

Popular science summary of the PhD thesis

PhD student	Ida Maria Gieysztor Bertelsen
Title of the PhD thesis	Evaluation of fibres recycled from fishing nets and methods for quantifying plastic shrinkage cracking
PhD school/Department	DTU Civil Engineering

Science summary

* Please give a short popular summary in Danish or English (approximately half a page) suited for the publication of the title, main content, results and innovations of the PhD thesis also including prospective utilizations hereof. The summary should be written for the general public interested in science and technology:

The use of polymeric waste materials as fibre reinforcement in building materials has gained attention due to their broad applicability, low price and sustainability aspects. This thesis is part of an EU-NPA project "Circular Ocean" aiming to explore new recycling opportunities for discarded fishing gear of polymeric materials and focuses on their potential use as fibre reinforcement in building materials such as concrete. Waste fibres obtained from discarded fishing nets of polyethylene were characterized and the fibre characteristics indicated that the fibres could be effective in controlling plastic shrinkage cracking in cement-based materials. The addition of these waste fibres was therefore mainly investigated with the aim of controlling the formation of plastic shrinkage cracking in fresh concrete. This type of cracking can be detrimental for the aesthetics and overall durability of the concrete structure. A well-established technique for mitigating these cracks is to add low fractions of randomly distributed synthetic fibres to the mixture. In order to evaluate the effectiveness of the addition of fibres, a digital image correlation technique (DIC) was applied. The DIC technique is used for tracking surface displacements and is therefore valued as an effective method for automated monitoring of surface cracking in e.g. concrete. This thesis contributes to a better understanding of how to quantify the formation of surface cracking based on the DIC data. A numerical post-processing approach for further analysis of the DIC data was developed, which enables a quantitative measure of the degree of surface cracking presented as crack width distributions over the entire specimen surface. This approach facilitated an objective comparison of cement-based mixtures with the addition of different types of fibres, fibre additions as well as other mitigation strategies. The results from the experimental program showed that the addition of waste fibres was effective in controlling the formation of plastic shrinkage cracking, although a much higher volume fraction was required compared to commercially available fibres of polypropylene.

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