Metrology solutions for the three-dimensional inspection of laser processed surfaces

Roger Artigas
President & CTO
The Group

- Leading-edge technology group that operates at the highest quality standards within the field of surface metrology
- Sensofar was founded on 2001, 100% private share. Subsidiaries in US, China and Germany with a worldwide distribution and service network (over 20 countries)
- 50+ employees worldwide
- Focus on Quality Control, Quality Inspection and R&D (industry & public)
- More than 1000 systems installed worldwide: semiconductor, PCB, medical devices, micromachining, laser texturing, optics, tooling, molding and many other applications.
The Company (premises)

- **Sensofar HQ**, Barcelona (Spain)
  - 1600 m² production and R+D facilities

- Operating independently metrology company with >10% market share. Companies on larger groups are less flexible, and less innovative.

- More than 20% investment in R&D.

- Relationship with local universities: teaching in master in photonics, working with graduate students, running master thesis, and industrial PhDs.

- Supporting and participating in European projects.

- Research partners with national metrology institutions like PTB, NPL, CEM,…

- Member of TC WG16 of the ISO 25178
Technology
Non-contact & Sensorhead non-moving parts surface metrology (Shape & Texture)

Confocal
- Confocal
- Confocal Continuous
- Confocal Fusion

Interferometry
- Phase Shifting Interferometry (PSI)
- Coherence Light Interferometry WLI (VSI)

Focus Variation

Reflectometry
- Thick and thin films
General purpose & Production systems
(Table-top products)

4-in1 technologies

- High resolution imaging
- High acquisition speed
- Sequential color
- Nikon objectives
In-line metrology solutions (Sensors)

- **Smart**, maximum measurement versatility
- **Sonix**, unprecedented high speed
- Both are robust, rugged and reliable enough for the harshest of manufacturing environments

Versatile and high-speed non-contact 3D surface profilers for use in in-line processes
New product
LASER FUNCTIONALIZATION OF SURFACES

ANTIBACTERIAL PROPERTIES

1) Tissue adhesion removal

2) Prevention of bacterial growth in implants

3) Application of antifouling properties in reactors
LASER FUNCTIONALIZATION OF SURFACES

Increase of friction coefficient in diesel engines

1) Hexagonal crater patterns
2) Increase in friction coefficient without increasing "spikes" of surface wear (Ssk)
LASER FUNCTIONALIZATION OF SURFACES

Tooling

Inserts

Exchangeable tips

Solid round tools

Crater wear on PVD coated turning tools

Coating adhesion
LASER FUNCTIONALIZATION OF SURFACES
Re-adjust laser parameters to achieve feature depth required.
Laser parameters adjustment:
• Number of slices
In-line metrology solutions (Sensors products)

- **S mart**, maximum measurement versatility
- **S onix**, unprecedented high speed
- Both are robust, rugged and reliable enough for the harshest of manufacturing environments

Versatile and high-speed non-contact 3D surface profilers for use in in-line processes
• Technologies: Interferometry (VSI)
• Measurement types: 3D and Thickness
• Single area measurements + offline stitching
• Automated measurements (MMR single point)
Integration & Challenges
Challenges for in-line integration

- Standardize communication protocol
Software

Many communication protocols:
- lack of standardization
  - CP/IP
  - XML files
  - Commands / Answers
  - Events

Commands / Answers - synchronous

Events - asynchronous
Challenges for in-line integration

• Standarize communication protocol
• Size of the sensors
• Data bandwidth: 1 Mpixel 3D image at 10 times/second equals to 1Tb /hour data storage
• Data processing in real time
Software

SensoPRO
- Automated analysis
- Customized plugins
- Optimized speed
Challenges for in-line integration

• Standarize communication protocol
• Size of the sensors
• Data bandwidth: 1 Mpixel 3D image at 10 times/second equals to 1Tb /hour data storage
• Data processing in real time
• Low cost
Thank you!

Dr. Roger Artigas
President & CTO
artigas@sensofar.com

SENSOFAR GROUP (Metrology / Medical)
Parc Audiovisual Catalunya - Ctra. BV1274, km 1
08224 TERRASSA (SPAIN)
T (+34) 93 700 14 92 - F (+34) 93 786 01 16
www.sensofar.com
Examples
Display manufacturer
China
Local integrator
In-line metrology

- S onix + SensoPRO
  Surface Texture plugin
- S mart + SensoPRO
  Prism plugin
Display manufacturer
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Local integrator
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- S onix + SensoPRO Surface Texture plugin
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IC substrate maker
Taiwan

Local integrator
In-line metrology
- Smart + SensoPRO
  Trace & Step
  Height plugins
IC substrate maker
Taiwan

Local integrator
In-line metrology
• Smart + SensoPRO
  Trace & Step
  Height plugins
Inspection machines manufacturer
Spain

OEM – Dental Implants Inspection system

- Smart + proprietary analysis software
Consumer electronics manufacturer

Consumer electronics
China

QA assessment on-site

- Plu neox* +
  SensoPRO Surface
  Texture plugin +
  SensoPRO SR
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