WP3: Intermetallics and advanced materials for marine engines

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Objectives

Subproject 3.1: *Novel materials for engine applications*

Examine possibilities of using novel materials in engines to facilitate the development of components that enable higher engine loads, hereby increasing efficiency and lower emissions. Ensure proper lifetime performance and durability.

Subproject 3.2: *Novel materials for turbine casing*

Material of turbine casing is reviewed in respect of material and design in order to meet requirements needed for higher exhaust gas temperatures.

Expected outcome

Subproject 3.1: Suitable new materials can be identified for at least two components for higher load operations and longer life time.

Subproject 3.2: Performance is improved through material / design optimization.

Partners: Max-Planck-Institut für Eisenforschung GmbH   ABB   KENNAMETAL STELLITE   WÄRTSILÄ   WIN GD Winterthur Gas & Diesel

Structure: Partners, roles

Max Planck Institut für Eisenforschung Düsseldorf:
Materials selection & optimization; materials investigation and testing activities

Kennametal Koblenz:
Materials selection and optimization of processing and joining technologies. Manufacturing of sample materials

ABB Baden:
Evaluation, prototyping and test of new material and test of new materials for advanced turbine case.

Wärtsilä Finland & Wärtsilä Netherlands:
WFI: Boundary conditions, material and processing selection; material testing activities incl. rig or engine validation; WNL: Work package deputy and coordination of research activities at partners
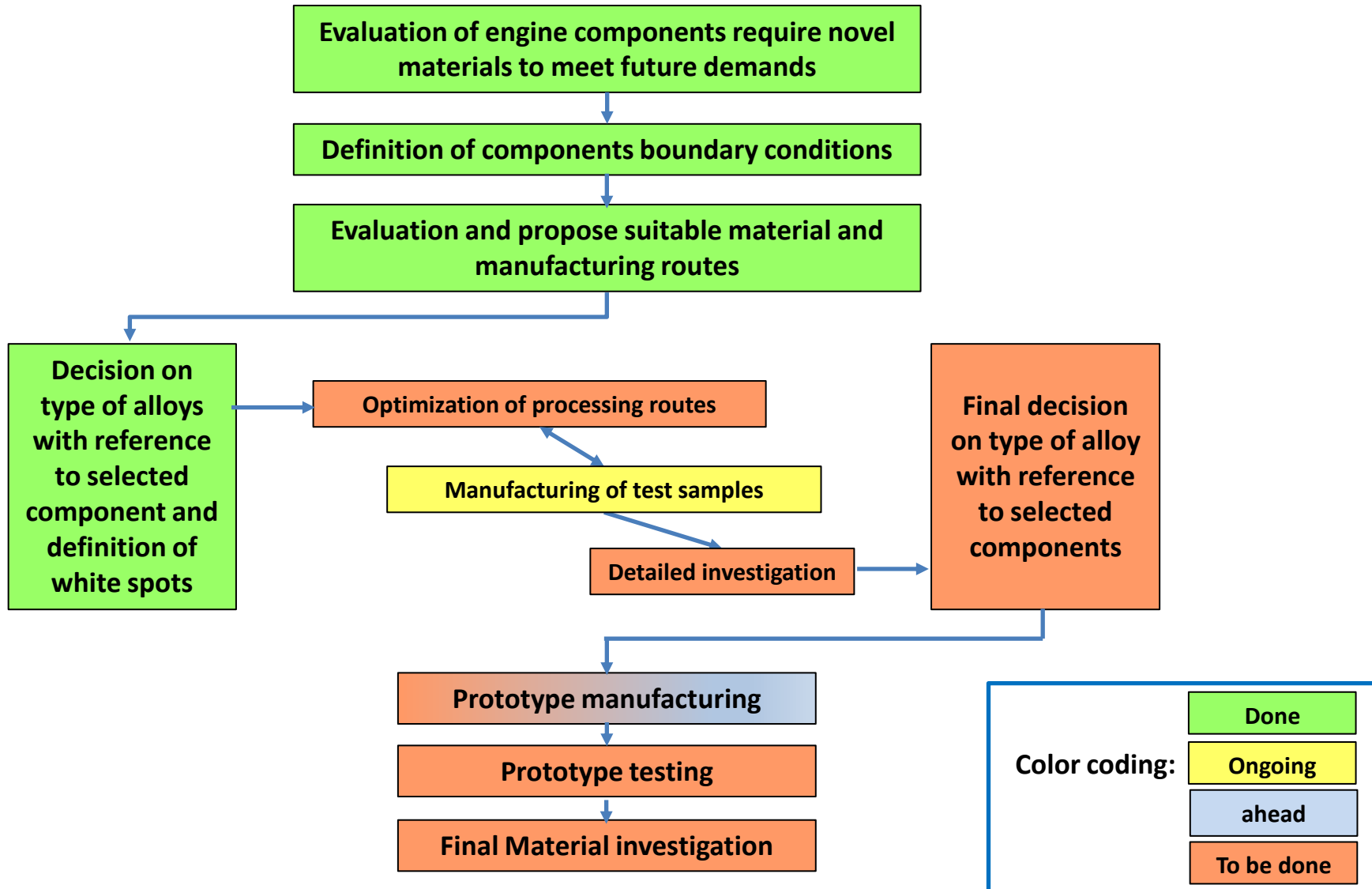
Winterthur Gas & Diesel Ltd.:
Boundary conditions, material and processing selection; material testing activities incl. rig or engine validation; Project lead and co-ordination of research activities at partners

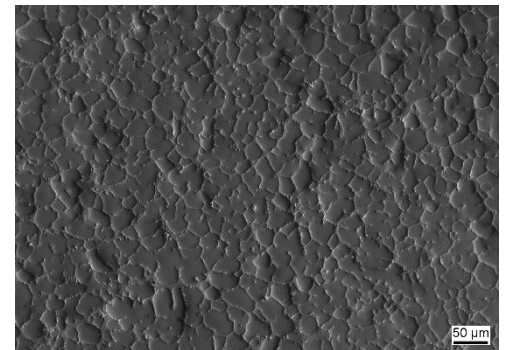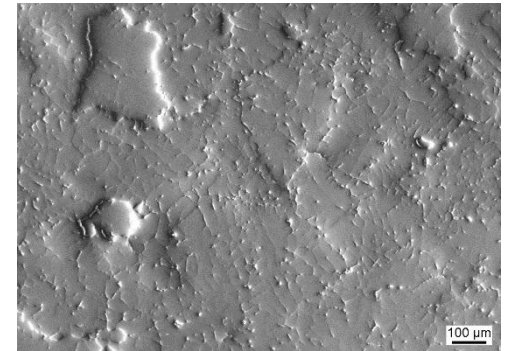## Status of Sub-project 3.1: Novel materials for engine application

Evaluation of engine components require novel materials to meet future demands

Definition of components boundary conditions

Evaluation and propose suitable material and manufacturing routes

Decision on type of alloys with reference to selected component and definition of white spots

Optimization of processing routes

Manufacturing of test samples

Detailed investigation

Final decision on type of alloy with reference to selected components

Prototype manufacturing

Prototype testing

Final Material investigation

Color coding:
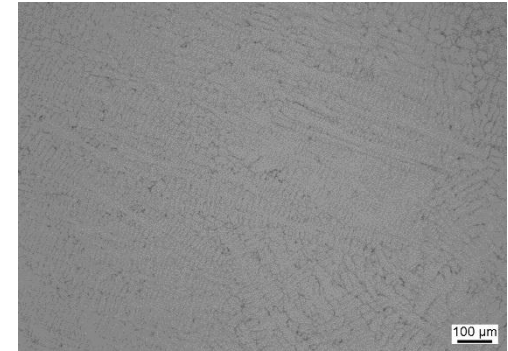- Done
- Ongoing
- ahead
- To be done

Status of Sub-project 3.1: Novel materials for engine application
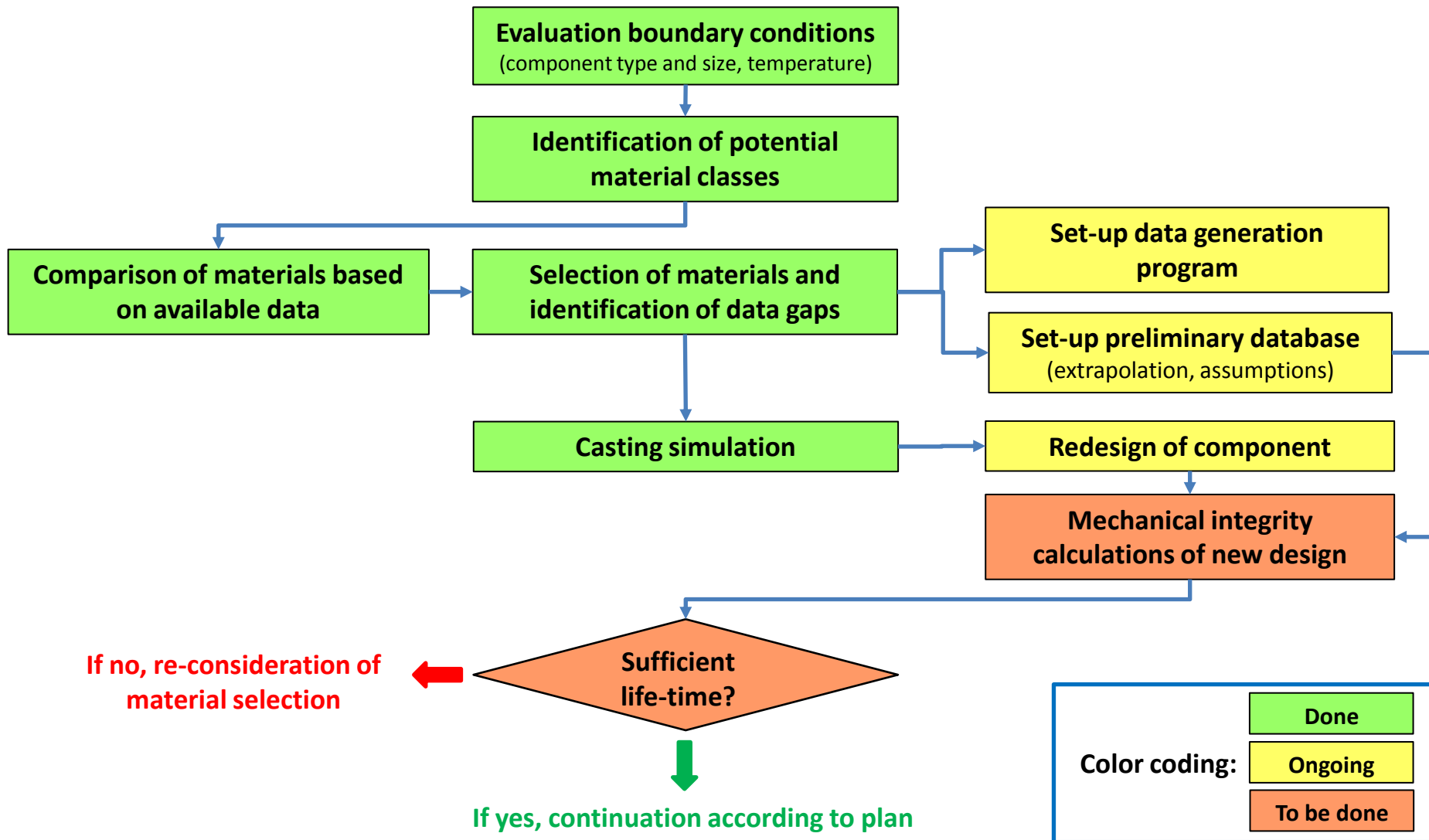

Achievements:

2 stroke & 4 stroke engine components identified and requirements defined

Most promising new materials chosen

Most promising / possible manufacturing routes identified

Status of Sub-project 3.2: Novel materials for turbine casing

Evaluation boundary conditions
(component type and size, temperature)

↓

Identification of potential material classes

Comparison of materials based on available data → **Selection of materials and identification of data gaps**

Set-up data generation program

Set-up preliminary database
(extrapolation, assumptions)

Casting simulation → **Redesign of component**

Mechanical integrity calculations of new design

Sufficient life-time?

If no, re-consideration of material selection

If yes, continuation according to plan

Color coding:
Done	(green)
Ongoing	(yellow)
To be done	(orange)

Status of Sub-project 3.2: Novel materials for turbine casing

Achievements:

- Decision on casting type, requirements are defined

- Decision on manufacturing method

- Material classes identified

- Review of availability of required material data