

# Surface Texturing–applied Eco/Bio Component and Technology

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⇒ Surface texturing applied on key components in the eco/bio industry or product and technology for surface texturing application

Definition and Effect of SST Technology

- Smart Surface Texturing (SST) technology adopts the nature's physical surface effects into the engineering surface system and thus creating a surface with the functions such as energy saving (GT), increased luminance efficiency (IT), or nature–friendly (BIO).

Power loss •  $\mu_{\text{loss}} = \mu W V$

Energy Saving

Friction Reduction

20% Increase in Fuel Efficiency

Client / Market

- Friction reduction transportation field, machine lubrication field, Solar cell luminance efficiency improvement field, hospital's anti–virus biofilm and self–cleaning field, display industry

Necessity of this Technology

- Relying on the shape and material of components processed using existing technology has limits regarding friction reduction and pro–/anti–cell increase technology, and to create a surface with additional function, smart surface texturing technology with surface pattern with the size up to several hundred microns needs to be applied.
- Relying on the shape and material of existing components has limits regarding friction reduction and pro–/anti–cell increase technology–this technology can be considered very original as it is an eco–friendly process–based high–precision machining technology that replaces existing chemical etching or MEMS method.
- Need friction reduction, pro–cell functional effect realization, and various converged machining

Technical Differentiation

- Using a component with fine patterns created on the surface, a functional component can be created. Obtainable effects include friction reduction, cell and virus–related characteristics improvement, and enhancement of optical function.
- Analyzing and simulating the smart textured surface in nature require pattern shape measuring technology, computer simulation technology to copy the pattern and estimate the function of the pattern, high–precision machining and control technology to process pattern, and chemical process for post–processing of surface; its technological ripple effect throughout the field of engineering is great.
- Based on realization of the eco–friendly method, this technology grants detailed surface texturing using a method other than chemical treatment–partially applied in the industry, and in particular, the technology goes beyond the limitations of material as it can even be applied on metal surface.
- This technology includes technologies for various ripple effects regarding surface texturing module, applicable eco/bio–related products, and machine for module application.
- As machining realizes uniform function, it is favorable for creating consistency in function between products.

Excellence of Technology

- For dimple and riblet machining, lubrication friction and air/fluid friction is reduced by up to 8 to 10%, which has been proven with theory and experiment.

DESIRED PARTNERSHIP

Technology Transfer

Licensing

Joint Research

Other



TECHNOLOGY READINESS LEVEL [TRL]



- High–precision machining method for surface texturing can be directly applied on hard material.
- Surface texturing shape research, machining process development and shape measurement/function evaluation technology is a leading advanced technology growing globally.
- Has 3 international patents and 34 other patents Received multiple awards including Award Certificate of Director of Patent and Trademark Office (No. 7487, 2009) and Order of Science and Technological Merit (Jinbo Medal) (No. 94, 2011)

Surface Texturing Technology Development for Functional Eco/Bio Component

Surface Texturing Design Technology

- Understand physical surface phenomenon in nature > Size, pattern, shape
- Interpret and design the texture shape > Secure CAD design data

Converged Machining Technology

- 3D Functional converged machining technology > Based on laser/ultrasonic waves, etc.
- Surface texturing module development > FTS/AAJ/Grinding/u–milling

Measurement and Evaluation Criteria

- Surface texturing shape measurement > Contact/non–contact micro measurement
- Surface texturing function evaluation > Friction reduction/luminance efficiency/pro–cell

Development

Application of Functional Surface Texturing Technology

Function Surface Texturing Technology

- Development of functional surface texturing process for hard–to–cut work
- Quality/economic feasibility improvement in product through realizing high–functional surface realization
- Goal: Lubrication friction reduction by 20%
- Goal: Cell association 20%

Example

1. Journal bearing surface machining (left)

2. Aluminum flat plate texturing (right)

Current Intellectual Property Right Status

PATENT

- Bearing device using Magnetorheological Elastomer (KR1334389)
- Grinding Apparatus for Surface Texturing and the Grinding Method Thereof (KR1400876)
- Optical Head for Machining Cone Shape and the Laser Processing Apparatus Using Thereof (KR1373839)
- Optical Head for Vertical Cutting and Laser Processing Apparatus Using Thereof (KR1373836)
- Abrasive Air Jet Machining Apparatus Capable of Optical Measurement (KR1334388)
- Abrasive Air Jet Machining Apparatus with A Function of Heat Treatment (KR1334387)
- Abrasive Air Jet Machining Apparatus Having Multioutlet Nozzle (KR1334386)