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Editorial

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Editorial

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Increasingly, we need to challenge and push the boundaries of what is within the realms of the possible and this issue brings together three examples of beneficial use of waste materials through adoption of a more circular approach and which look to push the boundaries of utilisation.

The first two papers are from authors based in India and highlight that the construction sector, cement industries and the government have recently put more emphasis on conserving the natural resources of the country and reducing carbon dioxide emissions.

'Durability behaviour of high-volume fly ash self-compacting recycled aggregate concrete' by Kumar *et al*. (2023) is the first of these papers.

They acknowledge that the strength and durability properties of conventional concrete containing high-volume fly ash (HVFA) and coarse recycled concrete aggregates (CRCAs) are well documented. However, very little information is available in the literature related to the durability behaviour of self-compacting concretes (SCCs) incorporating a high volume of fly ash along with CRCAs and fine recycled concrete aggregates (FRCAs). Their study aims to characterise the fresh and hardened-state properties of SCCs made with HVFA and to explore the maximum possible utilisation of both CRCAs and FRCAs in SCC design mixes. The research focuses on waste utilisation to promote sustainability of concrete materials and to overcome the scarcity of diminishing natural resources.

The durability properties of the SCC mixes were studied using the rapid chloride penetration test, initial surface absorption test and capillary suction test. The results of the study show that the concrete mixes made with replacement of natural coarse aggregates had satisfactory performance without compromising their fresh and hardened-state properties and that furthermore, the incorporation of HVFA in SCCs improved the hardened-state properties at later ages of curing due to the secondary pozzolanic reaction.

Given the importance of economics in the adoption of change, they conclude that the application of CRCAs and FRCAs along with HVFA in the SCCs not only promotes the utilisation of concrete waste from construction and demolition and by-products of industries to achieve more sustainable construction practices but also decreases the cost of concrete.

'Investigation of concrete incorporating ultra-high volumes of ash: a case study in India' by Titiksh and Wanjari (2023) is the second of these papers.

This describes three field studies undertaken with ultra-high volumes of coal-fired thermal power plant ash (CTPA) in terms of class F fly ash and coarse bottom ash in an M40 grade concrete pavement at the National Thermal Power Corporation (NTPC) Khargone, Khargone, India; NTPC Mouda, Nagpur, India; and Dhariwal Infrastructure Limited Tadali, Chandrapur, India.

The study highlights the on-site use of ultra-high volumes of CTPA in lieu of fine aggregates in 'green' concrete, which has seldom been reported. However, the authors caution that the study may not be universal owing to the variability of site-specific materials such as CTPA, fine aggregates, coarse aggregates and hyper-plasticisers. Hence, more studies are needed to establish a correlation between the performance of high-volume ash (HVA) concrete and varying grades of concrete as well as varying raw material properties.

The results indicated a non-significant difference in the values of the means of the compressive strength, indicating the field applicability of the developed mix designs for severe exposure conditions.

Importantly, the authors note that civil contractors often resort to incorporating higher cementitious contents during mix designs and adopting higher factors of safety to compensate for the negative effects of poor workmanship at the site. However, the drive to reduce emissions from concrete run counter to this practice. It is therefore essential, they conclude, to quantify the on-site performance of HVA concrete incorporating ultra-high volumes of CTPA and to evaluate it against the lab results.

The final paper is from Turkey: 'The numerical simulation of soil–structure interaction containing sustainable materials' by Saribas and Ok (2023).

In this paper the authors observe that, as a result of urban transformation activities, natural disasters and regional and global wars, billions of tonnes of waste concrete occur and therefore, the remediation process for waste concrete is a critical research topic given the pressure on our natural resources. The sustainability concept provides a primary bridge between the demand for natural concrete material and the remediation process of waste concrete by using recycled aggregate and recycled concrete aggregate. The timing of this paper is particularly poignant given the recent earthquakes in this region.

The numerical simulation results revealed that the recycled concrete aggregate (RCA) and mixed recycled aggregate (MRA), regarded in the sustainable concrete (SC) and filling material mixes with a

high replacement level, could have negligibly adverse effects on the structural and geotechnical indicators of soil–structure interaction (SSI) members. While this numerical simulation contains a wide range of research variables, there is an obvious need for further studies to reach more general conclusions on using SC and filling materials to construct foundation beams and soils. Whilst the findings of this paper indicate potential benefits, it is evident that caution must be exhibited in their use based on a thorough understanding of local factors.

As I come to the end of my 6 years on the editorial board of the journal, on which it has been a pleasure and a privilege to serve, I would reflect on the Institution of Civil Engineers' charter and throw out the challenge for us all to work in collaboration to not 'direct the great sources of power in nature for the use and convenience of mankind', but to 'direct the power of mankind for the benefit of nature' as we reach this critical inflection point in the health of our planet.

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