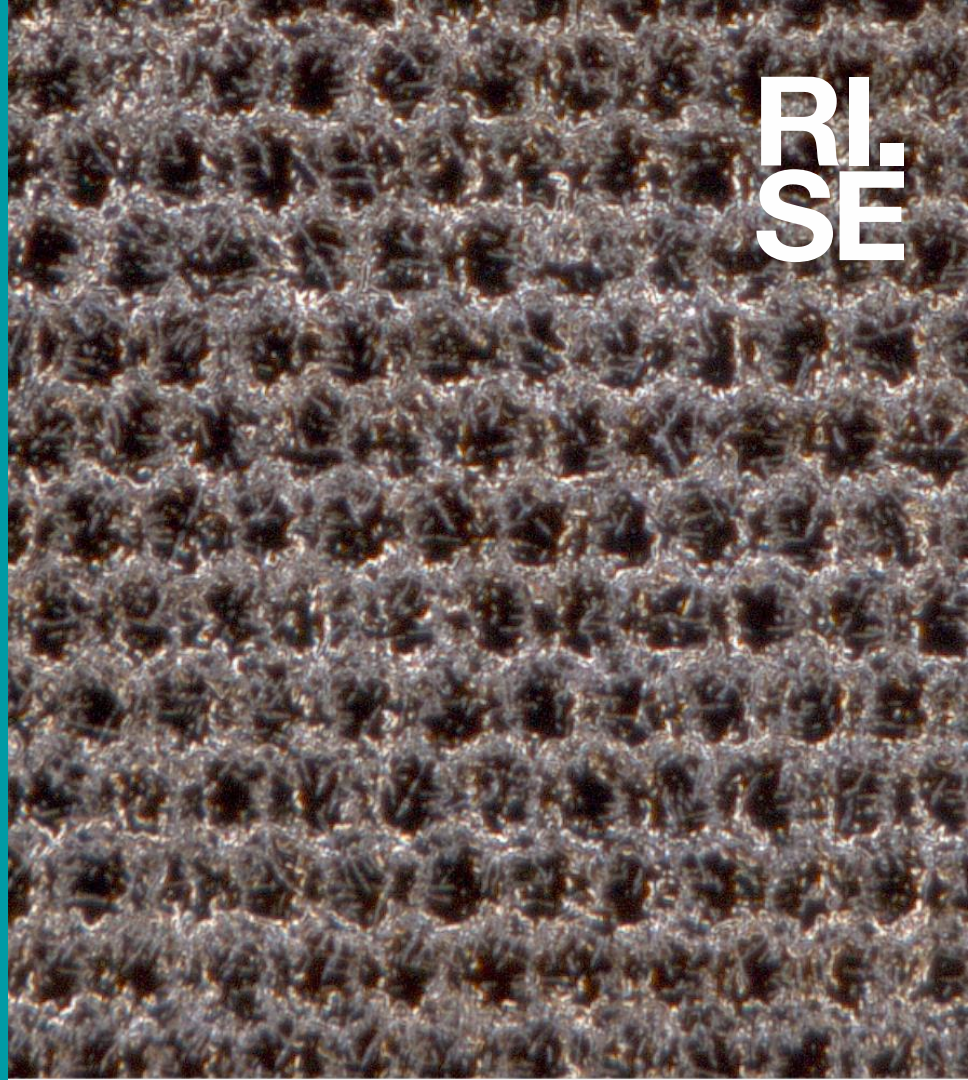
LaTex

Laser texturering before thermal spray

Cecilia Goyenola



RESEARCH INSTITUTES OF SWEDEN

Hela Sveriges forsknings- och innovationspartner

Koncernövergripande forskningsområden

Vårt erbjudande

Omställnings-ledning

- Strategiska färdplaner
- Omvärldsanalys
- Framtidsscenarier
- Policyutveckling

Tillämpad forskning och utveckling

- Forskningspartner
- Ledning och koordinering av forsknings-program
- Test och demo
- Industriella processer och uppskalning
- Problemlösning och expertstöd
- Innovationsledning

Provning, certifiering och kalibrering

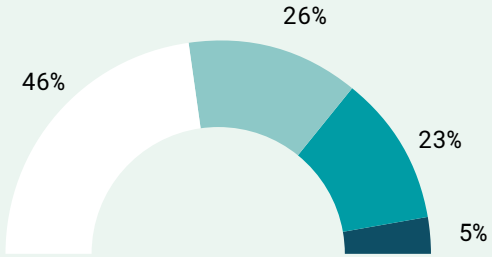
- Provning
- Besiktning
- Certifiering
- Kalibrering

Livslångt lärande

- Kompetensomställning
- Kunskapsstärkande aktiviteter
- Utbildning

Netto-omsättning

3 618 MSEK



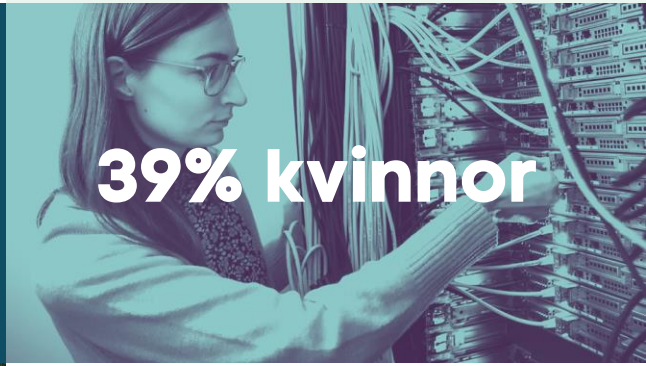
Fördelning av omsättningen

Näringsliv	1 651 MSEK
Offentliga finansiärer	954 MSEK
Statliga medel	827 MSEK
EU-medel	186 MSEK

Nionde plats i Karriär-barometern bland unga yrkesverksamma civilingenjörer

Över 130 test- och demonstrationsmiljöer

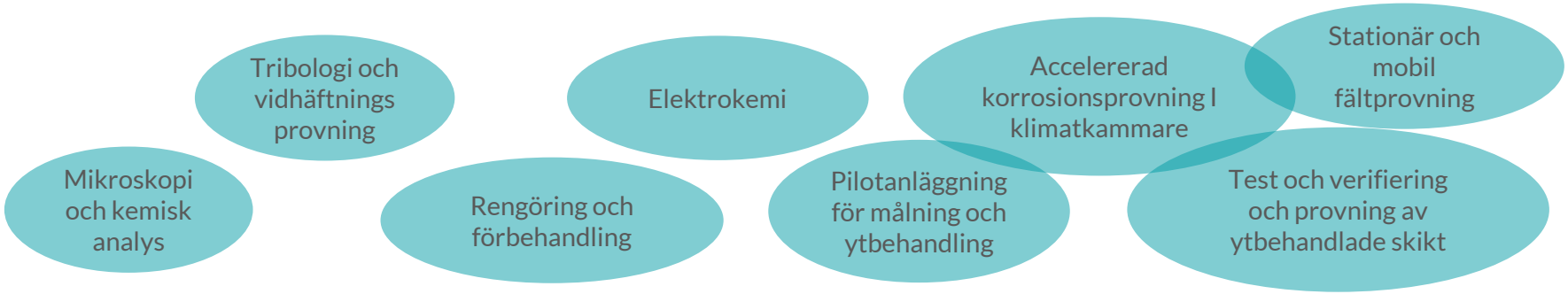
Ca 3 000 anställda



94% av våra projekt hållbarhetsdeklarerades i december 2021

Alla siffror avser 2021.

Ytteknologi på RISE: expertis över hela värdekedjan



Hur jobbar vi?

- Direkta företagsuppdrag
- Offentligt finansierade forskningsprojekt
- Medlemsfinansierade samarbeten
- Kurser, seminarier och utbildningar

Oberoende tredje part

Project LaTex
Laser texturing before thermal spraying

Cecilia Goyenola, RISE

cecilia.goyenola@ri.se

COORDINATOR: Teknikföretagen

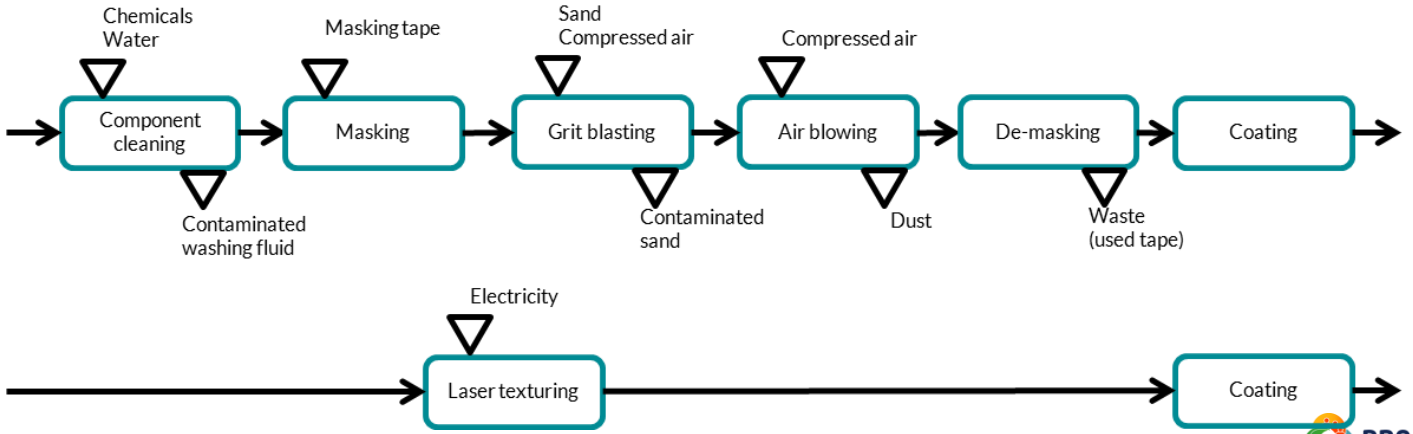
FOUNDERS: Swedish Production Academy, RISE, KTH, Chalmers

WITH SUPPORT FROM: Vinnova Sveriges innovationsmyndighet, Energimyndigheten, Formas, Strategic innovation programmes

PRODUKTION2030

Purpose and goals

- LaTex proposes the substitution of the traditional multi-step grit-blasting process by a one-step automated laser texturing as the surface preparation process before thermal spraying
- The overall goal of the project is to demonstrate the effectiveness and benefits of laser texturing before thermal spraying in industrial environments



PRODUKTION2030

LaTex – project details

Project partners:

RI. SE

HÖGSKOLAN VÄST

agaria

AZELIO

IKEA

LEAX SKARABORG

SKANDINAVISK YTFÖRÄDLING

TENNECO

- **Project time**:
  - 2021-11-15 – 2024-11-15
- **Budget**: 3 660 000 SEK
  - Grant: 1 830 000 SEK
- **Produktion2030**: Strategic innovation program with the support of VINNOVA, Energimyndigheten and Formas

PRODUKTION2030

Project structure & coordination

WP1	**Texture design** WPL: RISE – Åsa Lundevall Duration: 1121 – 0722	Goal: Find the most suitable texture for each application T1.1: Parametric study of laser parameter vs. texture structure T1.2: Establish a laser texturing strategy for best **coating** performance T1.3: Definition of laser parameters for different **substrate materials**
WP2	**Component demonstrators** WPL: Azelio – Aurélien Tricoire Duration: 0822 – 0724	Goal: Devise a strategy to transfer the chosen laser texturing from WP1 into components T2.1: Manufacturing of 2D-prototypes T2.2: Manufacturing of 3D-prototypes (including focus on robot programming) T2.3: Comparison grit blasting vs. laser texturing – geometry & stress
WP3	**Industrialization of laser texturing** WPL: HV – Nicolaie Markocsan Duration: 1223 – 1024	Goal: Define critical steps/actions for industrial implementation of laser texturing T3.1: Business case study T3.2: Strategy for automation T3.3: Sustainability assessment
WP4	**Project management & result dissemination** WPL: RISE – Cecilia Goyenola Duration: 1122 – 1124	Goal: Project administration, results dissemination, workshop, and publication T4.1: Preparation of administrative and technical reports T4.2: Results dissemination: 2 publications, conference presentation, int & ext workshops T4.3: General guidelines for implementation of laser texturing before thermal spray T4.4:Update of thermal spray course at HV to include laser texturing

PRODUKTION2030

WP1 – Texture design

- Surface effects and topography, from laser treatment
  - Generic parametric study
  - Effect on topography and morphology
  - Adhesion with thermal spray coatings

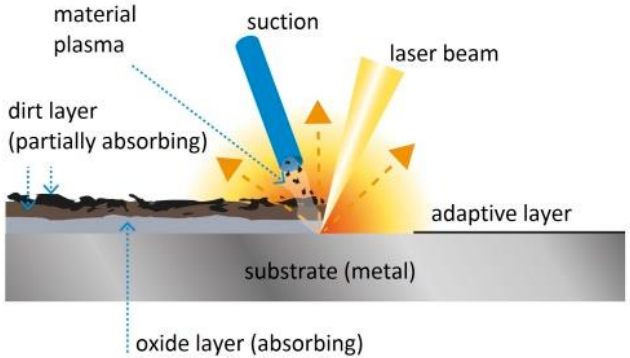
PRODUKTION2030

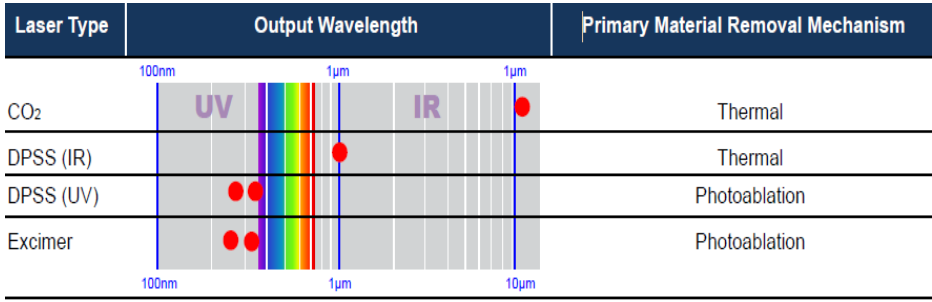
Surface treatment with laser

NdYAG Laser CL-50 @RISE

Nd:YAG Laser

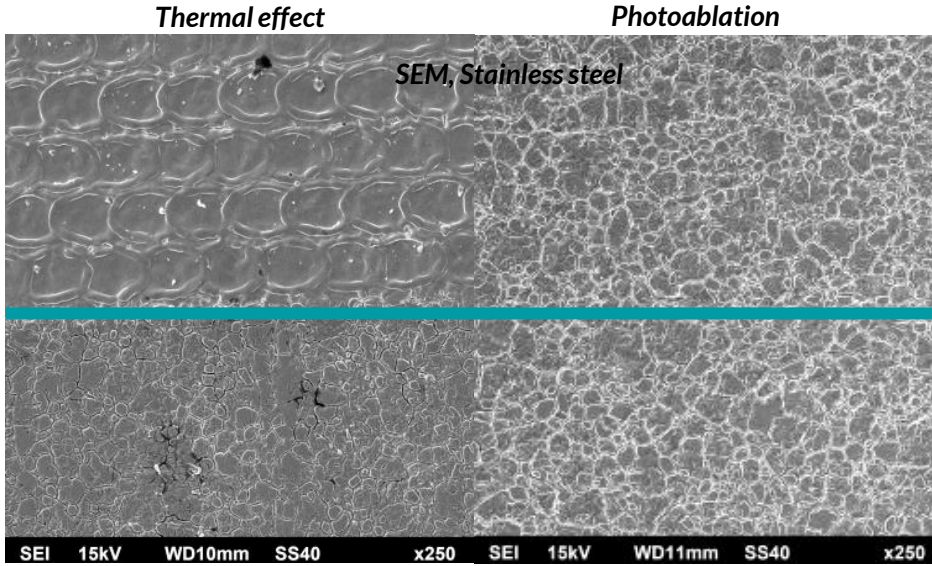
- Diode pumped solid state laser (DPSS)
- Near IR output wavelength
- Cleaning mainly by thermal effect by heating and gasification of surface contaminants
- Can re-melt the metallic surface
- Risk of thermal degradation in the CFRP through thermal heating





Overview comparison of various laser types for CFRP cleaning.

Source: Reinforced plastics, September/October 2013



- Laser used at RISE in the project LaTex
  - CL50, 50W Nd:YAG laser

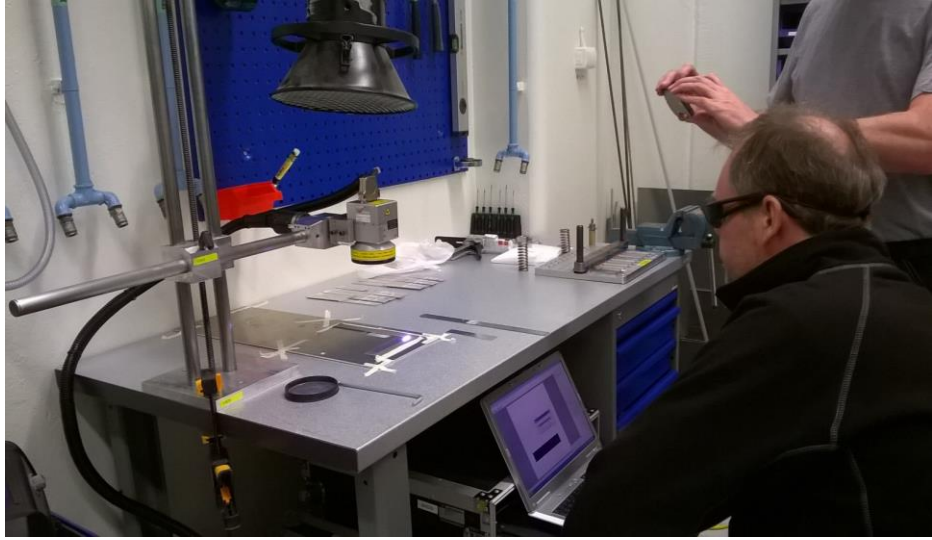
Examples of application – Nd:YAG lasers

Pretreatment for/before:

- Cleaning
- Adhesive bonding
- Brazing
- Welding
- Varnishing

Decoating, labeling and marking

Mold cleaning



Laser parameters to achieve specific effects

- Pulse frequency
  - higher frequencies result in lower effect
- Power
  - Percentage of full power
- Overlap between laser spots in the surface and between rows

- Multiple directions

Laser safety

- Class 4 Laser
- Hazards:
  - Eye injury
  - Skin injury (burn)
  - Material damage and burning

- Use laser-protective safety goggles all the time
- Follow the instructions by the laser responsible

The results shown during the AG42c meeting will be shared in more detailed once they are published

Questions so far…

- Substrate:
  - How will the laser treatment affect the phase stability on the surface?
  - How is the laser treatment dependent on the different material grades?
  - How does the laser treatment affect the residual stresses?
  - Does the opposite direction in residual stresses affect the coating? How?

- Topography and roughness:
  - Is Ra still a valid parameter as surface specification or is a new parameter needed?
  - How does the laser-textured topography affect the coating interlocking?
  - How does the laser texturing influence the final thermal spray roughness
  - Is there a problem if Ra/Rz have different values in different direction?
    - Remember that the laser texturing is directional

Cecilia Goyenola

cecilia.goyenola@ri.se
070-780 62 17