Intelligent Open Test Bed for Materials Tribological Characterisation Services
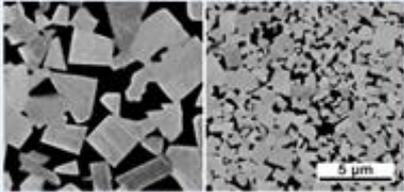
Dr. Amaya Igartua, TEKNIKER (amaya.Igartua@tekniker.es)

i-tribomat@ac2t.at; www.i-tribomat.eu

DT-NMBP07-2018, Open Innovation Test Beds for Characterisation

Motivation

new materials
steel, alloys, polymers, coatings, lubricants

Materials Characterisation

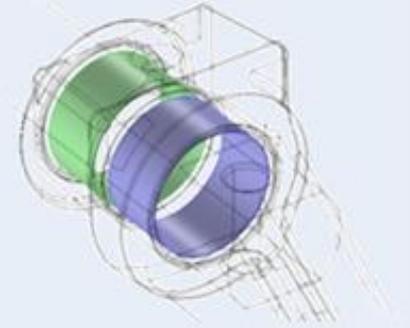**Tribological**

Functionality → Reliability → Maintainability → Recyclability

Performance

Innovative Industrial Applications

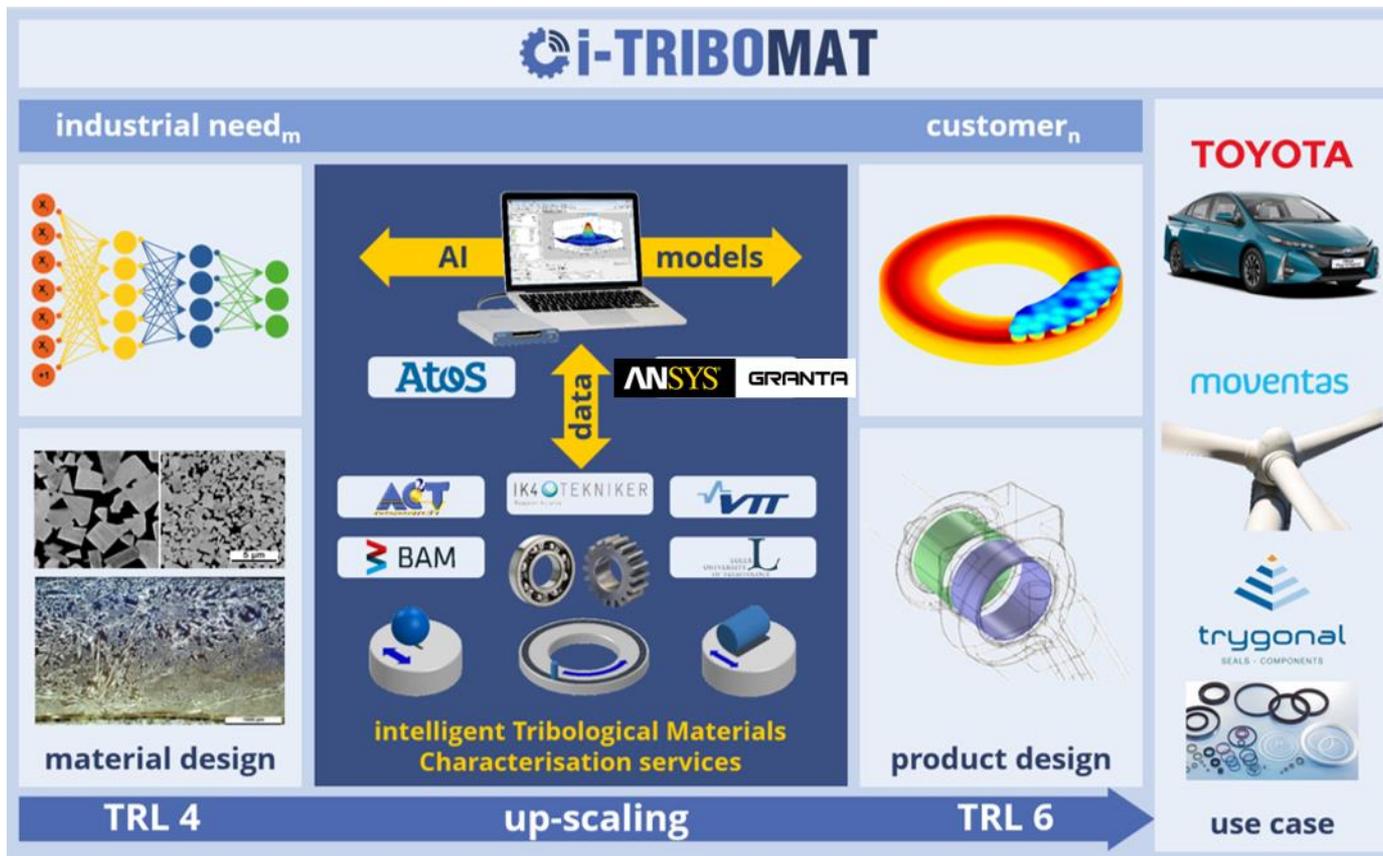**can a material be applied in a industrial system?**

product design
sectors: energy, transport, manufacturing...

Industrial Motivation → Materials up-scaling
Reduction of time to market & reduction of costs

Overall Approach

Main Concept - Implementation

- 4 Interacting Units
  - Shared infrastructure
    - Enabling standardised tribological materials characterisation services

  - IT-platform
    - Data driven services

  - Collaboration interface
    - Virtual work rooms and lab-to-field upscaling tools

  - Single-Entry Point
    - Service Provider
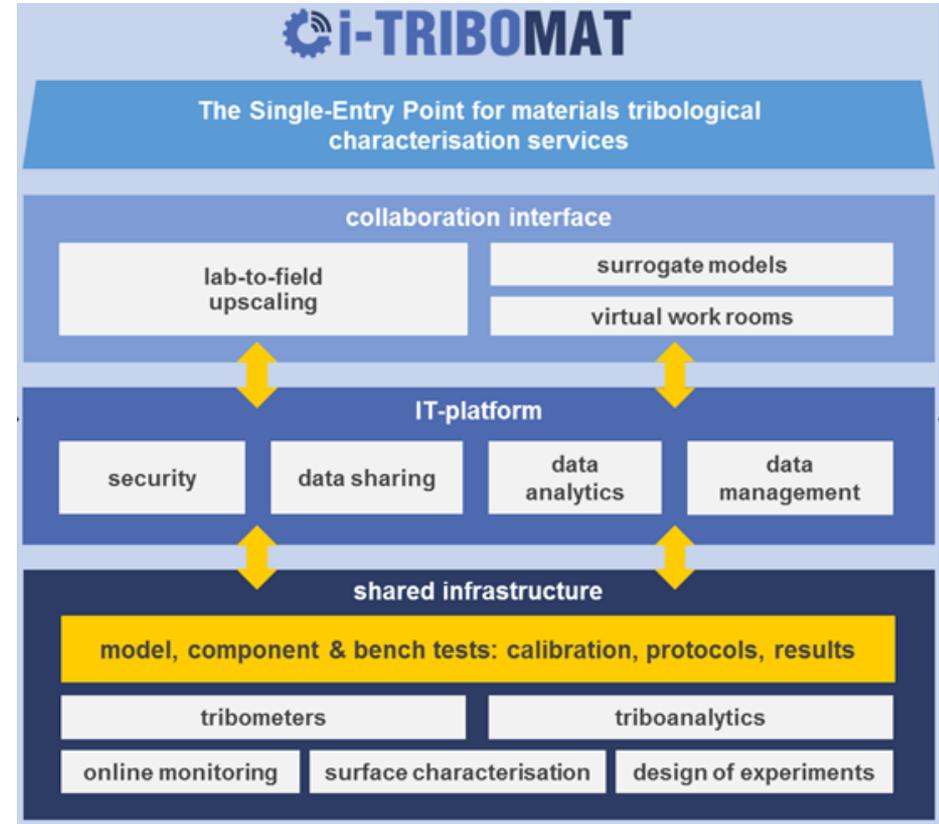
i-TRIBOMAT workflow & services

industrial users & customers

i-TRIBOMAT SEP

new materials & product design
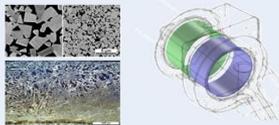
operational conditions
load, speed, temperature...
tribological system & tribological mechanisms

down-scaling

transferring operational conditions via modelling & simulation to laboratory for realistic tribo(logical)-testing

selecting tribometers from the shared infrastructure
pin-on-disc, ball-on-disc, cylinder-on-liner, rubber wheel, thrust washer, ball-on-rod, block-on-ring, FZG-test, drag friction test, journal bearing test, sealing test stand, vacuum tests...

designing experiments (DoE)
cost- and time-efficient testing matrix

TRL 4 & 5

services

material chracterisation
tribo-testing and triboanalytics
data-driven knowledge
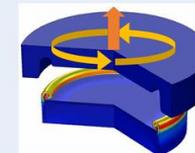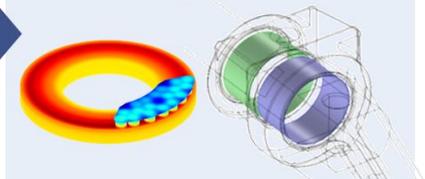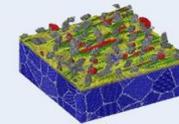data storage, sharing, analytics, artificial intelligence methods, ...

TRL 4 & 5

up-scaling

transferring laboratory results to field application (lab-2-field)

collaboration interface
virtual work rooms
numerical simulation
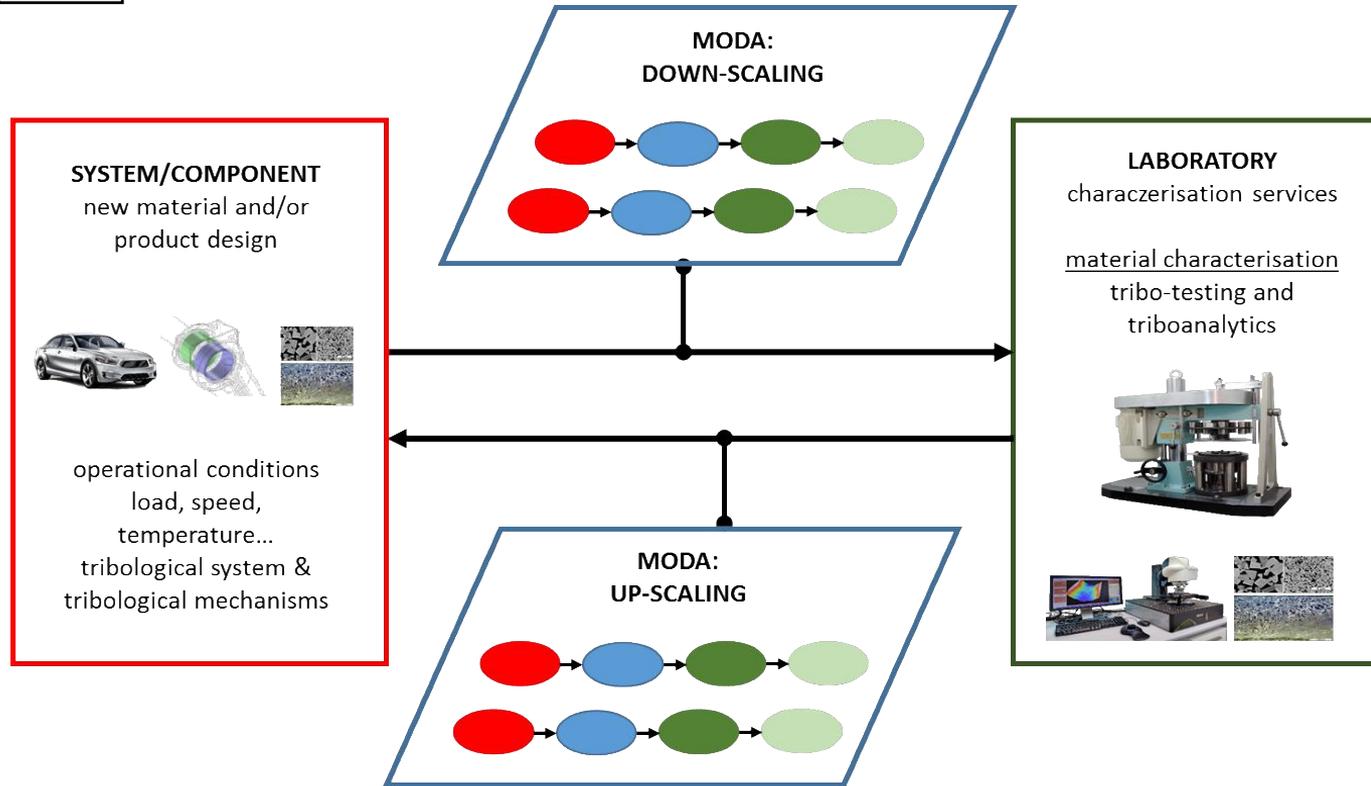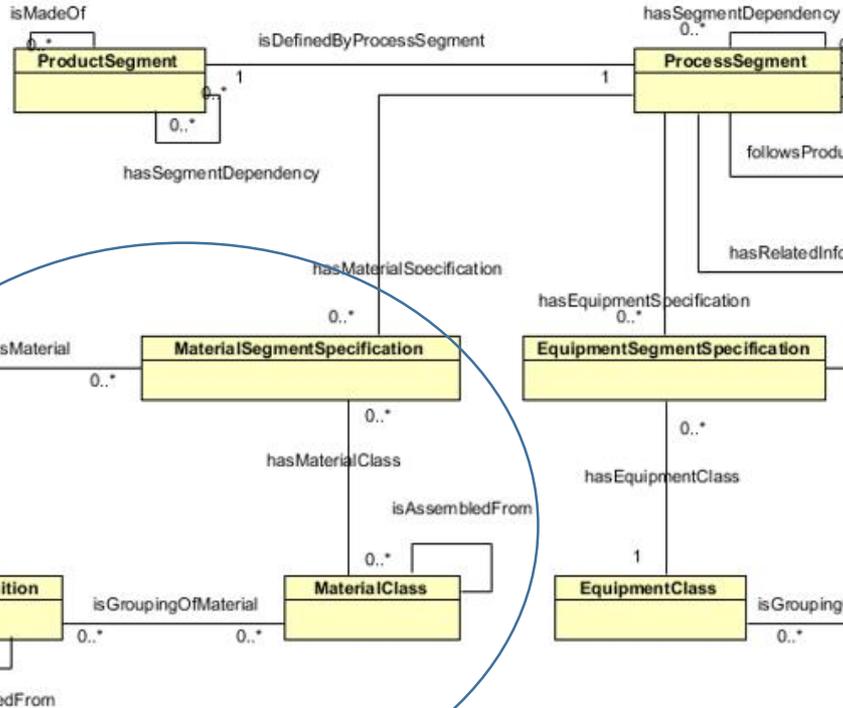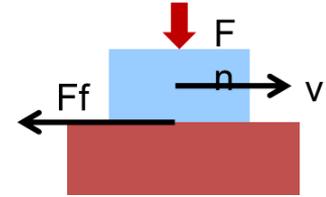surrogate models, ...

TRL 5 → 6

i-TRIBOMAT workflow - MODA

Figure 2: MODA linked to the workflow of i-TRIBOMAT

Idea- Combined Ontologies

i-Tribomat: represent the material not only as itself but as the evolution of it (properties, etc.) after a process

VARM is an ontology from the manufacturing domain. **EMMO** is an ontology from the materials domain

Class	Description	Data properties
MaterialClass	Represents a groupings of material definitions with similar characteristics.	• materialClassID (max=1) • description • model
MaterialDefinition	Represents a material.	• materialID (max=1) • description • model • maker
MaterialSegmentSpecification	Represents the material resources required for a process segment.	• description • quantityString • dateType

Potential connection with EMMO

Idea: Guided data uploading methodology

Experimental data in testbed projects will be **uploaded in a similar manner**:

Users will combine **data** generated from commercial or custom software **from different sources with manual annotations.**

How: Data from the raw files will be extracted to pre-defined data model entities and complemented with the manual inputs

Manual data inputs:
Graphical user interfaces: Ease the data uploading with simple and clear interfaces. Checks to ensure all inputs are filled correctly.

Automatic data processing:
Data verification: Check that provided data is well formatted

Data validation: Check that the provided data is good in context

Data extraction: Parse and transform the data to own model entities.
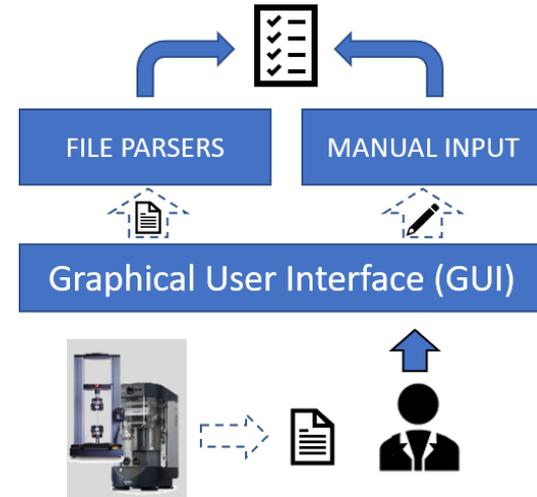
Project contribution to CHADA template

i-TRIBOMAT

i-TRIBOMAT	DT-NMBP07-2018	www.i-tribomat.eu	i-tribomat@ac2t.at

List of main characterisation methods used in the project	Level of use in the project (basic user, advanced user, method developer, instrumentation developer)	Main reference in the project	Contact email(s)
Pin on Disc (basic tribological test)	Advanced user	AC2T LTU VTT BAM TEKNIKER	ivana.toth@ac2t.at ichiro.minami@ltu.se Helena.Ronkainen@vtt.fi dirk.spaltmann@bam.de Alberto.alberdi@tekniker.es
Twin disc (rolling/sliding tribological test)	Method developer	TEKNIKER	Alberto.alberdi@tekniker.es
FZG (gear tribological test)	Advanced user	TEKNIKER	Alberto.alberdi@tekniker.es
TESSA (seals tribological test)	Instrument developer	TEKNIKER	Alberto.alberdi@tekniker.es

CONTACT US:

Coordinator:

AC2T research GmbH

Viktor-Kaplan-Straße 2/C
2700 Wiener Neustadt

+43 (0) 2622 81600
i-tribomat@ac2t.at

www.i-tribomat.eu