

**Fraunhofer Institute for
Transportation and Infrastructure Systems IVI**

Prof. Dr. Matthias Klingner
Zeunerstrasse 38 | 01069 Dresden
Phone +49 351 4640-800
matthias.klingner@ivi.fraunhofer.de | www.ivi.fraunhofer.de

DIMENSIONS

Pontoon size	13 x 13,5 m
Living space	100 m ²
Technical area	11 m ²

»autartec®«

SELF-SUFFICIENT LIVING ON WATER

PARTNERS

- AIB GmbH
- AWAS GmbH Dresden
- bendl HTS GmbH & Co. KG Sebnitz
- Brandenburg University of Technology Cottbus-Senftenberg
- BWB Beratungsgesellschaft für Wirtschaftliches Bauen
- Fraunhofer IKTS
- Fraunhofer IVI
- GEDES e. V.
- Heliateg GmbH
- ifn Anwenderzentrum GmbH
- INNIUS DÖ GmbH
- Rupp Betonerzeugnisse GmbH
- Technische Universität Dresden
- TUDAG – Deutsches Zentrum Textilbeton
- Wilde Metallbau GmbH

SPONSORED BY THE





IDEA AND CONCEPT

Surrounded by the barren nature of a former open-cast coal mine, the autartec® house has been floating on lake Bergheide since 2019. The building was designed and built within an »Innovative Regional Growth Core« project, funded by the German Federal Ministry of Education and Research (BMBF). With its futuristic look, renewable energy supply and integrated environmental technologies, it marks the beginning of the post-fossil era.

Its self-sufficient utilities sectors – electric energy, thermal energy, and water treatment – are represented by three interpenetrating cubes, offering surfaces that are optimally positioned for their respective energy intake.

The floating house is a symbol for connected alternative energy concepts and modern living culture. It offers many chances of becoming a cradle for further activities regarding new ways of life on both land and water. Inspiring and well-connected settlement structures with decentralized systems for autonomous energy supply, structurally integrated functional elements, natural air conditioning processes and overall home automation, in combination with favorable living and working conditions in the region, can make rural life more attractive for young people.

ENERGY PRODUCTION AND STORAGE

Modern buildings contain numerous electrical consumers with widely varying power and energy demands. An autonomous utility concept, therefore, needs to include

- energy generation,
- energy storage and
- intermittent power supply.

The autartec® design takes up conventional technologies and follows innovative approaches for the integration of storage elements in textile concrete components. Electrical energy is generated by

- conventional crystalline photovoltaic modules, arranged in a closed structure on a 70° slope façade, and
- building-integrated photovoltaic modules on a glass façade.

These elements, facing different directions, cover a surface of 54.2 m² and deliver up to 8.5 kWp. The energy is stored in structurally integrated lithium ion batteries, which can take up 50 kWh and supply the house and its inhabitants for as long as five days. An energy management system guarantees the ideal balance between energy producers, storage units and consumers in the building.

WATER TREATMENT

Each day, the inhabitants of a self-sufficient building use fresh water and produce large amounts of wastewater through household appliances and toilets. With a filtration plant, greywater is purified to reach fresh water quality again.

The research project investigated various methods of water treatment and developed an overall system. A miniature treatment plant for fresh water and greywater runs entirely without biological treatment stages and chemicals.

The plant

- integrates conventional water treatment for buildings,
- supplies several water tanks and
- uses membrane filtration as well as
- photocatalysis.

The floating house demonstrates all of the above treatment methods. Parts of the plant are integrated into the floats.

THERMAL ENERGY

In construction projects, strict directives limit the annual energy consumption. These can be met by innovative insulation concepts. For a house on floating metal pontoons, the insulation poses a great challenge. In addition to heat losses,

- heat production,
- heat storage and
- efficient cooling systems

play a dominant role in self-sufficient buildings. Individual roof and façade elements of the autartec® house are therefore designed towards high heat yields and natural cooling effects.

A 15° slope roof surface is equipped with solar panels for hot water production. Surplus yields can be stored in zeolith and salt hydrate, and released with delay. Combined with a lake water heat pump, the system guarantees a cozy living environment even in the wintertime.

A plant-covered wall uses the windward and leeward effect to create a cool envelope around the building, reducing the heat input in the summertime. The ceiling with adiabatic cooling lowers the room temperature on hot summer days by the sole use of air and water.