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Optimization of Heat Treatment Fixtures

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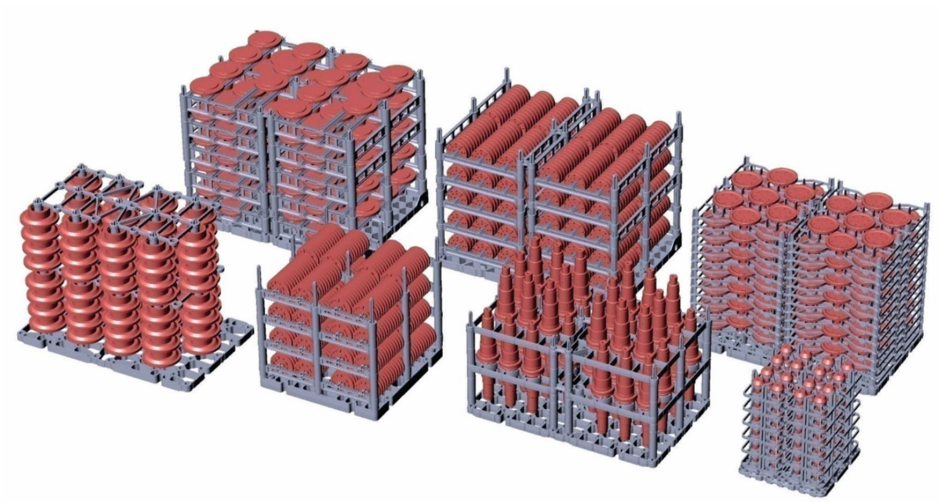

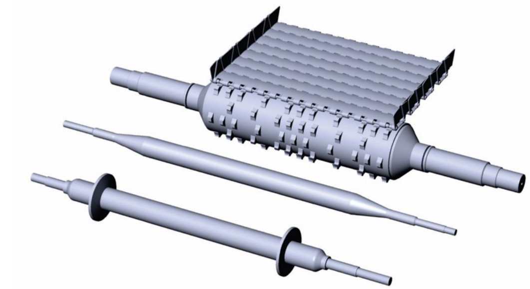

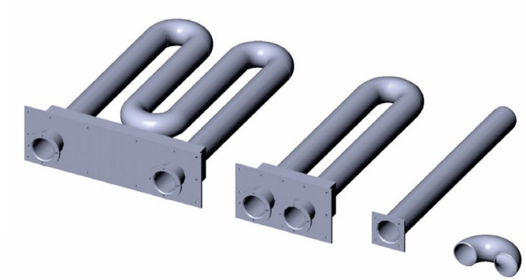

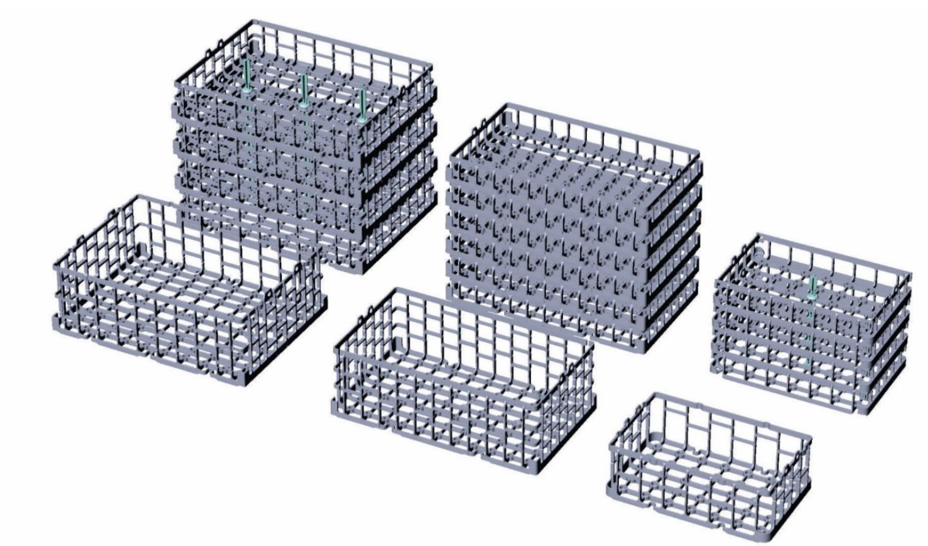

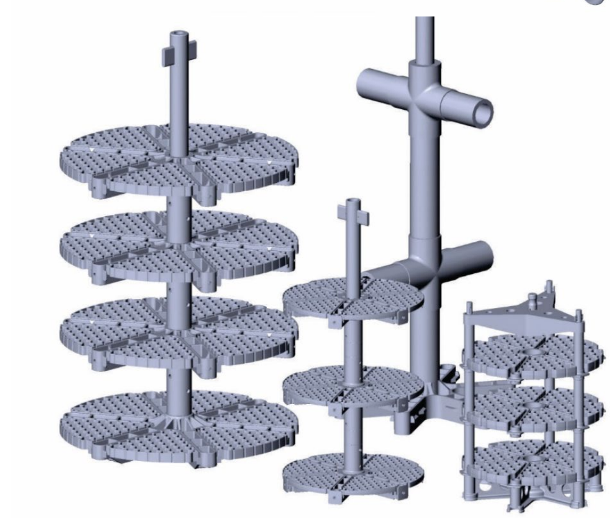

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Partners in Scandinavia

- Scandinavia (excl Finland): Calormet AB
- Finland : Asidom Equipment OY AB (Lars Lindholm)

CalorMet

ASIDOM

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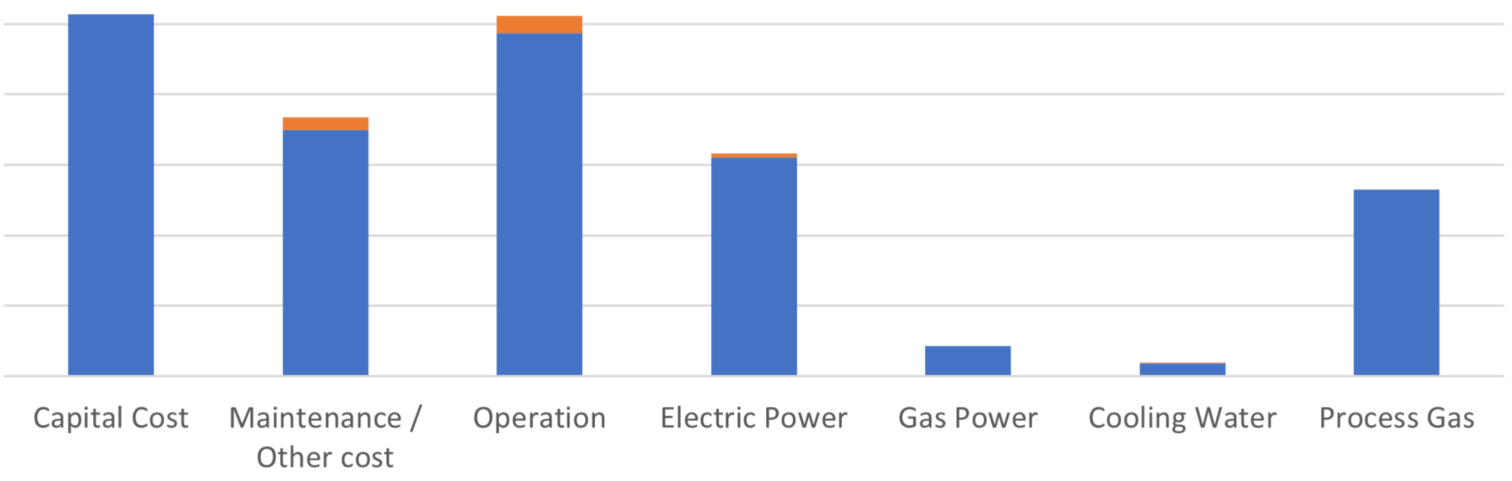
What is meant by optimizing a heat treatment fixture ?

- Good ratio between fixture weight and payload - High capacity
- Low weight - Easy handling
- Good draining of oil
- Good flow of gases and quench media
- Good support of parts
- Hybrid Fixtures ?

Cost ratio for batch carburizing furnace with 850kg and 935kg payload

- 7 days/week
- 3 charges/day
- Manually charging of parts and automatic loading



- Cost ratio 850 kg = 1,00
  935 kg = **0,93**

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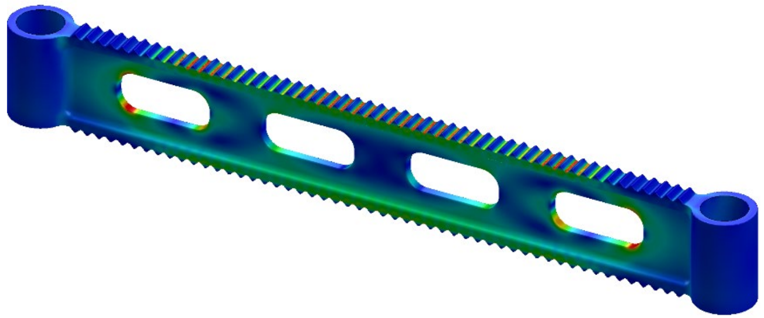
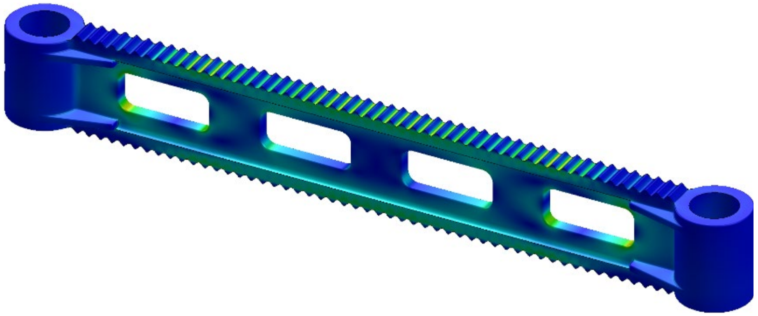
Low weight - easy handling

- By redesign and applying a higher alloy grade we get the same allowed load with a lower part weight.
- The lower weight compensate the higher alloy price/kg, so we keep the same price level.
- Weight saving is normally in the range of 15-30%



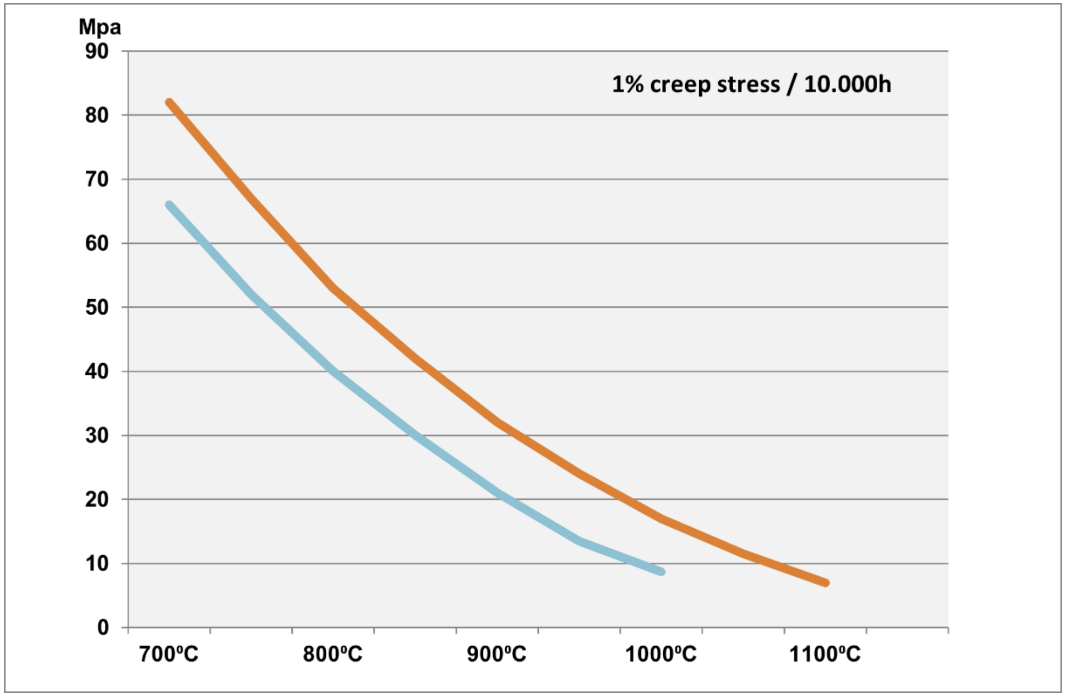
3,3 kg



4,6 kg

Wy can we increase the stress ?

- Above 700°C heat resistant alloys are no longer flexible and load calculation is done on basis of the creep stress.
- The max load is calculated on basis of 1% creep stress/10.000h.



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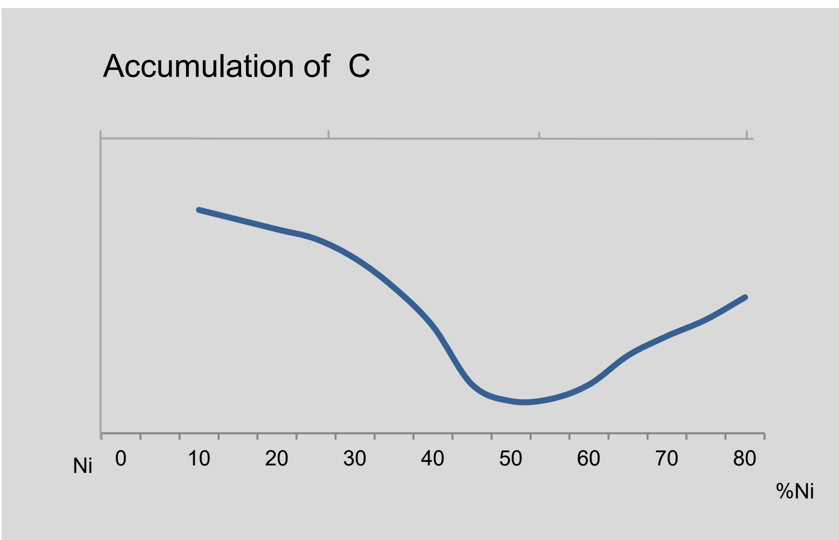
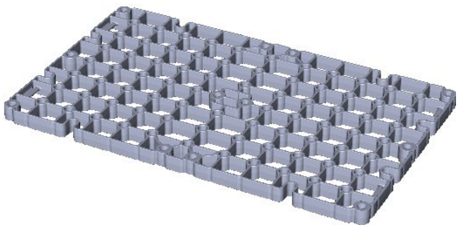
Higher alloy also and presision casting provides better properties in terms of:

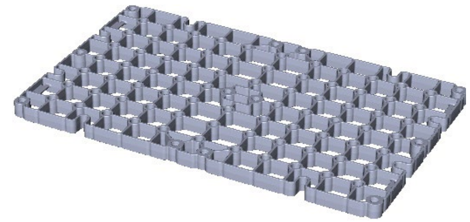
- Better resistance against thermal shocks.
- Better resistance against carburizing
- Smooth surface = good draining



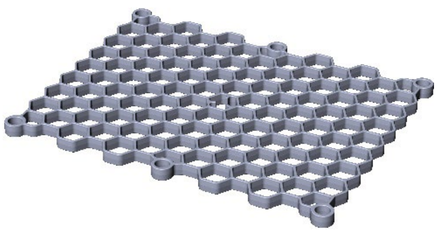
Some examples of redesign



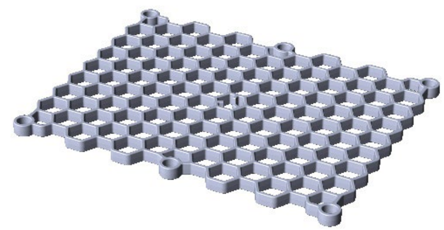
62,0 kg



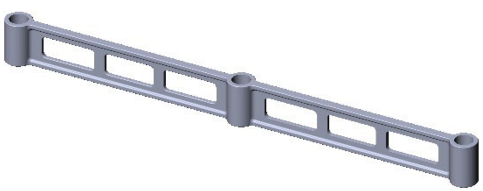
75,6 kg



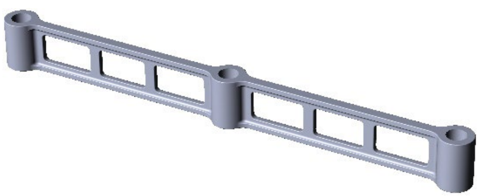
13,9 kg



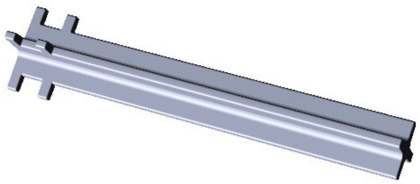
18,7 kg



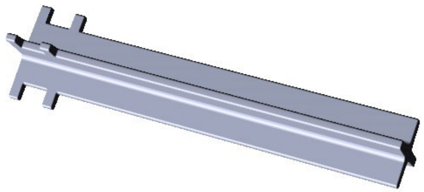
2,2 kg



3,7 kg



2,4 kg



3,0 kg

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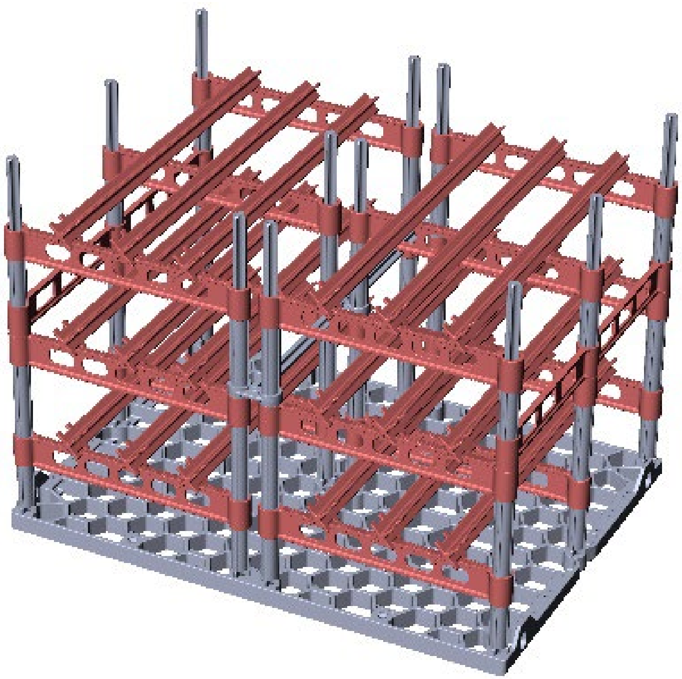
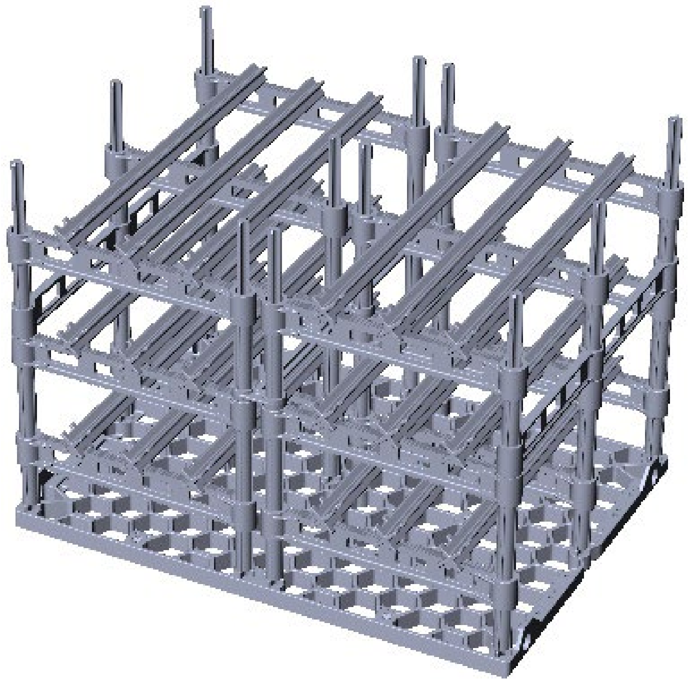
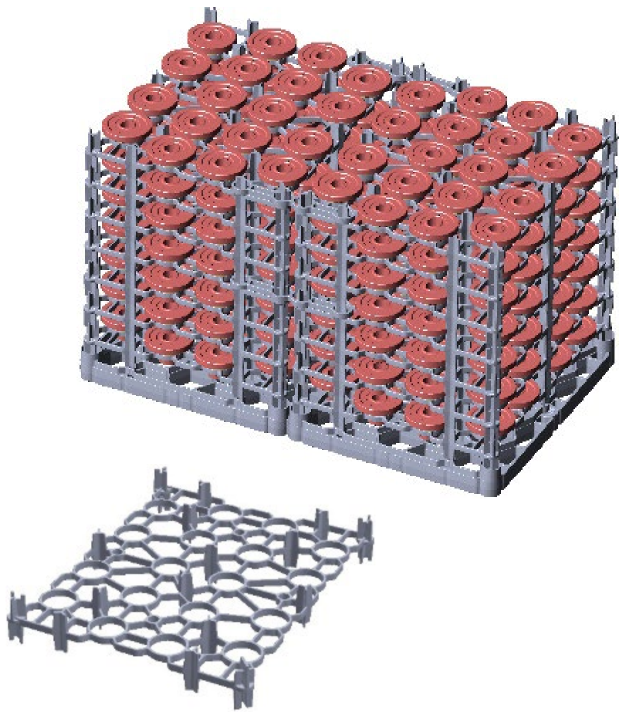
Examples of “light weight” standard fixture





Weight:	284 kg	235 kg
Weight ratio:	**82%**	100%

Example of “light weight” custom fixture



Fixture	284 kg	235 kg
Gear Wheel	225 kg	225 kg
Total	409 kg	482 kg
Weight ratio:	**85%**	100%

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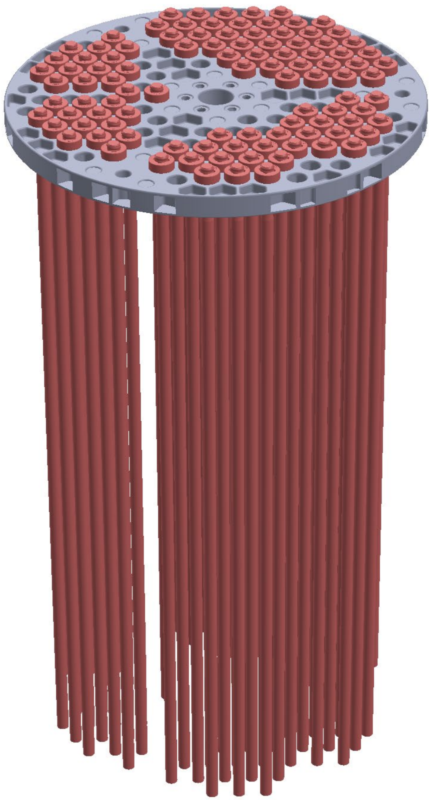
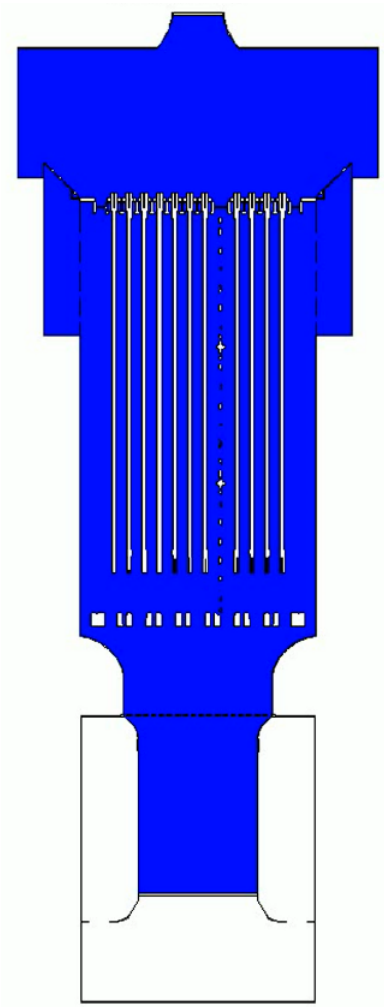
Simulation helps to understand flow through the charge

- Cooling flow simulation for drillung tools in a pit type convection cooling chamber





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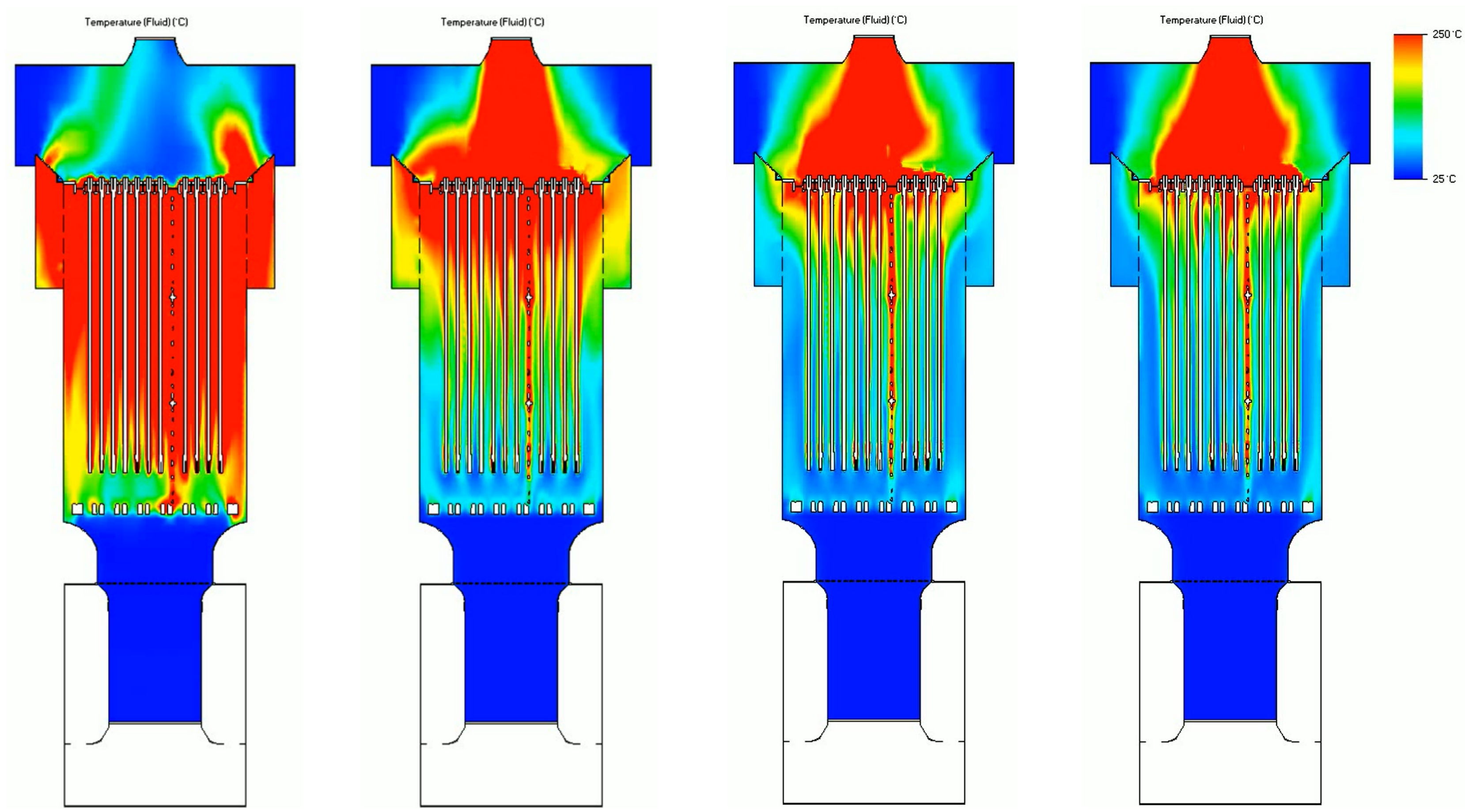
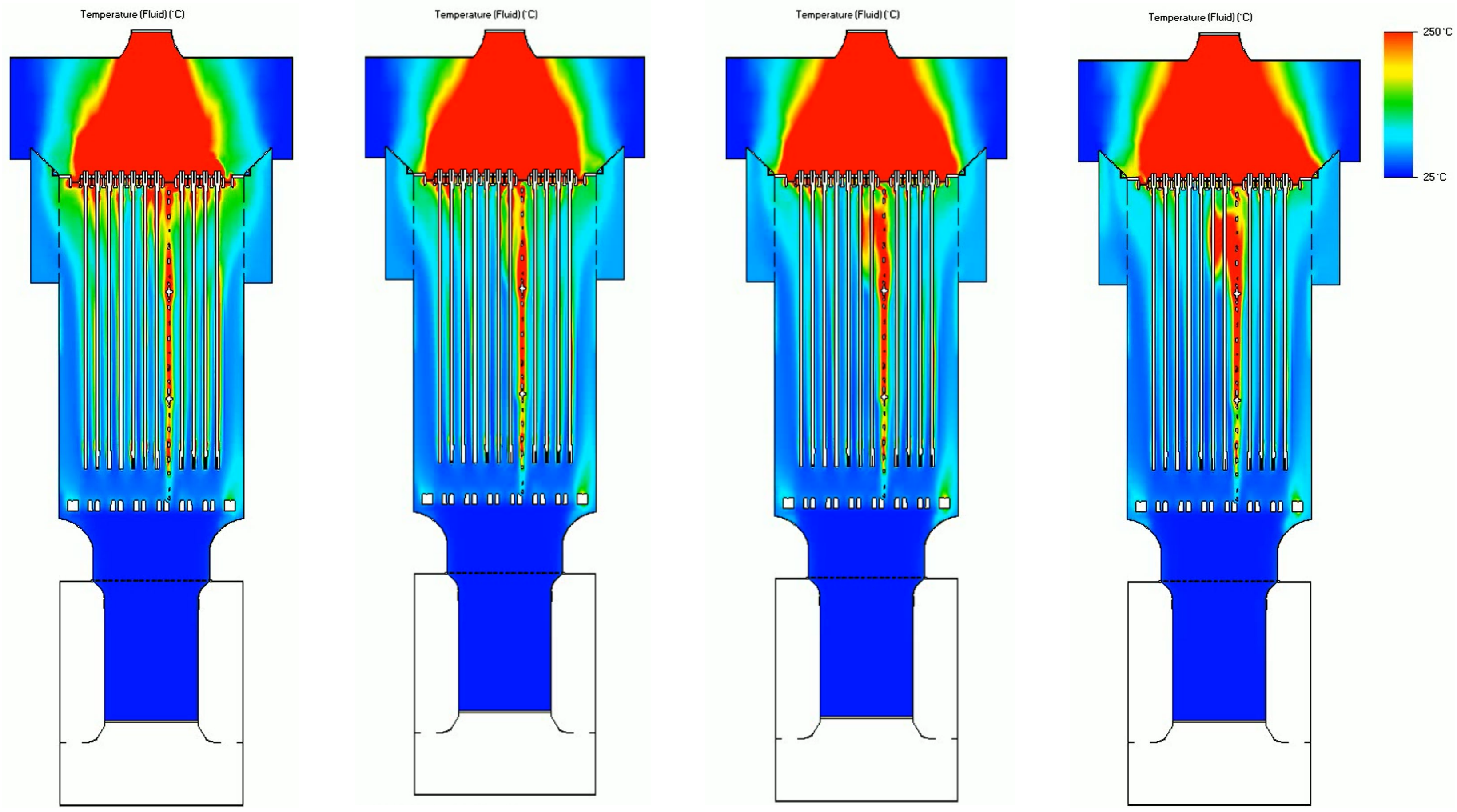
Simulation of convection cooling



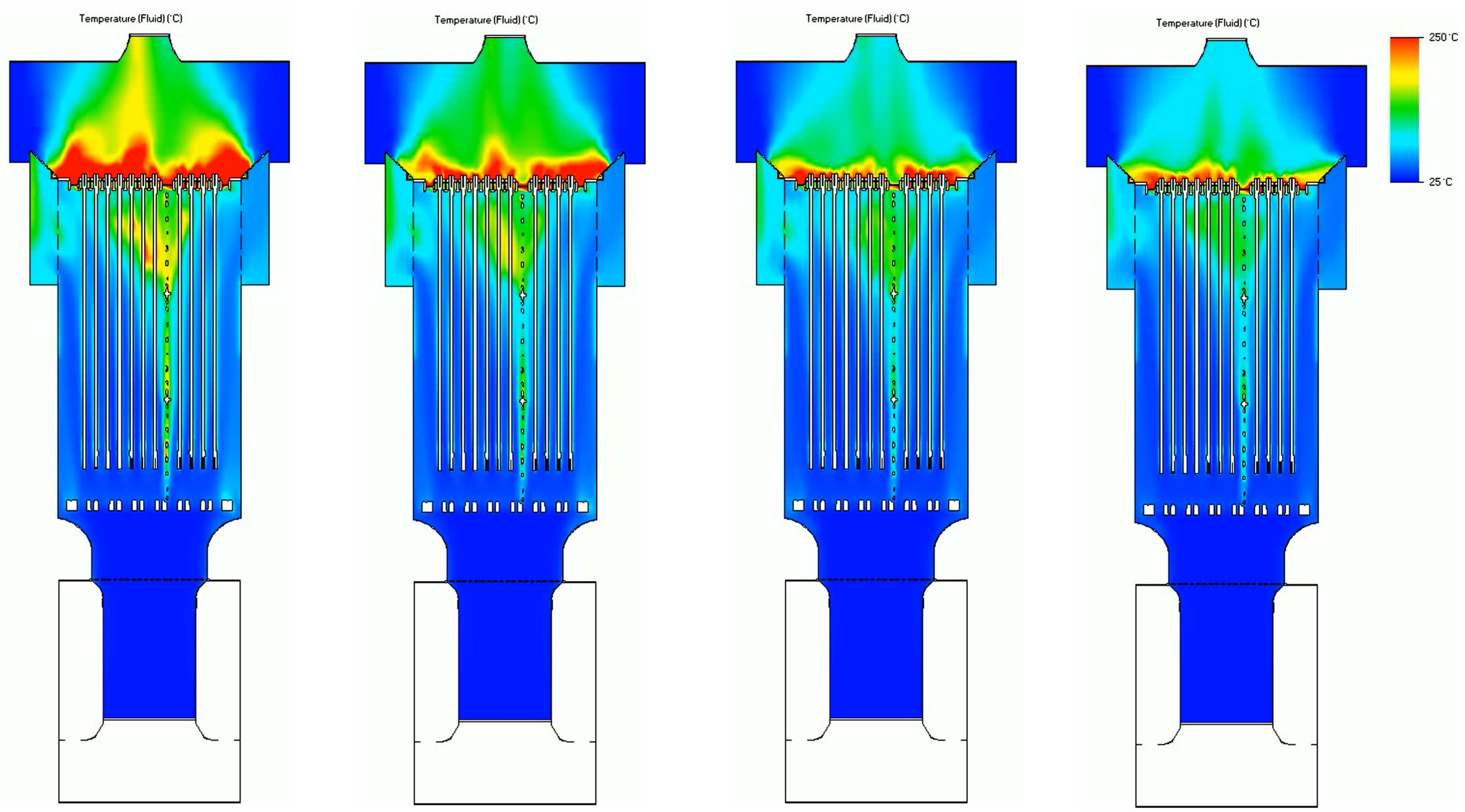
10 sec | 20 sec | 30 sec | 40 sec

Simulation of convection cooling



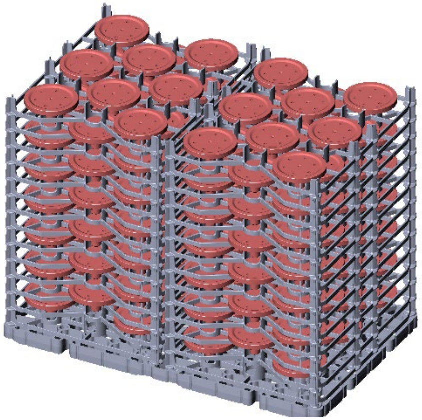
50 sec 60 sec 70 sec 80 sec

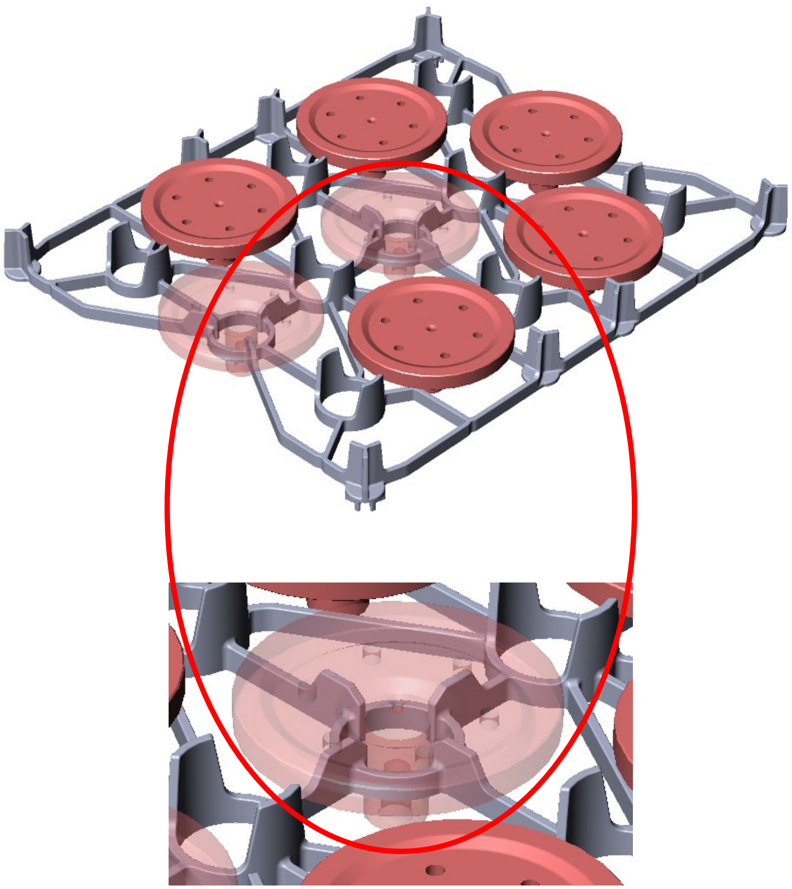
Simulation of convection cooling

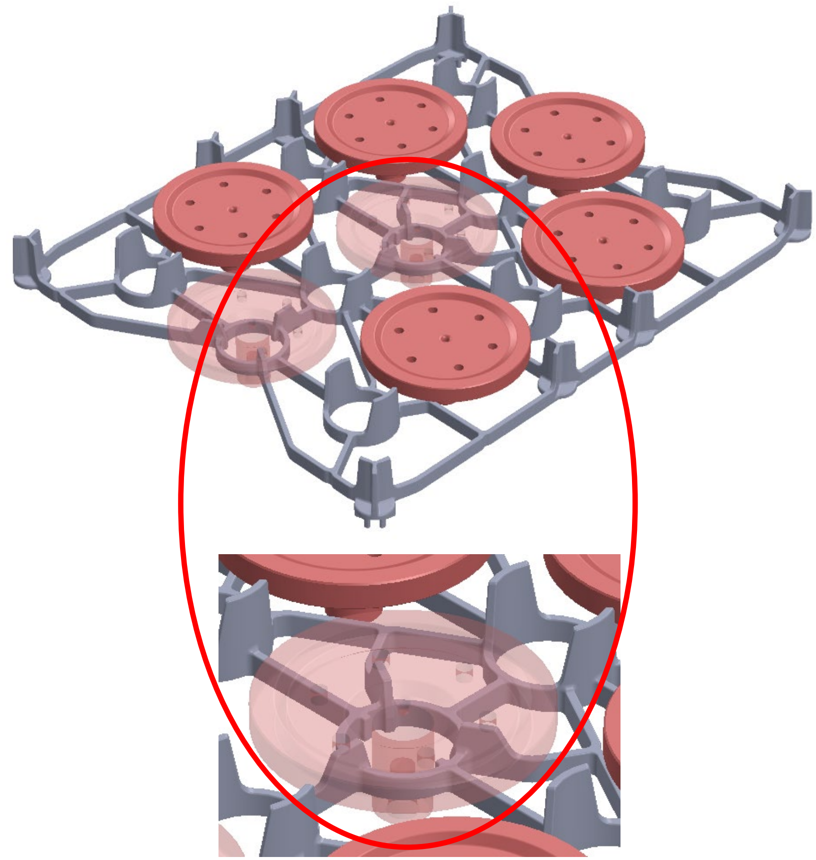


300 sec 400 sec 500 sec 600 sec

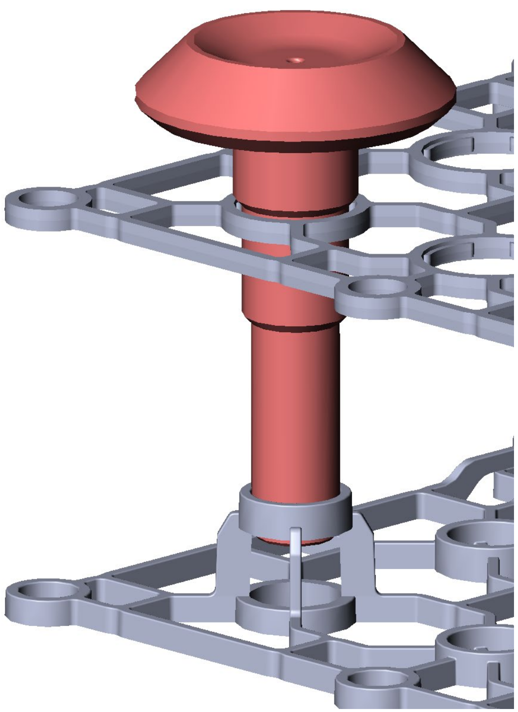
The importance of right support of parts

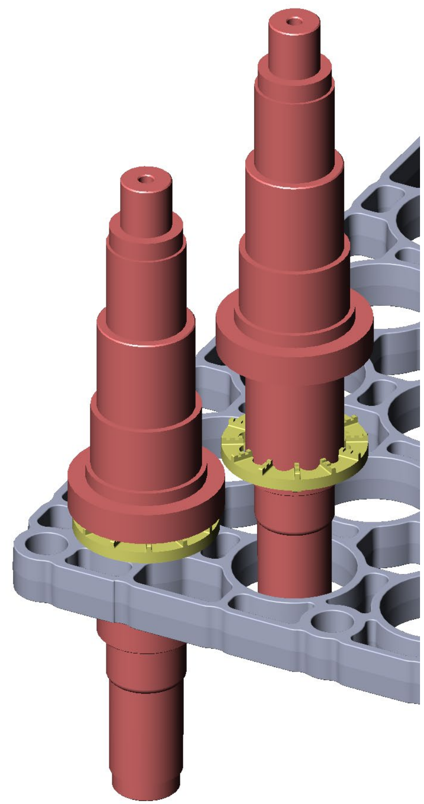




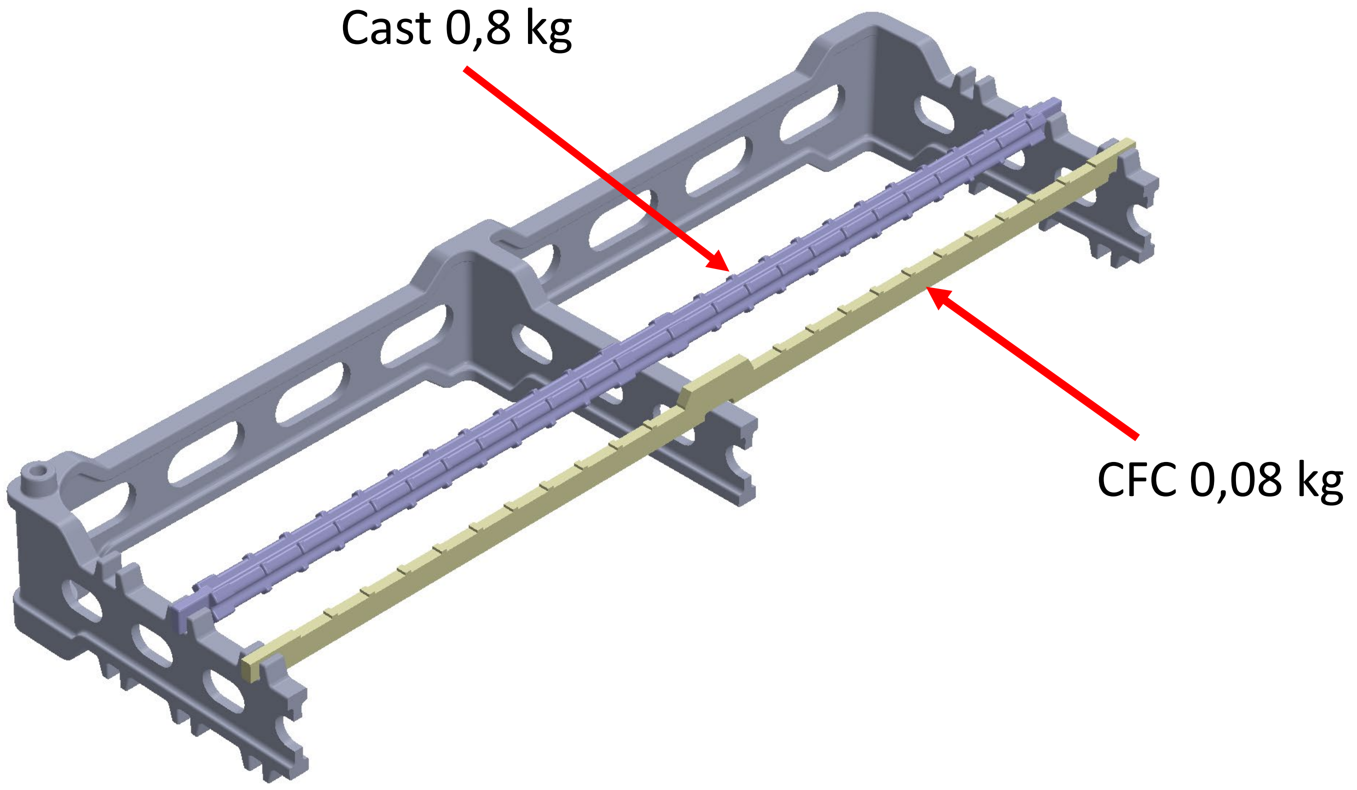


The importance of right support of parts





Hybrid Fixtures ?



Thanks