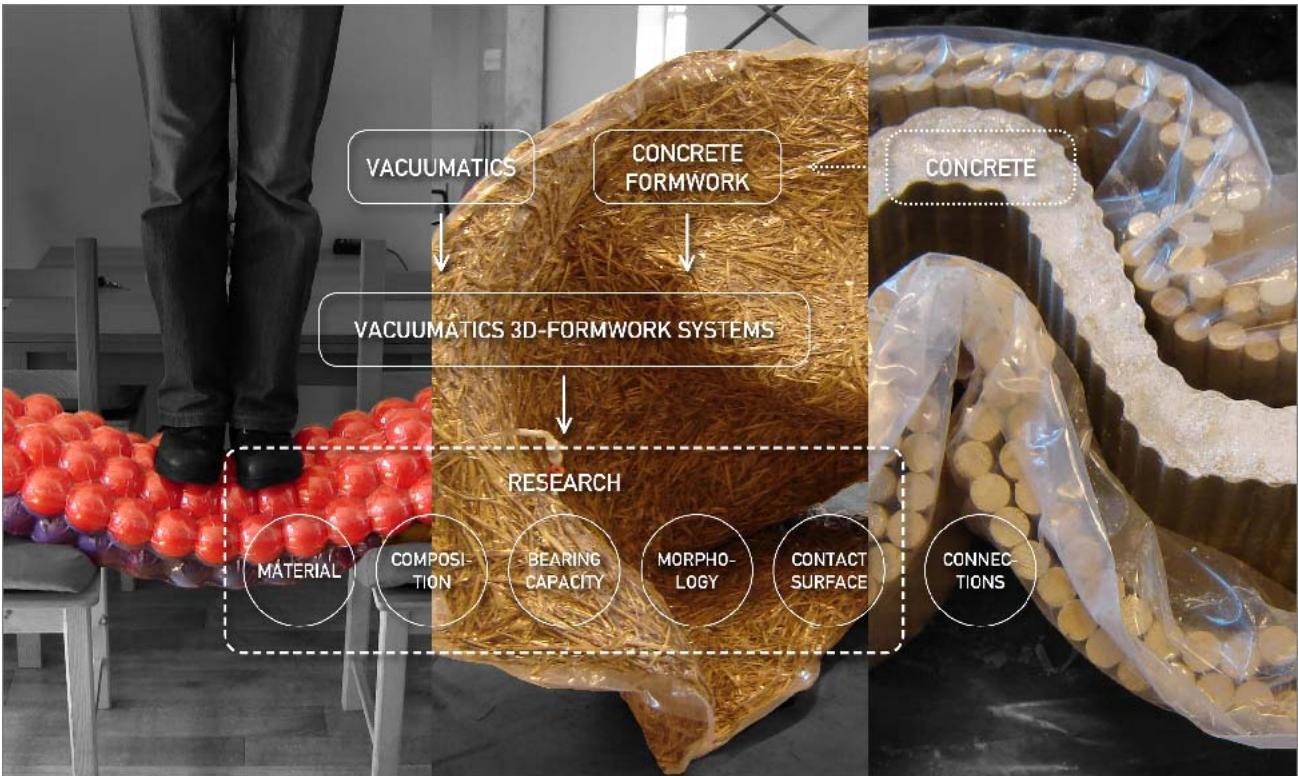


# VACUUMATICS

## 3D-formwork systems



### Free-Formed Concrete Architecture



#### SUBJECT

The limiting factor at the moment with respect to the “acceptance” of concrete in the free-form design practice is the manufacturability and adaptability of its formwork system. Any change in shape or texture can be regarded as a complex, time consuming, labour intensive and thus financially unattractive process. A rather “new” and relatively low-tech way to realize the requested (adaptable) geometrically complex shapes can be found with the introduction of vacuumatics.

#### GOALS

A fundamental understanding of the structural and geometrical potential of vacuumatics in full collaboration with the latest developments in concrete technology.



#### EXPECTED RESULTS

The development of vacuumatics to be applied as a fully adaptable moulding technique for the production of geometrically complex shapes in ultra high performance concrete.



## VACUUMATICS 3D-Formwork Systems Free-Formed Concrete Architecture

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### Subject

The limiting factor at the moment with respect to the "acceptance" of concrete in the free-form design practice is the manufacturability and adaptability of its formwork system. Any change in shape or texture can be regarded as a complex, time consuming, labour intensive and thus financially unattractive process. A rather "new" and relatively low-tech way to realize the requested (adaptable) geometrically complex shapes can be found with the introduction of vacuumatics.

### Goals

A fundamental understanding of the structural and geometrical potential of vacuumatically prestressed adaptable structures (vacuumatics) will result in the further development of free-formed concrete architecture, especially when its application is fully promoted in collaboration with the latest developments in concrete technology, like for instance Ultra High Performance Concrete (UHPC), Fibre Reinforced Concrete (FRC) and Self-Compacting Concrete (SCC).

### Research Question

How can vacuumatics be effectively applied as fully adaptable 3-dimensional formwork systems to create geometrically complex shapes and surface textures in concrete.

### Strategy

The research focuses on three essentially different systems: an addition to "traditional" formwork systems, an "infilled-frame" formwork system and a self-supporting closed formwork system. In order to effectively develop these typologies several research topics will be further elaborated, regarding aspects like: material, composition, bearing capacity, morphology and contact surface.

### Expected Results

The current knowledge on vacuumatics is very limited and experience is mainly obtained by trial-and-error based experiments of certain specific prototypes. With this specific research the combination of systematic theoretical and experimental research will provide fundamental insight in the overall effectiveness of Vacuumatics 3D-Formwork Systems in relation to other conventional formwork systems.

### Preferred Partners Applications / Sponsors

ABT Consulting Engineers / Hurks Beton Veldhoven / foil manufacturing industry

### Prime Publication / Prototyping

- F. Huijben, F. van Herwijnen, G. Lindner (2007), "Vacuumatic pre-stressed flexible architectural structures", *III International Conference on Textile Composites and Inflatable Structures*, Structural Membranes 2007, Barcelona (SP), p.197-200
- F. Huijben, F. van Herwijnen (2007), "Vacuumatics; shaping space by 'freezing' the geometry of structures", *International Conference on Tectonics*, Tectonics: Making Meaning 2007, Eindhoven University of Technology, Eindhoven (NL)
- F. Huijben, F. van Herwijnen (2008), "Vacuumatics: vacuumatically prestressed (adaptable) structures", *6<sup>th</sup> International Conference on Computation of Shell & Spatial Structures*, IASS-IACM 2008: Spanning Nano to Mega, Ithaca NY (USA)

### Research Period

2008 – 2012