Agathon Technology: Adaptive Infeed and Pre-machining of Superhard Materials
Agathon at a glance
New Technology for Grinding Systems: Adaptive or Force Controlled Infeed
Laser processing: Pre-machining of Superhard Materials
Agathon at a glance

- Swiss company, founded 1918, privately owned in the 4th generation
- 210 employees and 15 trainees in Switzerland, 230 employees worldwide
Agathon at a glance

• Mastering all key technologies and key components
• Own Research & Development (20% share)
• Production and assembly in Switzerland
Core activities

Grinding Machines and Laser Machines

Support and Services

Standard Parts
Guiding and Centering Elements
Worldwide close to the customer

- 1 central R&D and manufacturing center in the heart of Switzerland
- 4 local sales and service centers
- 7 local partners for Sales and Services for machines and standard parts
New Technology for Grinding systems: Adaptive or Force controlled infeed

Grinding with constant normal force.
Accurate force measurement

Fundamental forces of a grinding operation

• **tangential** Force $\rightarrow F_t$
• **normal** Force $\rightarrow F_n$

Important

- Precise Force Measurement
- Continuously monitoring
Force controlled infeed

• Set part dimensions

• Set a $F_{n\text{max}}$ in the Program

⇒ The machine grinds with a closed loop controlled constant force (e.g. adapts the infeed speed)

A maximal force can be set in the HMI as a safety feature
Example control data

**Without force control**

- Initial run, showing **normal forces** of an 8-sided insert
  → starting point for manually optimizing the process

**With force controlled infeed**

- **target** normal force of 100N is set
  → algorithm immediately adapts the Infeed speed
Comparison Video Fixed vs. adaptive feed
Tests

Example: CBN, 60s cycle time

- Already optimized program, with small material removal
  - force controlled infeed showed same result as manually optimised

Example: Carbide, 119s $\rightarrow$ 96s

- Program not optimized, insert requires high material removal
  - Set-up much faster
  - Higher infeed-speeds were realized
Force controlled infeed

Benefits

• Easy to find ideal process settings

• Easy to implement in existing programs

• Easy to detect wheel dullness

Especially useful for PCD

• Adapt to PCD thickness variations (±15%)
For each Agathon Machine platform available

Independent of
- 4-axis
- 5-axis

Grinding Center
Further Options

**PowerGrind**
outstanding conditioning process for up to 60% higher productivity

**PeriGrind**
more flexibility of production capability. Extended possibilities with the periphery grinding rim

**AGP-Iso**
automatic programming of ISO indexable inserts for easy creation of grinding programs

**LiveStatus**
Display of the machine park status in real-time on any mobile device
Laser processing: Pre-machining of superhard materials
PCD Challenges

Growing use of lightweight materials,
- Aluminium, CFK, ...

Growing use of superhard cutting tools,
- PCD, pCBN, Ceramics, ...

But PCD Tool manufacturing is still...
- demanding
- work- and time consuming
- expensive
Removal rates of each process

<table>
<thead>
<tr>
<th>Process</th>
<th>Carbide</th>
<th>PCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grinding</td>
<td>800</td>
<td>0.10</td>
</tr>
<tr>
<td>Laser</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

Every material has the optimal process.

Faster w. grinding

Faster w. Laser
The Solution: Neo for Laser Roughing

• Small footprint
• Manual loading

• Industrial Laser source
• 3 optical axis
• 3 mechanical axis

→ Working area 50x50x50 mm
    2 x 2 x 2 in
Kinematic possibilities

1 linear axis

Z: -50mm ... +20mm

2 rotating axis

225° A-Axis; 360° B-axis

A: -45° ... + 180°
The Concept: Effective pre-machining

After brazing:
stock > 0.15 mm

after Neo:
stock 0.03 mm

after grinding:
± 0 mm

Carbide: 800 mm³/min
PCD: 0.1 mm³/min

PCD: 10 mm³/min
Neo benefits

Faster processing
• Reduce large amount of stock with 100x faster process

Less consumables
• Reduced grinding work (start from near-to-net-shape)

Low operation cost
• Robust industrial laser source with long lifetime
• No wear parts

Low initial investment
• Small apparatus for small/medium batch sizes
• Intentionally designed for laser process
Comparison Video Grinding – Laserroughing/Grinding
Meet us at the IMTEX 2019
HALL NO. 4 at BOOTH NO. A106
with FRANCIS KLEIN & CO. PVT. LTD.

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