Dansk Betondag 2025

Betonkonstruktioner i en maskinverden

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LIEBHERR

Hvorfor teste…

Test af ny teknologi

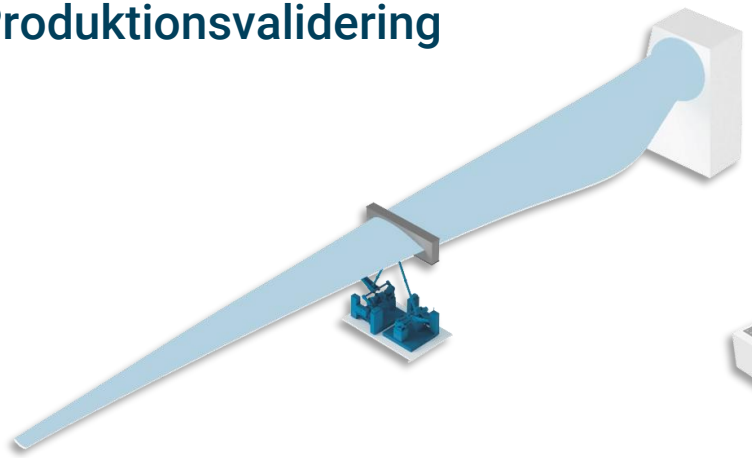
Demonstrere nye koncepter

Validering og kalibrering af model

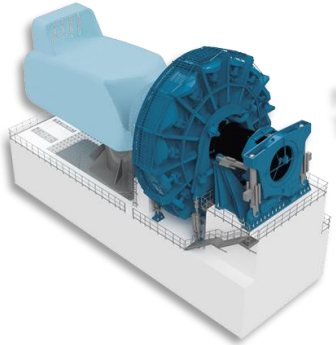
Test funktioner, ydeevne og optimering

Levetids- og pålidelighedstest

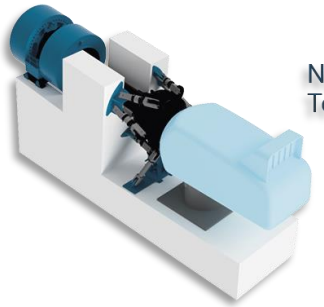
Produktionsvalidering



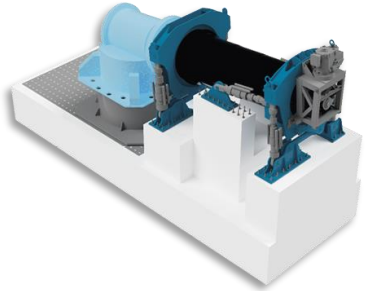
Blade Exciter



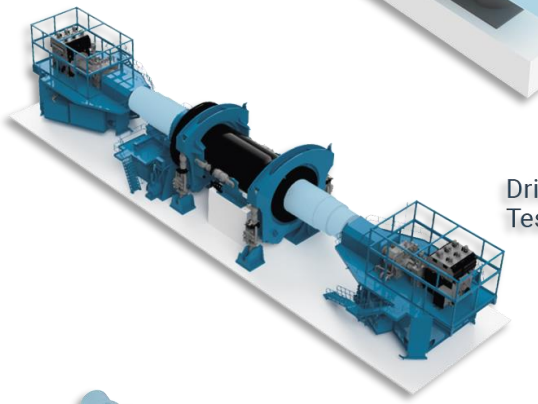
Nacelle
Test Bench



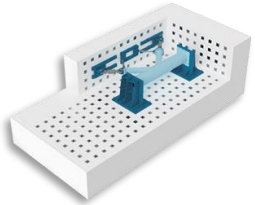
Nacelle & Grid
Test Bench



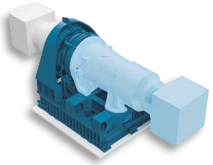
Main Bearing
Test Bench



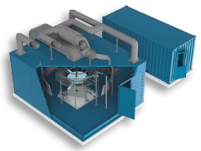
Drive- & Powertrain
Test Bench



Strong
Floor



End-of-Line
Test Bench



Rain Erosion
Tester

Pitch System
Test Bench

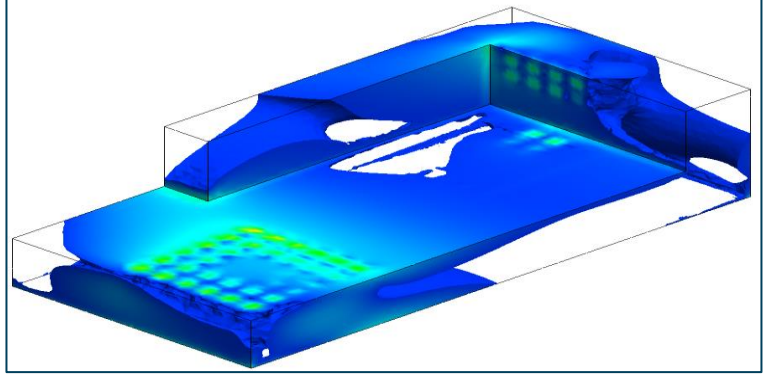
Processen fra koncept til aflevering…

1 - Konceptfasen

Skitsere testløsning ud fra kundens behov
Finde egnet fundamentsløsning

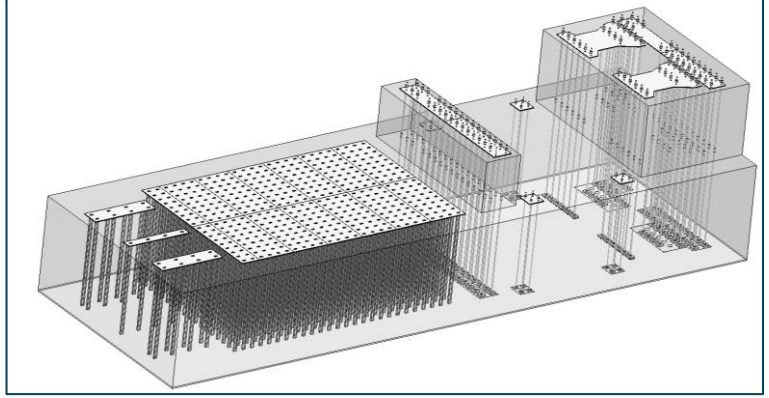
2 - Designfasen

Geoteknisk support struktur
Betonfundament og vibrationsdæmpning
Maskininterface og forankring



3 – Udbud og indkøb

Udbudsmateriale, forhandling og kontrahering
Opdelt i geoteknisk support struktur og fundament



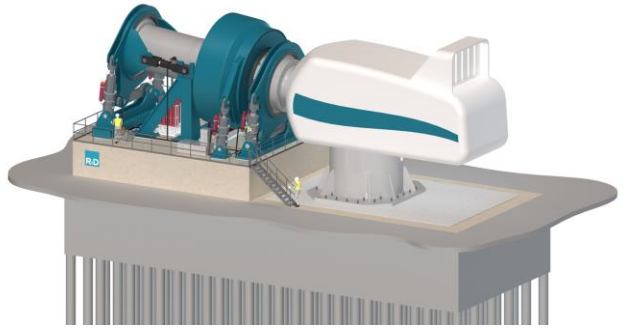
4 - Udførelsesfasen

Tilsyn og opfølgning på entreprenørens arbejde
Herunder sikkerhed og koordinering

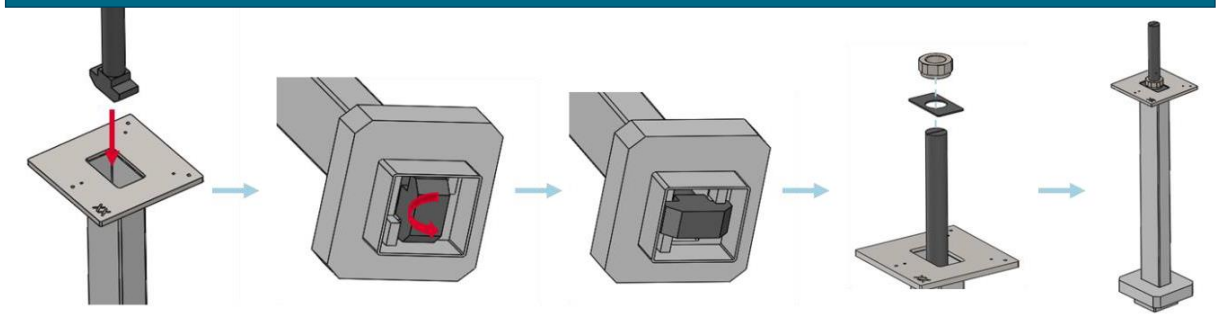
5 – Installation og aflevering

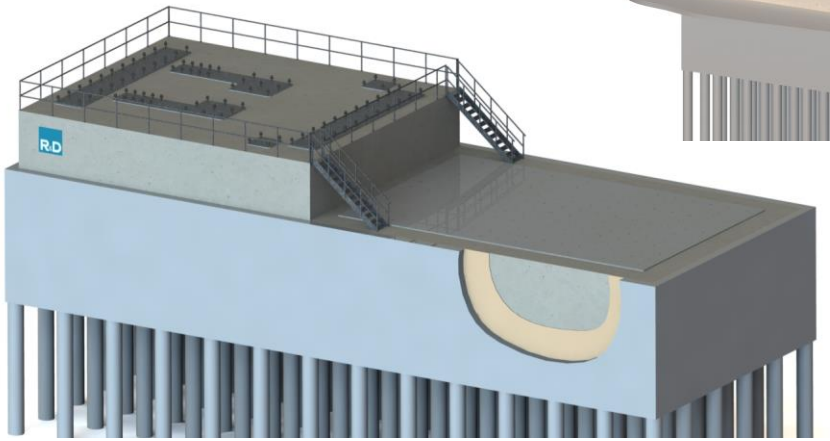
Aflevering af fundament
Maskininstallation og indkøring

Forankring og tolerancer…

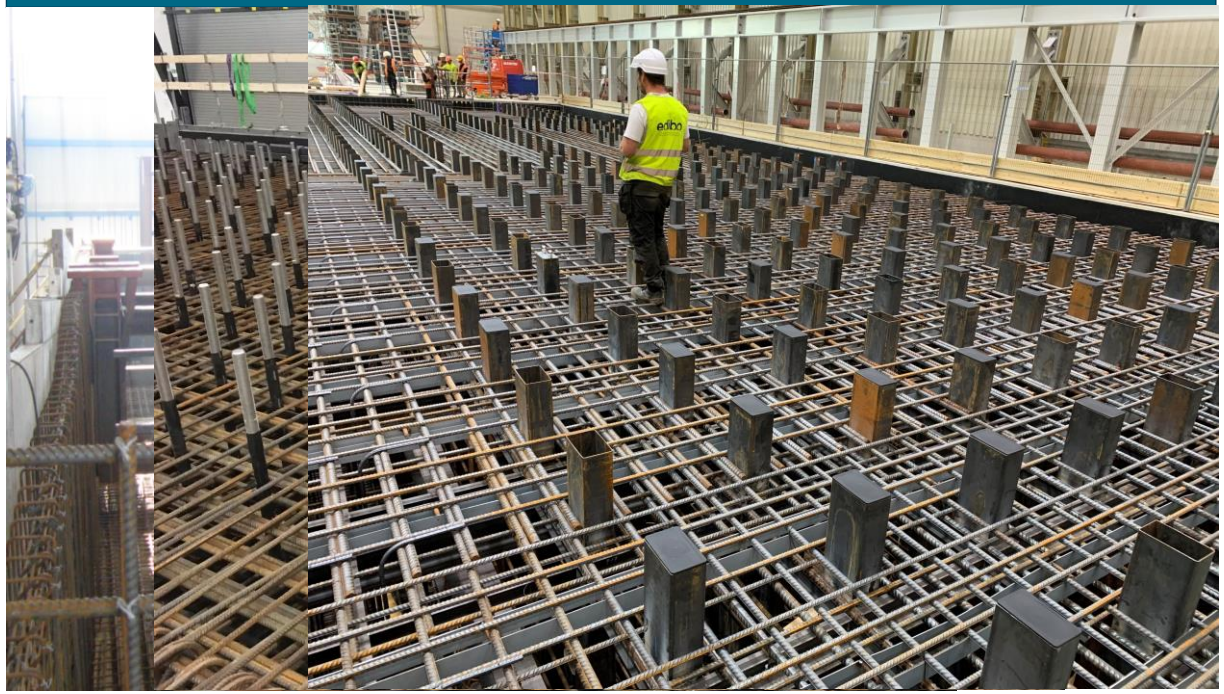


”Strong point”

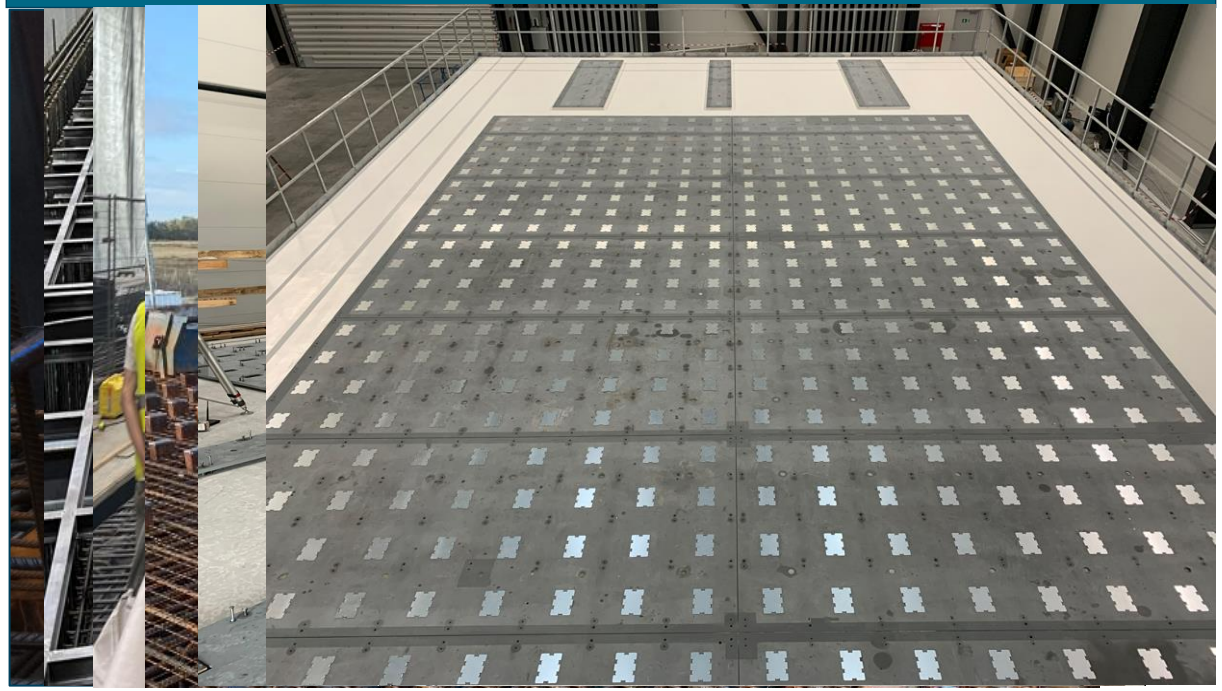




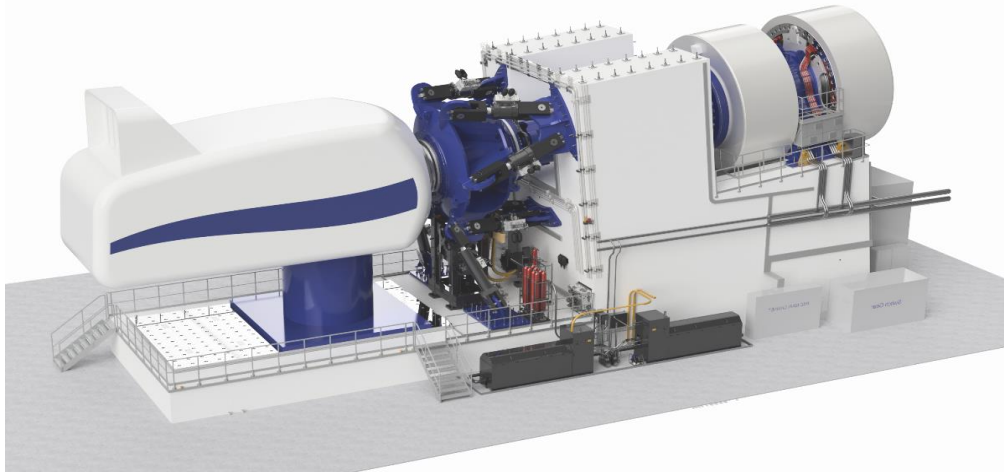
Forankringsløsninger

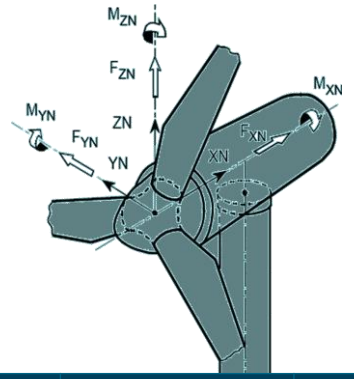


Indbygning



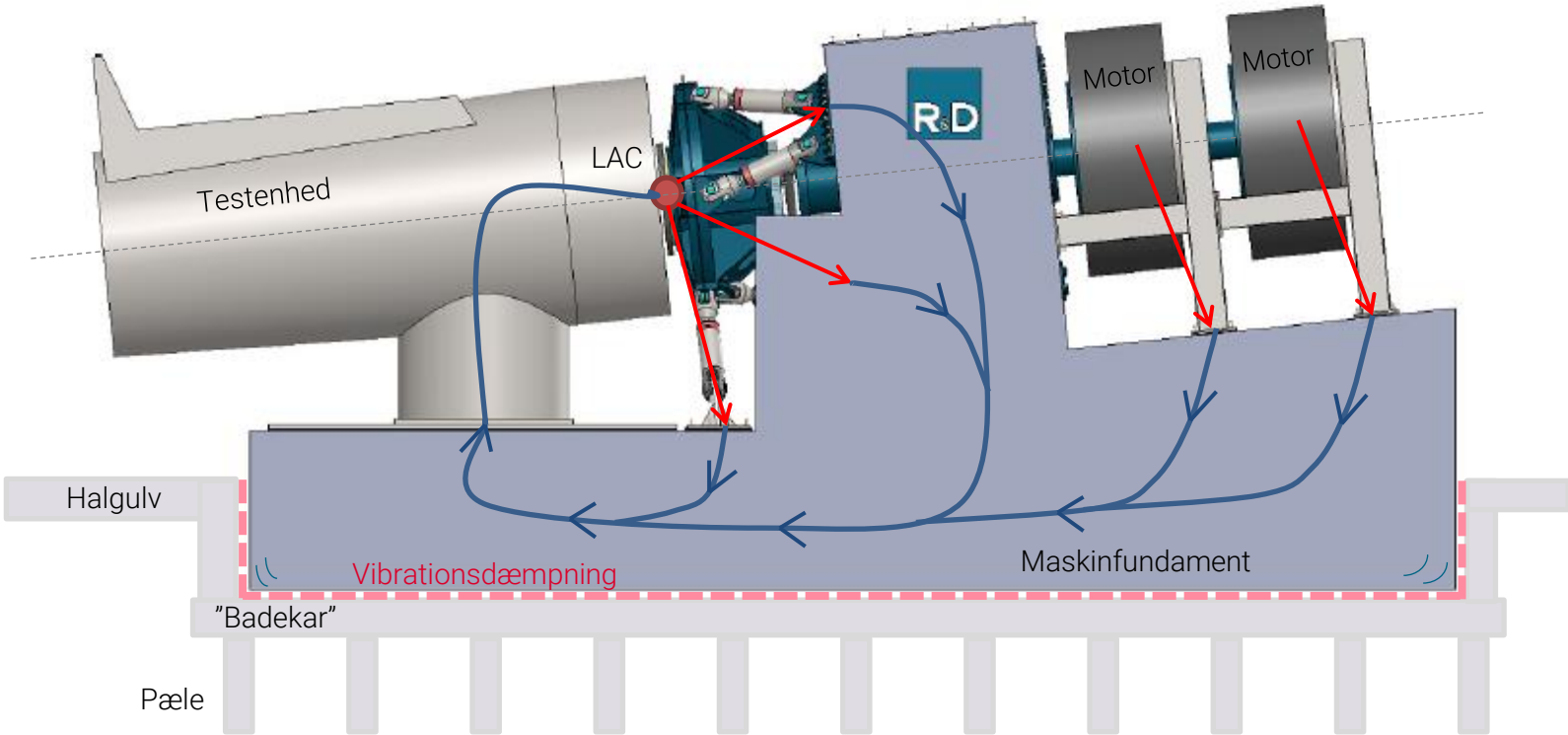
Dynamiske påvirkninger…





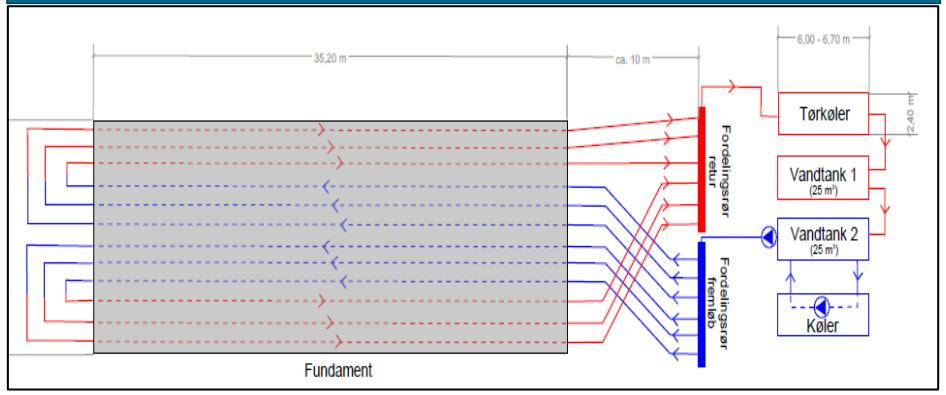
LAC Last	Min.	Max.
F_x – Thrust	-10.000 kN	10.000 kN
F_y – Horizontal	-2.200 kN	2.200 kN
F_z – Vertical	-12.000 kN	8.000 kN
M_x – Torque	-1.000 kNm	12.100kNm
M_y – Tilt	-80.000kNm	55.000kNm
M_z – Yaw	-57.000 kNm	45.000 kNm

Lasteksempel – ikke specifik testopstilling

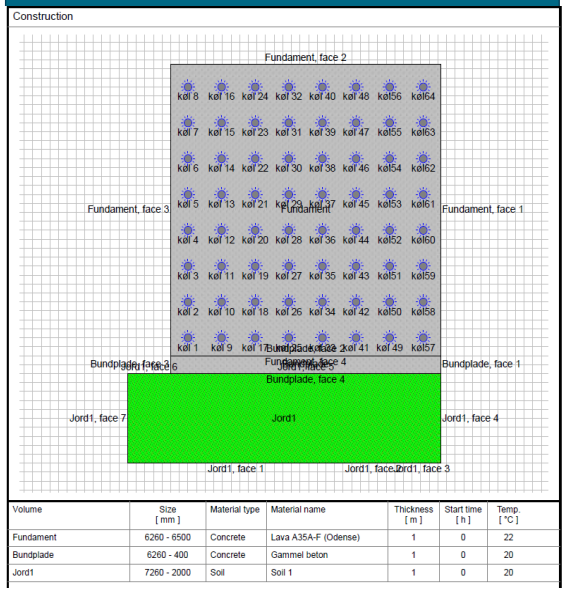


Køling af beton under hærdning…

Kølekoncept

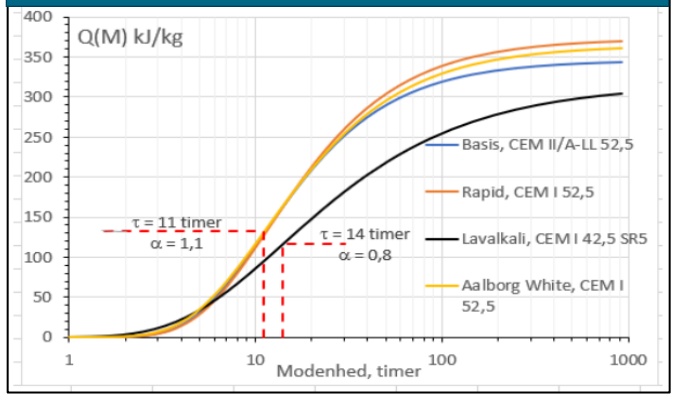


Design input

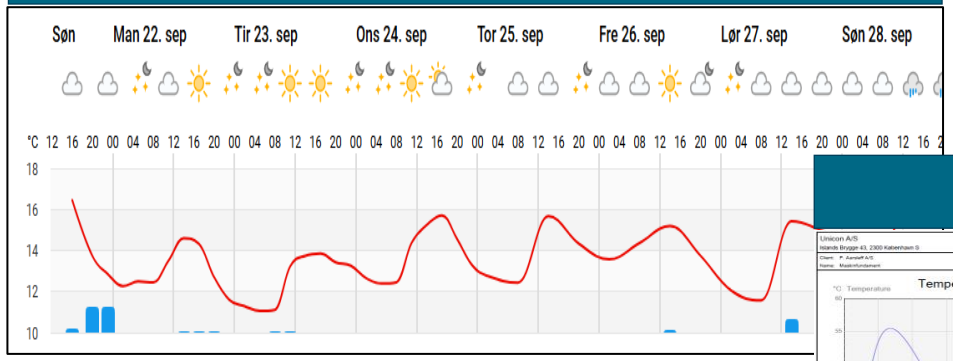


Volume	Size [mm]	Material type	Material name	Thickness [m]	Start time [h]	Temp. [°C]
Fundament	6260 - 6500	Concrete	Lava A35A-F (Odense)	1	0	22
Bundplade	6260 - 400	Concrete	Gammel beton	1	0	20
Jord1	7260 - 2000	Soil	Soil 1	1	0	20

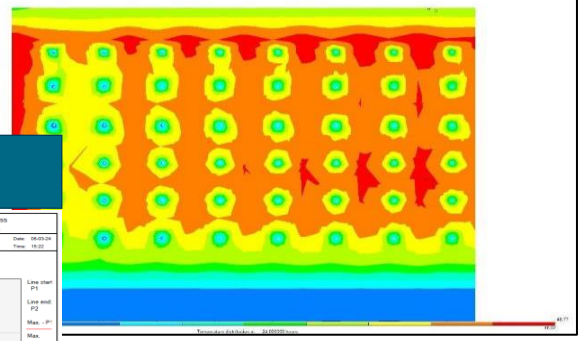
Varmeudvikling i betonen



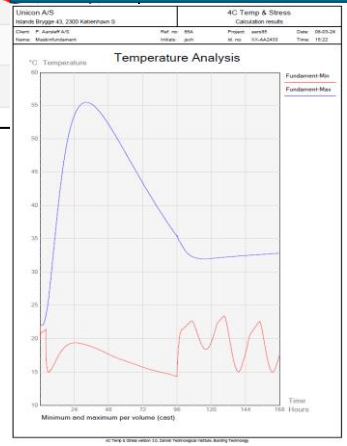
Luft- og udstøbningstemperatur

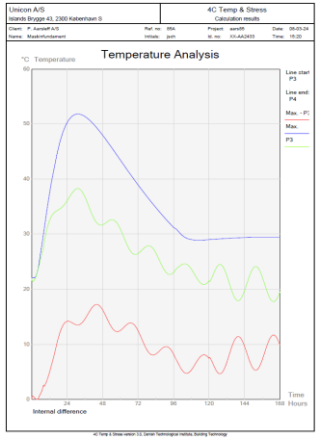


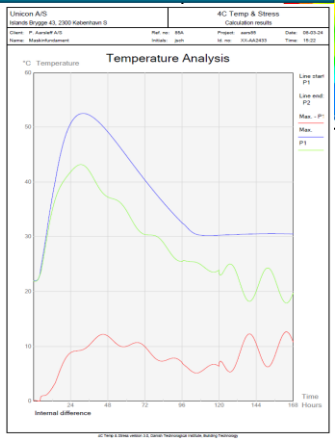
Varmetab til omgivelser



Temperatur analyse

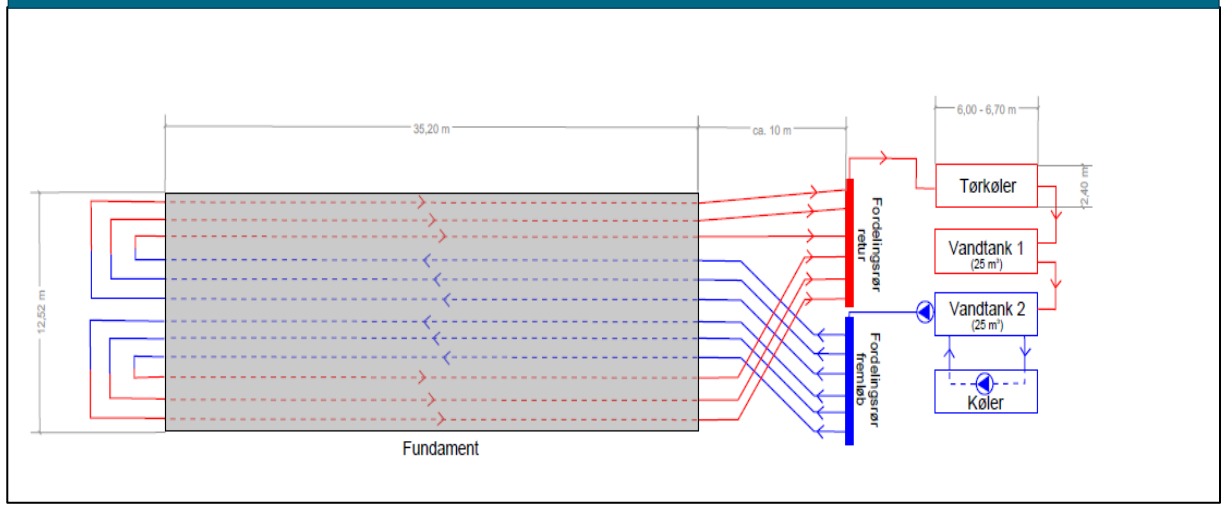






Køling af beton under hærdning…

Kølekoncept

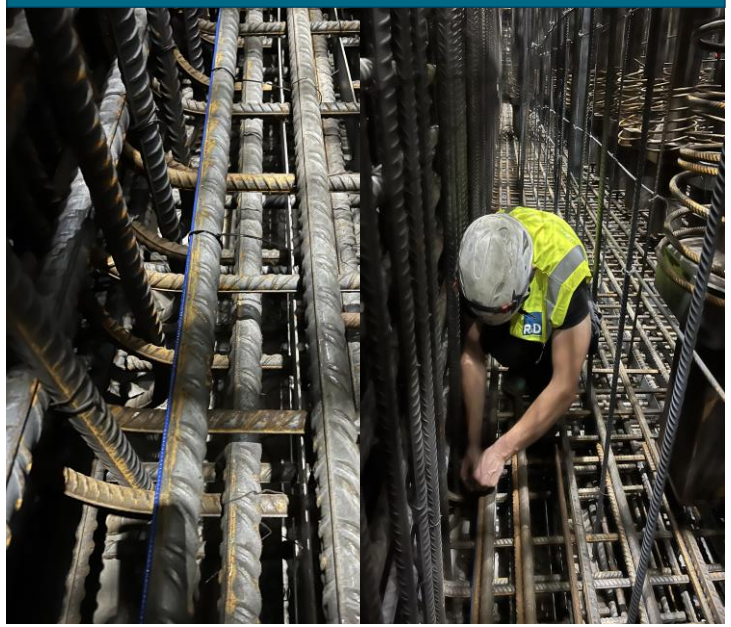


Temperaturmålinger

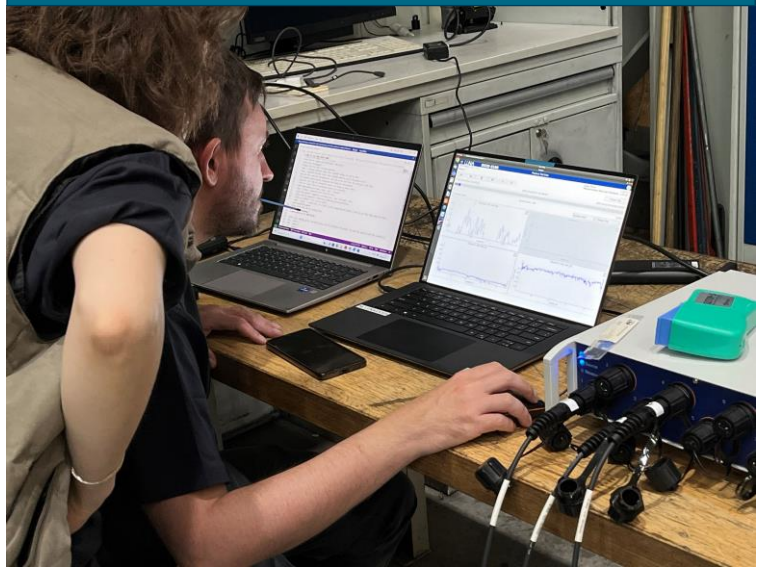
Optiske fibre...

Forsøg med Aarhus Universitet

Indbygning i fundament



Målinger og dataopsamling

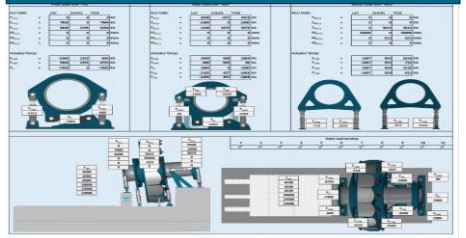


Strukturel Health Monitoring…

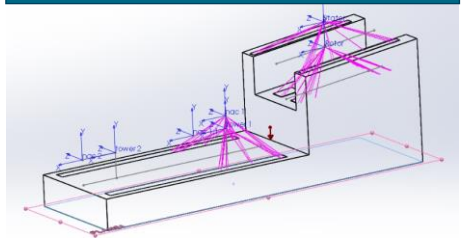
Beregningsanalyse

Test scenarie

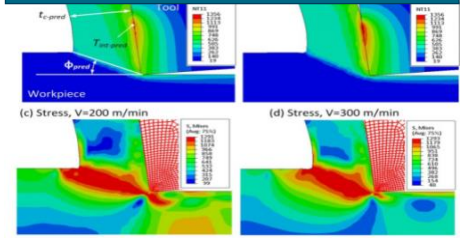
Last beregner



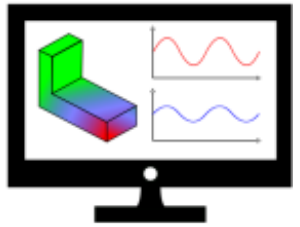
FE-modellering



Design resultater



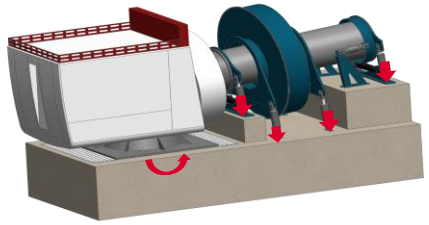
Skadeakkumulering



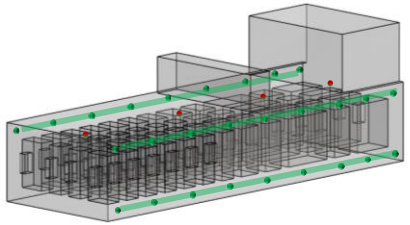
Fysisk måling – SHM system

Test scenarie

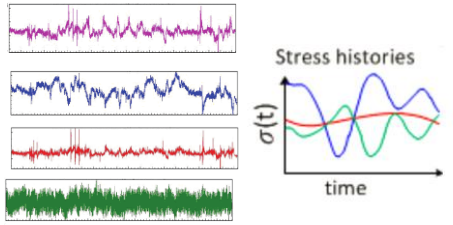
Belastninger



Tøjningsmåling



Dataopsamling



Skadeakkumulering

Creating Value Through World-Class Engineering