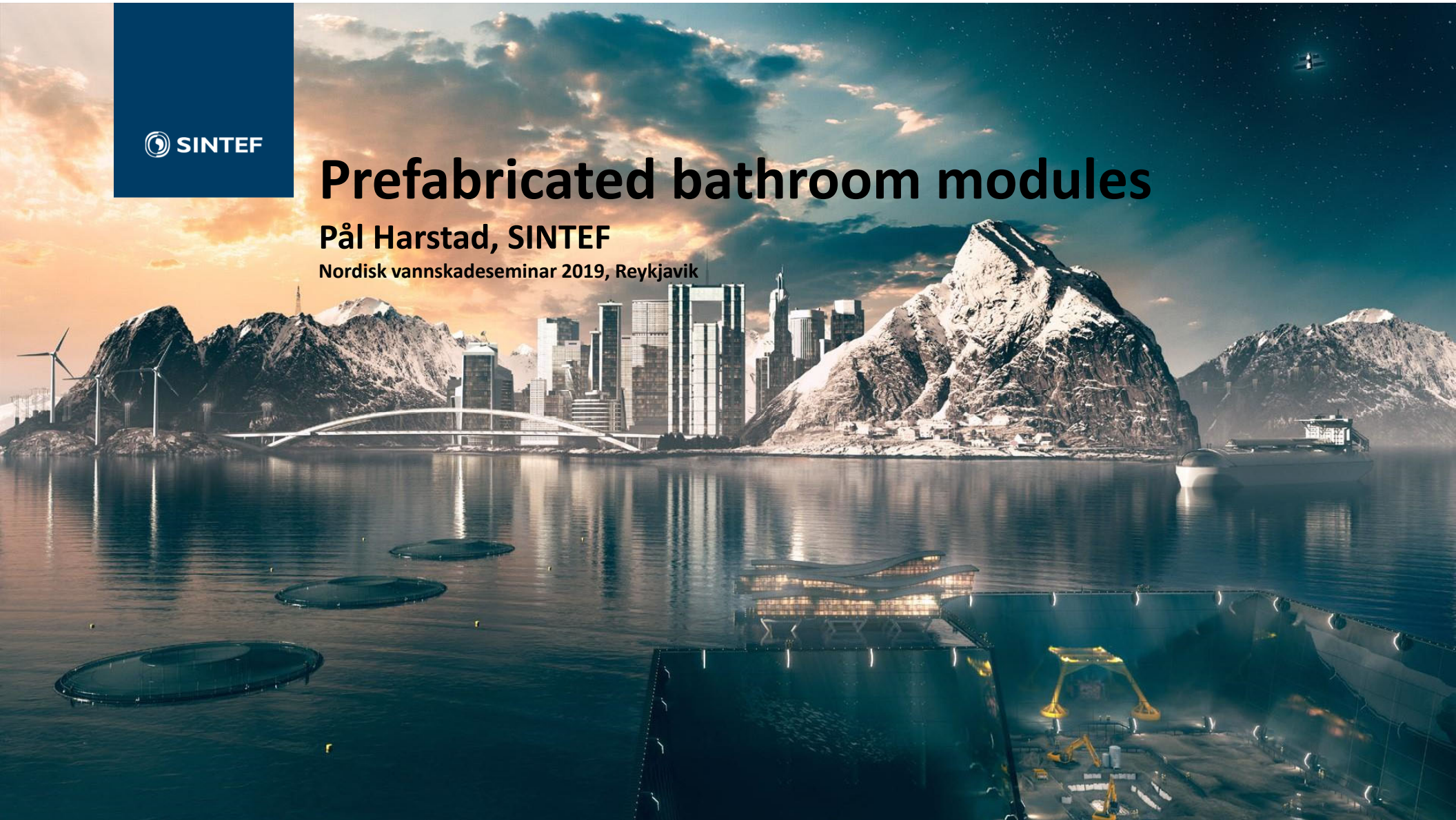




# Prefabricated bathroom modules

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Nordisk vannskadeseminar 2019, Reykjavik







## *World Sensation: PREFABRICATED INFLATABLE BATHROOM*

- Water proof
- Light weight
- Reusable
- Transportable

# AGENDA

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- What is a prefabricated bathroom module (PBM)?
- Why prefabrication?
- Regulations/requirements
- Testing
- Challenges and experiences
- Market
- Status



## How to define PBM

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- A complete, waterproof bathroom
- Produced in a factory
- Transported to the final building
- Floor, walls, ceiling
- WC, hand basin, shower, mixers etc
- Electrical installations, ventilation

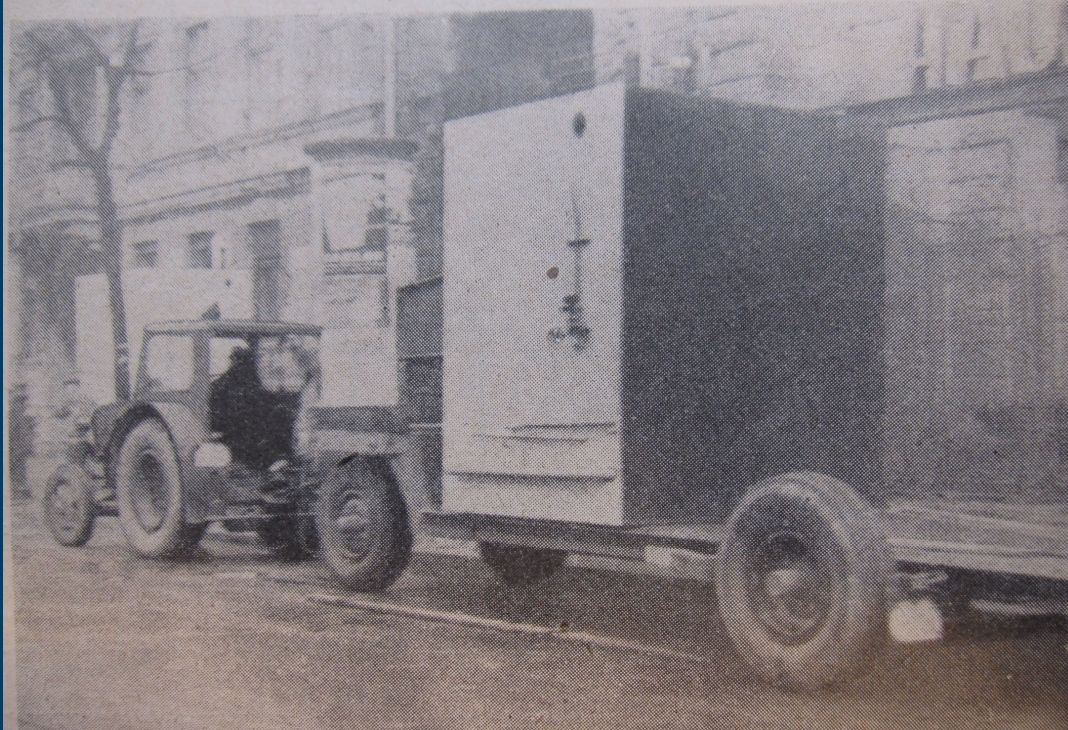




# Why prefabrication

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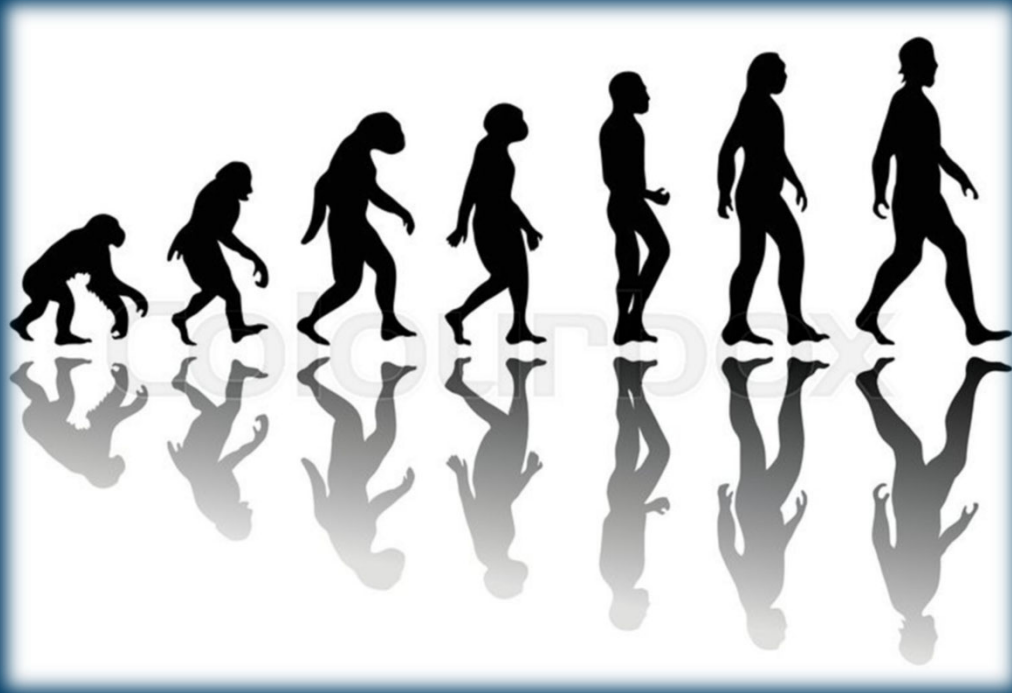
- Production line
- Accurate design
- Repetitive
- Ideal work conditions
- Predictable
- Reduced cost



## The early days

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- Experimental
  - Example from Soviet Union 1961
  - Not common in use
  - Difficult/expensive transport
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- Small scale use from the '70s
  - Increasing use since 2000
  - More available transport



# Development

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- Former module house producers
- Lack of knowledge
- Poor waterproofing





# Development

- Different constructional materials:
- Combinations



# Regulations and requirements

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- For Norway:
- The law = DiBK
  - Official requirements
- Functional requirements (TEK)
- Documentation(DOK)
  - Byggevare vs. Built on site

# Testing and certification

- Testing:
  - Water tightness
  - Load bearing capacity
  - Water & waste installations
- Fire aspects
- Environmental evaluation
- SINTEF Certification issue Technical Approval





# Challenges

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- Slope - requirements
- Built-in water installations - requirements



# Challenges

- Membrane repair
- Changes to the construction
- Renovation





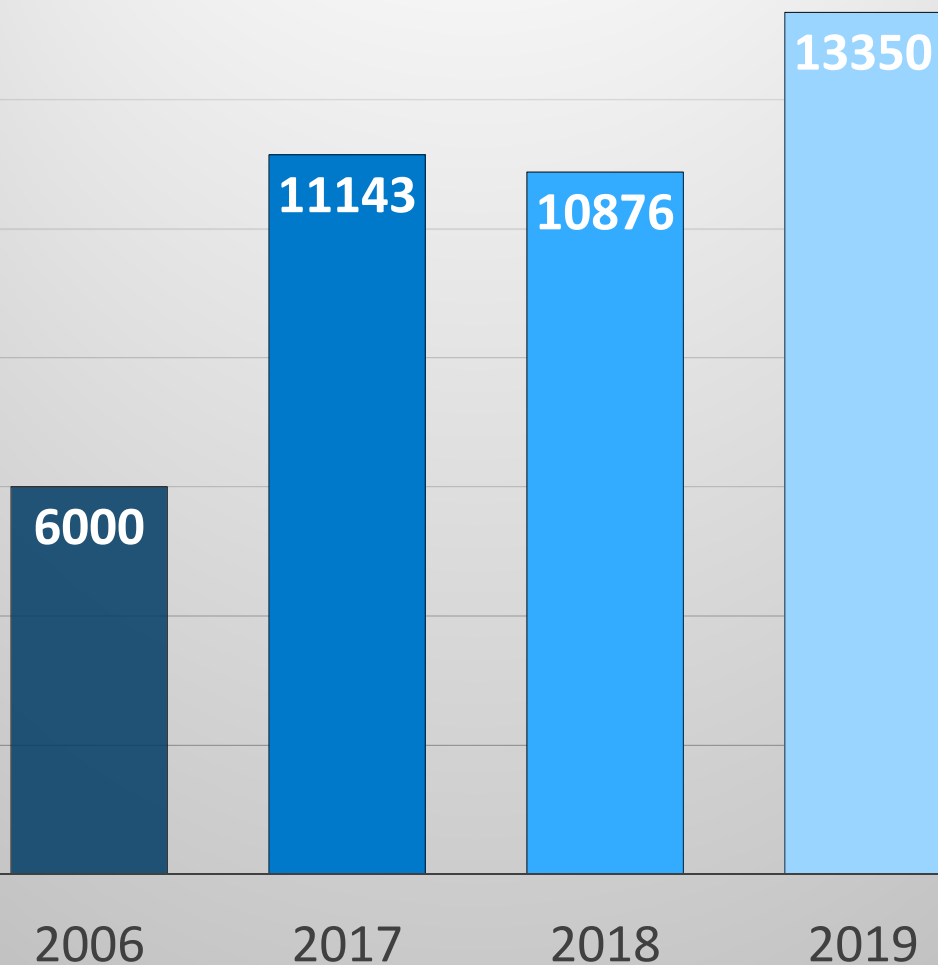
## Experiences

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- Design process is important
- An error can cause: Systematic fault
- Large number affected
- Media – sensation
- Poor handling/storage at building site



Antall

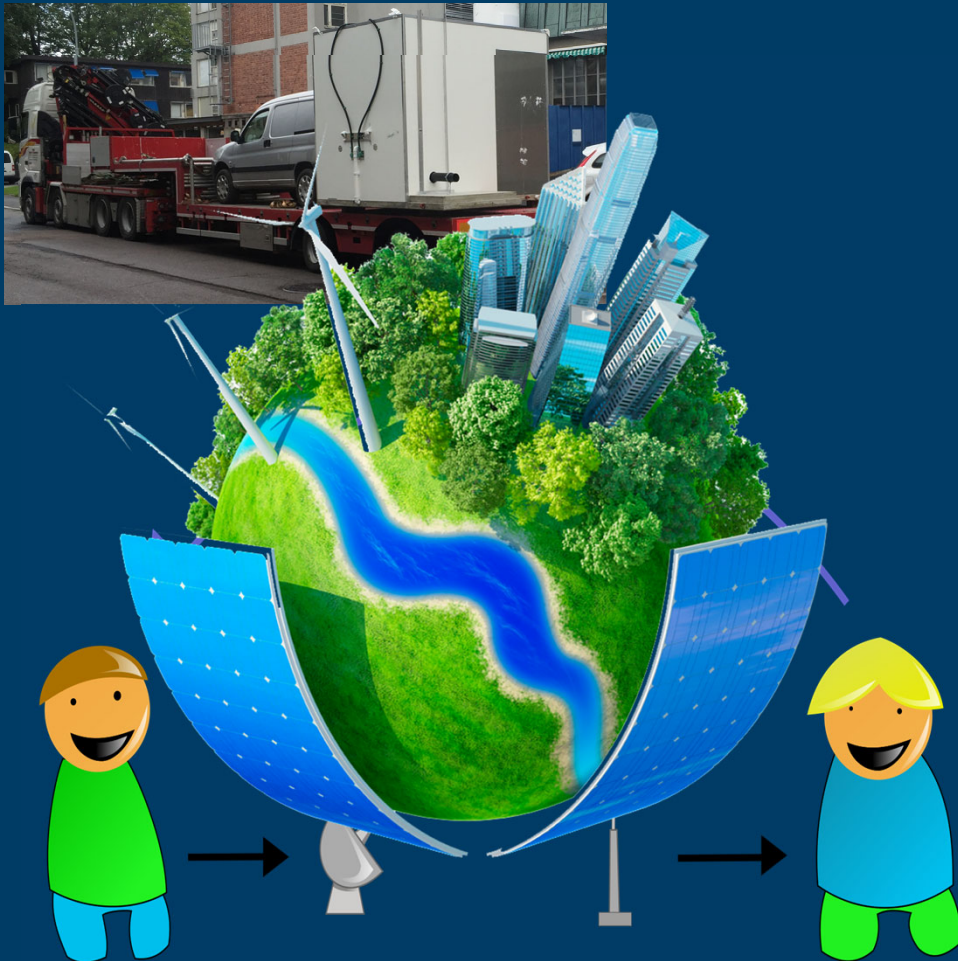


## Market

Norway only

- 2018; Total 33423 new homes
- Approximately 17500 new dwellings in building blocks + 3000 hotel rooms = 20500
- 10876 PBM units delivered
- Close to 50%
- Today all producers have SINTEF certificate

# Status



- Increasing prefabrication
- Improved quality
- User – producer communication; early and clear
- Environment and climate assessment



# Thank You

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- Any questions?