

Intelligent Open Test Bed for Materials Tribological Characterisation Services

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EPPN workshop



Atos



ANSYS

GRANTA



TOYOTA



moventas



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“i-TRIBOMAT is the Open Innovation Test Bed for Materials Tribological Characterisation”
Wherever moving bodies are in contact with each other, the respective materials undergo certain **friction and wear** that define their **tribological performance**.



Industrial innovation among European industry calls for the incorporation of **new advanced materials** that requires an **extensive tribological characterisation**.

i-TRIBOMAT aims at establishing the world first open test bed for tribological characterisation of materials to support industrial innovations by **upscaling new advanced materials to the mechanical component level**.

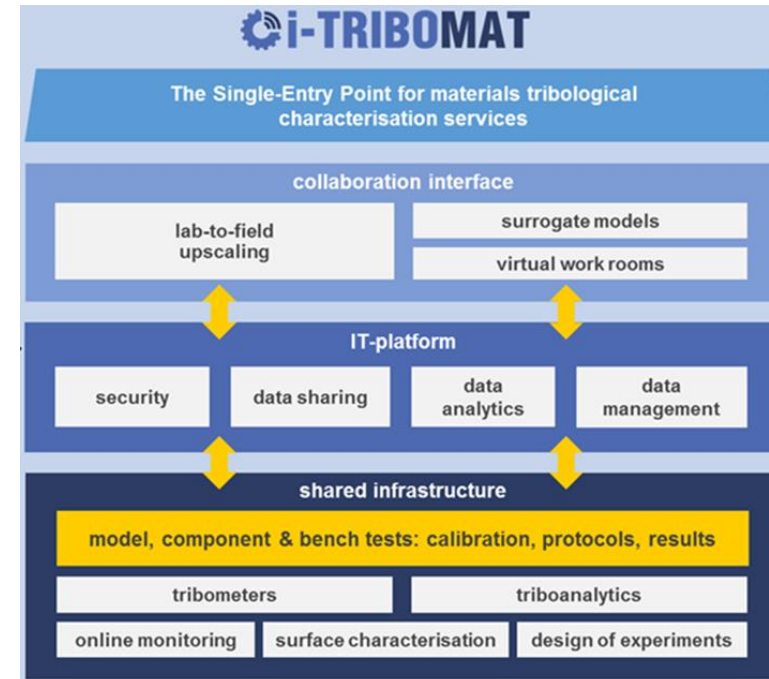
Industrial Motivation

“Reduction of time to market & costs for materials up-scaling”

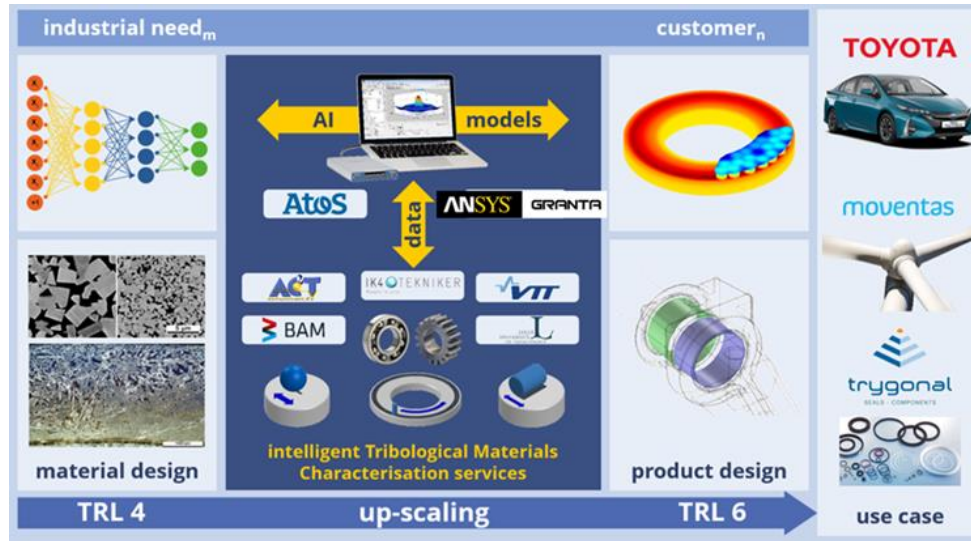
The i-TRIBOMAT offer **combines** conventional **laboratory tribotests** with **Artificial Intelligence** tools, i.e. federated data analytics, database searches and finite element modelling, which allow up-scaling laboratory test results and online monitoring data **to infer friction and wear behaviour of real components**.

i-TRIBOMAT is built on 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



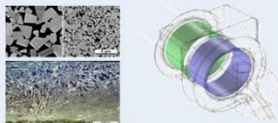
i-TRIBOMAT in short



An intelligent tribological infrastructure is set up. GRANTA and ATOS as **artificial intelligence** experts develop the **IT platform** and 5 of the most competent European tribology centres, AC2T, BAM, VTT, LTU and TEKNIKER, provide their expertise and share their tribological characterization equipment, among which are **more than 100 tribometers**. The project also includes **3 use cases** lead by TOYOTA, MOVENTAS and TRYGONAL.

Industrial users & customers

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

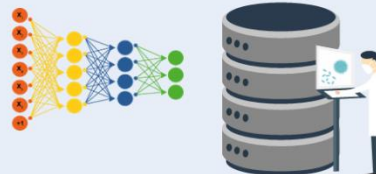
TRL 4 & 5



i-TRIBOMAT SEP

services

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



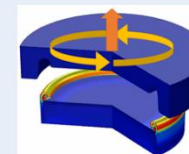
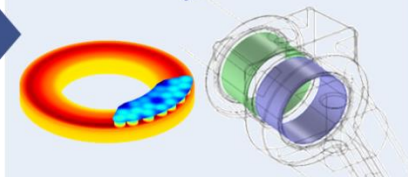
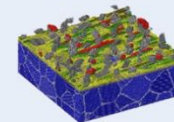
TRL 4 & 5



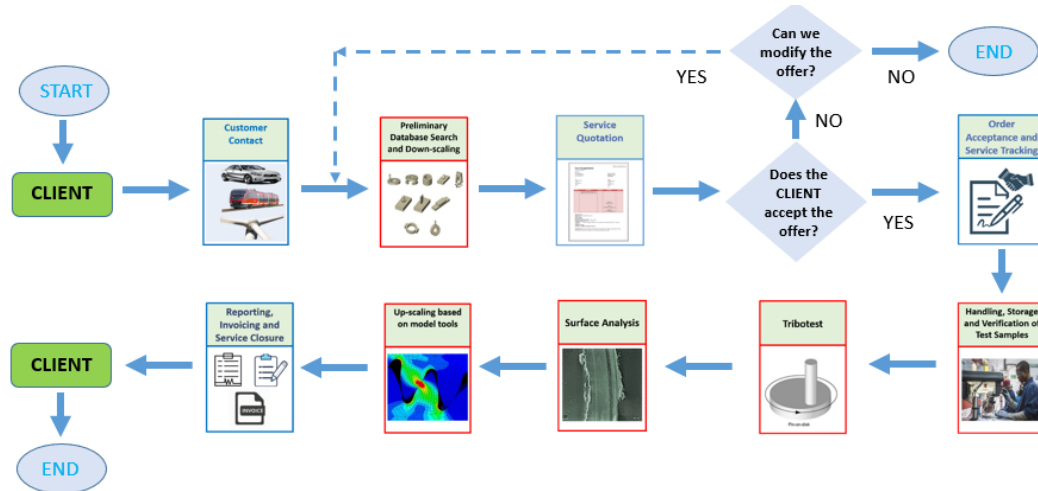
up-scaling

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

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



TRL 5 → 6



Each function that the OITB i-TRIBOMAT will perform for the provision of the service is defined as an **independent module**.

These service modules are stand-alone. In each of these modules, **input** and **output** data of a pre-established nature are defined, as well as the different **roles played** by the operators and experts in charge of carrying out these functions.

According to the customer's requirements, each service has been **designed ad-hoc**, sequentially linking different modules.

Test Bed Operation – B2B relations



Standardised tribological characterisation services

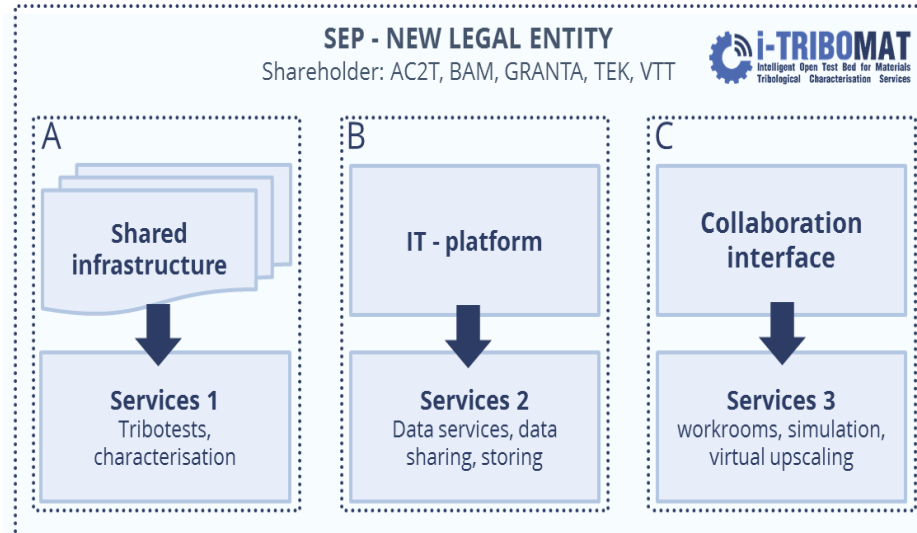
A **Shared infrastructure**
operated & owned by: AC2T, BAM, VTT, TEKLTU
Services 1
offered to SEP by partners, SEP to customers

Data driven services

B **IT - platform**
operated by: SEP
Services 2:
offered to customers by SEP

Virtual workrooms and up-scaling services

C **Collaboration interface**
operated by: SEP
Services 3:
offered to customers by SEP



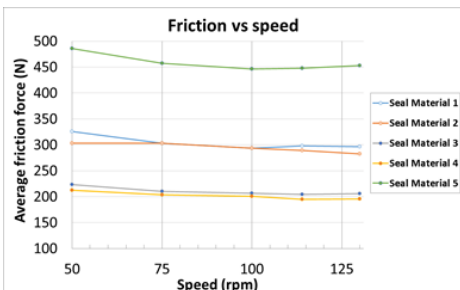
Success Cases of Collaboration with the Industry *

CASE STUDY 1 : Comparison of sealing system gasket materials under real working conditions

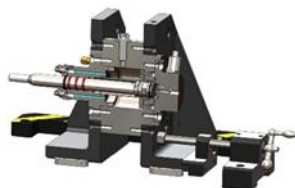
Service 1



Pilot for tribological testing of seals



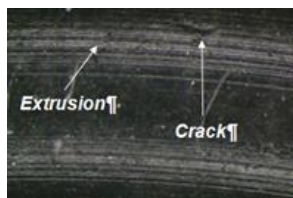
Mechanical degradation of elastomeric seals



Test chamber



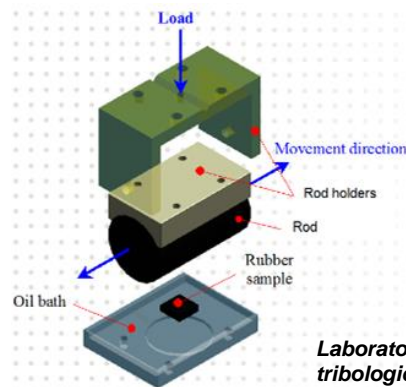
Thermal degradation of elastomeric seals



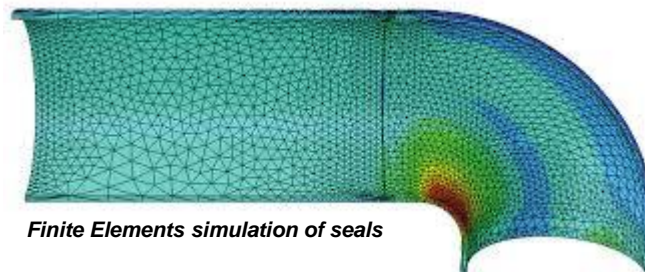
Extrusion

Crack

Service 3



Laboratory set-up for tribological testing of seals



Finite Elements simulation of seals



Elastomeric seal



Seal degradation in laboratory tests

* Illustrative example not developed under the i-TRIBOMAT project

Success Cases of Collaboration with the Industry*

CASE STUDY 2: Simulation of wind turbine gearbox failures (gears and bearings) for selection of lubricants.

Service 1

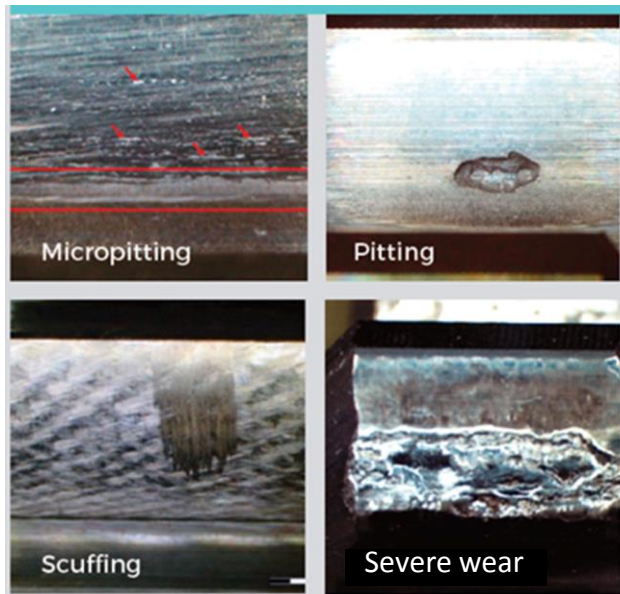
Pilots for tribological testing of gears and bearings



Cylindrical roller bearing



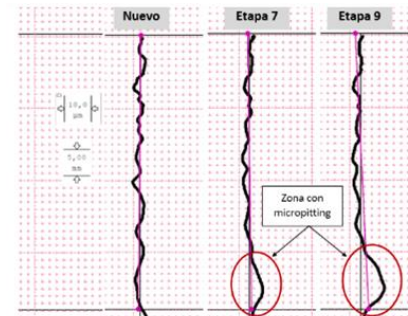
Conical roller bearing



Gear failure modes



Wind turbine gearbox



* Illustrative examples not developed under the i-TRIBOMAT project

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