voith.com



The application of CAESES from the perspective of a propeller maker

David Bendl | 2024-09-10



eVSP Stator Cooling

eVSP





- propulsion and steering unit
- units within a power range from 180 kW to 3800 kW
- D = 0.9 .. 3.6 m
- speed range up to 18 kn
- now with directly integrated electric motor (PM motor)

eVSP Stator Cooling





eVSP Motor Cooling Increasing of Cooling Effect by adding Fins





Simplified Geometry for CFD







Cooling Fin Geometry Parameters





Cooling Fin Geometry Parameters

Design : DA_Geo_01_des0000 Height = 0.010 m Length = 0.015 m Width = 0.002 m Keep Height = 1.00 Keep Length = 1.00



Cooling Fin Matrix Parameters



David Bendl | 2024-09-10 | CAESES Usermeeting





VOITH

Implementation of Cooling Matrix by Feature in only 4 Steps



83 84 85 86 87 88 89 90 91 Brep cadMatrix(lstBlocks) David Bendl | 2024-09-10 | CAESES Usermeeting



PersistenSection is used in

Brep Fin is created and positioned

```
4) List of Brep Fins is put into
one Brep as container
```

VOITH

Parameter Study Ensemble Investigation





Total

1152

Channel Flow One Fin



Temperature [k] 301.15 299.15 297.15 295.15 293.15

Minor influence on flow mixture \rightarrow low cooling effect



Channel Flow Nine Fins





High influence on flow mixture \rightarrow good cooling effect

Design 1041

Results Parameter Study







VSP Headbox Optimization







VSP Headbox Parameters







VSP Headbox Creation Design Curves Origin & Position





VSP Headbox Creation Surfaces





VSP Headbox Creation BReps





VSP Headbox Creation Rotor Domain





Headbox Study Geometry





Meshing Star CCM+ Customer Hull Geometry





manual task: hull geometry preparation

Meshing Star CCM+ Bare Hull Mesh





manual task: mesh setup

Meshing Star CCM+ Hull and Headbox Combination





optimization chain adds headbox geometry

Meshing Star CCM+ Propulsion Mesh





optimization chain creates propulsion mesh

Headbox Study Pressure Distribution







VLJ Fast Monohull Integration

Voith Linear Jet





- propulsor for high-speed vessels
- high efficiency for low and high speeds
- compact and silent due to encasing of the rotor by a nozzle
- target maximum speed 25 35 kn
- size range 0.9 m 3.2 m
- power range 900 kW 10 MW

Evolution of VLJ models

Open Water



First calculations / optimizations started with simple open water case.

Since the VLJ does not work without tunnels and has a strong interaction with them a generic hull model was created.



Generic Hull Stern Integration

VLJ Fast Monohull Integration





Fast Monohull Hard Chine Hull







VLJ Integration





Inlet Tunnel Definition Curves





Inlet Tunnel MetaSurface Section





Inlet Tunnel MetaSurface Section

VOITH



construction plane derives its origin and normal from spine curve

position on spine is given by the metasurface advance parameter

construction plane intersections sidecurves and apex \rightarrow circle based on three points

With the intersection curve of the hull two side fillets are created

Final Assembly Tunnels





Final Assembly Nozzle





Final Assembly Shaft Line and Rudder





Stern Geometry Variation





Wave Pattern, Pressure Distribution Different Speeds





Wave Pattern, Pressure Distribution Different Speeds







Thank you

David Bendl | 2024-09-10 | CAESES Usermeeting