Objectives of Work Package

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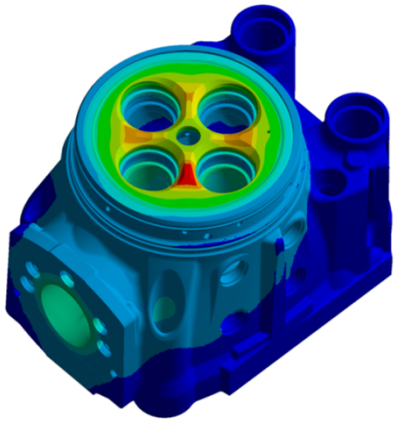
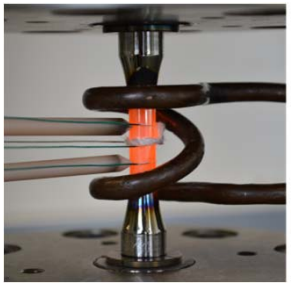
WP 4.1 New materials and design for cylinder heads

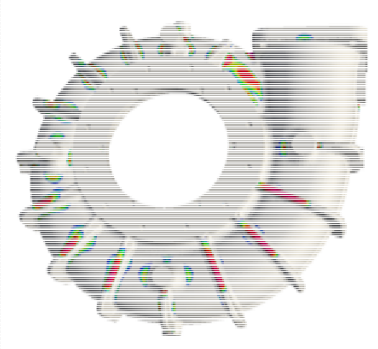
- Improvement of thermomechanical cycle resistance of factor 2 under increased temperature of 50 K
- decreased weight of cylinder head of 20%





WP 4.2 New materials for the turbocharger turbine casing

- Typical Load Cycles for Ferry Applications
- Improvement of thermomechanical cycle resistance under increased temperature of 70 K under corrosion environment

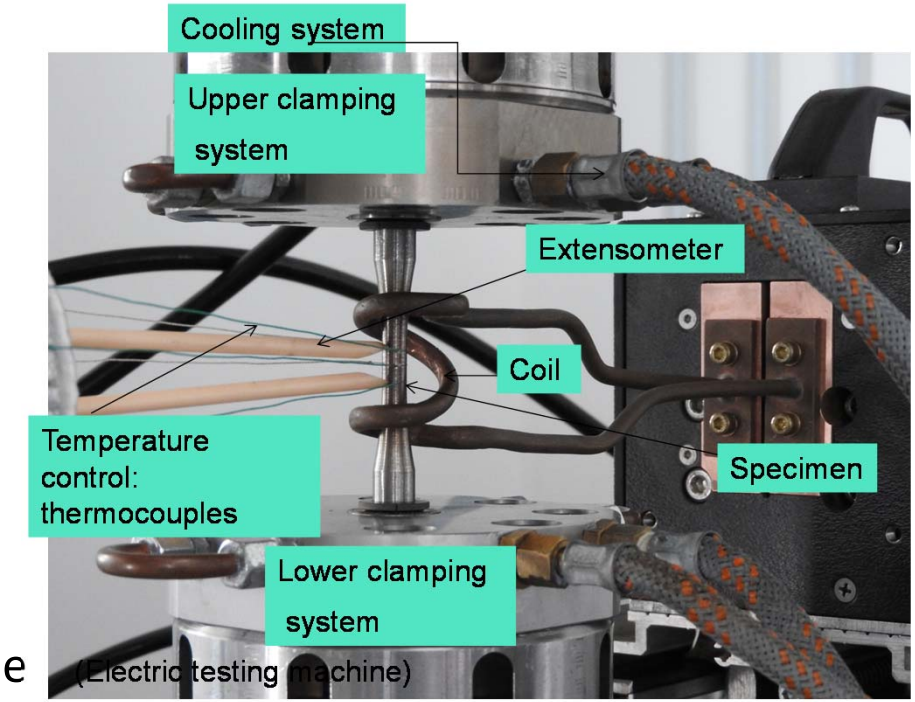


Partners:

Fraunhofer IWM
Hochschule Offenburg University of Applied Sciences
Fraunhofer ICT
BAM Bundesanstalt für Materialforschung und -prüfung

Main results achieved during 1st year
WP4.1

- 2 of 8 pre experimental material tests have been finished
- Fatigue tests and incremental step test for a preliminary study
- Typical influence of the temperature on the sequence of elasticity modulus

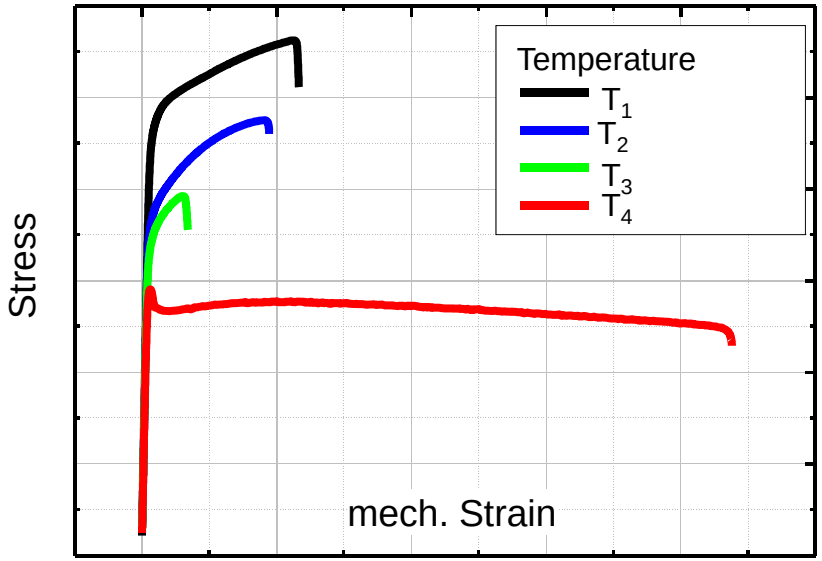


Main results achieved during 1st year

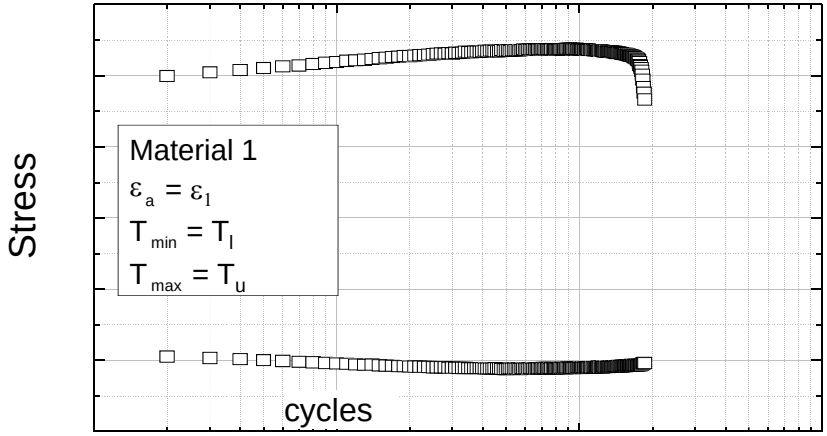
WP4.1

- Hot tensile test for first rating of materials

Hot tensile test and OP-TMF Test of material 1

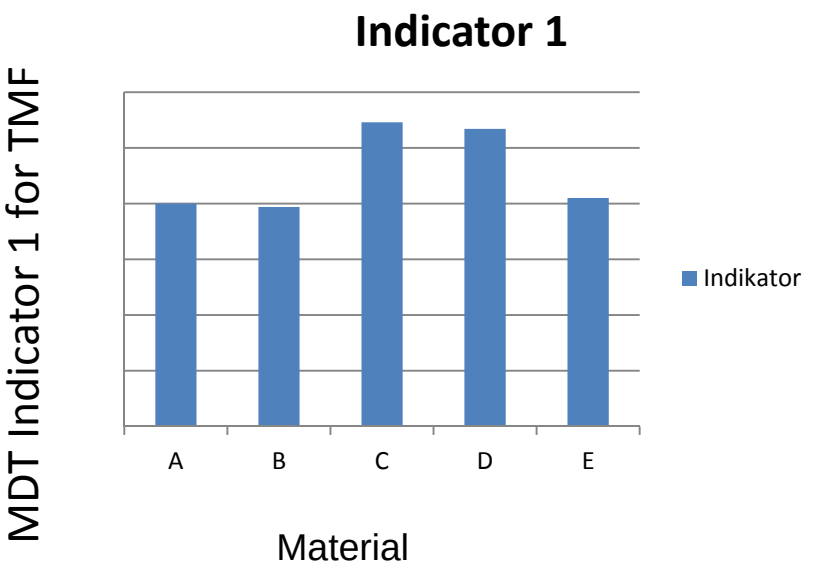


- Out-of-Phase TMF operations for preliminary estimation of thermomechanical fatigue



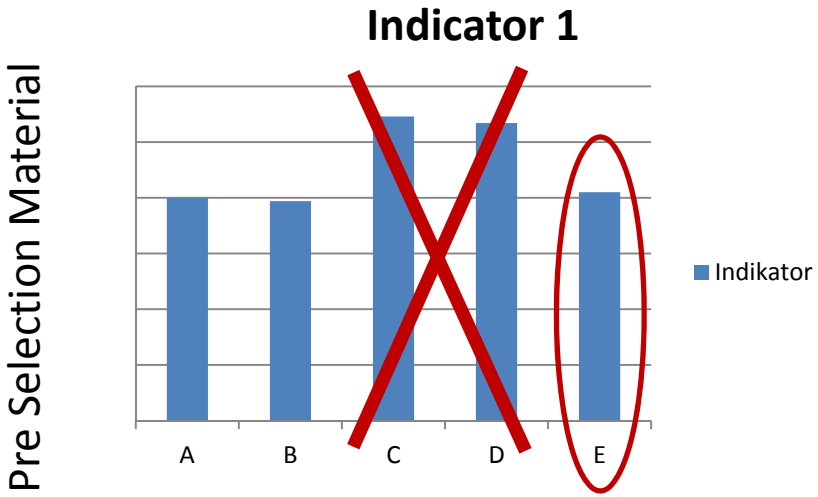
Main results achieved during 1st year
WP4.2

- Evaluating the pre tests
- Selection of the material by a predefined indicator



- Material C,D is not suitable due to
  - → Material costs too high
  - → Processing costs relative high

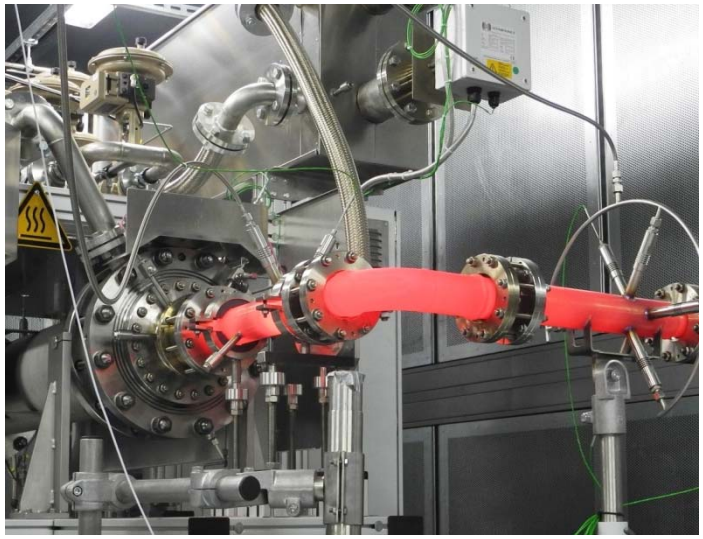
  Material E is the choosen one



Main results achieved during 1st year

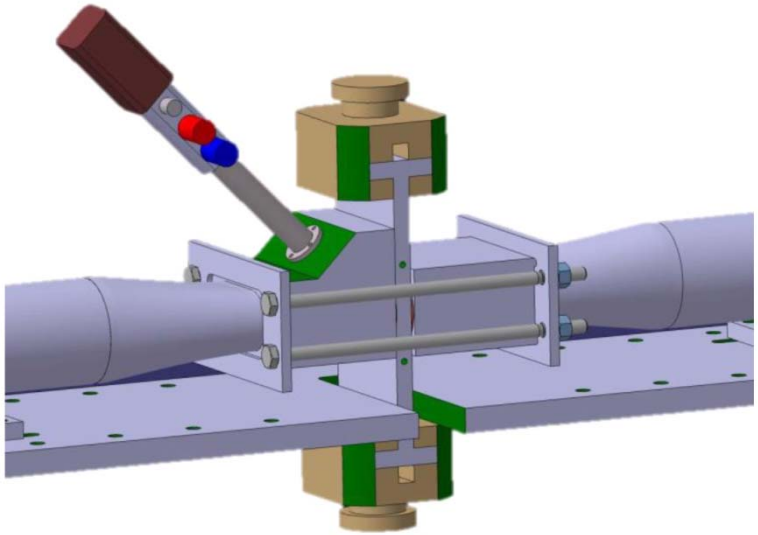
WP4.1

- Planning of test rig is still ongoing



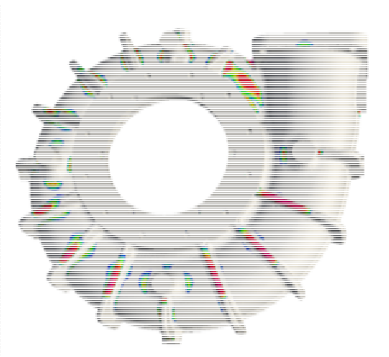
Hot Gas Test Rig

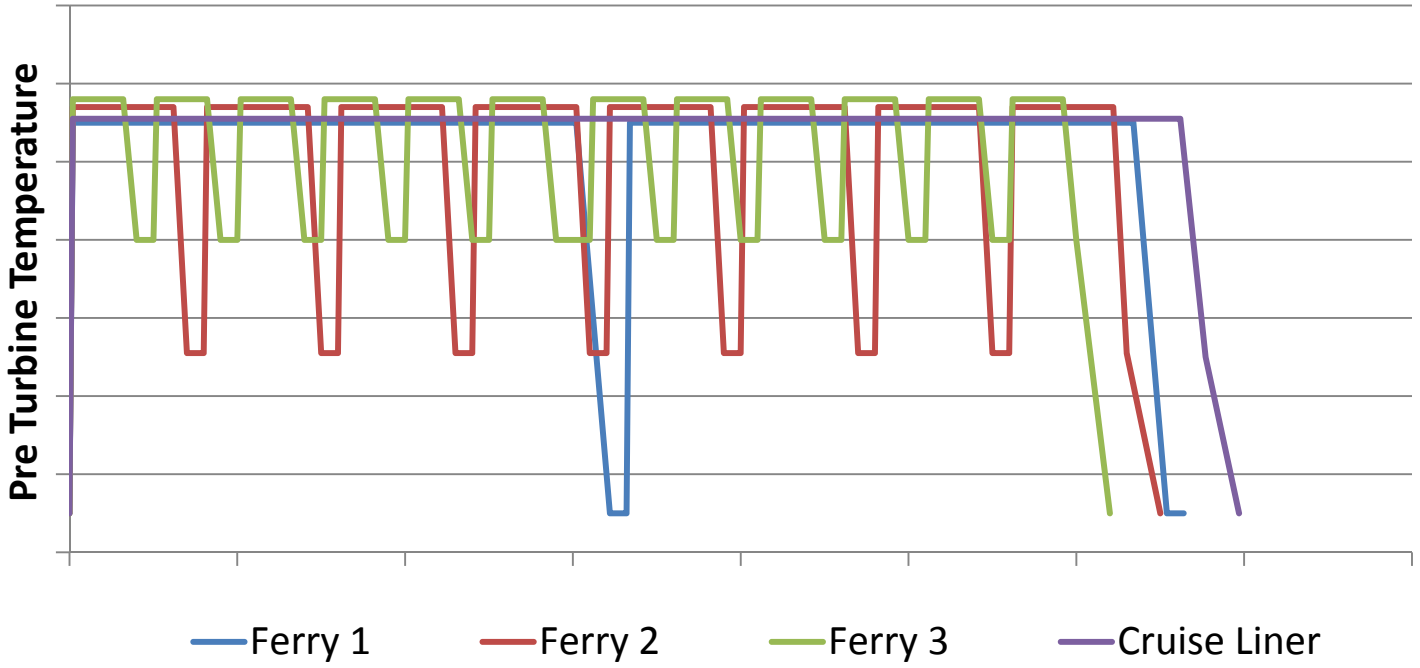
- CFD Analysis is conducted for pre defining the specimen for test operation
- Based on FEM and CFD analysis suitable hardware must used for testing
- Design for the test bed is in discussion (exemplary showing in the right)



Introductuion WP4.2

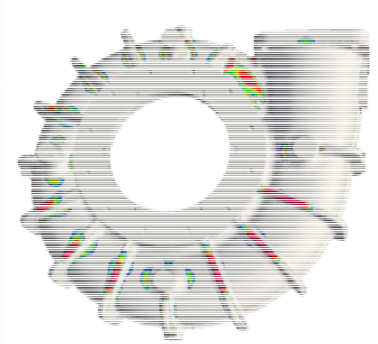
- Ferry applications are very cyclic marine applications. Thermo-mechanic fatigue damage is dominant compared to creep damage.
- Cruise liner applications are stationary applications with large dwell times at elevated temperature. Creep damage is dominant compared to thermo-mechanic fatigue damage.

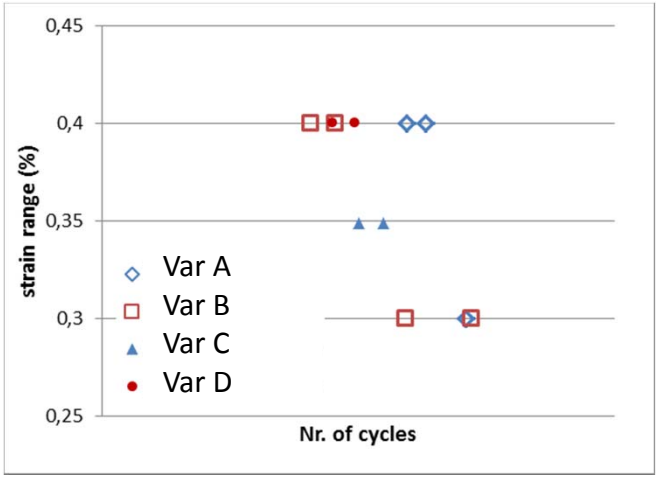




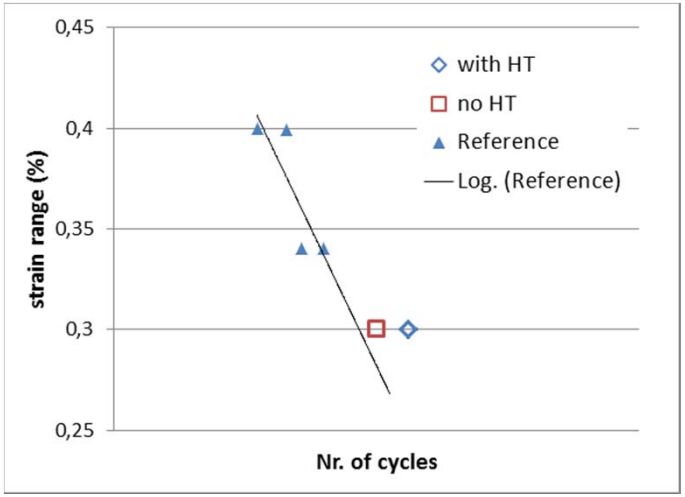
Main results achieved during 1st year
WP4.2

- three different casting batches produced
- manufacturing problems solved (bent shape)
- Test Running @ BAM





LCF Results



TMF Results

Future Work

WP4.1

- Final Material investigation for TMF
- First test at fatigue test rig for superimposed thermal and mechanical loading

WP 4.2

- Finalisation of low cycle fatigue, thermomechanical fatigue and creep tests
- Derive of a constitutive equation for the creep behaviour and the load limits of the material
- Validation of the material model