Disruptive change in mineral building materials - high-performance prefabricated elements made of UHPC for circular buildings

Michael Olipitz

SDO ZT GmbH, St. Jakob i/R, Kärnten, Austria

Contact: office@olipitz.com; www.olipitz.com

Abstract

Concrete (NPC) is the most commonly used building material worldwide, which has great development potential in the form of UHPC. With the help of high-performance prefabricated elements, significant advantages can be achieved in relation to the classic in-situ concrete construction in terms of resource and energy efficiency as well as in terms of recyclability and durability. This report uses specific application examples to show the savings that can be achieved in manufacturing phase A. When used appropriately for the material, high-performance precast elements made of UHPC can save up to 85% in resources (R) and up to 65% in energy (GWP = CO2e = E) achieve. The implementation of high-performance prefabricated parts in our new buildings enables significant changes in buildings, both in terms of emissions consumption and urban mining potential. The disruptive change in the construction industry requires consistent choose, want, venture and repeat from those involved. In this regard, we are all called upon to make a contribution together.

Keywords: Include a list of not more than 10 keywords, for example: post-tensioning; anchors; slabs; walls; high-rise buildings.

1 Introduction

Building has always represented the fight against erosion, which has been countered by constant technological developments over the course of building history, with the result that ever more energy-intensive construction methods have become established across all materials. In the 21st century we are at the crossroads of counteracting these energy-intensive construction methods with new technological developments. Resource and energy efficiency as well as the conversion of the linear economy into the circular economy are in the foreground in almost all specialist areas of constructive building research. It is undisputed that the future path to a reasonably climate-neutral circular economy by 2040 will involve far-reaching transformations in buildings, industry and production.

If one looks at the emissions of a building or a component over the life cycle phases according to [1], one can assume that approx. 55% of the total energy in the production phase (phase A1-A5) is mainly emitted as embodied energy (PENRT). The embodied energy of building materials is determined by the choice of material, the choice of structure and the manufacturing process of the building materials, the design process of which is referred to as creative potential for climate-friendly constructions. New developments in the material sector, which have increasingly resulted from the material concrete since the turn of the millennium, include glass-fiber concrete, ultra-high-performance (UHPC) concrete, gradient-

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