

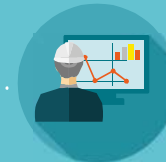


hybrid
GEOTABS

Controlling the power of the ground by integration

hybridGEOTABS

comfort supplied in a sustainable way
hybridGEOTABS demo buildings



prof. ir. Wim Boydens, boydens engineering
CSTO project partner

hybridGEOTABS
09 February 2021



hybridGEOTABS project

*Model Predictive Control and Innovative System Integration of GEOTABS
in Hybrid Low Grade Thermal Energy Systems*

Sept 2016 – Feb 2021

Horizon 2020 Research and Innovation Action 723649



The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723649. The original project acronym is "MPC-.GT".



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PROJECT CONSORTIUM



REHVA



Federation of
European Heating,
Ventilation and
Air Conditioning
Associations



boydens engineering



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Maastricht University

ENERGOKLASTR

VIESSMANN



Funded by the European Commission under the Horizon 2020 Programme: project number 723649 (proposal name "MPC-;GT")



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GEOTABS CONCEPT

TABS

Thermally Activated
Building System

(e.g. Concrete Core Activation)



GEO

(shallow) geothermal energy
upgraded using heat pump

GEOTABS



- Pioneers 1980-1990, Meierhans, B. Olesen, Switzerland, Germany, Austria...
- GEOTABS towards optimal design and operation, 2010 L.Helsen, B.Olesen,...
- Increased implementation 1990-2020
- Robust and proven solution, high RES, high comfort
- Barriers for deployment...

WHY HYBRID?

“EVERY BUILDING DESERVES A SHARE OF GEOTABS”

TABS

- High thermal comfort
- Daily storage
- Low temperature heating ($24^{\circ}\text{C}-28^{\circ}\text{C}$) & high temperature cooling ($16^{\circ}\text{C}-20^{\circ}\text{C}$)

GEOthermal

- Low-carbon RES
- Seasonal storage
- Low-temperature source ($8^{\circ}\text{C}-15^{\circ}\text{C}$)

HEAT PUMP

Small ΔT

- Active heating/cooling: COP \uparrow
- Passive cooling (bypass)



WHY MPC?

- Anticipation of setpoints towards future loads, operate GEOTABS at highest efficiency
- model predictive control (MPC), introducing AI...

What: make a virtual model of building and system to predict the effect of different actions and choose the optimal action now...time and time again

Moreover...
 A solution to balance the geothermal system?
 ...a solution to optimize investment cost?

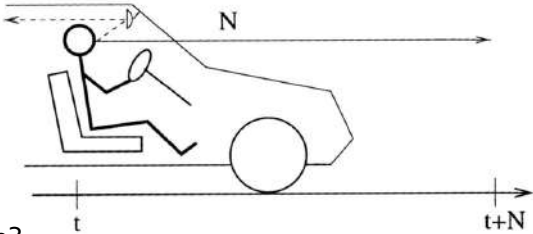
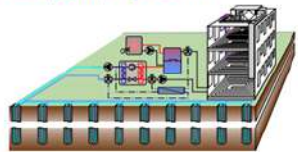


Figure 1.3: MPC analogy [E.F Camacho and C. Bordons, Model Predictive Control]

KU LEUVEN ARENBERG DOCTORAL SCHOOL
 Faculty of Engineering Sciences

Modeling, optimal control and HVAC design of large buildings using ground source heat pump systems



Damien Picard

Supervisor: Prof. Dr. Ir. L. Helsens

Dissertation presented in partial fulfillment of the requirements for the degree of Doctor of Engineering Science (PhD): Mechanical Engineering

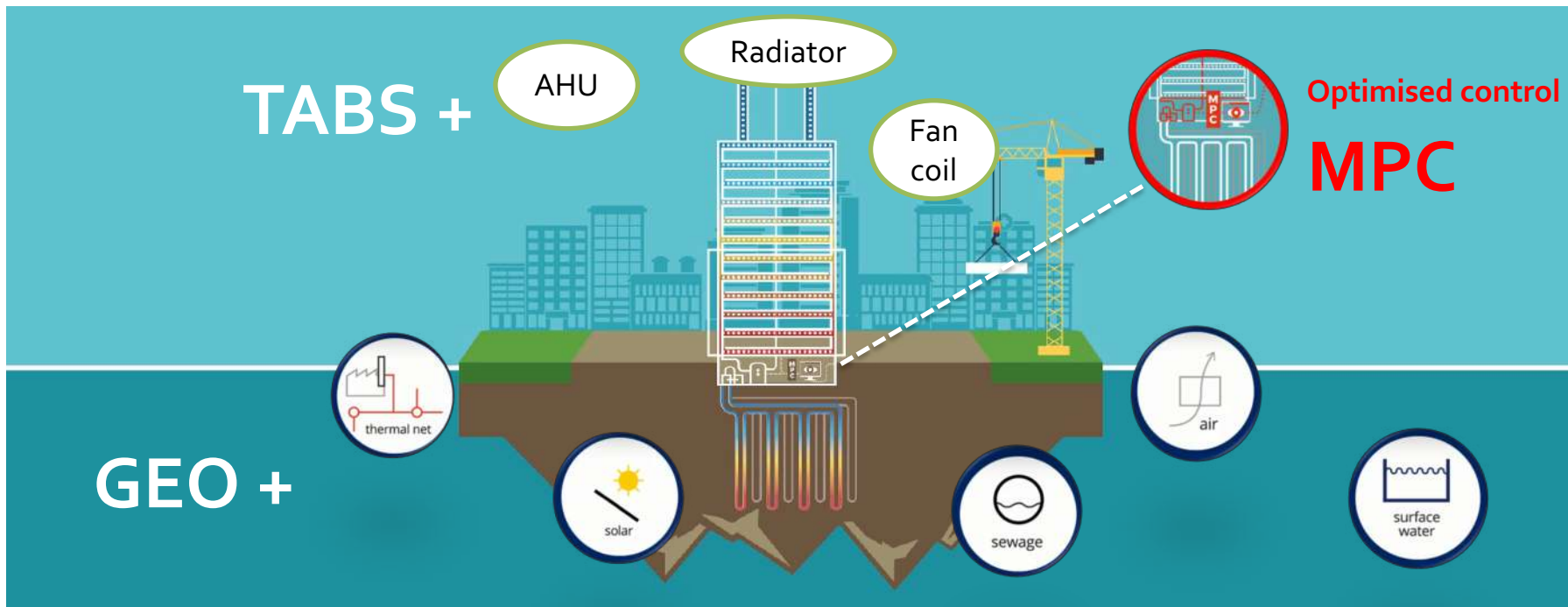
Use the best system (cost & climate & environment!) of the hybrid as much as possible



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This is hybridGEOTABS



DEMONSTRATION AND CASE-STUDY BUILDINGS





Controlling the power of the ground by integration

hybridGEOTABS film





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Documentation and materials coming on www.hybridgeotabs.eu



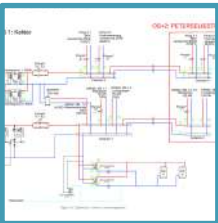
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email: hybridgeotabs@ugent.be

www.hybridgeotabs.eu

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