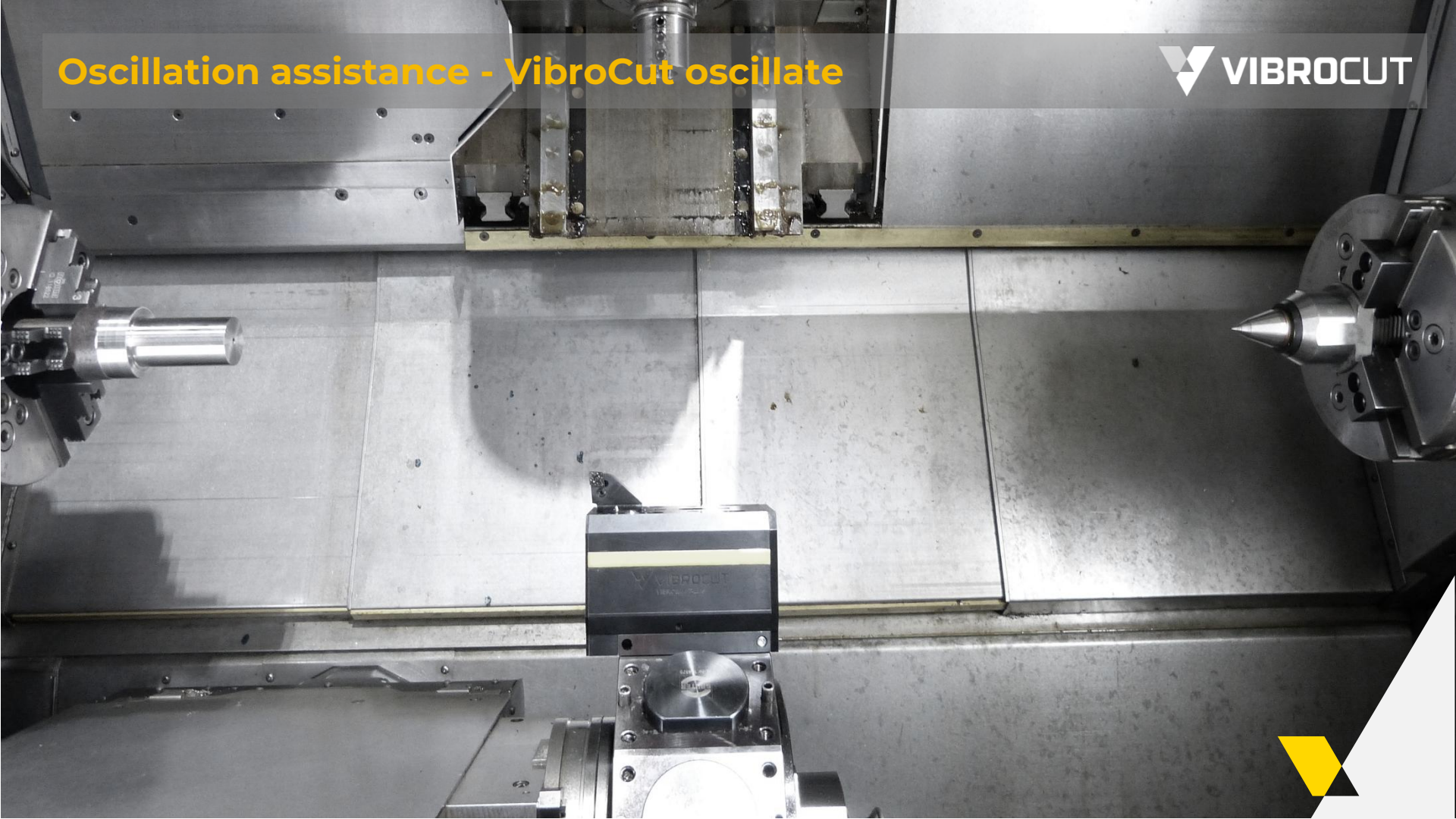
Oscillation assistance - VibroCut oscillate



Oscillation-assisted turning - VibroCut *oscillate*

Classification of the technology

Manufacturing process:

- Turning (longitudinal / facing turning, grooving / parting off, internal / external turning, etc.)

Mode:

- 1-dimensional (longitudinal)

Oscillation frequency:

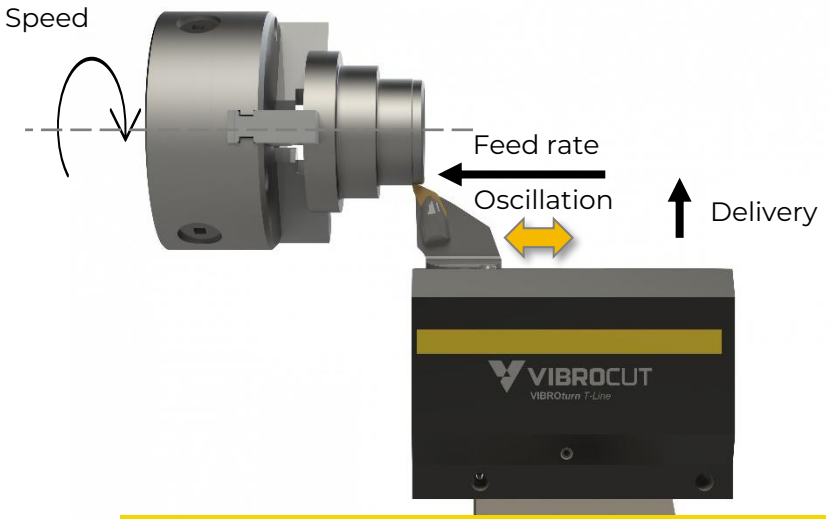
- Low frequency 1...100 Hz

Oscillation generation:

- Non-resonant

Orientation to process kinematics:

- In feed direction



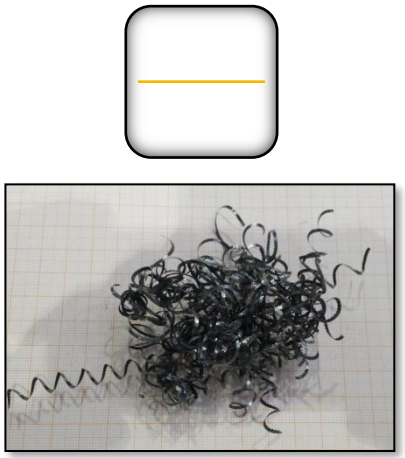
Objective: Realization of an economical and robust chip breaking behavior

Process reliability

Productivity

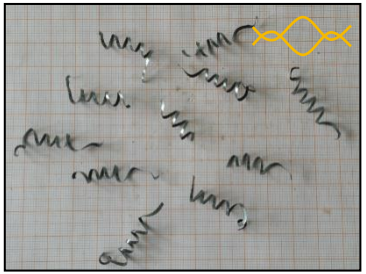
Oscillation-assisted turning - VibroCut *oscillate*

Chip breaking behavior as a function of the oscillation parameters

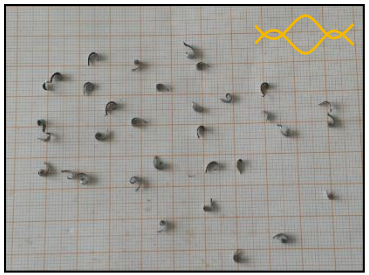


- Material C55
- v_c = 190 m/min
- a_p = 0,5 mm
- f = 0,1 mm

With cut interruption



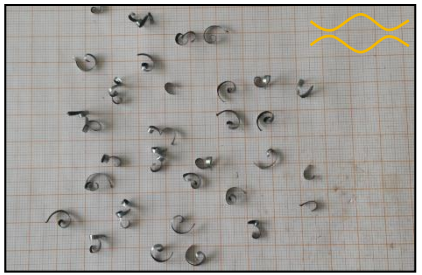
$\hat{A}$ = 0,11 mm | f_{vib} = 13 Hz



$\hat{A}$ = 0,11 mm | f_{vib} = 65 Hz

Without cutting interruption

$\hat{A}$ = 0,08 mm | f_{vib} = 13 Hz



$\hat{A}$ = 0,08 mm | f_{vib} = 65 Hz

Â...Oszillation stroke
f_{vib}...Oszillation frequency

Oscillation-assisted turning - VibroCut *oscillate*

USP of oscillation technology

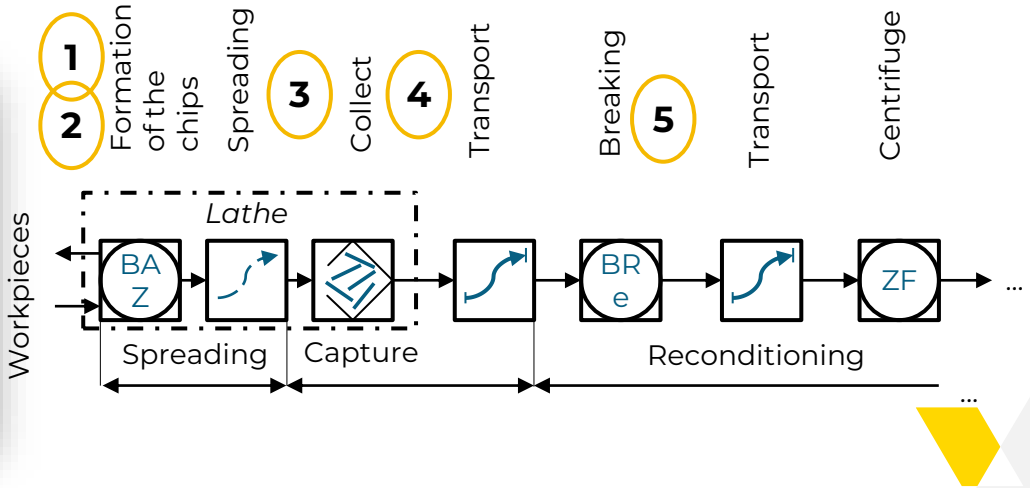
- Short chips in any material
- Safe chip breaking
  - for all:
    - Cutting values
    - Tool geometries
  - and independent of:
    - Material batch fluctuations
    - Tool wear
- Adjustable chip length with oscillation parameters

➢ **Robust and safe chip breaking!**

Oscillation-assisted turning - VibroCut *oscillate*

Problem definition: In the chip flow - from machining to disposal

1. **Formation of long single chips and tangled chips**
   Poor chip breaking reduces process reliability!
2. **Formation of chip nests**
   Chip nests increase the risk of collision!
3. **Discharge by chip conveyor is hindered**
   Process stop for manual removal of chips!
4. **Low bulk density in the chip container**
   Frequent changing and transport of containers!
5. **Poor output rates during crushing**
   Inefficient chip processing!



Oscillation-assisted turning - VibroCut *oscillate*

Product line - VibroCut *oscillate*

Innovative, retrofittable tool holders:

- Driven with live tool of the turret
- Rigid bearing of the tool holder
- Highest oscillation parameters

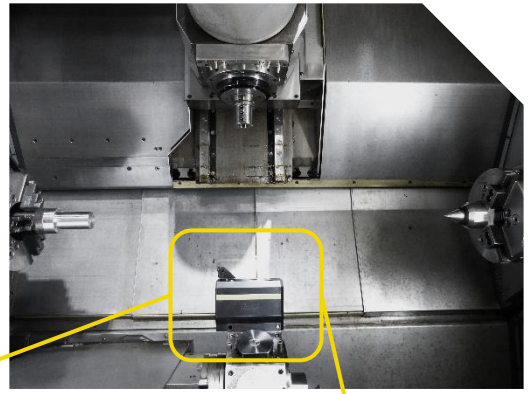
Performance parameters:

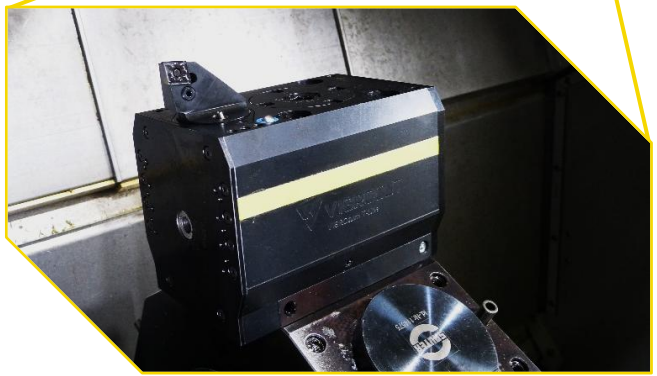
Frequency:	f_{vib} = 1...100 Hz
Stroke (adjustable):	Â = 0...0.6 mm
Process forces:	$f_{c,max}$ = 9 kN

Unique position:

- Unique performance
- Gentle on the machine compared to control cycles
- Reliable and adjustable chip breaking
- Control-independent

➢ Flexible retrofitting independent of the machine manufacturer!



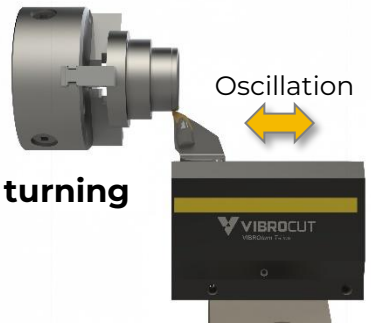


Oscillating system for turret axle

Oscillation-assisted turning - VibroCut *oscillate*

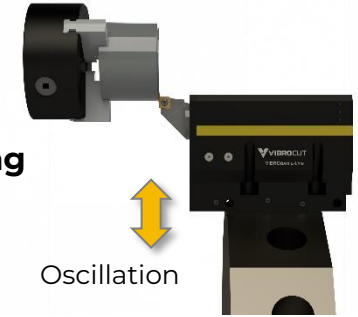
VibroCut *oscillate - Process variants*

External longitudinal turning

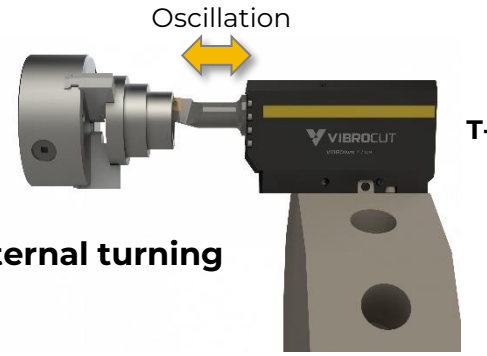


T-Line

Face turning

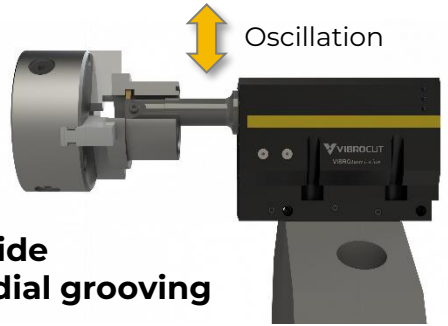


L-Line



Internal turning

T-Line



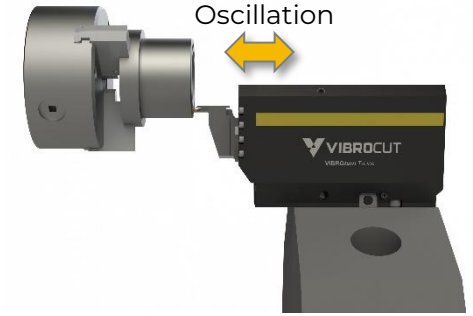
Inside Radial grooving

L-Line

Oscillation-assisted turning - VibroCut *oscillate*

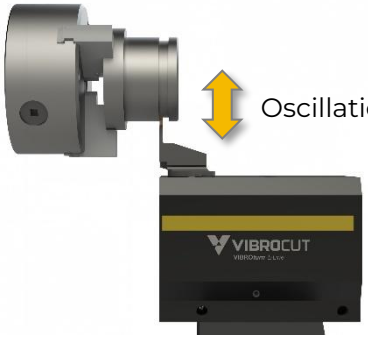
VibroCut *oscillate - Process variants*

Axial grooving

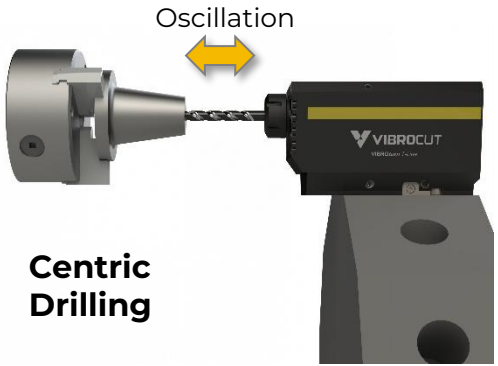


T-Line

Radial grooving



L-Line



Centric Drilling

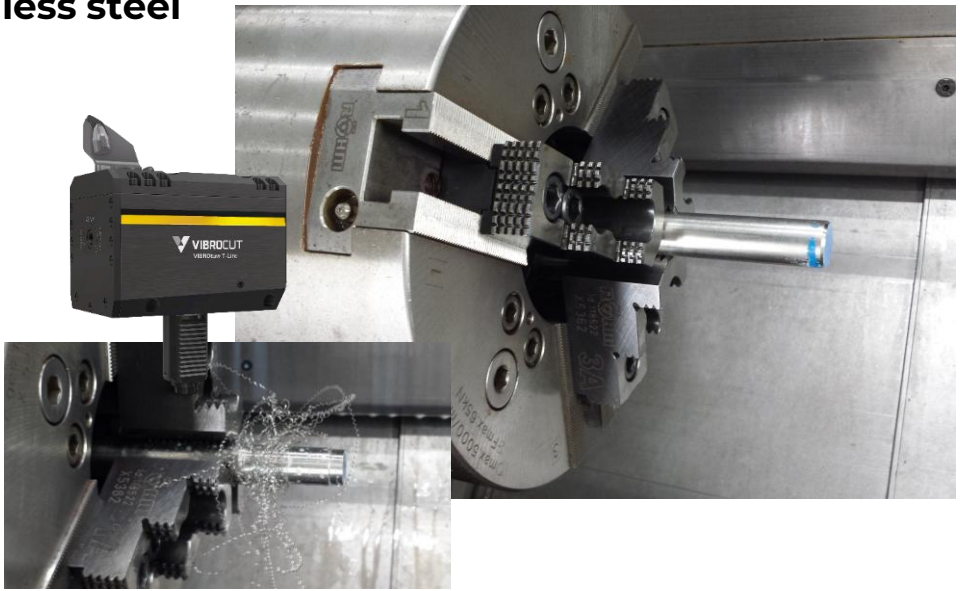
T-Line

Oscillation-assisted turning

Application for longitudinal turning of stainless steel (valves, surgical components etc.)

- Material: Stainless steel 1.4307 (X2CrNi18-9)
- Tool: VBMT 160404-MM 2015
- Cutting values: a_p = 0.2 mm; f = 0.08 mm; v_c = 200 m/min
- Oscillation parameters: f_{OS} = 27 Hz; Â = 0.115 mm

➢ **Problem:** long tangled chips, scratched surfaces and component rejects



Customer benefits

✓ Short chips

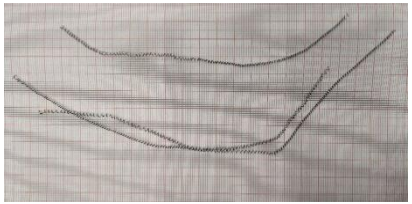
✓ No scratched surfaces

Improved process reliability

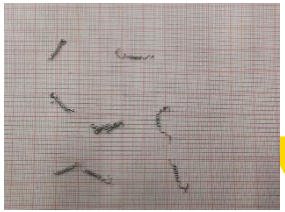
No component rejects

Automation possible

Conventional turning



VibroCut ***oscillate***



Oscillation-assisted turning

Application for internal turning of nickel-based alloys (engine components, boring bars etc.)

- Material: Inconel 718
- Tool: DNMG 150608-MR 4315
- Cutting values: a_p = 0.2 mm; f = 0.15 mm; v_c = 30 m/min
- Oscillation parameters: f_{OS} = 7...15 Hz; Â = 0.19 mm

➢ **Problem:** long tangled chips

Customer benefits

✓ Short chips

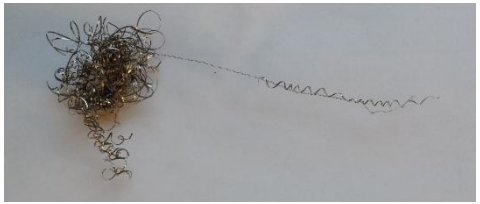
✓ No chip jamming on boring bar

Improved process reliability

No machine downtimes due to machine downtimes

Automation possible

Conventional turning



VibroCut ***oscillate***

Oscillation-assisted turning

Application for longitudinal turning of plastics (distance parts, sockets etc.)

- Material: PP (schwarz)
- Tool: VCGT 160408FN-ALU
- Cutting values: a_p= 1 mm; f = 0,3 mm; n = 2.000 m/min
- Oscillation parameters: f_{OS}= 50 Hz; Â = 0,45 mm

➢ **Problem:** long tangled chips, no automation possible

Customer benefits

✓ Short chips

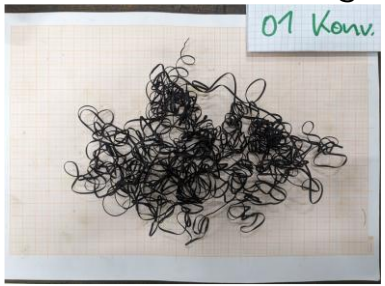
✓ No process problems due to chips

Improved process reliability

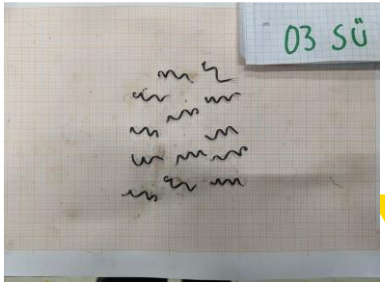
No machine downtimes due to machine downtimes

Automation possible

Conventional turning



VibroCut ***oscillate***



Oscillation-assisted turning - VibroCut *oscillate*

VIBROCUT

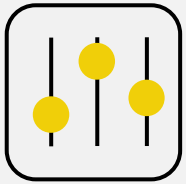
Benefits of VibroCut *oscillate*

Increase in machine availability

Improving process reliability

Enabling automation and unmanned operation

Improvement - chip handling and processing



Robust improvement of efficiency and cycle times

ROI < 1 year

ROI-calculator: https://vibrocut.de/en/cost-savings-with-vibroturn/

Oscillation-assisted turning - VibroCut *oscillate*

VIBROCUT

ROI < 1 year

- Increase productivity
- Increase TCO and OEE
- Greater process reliability
- Improvement of chip handling and processing
- Automation and unmanned operation
- Prevention of accidents at work

Calculation example for controlled chip breaking

Hourly machine rate: 45 €/h

Planned occupancy time: 6000 h/year
750 shifts/year

Machine downtimes due to chip breaking:
2 - 6 minutes / h

ROI < 1 year

Standstill due to Chip breaking	Productivity increase [per a]	Savings per machine
2 minutes / h	200h (3,3%)	**9,000 €**
4 minutes / h	400h (6,7%)	**18,000 €**
6 minutes / h	600h (10%)	**27,000 €**

https://vibrocut.de/en/cost-savings-with-vibroturn/

VibroCut – Hybdrid machining

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"VibroCut combines technique and technology for hybrid machining"