



# **NewSkin: Innovation Eco-system to Accelerate the Industrial Uptake of Advanced Surface Nano-Technologies.**

**Value Proposition: Texturing During Moulding for polymers in Automotive and General Industry**

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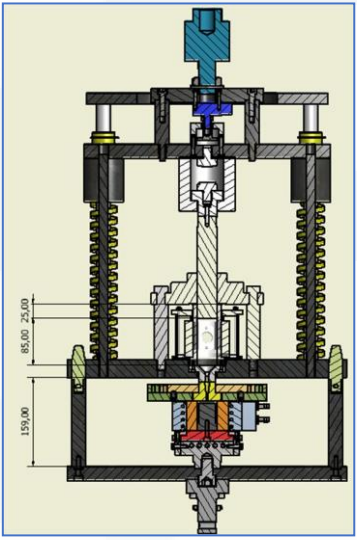
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# NewSkin Value Propositions for Automotive and General Industry

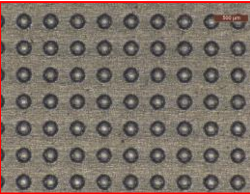


- Demoulding Test Rig

Partner(s)	Instituto Tecnológico de Aragón
Value Proposition	ITA Value Proposition 1: Experimental evaluation of micro/nano texturing during moulding for polymeric components with a Demoulding Test Rig
Description	ITA offers a test rig for the assessment of release coatings and micro/nano-textures transfer during moulding. Demoulding processes are more demanding with micro/nano textured surfaces and interaction between polymers and release coatings must be evaluated.
Test probe size	50x50x50 mm
Material	Elastomers, thermoset and thermoplastic polymers
Conditions	T <sup>º</sup> – Up to 300ºC / P – 100kN /
Outcomes	Evaluation of textures transfer and coatings with different chemical formulations in demoulding processes. Friction forces, adhesion forces, efficiency of release coatings and contact angle with polymers. Evaluation of the number of cycles before cleaning.
Available from	All capabilities - June 2021.
Target Markets	Assessment of coatings and microtextures in elastomers and thermoset polymers already available (NBR, EPDM, FKM, ...). Molded component manufacturers: Rubber, TPU, PP, PA Manufacturers of release coatings for easier demoulding.
Product Examples	Textured Seals made of different polymers
Customer Examples	Micro-textured rubber dynamic seal (V-Ring) with a friction reduction up to 40% in harsh dynamic applications (backed by laboratory data). Evaluation of PVD, Sol-Gel release coatings efficiency (up to 50%) and durability for different chemicals formulations (reduction of fluorinated derivatives). <a href="https://www.softslide.eu/">https://www.softslide.eu/</a>



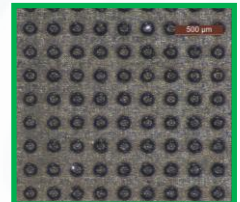
Textured plates



Texture transfer from mould to component



Textured component



Mould plates need to be textured and coated.  
Rubber/microtextures/coating were already evaluated



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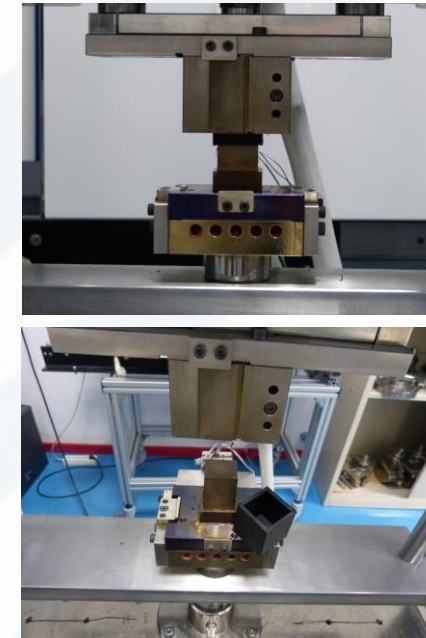
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## • Demoulding Test Rig



<b>Partner(s)</b>	<b>Instituto Tecnológico de Aragón</b>
<b>Value Proposition</b>	<b>ITA Value Proposition 1:</b> Experimental evaluation of micro/nano texturing during moulding for polymeric components with a Demoulding Test Rig
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<b>Product Examples</b>	Textured Seals made of different polymers
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Transfer of textures in flat surfaces.  
 Transfer of textures in curved surfaces.  
 Transfer of textures in inner/outer part.  
 Evaluation of coatings release agents in the moulds.  
 Manufacturing of small textured components (50x50x50 mm).  
 Polymers up to 300°C.  
 Control of Force-Displacements and T<sup>a</sup> of all process.



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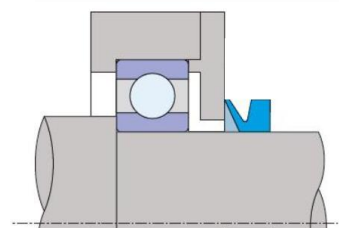
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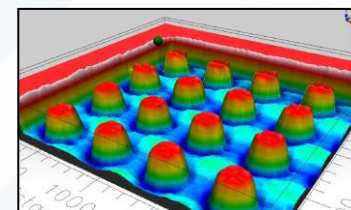
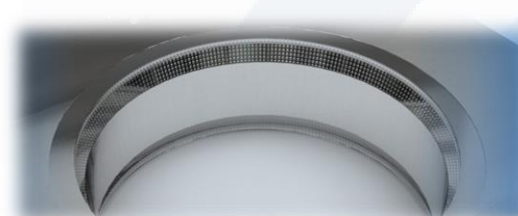


## • Demoulding Test Rig

Partner(s)	Instituto Tecnológico de Aragón
Value Proposition	<b>ITA Value Proposition 1:</b> Experimental evaluation of micro/nano texturing during moulding for polymeric components with a Demoulding Test Rig
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Target Markets	Manufacturers of release coatings for easier demoulding.
Product Examples	Textured Seals made of different polymers
Customer Examples	Micro-textured rubber dynamic seal (V-Ring) with a friction reduction up to 40% in harsh dynamic applications (backed by laboratory data). Evaluation of PVD, Sol-Gel release coatings efficiency (up to 50%) and durability for different chemicals formulations (reduction of fluorinated derivatives). <a href="https://www.softslide.eu/">https://www.softslide.eu/</a>



Textured rubber seal



Textured metallic mould

Before start with mass production industrial processes, the viability of the texturing during moulding is evaluated in a laboratory level.





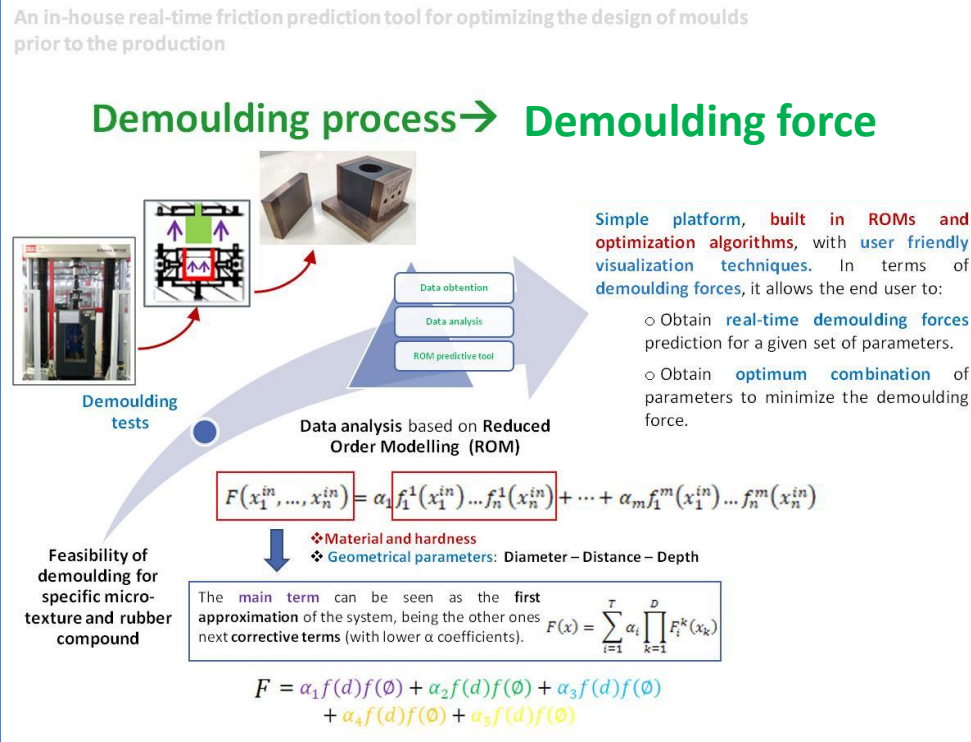
# NewSkin Value Propositions for Automotive and General Industry



- ROM's

Example of application: Prediction of demoulding forces levels on real time.

Partner(s)	Instituto Tecnológico de Aragón
Value Proposition	ITA Value Proposition 2: Reduced Order Model-based tools for efficient design of nano/micro-structured functional surfaces and for definition of integrated "Smart" test plans.
Description	ITA offers ROM-based tools fed either by simulations or experimental data for the design of micro/nano-structured surfaces to yield advanced functionalities (low friction, lotus effects, improved convective properties, catalytic effect ...) In relation to "integrated smart test plans" the idea behind is to leverage model simulations and multi-objective optimization approaches to help minimize costly, time-consuming physical testing.
Test probe size	Any
Material	Elastomers, thermoset and thermoplastic polymers
Conditions	To be defined by the customer
Outcomes	ROM-based tools for the design of micro/nano structured surfaces under efficient testing (experimental or virtual) and efficient process
Available from	Already available
Target Markets	Molded component manufacturers
Product Examples	Moulded Textured Seals made of different polymers
Customer Examples	Microtextured rubber dynamic seal (U-Cup) with a friction reduction up to 40% for a wide range of operating conditions.  <a href="http://www.mouldtex-project.eu/">http://www.mouldtex-project.eu/</a> Smart optimization of the injection plastic processes with a digital twin  <a href="https://www.itainnova.es/tech/caelia/en/">https://www.itainnova.es/tech/caelia/en/</a>



Example of application: optimization of formulations in release coatings.



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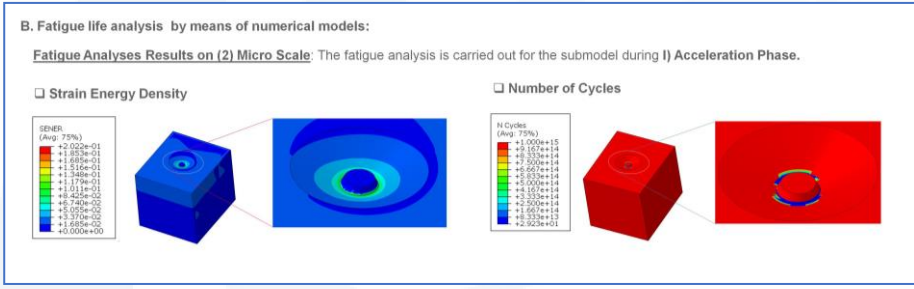
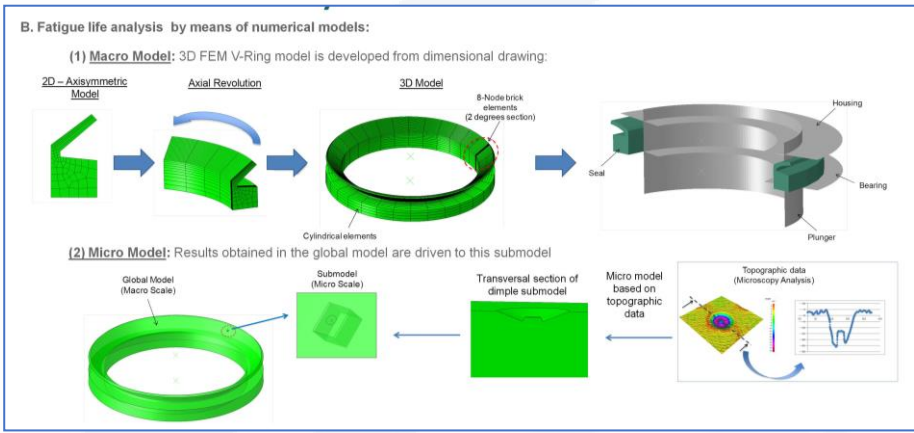


- KBS

Advance simulations in soft-materials

Analysis of different scales macro/micro/nano

Partner(s)	Instituto Tecnológico de Aragón
Value Proposition	<b>ITA Value Proposition 3:</b> Knowledge-based – Simulations (KBS) for the efficient design of micro/ nano-structured functional surfaces and generation of surface data focused on “material management”.
Description	ITA offers KBS to study in detail moulding/demoulding behaviour of new materials such as reinforced polymers, biopolymers, and different micro/nano textures and geometries with enhanced functionalities (Abaqus, CFD, Durability virtual testing, Molecular dynamics).  Information management in the form of material property data and simulation management plays a crucial role. Although data repositories exist, they are often siloed and company-specific. Information generated from simulation is intended to be findable (unambiguous identification of data), accessible (in a standard or easy readable format) and reusable (data contains sufficient metadata to be contextually well-defined for a specific purpose).
Test probe size	Any
Material	Elastomers, thermoset and thermoplastic polymers
Conditions	To be defined by customer
Outcomes	Optimized numerical model
Available from	Simulation (already available for microscale)  Material information management (to be developed)
Target Markets	Molded component manufacturers
Product Examples	<a href="https://www.itainnova.es/es/proyectos">https://www.itainnova.es/es/proyectos</a>
Customer Examples	



Estimations of fatigue behaviour at macro/micro scale



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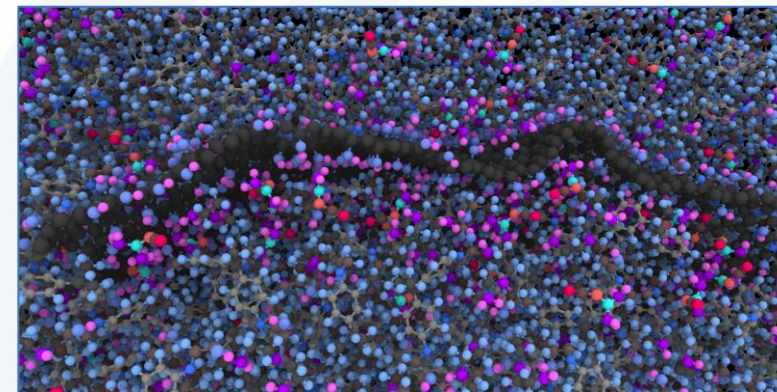
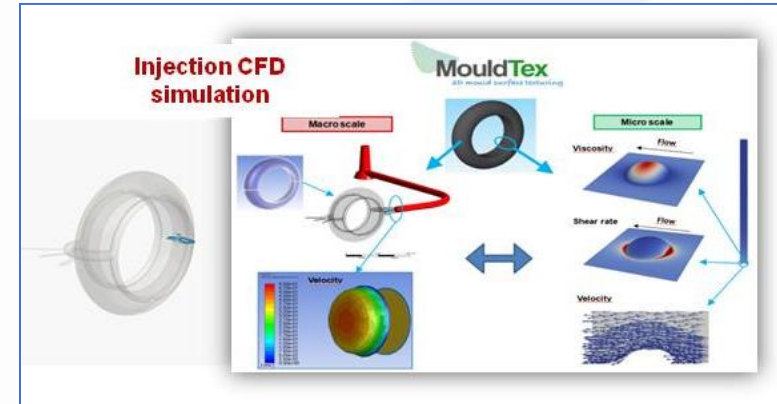
# NewSkin Value Propositions for Automotive and General Industry



- KBS

Simulations of the injection and filling behaviour with micro-cavities

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Test probe size	Any
Material	Elastomers, thermoset and thermoplastic polymers
Conditions	To be defined by customer
Outcomes	Optimized numerical model
Available from	Simulation (already available for microscale)  Material information management (to be developed)
Target Markets	Molded component manufacturers
Product Examples	<a href="https://www.itainnova.es/es/proyectos">https://www.itainnova.es/es/proyectos</a>
Customer Examples	



Analysis of forces at molecular level.



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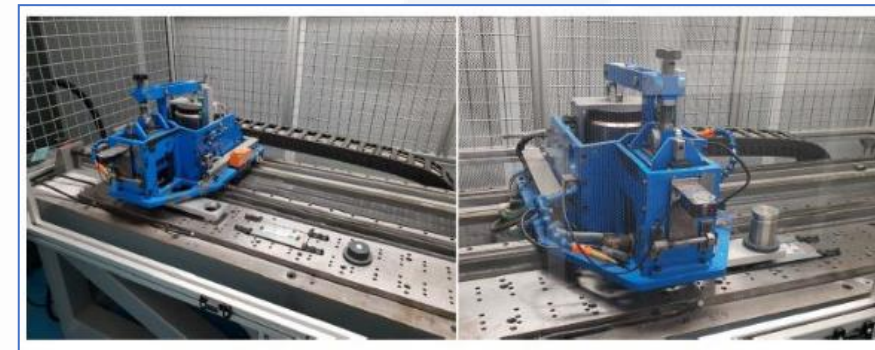


# NewSkin Value Propositions for Automotive and General Industry



- Design and development of test rig

<b>Partner(s)</b>	<b>Instituto Tecnológico de Aragón</b>
<b>Value Proposition</b>	<b>ITA Value Proposition 4:</b> Design and Development of devoted test rigs and sensors related to upscaling and testing of different technologies (Texturing During Moulding, Roll to Roll, Tribological performance, ....) for verification and validation (V&V tools)
<b>Description</b>	ITA offers design, development, manufacturing, certification and set-up of devoted test rigs for measurement of specific product functions, model verification or product validation.  Verification ensures that a model is correctly numerically implemented; verification is followed by validation, in which the physics implemented in the model is assessed by checking accuracy of predictions against experimental measurements.  Devoted test rigs and sensors are focused on assess properties related to Texturing During Moulding.
<b>Test probe size</b>	Any
<b>Material</b>	Elastomers, thermoset and thermoplastic polymers
<b>Conditions</b>	To be input by customer
<b>Outcomes</b>	Test rig prototype and measurement protocol
<b>Available from</b>	Already available
<b>Target Markets</b>	Molded component manufacturers:
<b>Product Examples</b>	Sensors in resin transfer moulds; Long stroke tribometer for a specific component
<b>Customer Examples</b>	



Long path tribometer developed in ITAINNOVA.



Permeability test rig for composites developed in ITAINNOVA.



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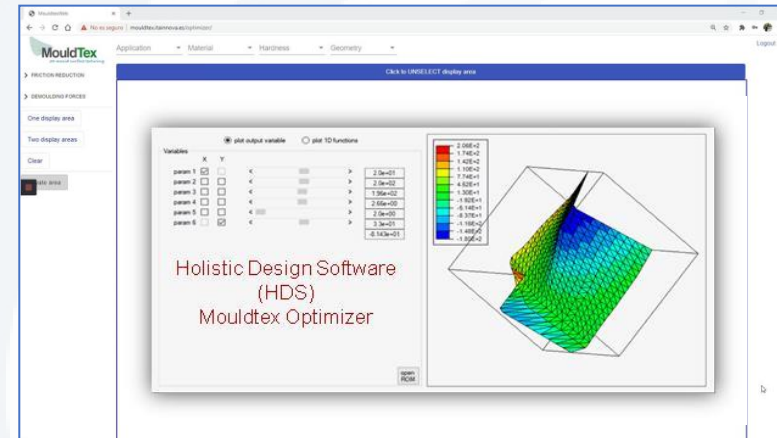
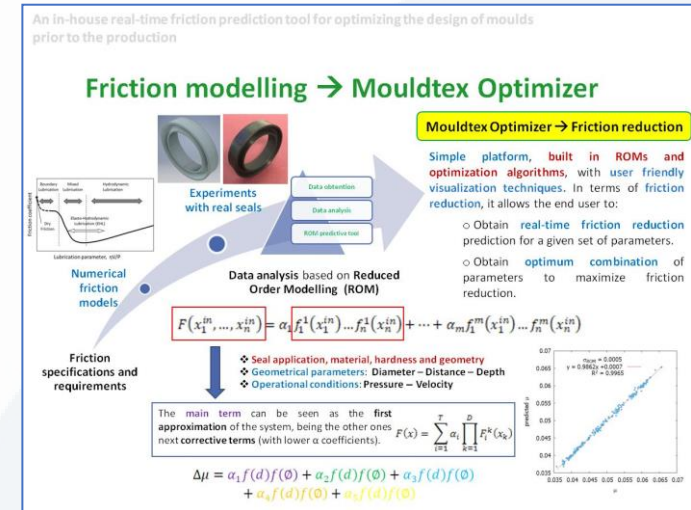


# NewSkin Value Propositions for Automotive and General Industry



- HDS

Partner(s)	Instituto Tecnológico de Aragón – LUH
Value Proposition	ITA Value Proposition 5: Holistic Design Software (HDS) for the design and optimisation of texture patterns for rubber seals
Description	Software based on friction models (provided by LUH) and ROMs for the quick design and optimisation of surface textures for friction reduction in rubber seals
Test probe size	Any
Material	Elastomers, thermoset
Conditions	To be defined by customer
Outcomes	Optimal texture pattern with improved friction performance for a range of operation.
Available from	Already available, database of seals and materials to be enlarged
Target Markets	Rubber seals manufacturers;
Product Examples	U-Cup (FKM80A; FKM90A)
Customer Examples	



Optimization on real time of textured rubber dynamic seals for friction reduction with an Holistic Design Software

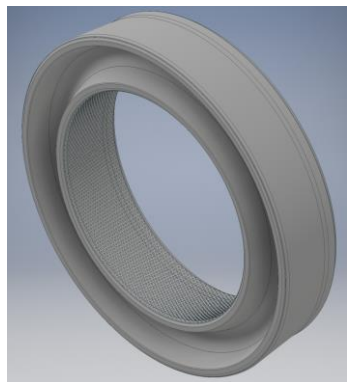


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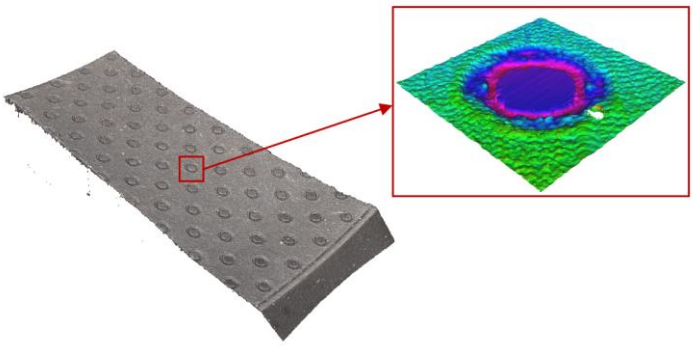
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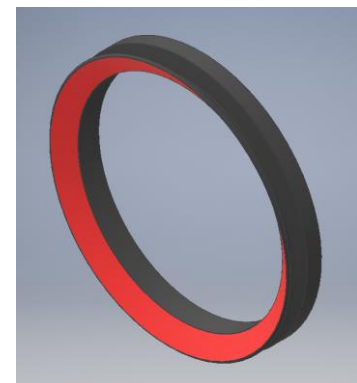
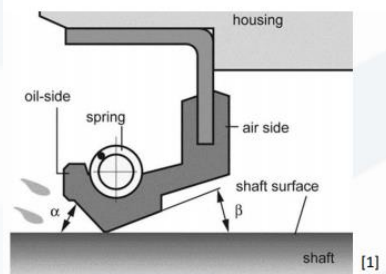
- Use Cases – reduce friction (First Case; ITA+LUH+AIMEN)



- Example done: Reciprocating dynamical rod seal



- New Cases



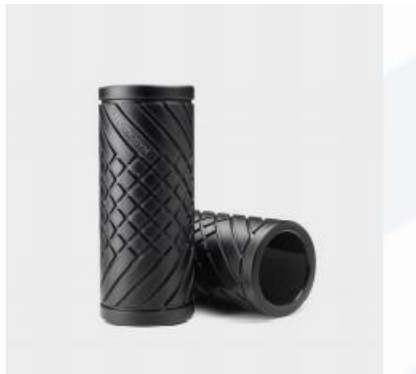
- Example done: Rotating V-Ring seal



# NewSkin Value Propositions for Automotive and General Industry



- Use Cases – increase friction (second case ITA+LUH+AIMEN)



- Example: Strong grip and scratch resistance; application of Texturing During Moulding in thermoplastic materials.



# NewSkin Value Propositions for Automotive and General Industry



## • Summary

In New Skin, experimental evaluation of **micro/nano texturing during moulding** for **polymeric** components with a **Demoulding Test Rig** will be done. Demoulding processes are more demanding with micro/nano textured surfaces and interaction between polymers and **release coatings** must be evaluated. Furthermore, ITAINNOVA offers:

- **ROM-based tools** fed either by simulations or experimental data for the design of micro/nano-structured surfaces to yield advanced functionalities (low friction, lotus effects, improved convective properties, catalytic effect ...)
- **Knowledge-Base-Simulations** to study in detail moulding/demoulding behaviour of new materials such as reinforced polymers, biopolymers, and different micro/nano textures and geometries with enhanced functionalities (**Abaqus, CFD, Durability virtual testing**, Molecular dynamics).
- **Design, development**, manufacturing, certification and set-up of devoted **test rigs** for measurement of specific product functions, model verification or product validation
- **A Holistic Design Software (HDS)** for the design and optimisation of texture **patterns for rubber seals** in collaboration with Leibniz University Hannover (LUH).





# Thank you!

## CONTACT US:

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