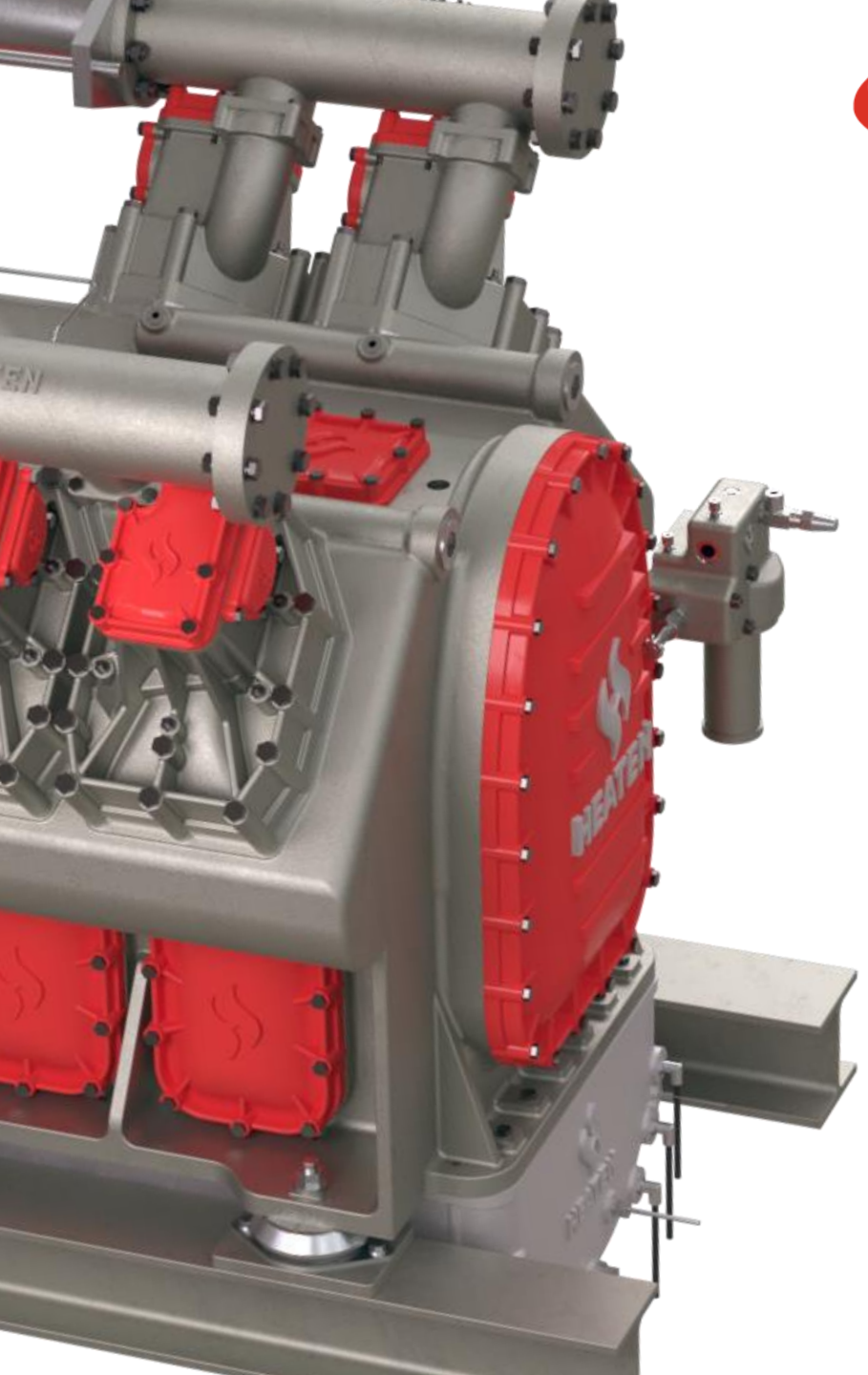
Hall 4A


Chillventa Specialist Forums 2022
Chillventa Fachforen 2022
CONNECTING EXPERTS.



HEATEN

Chillventa 2022

Rapid prototyping of Heaten’s industrial very high temperature heat pump

Problem -

De-carbonizing heat is the elephant in the room for the industrial energy transition

Electrifying industrial heating processes is the most important decarbonization lever

65%

of industrial CO2 emissions come from the combustion of fossil fuels

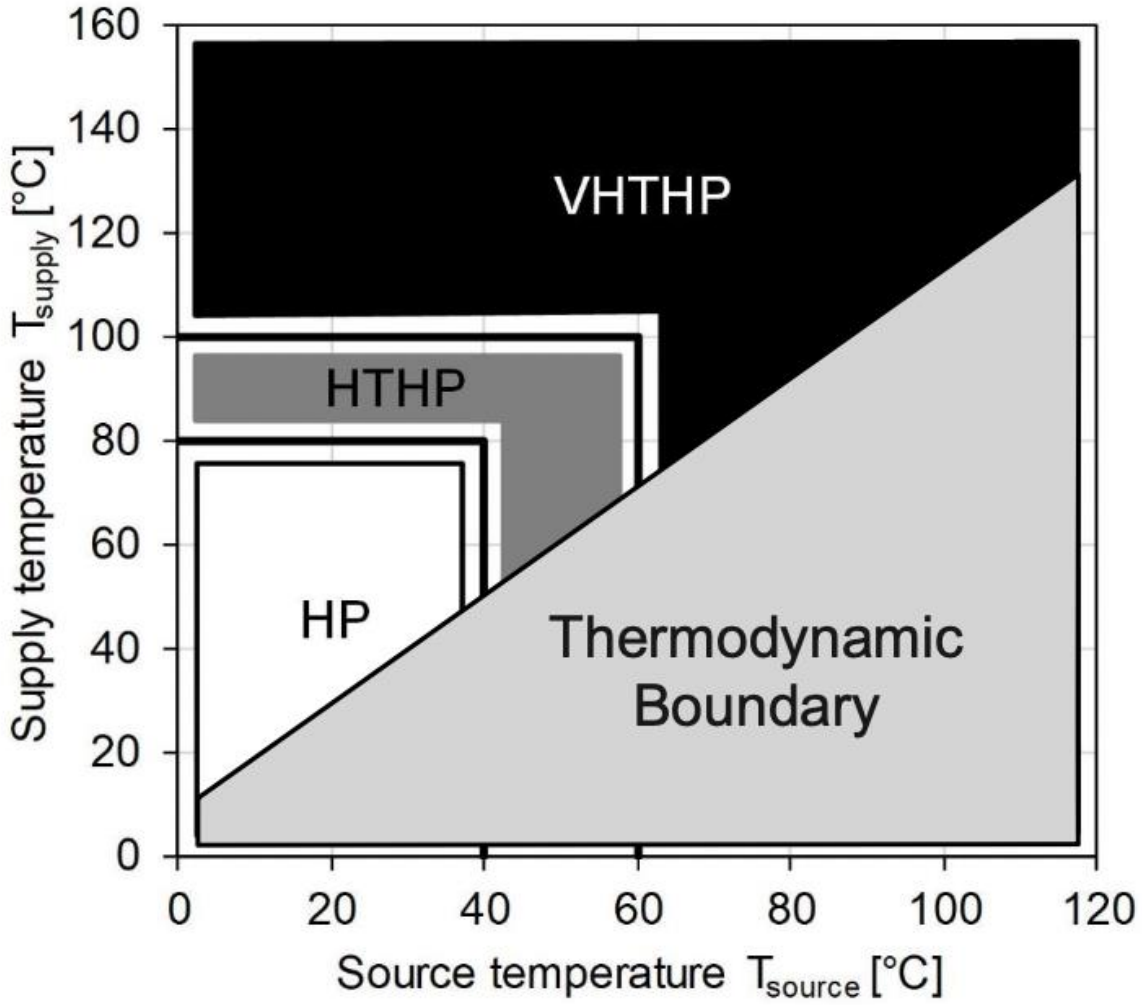
91%

CO2 emission reduction potential, in low- to medium-temperature industries

30%

of the total heat energy is required for process temperatures between 100-170˚C

Heaten's robust and reliable VHTHP's deliver up to 200˚C, direct steam supply, and a high performance with variable load.



HEATEN

VHTHP: Very High Temperature Heat Pump

HTHP: High Temperature Heat Pump

HP: Conventional Industrial Heat Pump

Source: Arpagaus et al. (2018): Review on High-Temperature Heat Pumps, https://doi.org/10.1016/j.energy.2018.03.166

OST

MARKET SEGMENTS & EXAMPLES

PET bottle industry

- Process heat 100-150°C

Pulp and Paper

- Huge energy demand

Drying processes

- Paint shops
- Spray drying
- Brick drying

Brewery industry

- Brewing process (mashing, lautering, boiling)
- Filling process (sterilization, washing, pasteurization)

Carbon Capture

- Significant reduction in OPEX for carbon capture technologies
- High efficiency process to de-carbonize capture processes

Sugar & Dairy

- Process at 80-150°C
- Pasteurization 100-150 °C

HeatBooster Roadmap

Temperature

Sector	Process	20 40 60 80 100 120 140 160 180 200	[°C]
Paper	Drying		90 to 240
	Boiling		110 to 180
	Bleaching		40 to 150
	De-inking		50 to 70
Food & beverages	Drying		40 to 250
	Evaporation		40 to 170
	Pasteurization		60 to 150
	Sterilization		100 to 140
	Boiling		70 to 120
	Distillation		40 to 100
	Blanching		60 to 90
	Scalding		50 to 90
	Concentration		60 to 80
	Tempering		40 to 80
	Smoking		20 to 80
Chemicals	Destillation		100 to 300
	Compression		110 to 170
	Thermoforming		130 to 160
	Concentration		120 to 140
	Boiling		80 to 110
	Bioreactions		20 to 60
Automotive	Resin molding		70 to 130
Metal	Drying		60 to 200
	Pickling		20 to 100
	Degreasing		20 to 100
	Electroplating		30 to 90
	Phosphating		30 to 90
	Chromating		20 to 80
	Purging		40 to 70
Plastic	Injection modling		90 to 300
	Pellets drying		40 to 150
	Preheating		50 to 70
Mechanical engineering	Surface treatment		20 to 120
	Cleaning		40 to 90
Textiles	Coloring		40 to 160
	Drying		60 to 130
	Washing		40 to 110
	Bleaching		40 to 100
Wood	Glueing		120 to 180
	Pressing		120 to 170
	Drying		40 to 150
	Steaming		70 to 100
	Cocking		80 to 90
	Staining		50 to 80
	Pickling		40 to 70
Several sectors	Hot water		20 to 110
	Preheating		20 to 100
	Washing/Cleaning		30 to 90
	Space heating		20 to 80

Technology Readiness Level (TRL) of heat pumps:

- Conventional HP < 80°C, established in industry
- Commercial available HTHP 80 to 100°C, key technology
- Prototype status, technology development, HTHP 100 to 140°C
- Laboratory scale research, functional models, proof of concept, HTHP > 140°C

Heaten AS

2010 First principle review of ORC & heat pump thermodynamics; focus on R&D into ORC machines

2013 - ORC system engineering & long-term testing; achieved 60000 hours

2017 Pivot development towards R&D into Very High Temperature Heat Pump

2019 Feb First commercial HP customer installation

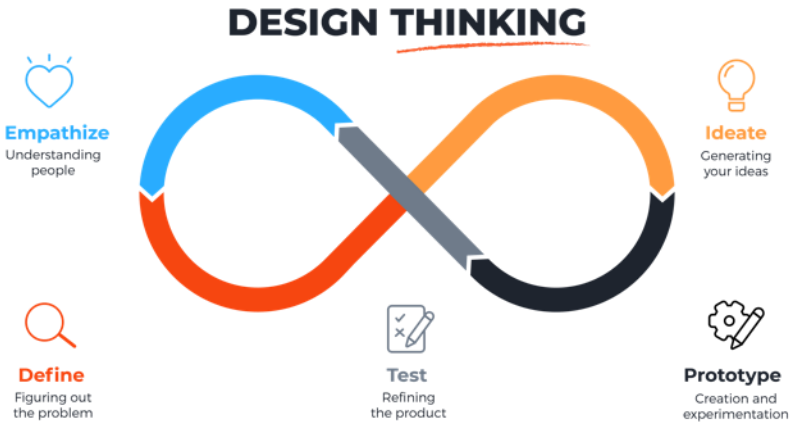
2019 Dec Technology team consolidated to develop large scale Heat Pumps for industrial customers

2020 March **Heaten AS**, co-founded by CTO & director of R&D, acquires VHE assets

2022 **Heaten's** first machine on test bed

CHALLENGE

Traditional rapid prototyping approach takes 3-6 years
(for capital and manpower intensive projects)



- **Rapid prototyping is not to rapidly deliver a prototype!**
  - Projects often get caught in the design process infinity loop.
- **3 key ingredients of successful rapid developments:**
  - Team culture & experience
  - Front end loading
  - Partners

Source: https://qatestlab.com/resources/knowledge-center/alpha-beta-gamma/
https://www.maqe.com/insight/the-design-thinking-process-how-does-it-work/

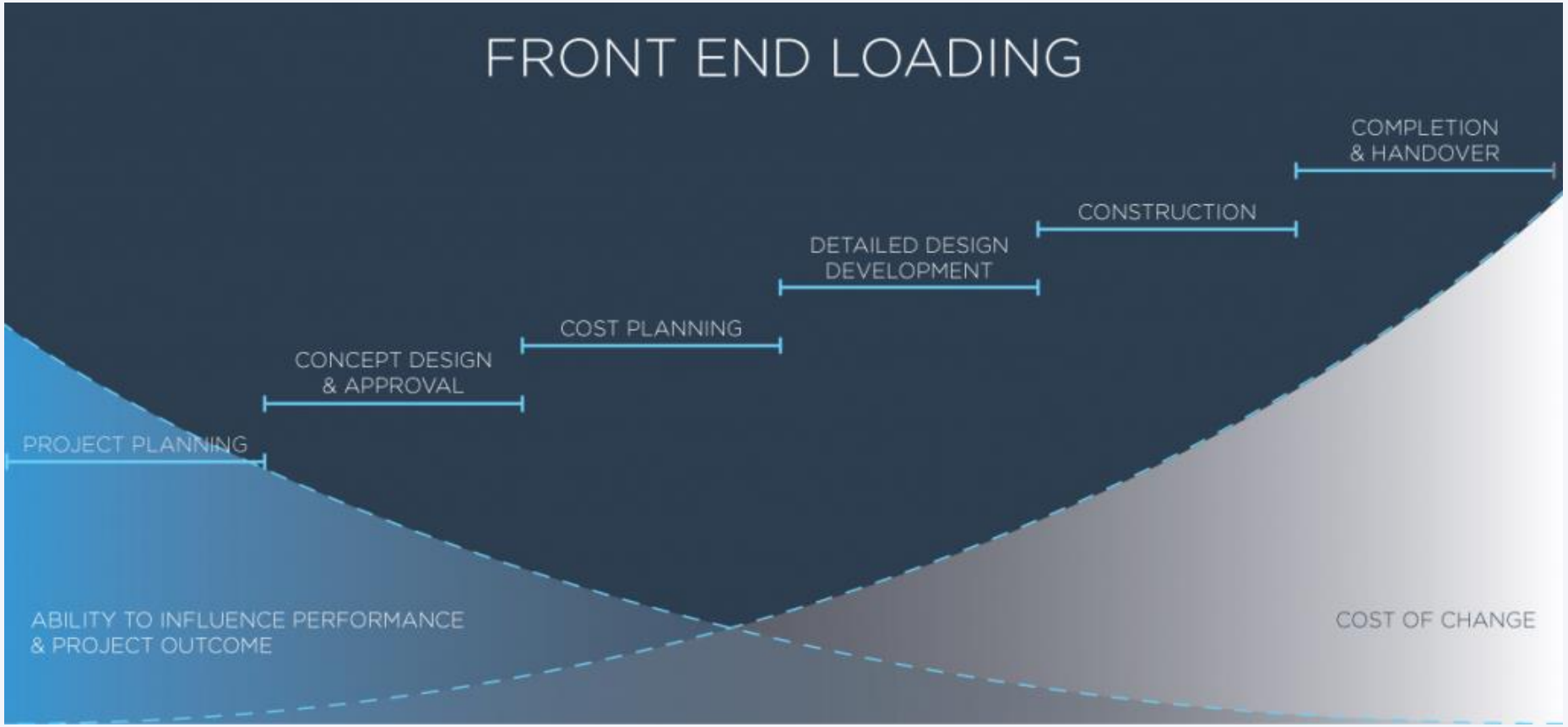
FRONT END LOADING

With highly capital intensive, long lifecycle projects, drive changes when costs are low.

1. **Knowledge:**
   Do not re-invent the wheel.

2. **HR:**
   Hire for the best.

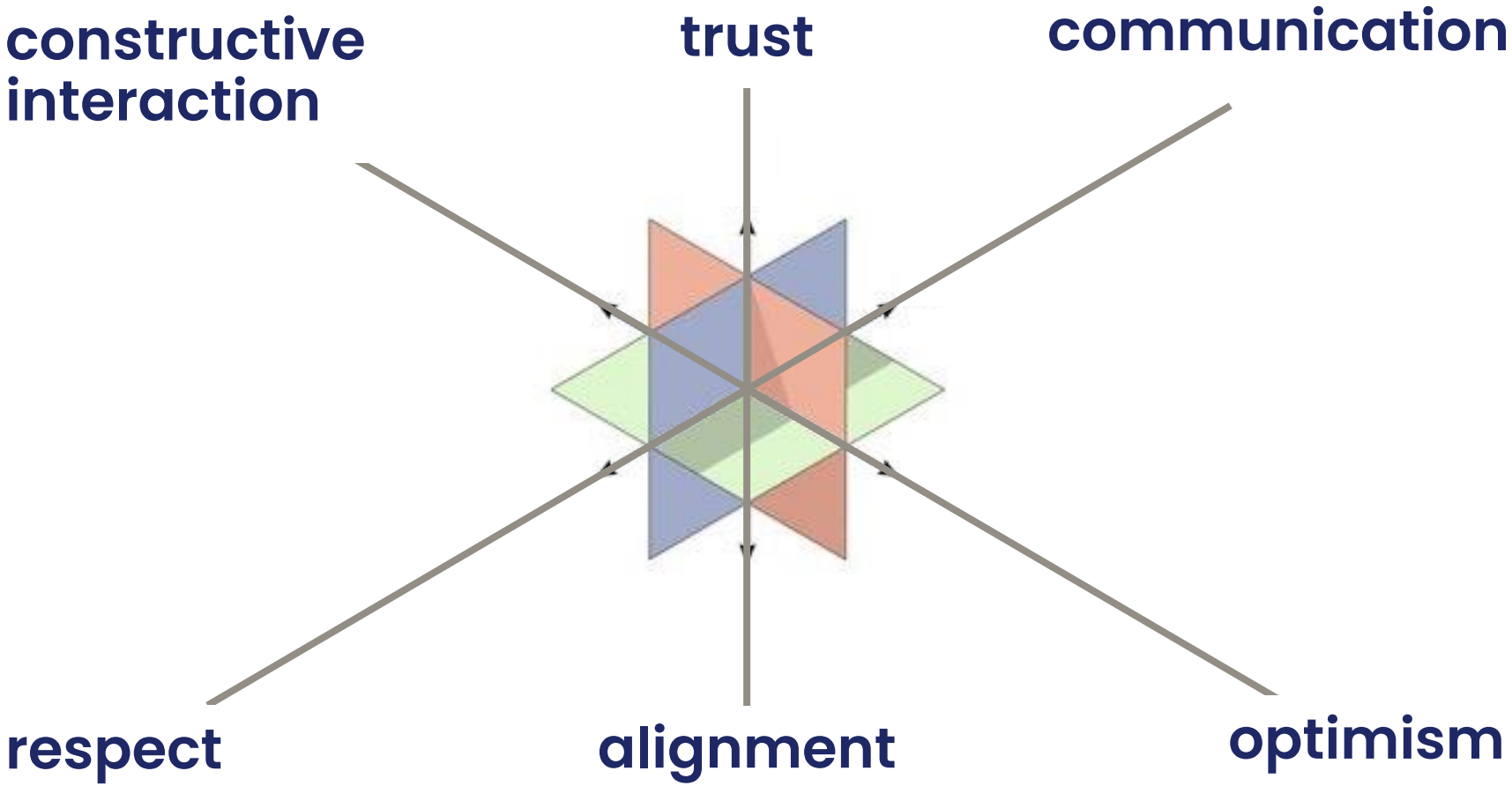
3. **Execution:**
   Intervention culture.



Source: https://www.mavtechglobal.com/using-feed-for-a-successful-batch-implementation/

TEAM

Company culture is a necessary condition for successful front-end loading.



Source: https://lyssaadkins.com/

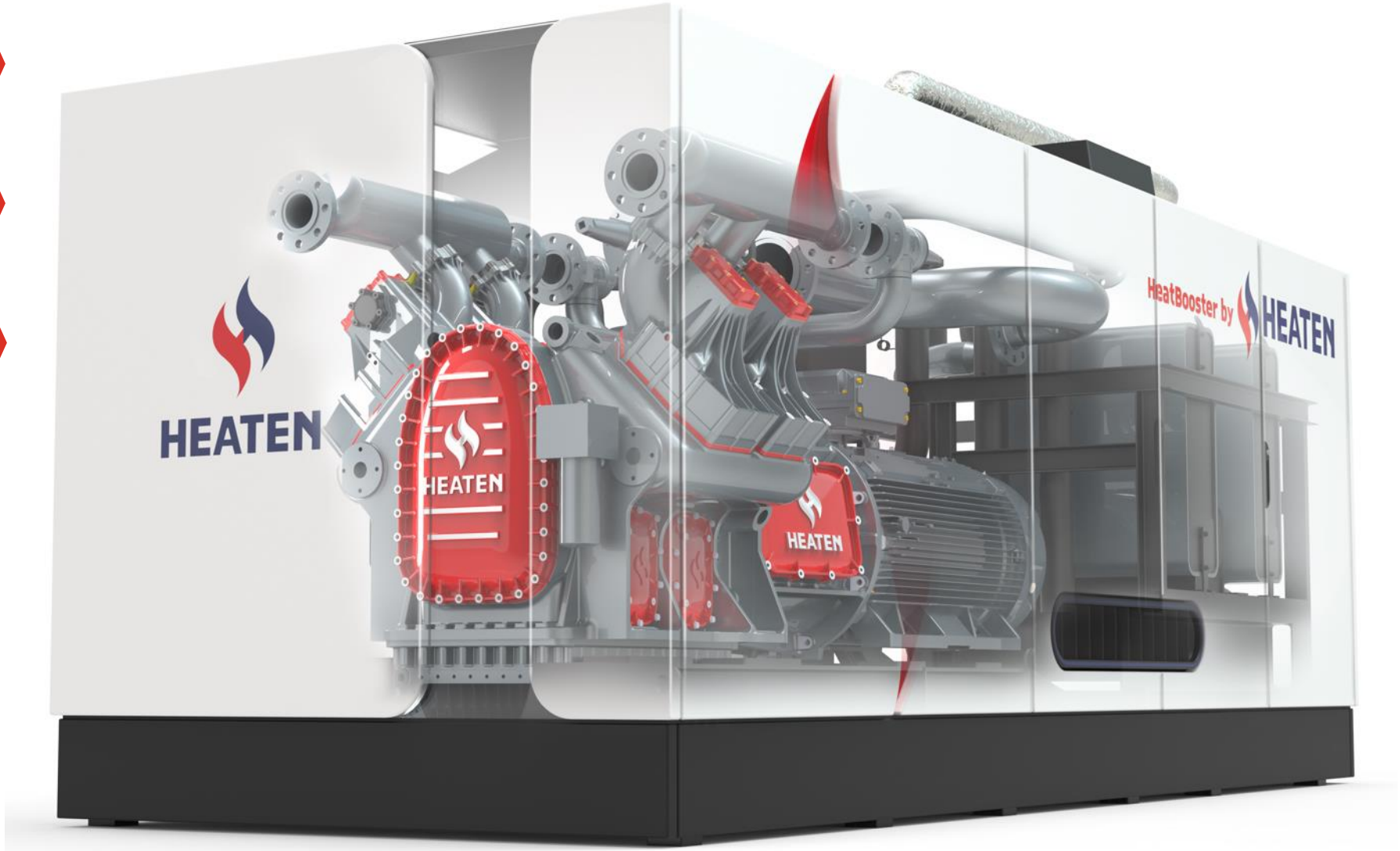
12 MONTHS TO PRODUCT

Building on 8 years of R&D and design experience – Heaten's 1MWt VHTHP

Knowledge

Team

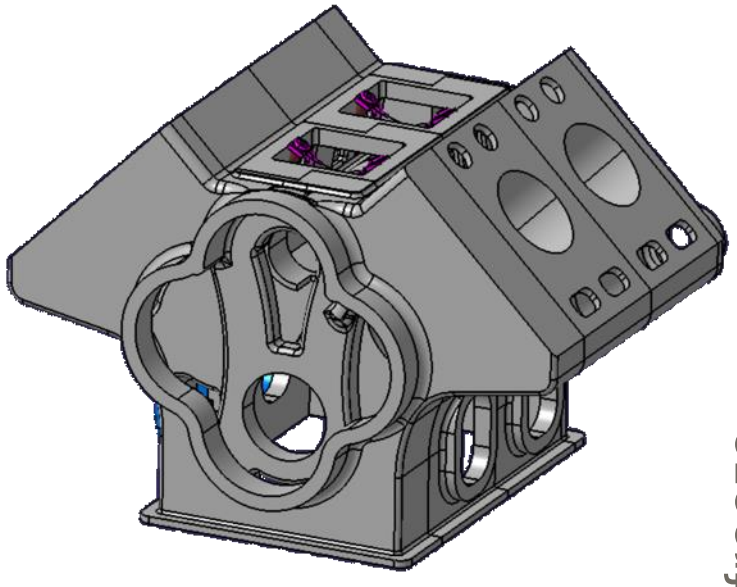
Partner



EXAMPLE 1: CRANKCASE

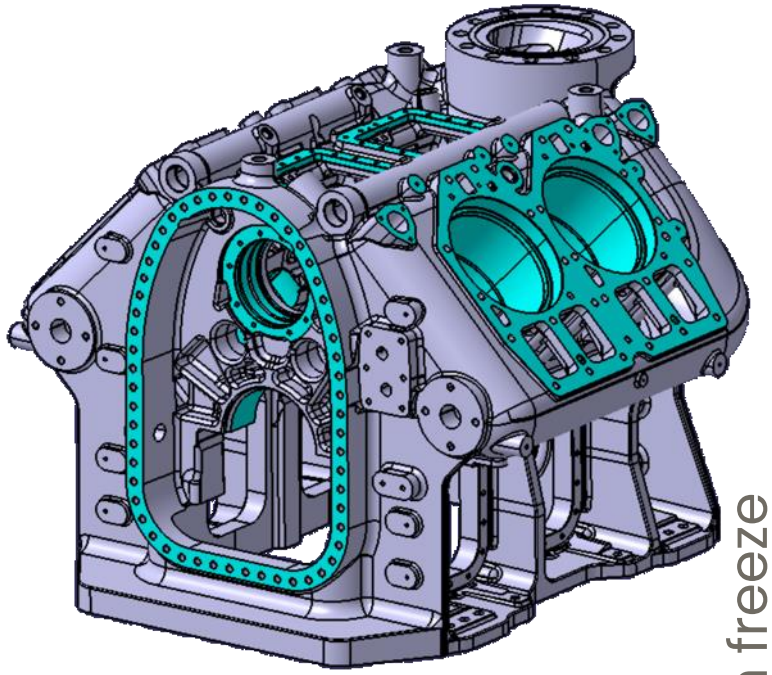
Evolution of the crankcase

Concept stage (3D)



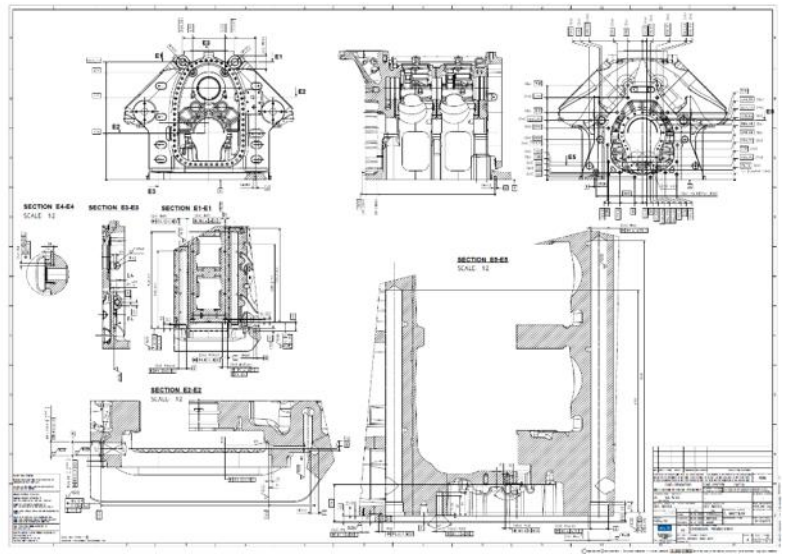
Concept freeze

Detailed design (3D)



Design freeze

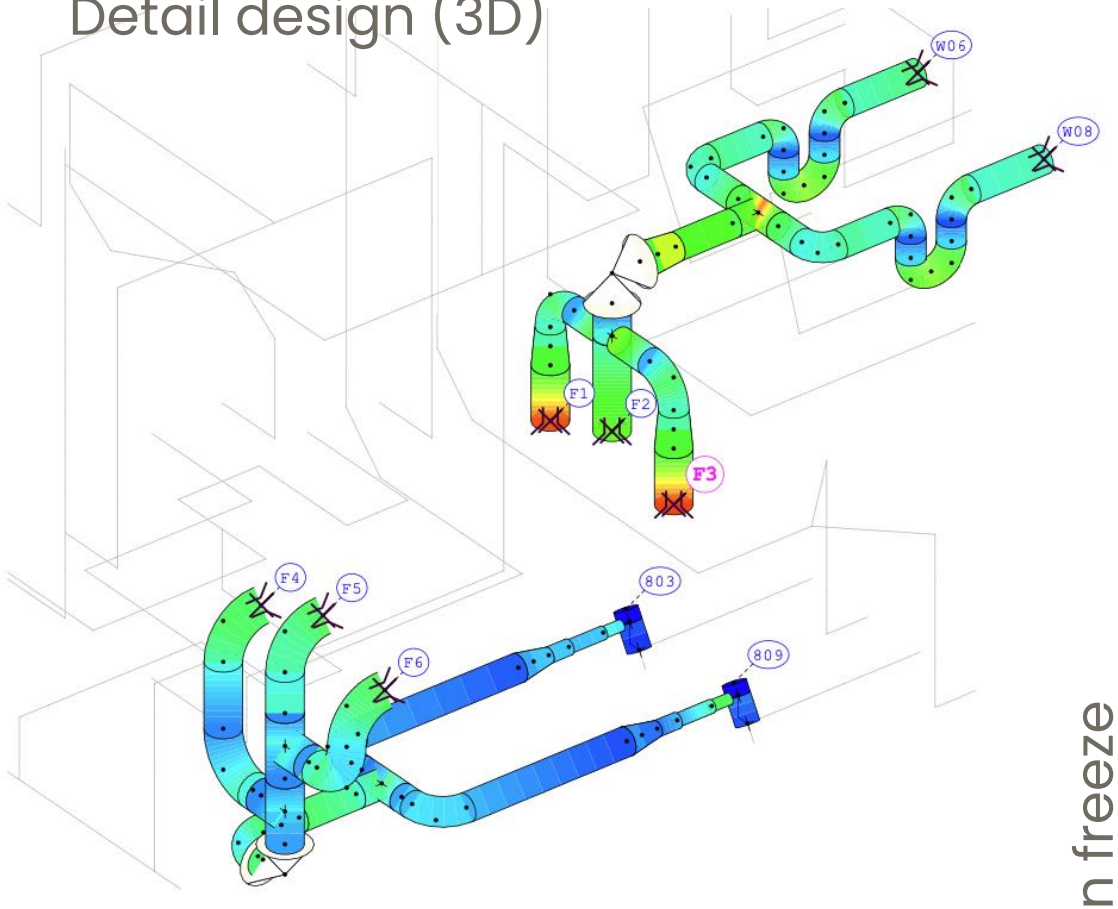
Drawing creation (2D)



EXAMPLE 2: HYDRAULIC UNIT

Partnering with suppliers key to success

Detail design (3D)



Design freeze

Manufacturing and assembly

HEATEN'S MAIN PARTNERS & INVESTORS

Strong partners and investors

The largest independent motor development company in the world

A global chemistry company with leading market positions in Titanium Technologies, Thermal & Specialized Solutions

KB Anlagenbau is a very experienced solution provider for plant and pipeline construction.

HOERBIGER is one of the world's leading suppliers of performance-defining components for reciprocating compressors.

Norwegian State Climate investment company

Created by Prime Coalition

The corporate venture capital arm of Shell

Norwegian investment company.


HeatBooster by HEATEN
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Visit us in hall 4 at stand 4-334!

Hall 4A


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