

Pneumatic forming of hardened concrete for double curved shell structures

Double curved shell structure | pneumatic formwork | plane starting position | casting material

Vienna University of Technology has developed a new labour and cost-saving construction method for double curved shell structures. In a first step the casting material is poured into individual shell segments on a flat plate. In a second step the segments are bent and lifted into their final position using wedge-shaped air cushions as pneumatic formwork.

Background

Double curved shell structures are strong and material saving structures. They can be built with exceptionally big diameters.

The state of the art in the construction of shell structures is characterised by high labour input. Therefore shell structures may not be built too frequently unless labour-saving construction methods are developed.

Technology

The novel cost-saving construction method is starting from individual flat plate segments. The challenge of forcing a flat plate into a double curved shell structure requires large strains in the middle plane of the flat shape. The novel method solves this problem with pneumatic formwork using wedge-shaped air cushions.

Advantages

- Quick and cost-saving construction
- Shell structures with diameters up to 52m
- Free form geometry
- Suited for a variety of casting materials
- No residues of formwork material

Potential applications

The construction method is especially suited for shell structures in event and sports venues, for pedestrian and bike bridges, viaducts for large and small wildlife as well as bowl and basin shaped geometries for industrial buildings like solar collectors.



Figure 1: Inflated dome - pilot construction realized in 2017 by ÖBB, the Austrian rail operator as a wildlife crossing over railroad tracks

[Click to watch the video](#)

State of development

Proof of concept, simulation, test shells with diameters of 13 m and 26 m
Pilot wildlife crossing Koralmbahn with a diameter of 52 m

Options

Expertise, R&D cooperation

Inventors

Johann KOLLEGER
Benjamin KROMOSER