBME)
Warsaw University of Technology
Al. Armii Ludowej 16, 00-637 Warsaw, Poland
e-mail: j.sokolowska@il.pw.edu.pl, web page: <http://www.kimb.il.pw.edu.pl>

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Summary. *Polymer Concrete (PC) belongs to a group of building particulate (concrete-like) composites, where a cement paste was entirely replaced by a resin binder. The main field of PC applications are of precast elements, like manholes, pipes, slabs, chemical resistant vessels, etc. In the case of pre-cast elements, the usefulness and durability of polymer composites depend on the selection of the material composition for obtaining composites with controllable properties. This task is a material design and optimization procedure. Many of this kind reliable elements, like electrolytic cells, need quality control. Therefore, the development of nondestructive assessment methods for polymer composites is an important need. Ultrasonic methods are among the most common nondestructive techniques used in material science and industry. They are well-known and standardized for traditional building materials, like metals, cement concrete and rocks. In the case of polymer concrete composites, ultrasonic methods are at the introductory stage.*

The aim of the paper was analysis of the usability of ultrasonic methods for assessment of PC properties, especially polymer concrete with fly ash. The composition, microstructure and sample geometry were analyzed as the most important factor affecting an ultrasonic wave propagation. On the basis of the results obtained, including evaluation of commercial vinylester tanks, the following main conclusions about ultrasonic assessment of polymer concrete precast elements were formulated:

- *the regression functions obtained for selected PCs justify the possibility of applying ultrasonic methods for the nondestructive evaluation of properties of precast elements made from various polymer concretes;*
- *in engineering practice, a reference curve should be made for the given type of polymer concrete, taking into account the type of resin binder and the type of aggregate;*
- *to develop a reference curve for calibration procedures the following parameters can be varied: the aggregate to resin binder ratio, the sand fraction, in a limited range, the microfiller content, and if necessary, the aggregate moisture content;*
- *the material optimization approach (material model of polymer concrete) gives the possibility of developing a reference curve for the given PC type with high accuracy and uniform distribution of data points in the tested range of mechanical properties and pulse velocity;*

An effect of microfiller replacement with fly ash in polyester and vinylester concretes on ultrasonic wave propagation was tested. The composition of fly ash polymer concrete were determined using material optimization approach. Propagation of ultrasonic wave was characterized using a wave velocity and a frequency spectrum characteristics. Finally, regression functions for ultrasonic evaluation of fly ash polymer concrete were proposed.