Introduction into OTEC PULSFINISH

Improvement of the manufacturing of camshafts components
AGENDA

1. Possible task
2. Machine in use
3. Status Quo
4. Possible improvement
   4. 1. Alternative 1
   4. 2. Alternative 2
   4. 3. Alternative 3
   4. 4. Alternative 4
   4. 5. Alternative 5
5. Possible potentials (saving in process)
1. Possible task

- Smoothing of the contact area (radius of the cam)
- Smoothing of the cam
- Smoothing of the spiral groove
- Deburring/edge honing of the spiral groove
- Deburring/edge honing of the toothed camshaft
2. Machine in use

- Streamfinishmachine with pulse drive which is prepared for a fully automatic operation to integrate into the line production

  Video SF 3/105 with pulse drive

- Possibility of deburring, edge honing, grinding, smoothing, polishing
3. Status Quo

Overview of the current production process

- Turning/Milling
- Deburring
- Hardening
- Cleaning of the internal gear
- Hardening
- Grinding
- Finishing
- Bandfinishing
4. Possible improvement
4.1. Alternative 1

The two working station finishing and bandfinishing can be replaced with one OTEC PULSFINISH working station.

Diagram:

- Turning/Milling → Deburring → Hardening → Cleaning of the internal gear
- Hardening → Grinding → Finishing → Bandfinishing

OTECPULSFINISH for polishing and finishing
Definition of measuring points

Measuring point 1

Measuring point 2
Analysis of Alternative 1

Required task:
The surface on measuring point 1 and measuring point 2 need to have Rz-Wert < 1,0 µm
4. Possible improvement

4.2. Alternative 2

The three working station grinding, finishing and bandfinishing can be replaced with one OTEC PULSFINISH working station.
4. Possible improvement

4.3. Alternative 3

The three working station deburring, finishing und bandfinishing can be replaced with two OTEC PULSFINISH working station.
4. Possible improvement

4.4. Alternative 4

The four working station deburring, grinding, finishing and bandfinishing can be replace with two OTEC PULSFINISH working station.
4. Possible improvement

4.5. Alternative 5

The four working station deburring, grinding, finishing and bandfinishing can be replace with one OTEC PULSFINISH working station.

**Diagram:**
- **Turning/Milling** → **Deburring** → **Hardening** → **Cleaning of the internal gear**
- **Hardening** → **Grinding** → **Finishing** → **Bandfinishing**

**OTECE PULSFINISH**
for deburring, grinding, polishing and finishing
(1 station directly after turning/milling)
Definition of measuring points

Measuring point 4
Measuring point 3
Measuring point 2
Measuring point 1
Analysis of Alternative 5

- Work piece were deburred, grinded, and a rounding was created
- Smoothing of the work piece below Ra 0,1 µm

Optimizing of the Turning/ Milling process can result to achieve the requirements in a single-step process

### Roughness Ra

<table>
<thead>
<tr>
<th>Roughness Ra</th>
<th>Measuring Point 1</th>
<th>Measuring Point 2</th>
<th>Measuring Point 3</th>
<th>Measuring Point 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>before</td>
<td>0.341</td>
<td>0.427</td>
<td>0.336</td>
<td>0.388</td>
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<tr>
<td>BP1</td>
<td>0.0591</td>
<td>0.0538</td>
<td>0.0649</td>
<td>0.0608</td>
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<tr>
<td>BP2</td>
<td>0.0434</td>
<td>0.0568</td>
<td>0.0377</td>
<td>0.0708</td>
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<tr>
<td>BP3</td>
<td>0.0708</td>
<td>0.0497</td>
<td>0.0632</td>
<td>0.0902</td>
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<tr>
<td>BP4</td>
<td>0.085</td>
<td>0.0585</td>
<td>0.0828</td>
<td>0.0728</td>
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</tbody>
</table>
5. Possible potentials (saving in process):

<table>
<thead>
<tr>
<th>Potential</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Alternative 3</th>
<th>Alternative 4</th>
<th>Alternative 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Replacement of finishing and bandfinishing</td>
<td>Replacement of grinding, finishing and bandfinishing</td>
<td>Replacement of deburring, finishing and bandfinishing</td>
<td>Replacement of deburring, grinding, finishing and bandfinishing</td>
<td>Replacement of deburring, grinding, finishing and bandfinishing</td>
</tr>
<tr>
<td>Quantity of working station</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Achievable</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
Thank you for your attention!