

January 20



TIMESAVERS INTERNATIONAL

**Specialized Sheet Metal Deburring and Finishing  
Technologies**

# SPECIALIZED REQUIREMENTS IN SHEETMETAL INDUSTRIES

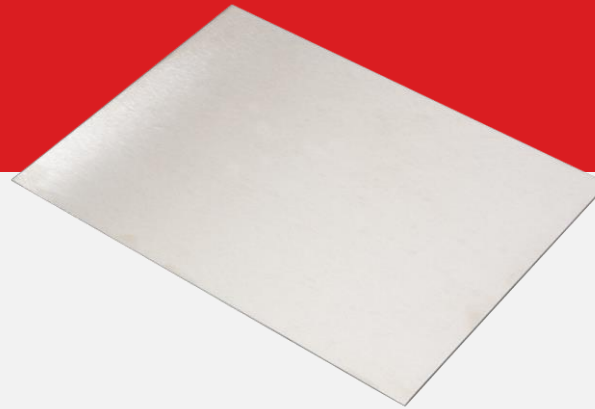
1

**DEBURRING,  
EDGE ROUNDING**



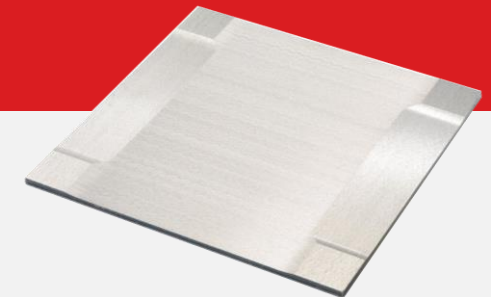
2

**STAINLESS STEEL  
FINISHING**



3

**PRECISION  
GRINDING**



# SPECIALIZED APPLICATIONS FOR SHEETMETAL

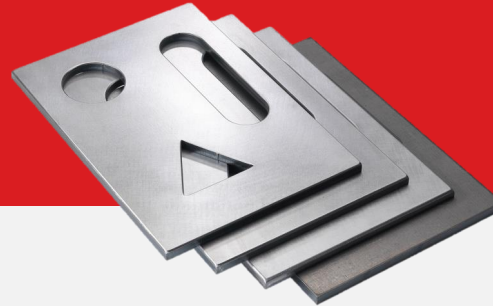
1

**DEBURRING**



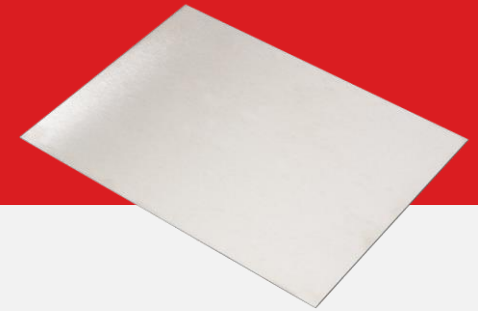
2

**EDGE ROUNDING**



3

**FINISHING**



4

**PRECISION GRINDING**

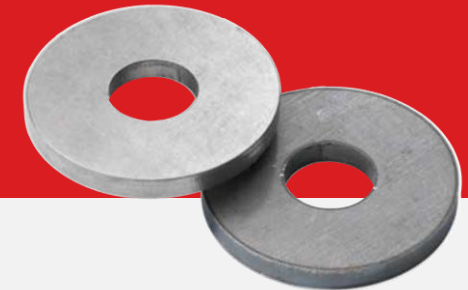


5

**SLAG REMOVAL**



**LASER OXIDE REMOVAL**

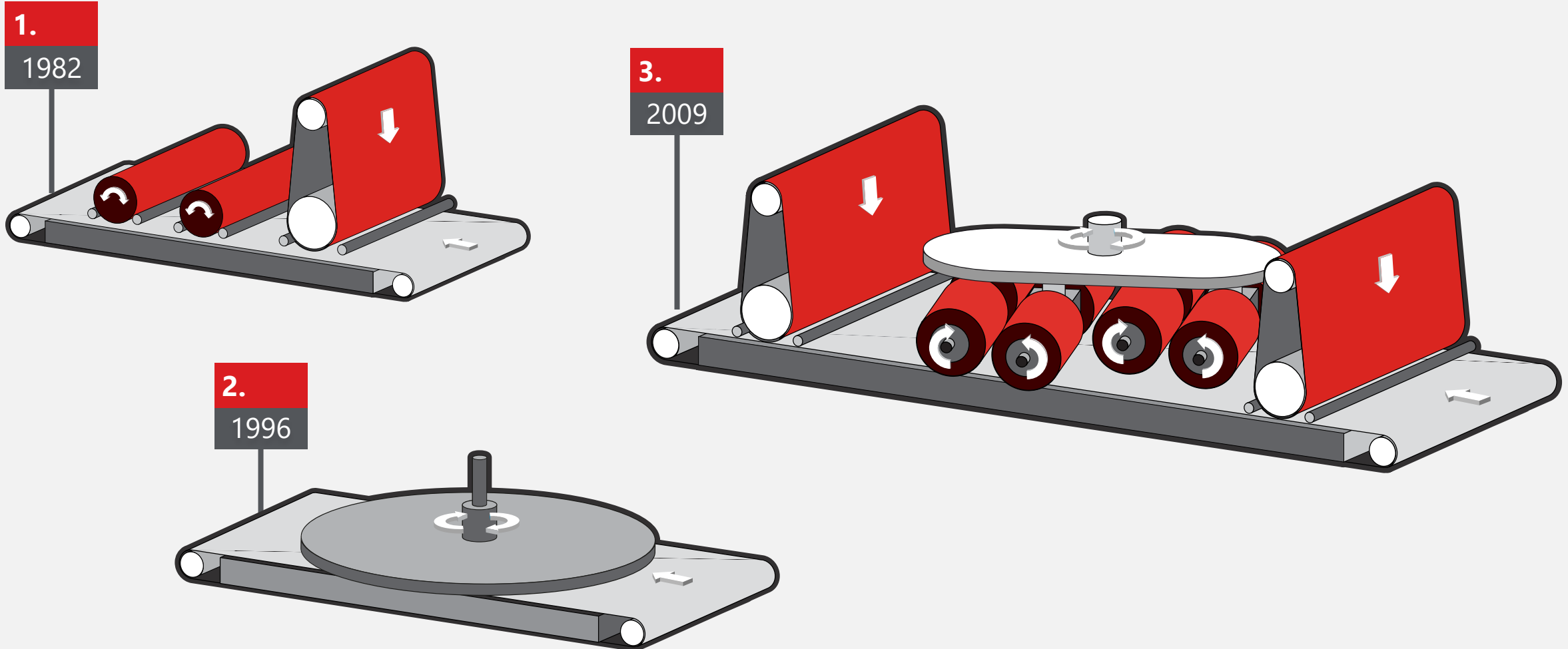


# TREATMENT OF WIDE VARIETY OF PARTS

DEBURRING, FINISHING AND HIGH-PRECISION GRINDING PROCESSES ARE TYPICALLY DONE FOR:

1 Stainless steel	5 Copper	9 Small parts	12 Cutted parts
2 Aluminium	6 Foiled parts	10 Big plates	13 Stamped parts
3 Steel	7 Zincor parts	11 Laser cut parts	14 Deep pocket parts
4 Titanium	8 Plasma cut parts	Graphite	Plastics

# DEVELOPMENTS IN DEBURRING AND EDGE ROUNDING



# FINISHING

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# DIFFERENT TYPE OF FINISHES



<ul style="list-style-type: none"> <li>▪ No 0</li> <li>▪ Hot rolled, tempered</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 1</li> <li>▪ Hot rolled, tempered, etched, passivated</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 2D</li> <li>▪ Cold rolled, tempered, etched, passivated, dull finish</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 2 B</li> <li>▪ Cold rolled with polished rolls, tempered, etched, passivated, glossy finish</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 3</li> <li>▪ Ground surface with grit 80-120</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 4</li> <li>▪ Ground surface with grit 150-320</li> </ul>
<ul style="list-style-type: none"> <li>▪ No 5</li> <li>▪ Ground with non-woven abrasive</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 6</li> <li>▪ Surfaces processed with grinding compounds</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 7</li> <li>▪ Ground with grit 280 and polished with compounds</li> </ul>	<ul style="list-style-type: none"> <li>▪ No 8</li> <li>▪ Ground with grit 320 and mirror finished</li> </ul>	<ul style="list-style-type: none"> <li>▪ Hairline finish</li> <li>▪ Ground with grit 180 followed by long scratch grit 180</li> </ul>	<ul style="list-style-type: none"> <li>▪ BA finish</li> <li>▪ Annealed in controlled atmosphere, mirror like finish with some imperfections</li> </ul>

# VARIOUS SOLUTIONS USED FOR FINISHING



1

- No 3 and No 4 Finish



2

- No 5 Finish



3

- No 6 and No 7 Finish



4

- No 8 Finish



5

- Hairline Finish





1

- Sheets or plates



2

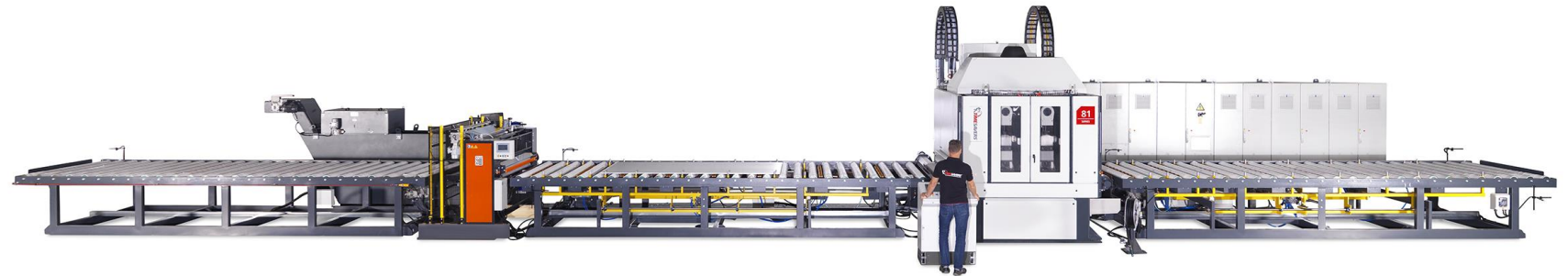
- Coils



# SHEET LINE



COMPLETE LINE  
WITH  
AUTOMATIC  
STACKING,  
GRINDING, PVC  
COATING AND  
DESTACKING



# COIL LINE



COMPLETE LINE  
WITH  
UNWINDING,  
LEVELING,  
GRINDING,  
WASHING, PVC  
COATING AND  
REWINDING



# From deburring to controlled edge conditioning



# EDGE FORMATION DUE TO VARIOUS TECHNOLOGIES

1

▪ Turret punch



2

▪ Guillotine shear



3

▪ Plasma cutting



4

▪ Water jet cutting



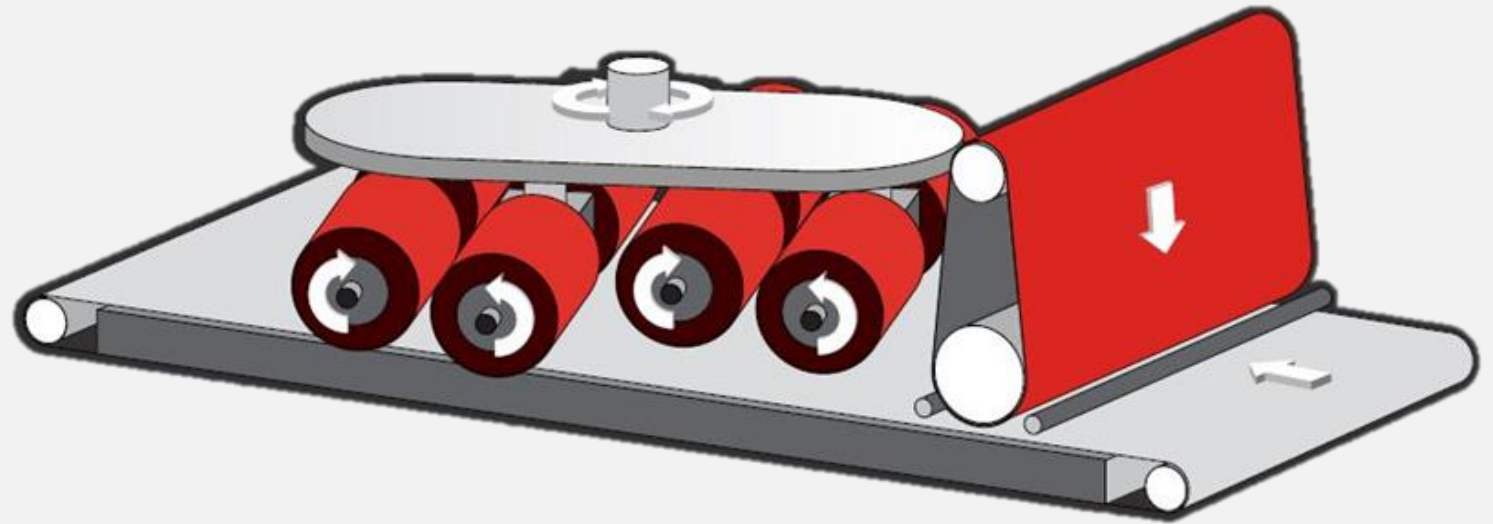
5

▪ Laser cutting machine



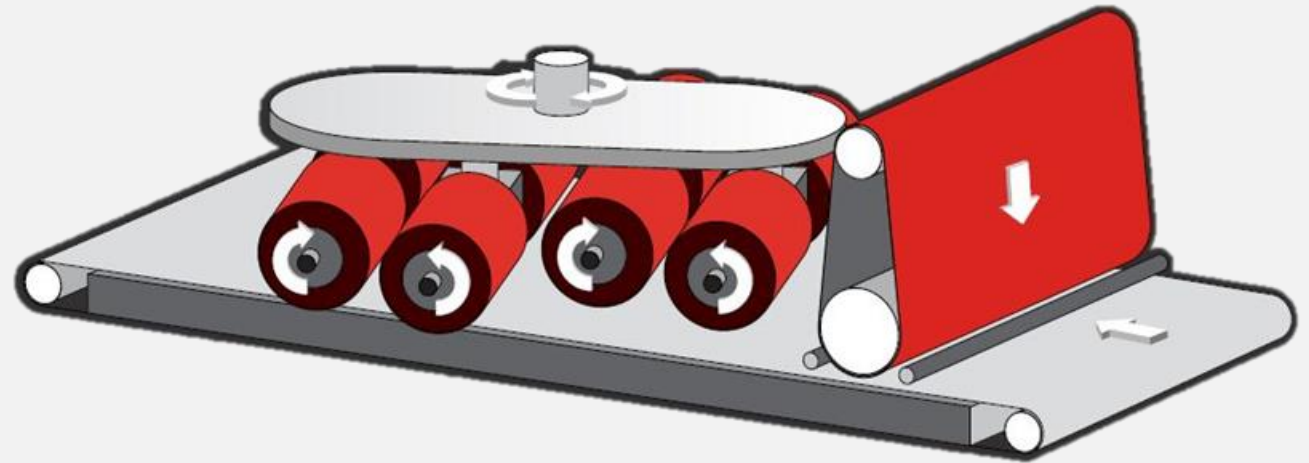
# EDGE DEBURRING

- Removes upstanding burr
- Homogenous radius around the part
- Make radius (up to 2 mm)
- Removes burr from pvc coated parts
- Removes burr from parts with protrusions



# OXIDE LAYER REMOVAL

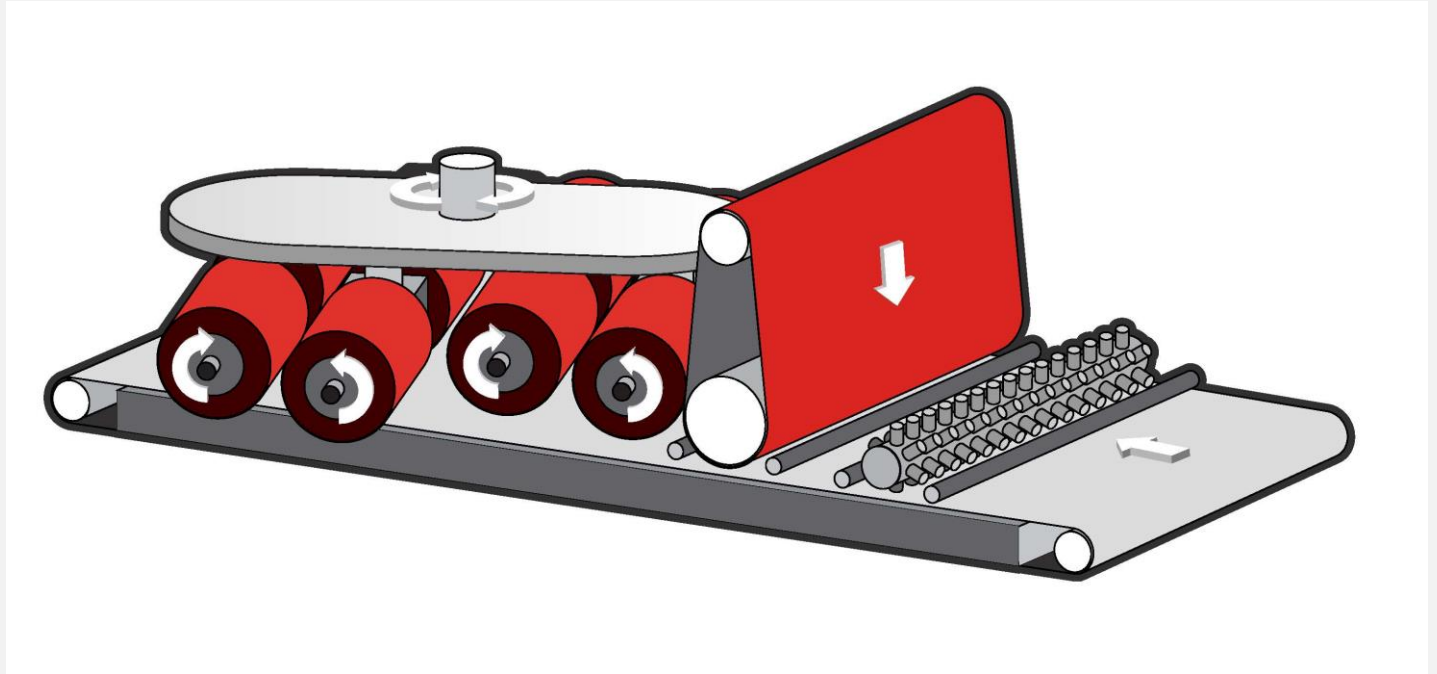
- Remove upstanding burr
- Homogenous radius around the part
- Remove oxide layer





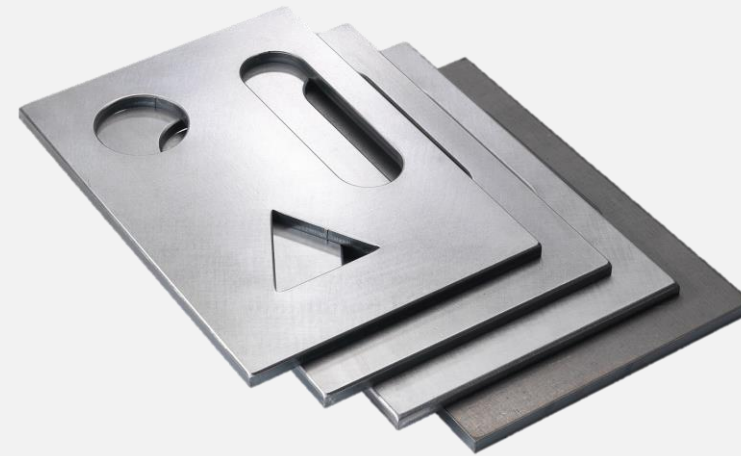
# HEAVY SLAG REMOVAL

- Removes heavy burr
- Homogenous radius around the part
- Make radius (up to 2 mm)





# VARIOUS DEBURRING SOLUTIONS - VIDEO



# TOOLINGS FOR DEBURRING

1

- Grinding belts



2

- Scotch brite brushes



3

- Disc pads



4

- Flap brushes



5

- Laser oxide removal brushes



6

- Hammer head



# CALIBRATING

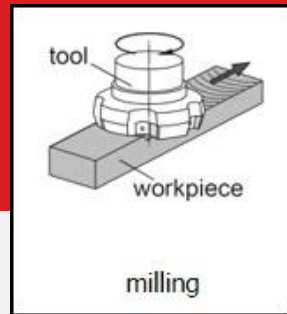
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# STOCK REMOVAL FROM PLANE SURFACE

1

- milling



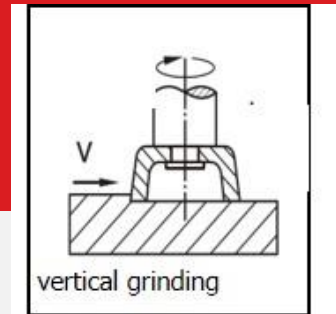
2

- grinding



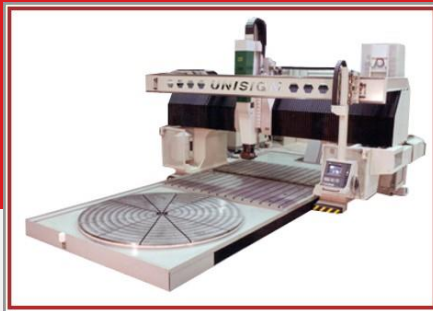
3

- Stone grinding



1

- milling



2

- grinding



3

- Stone grinding

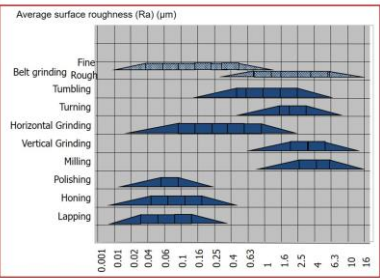


# COMPARE PROCESS PARAMETERS



1

▪ Surface quality



2

▪ Tolerances

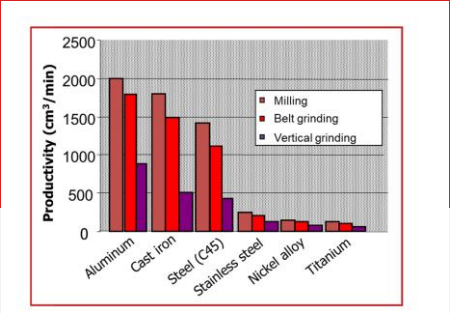
*Cross reference of tolerances for various production technologies*

	High stock removal		
	Wheel grinding	Belt grinding	Milling
Flatness (mm)	0,02	0,02	0,2 – 0,5
$t \pm 0,02$ Thickness (mm)	0,01	0,02	0,1
Parallelism (mm)	0,02	0,02	0,2 – 0,5

Sheet – 1000x800 (mm). According to DIN 876

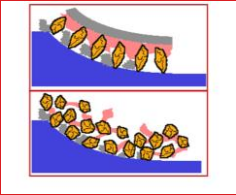
3

▪ Productivity



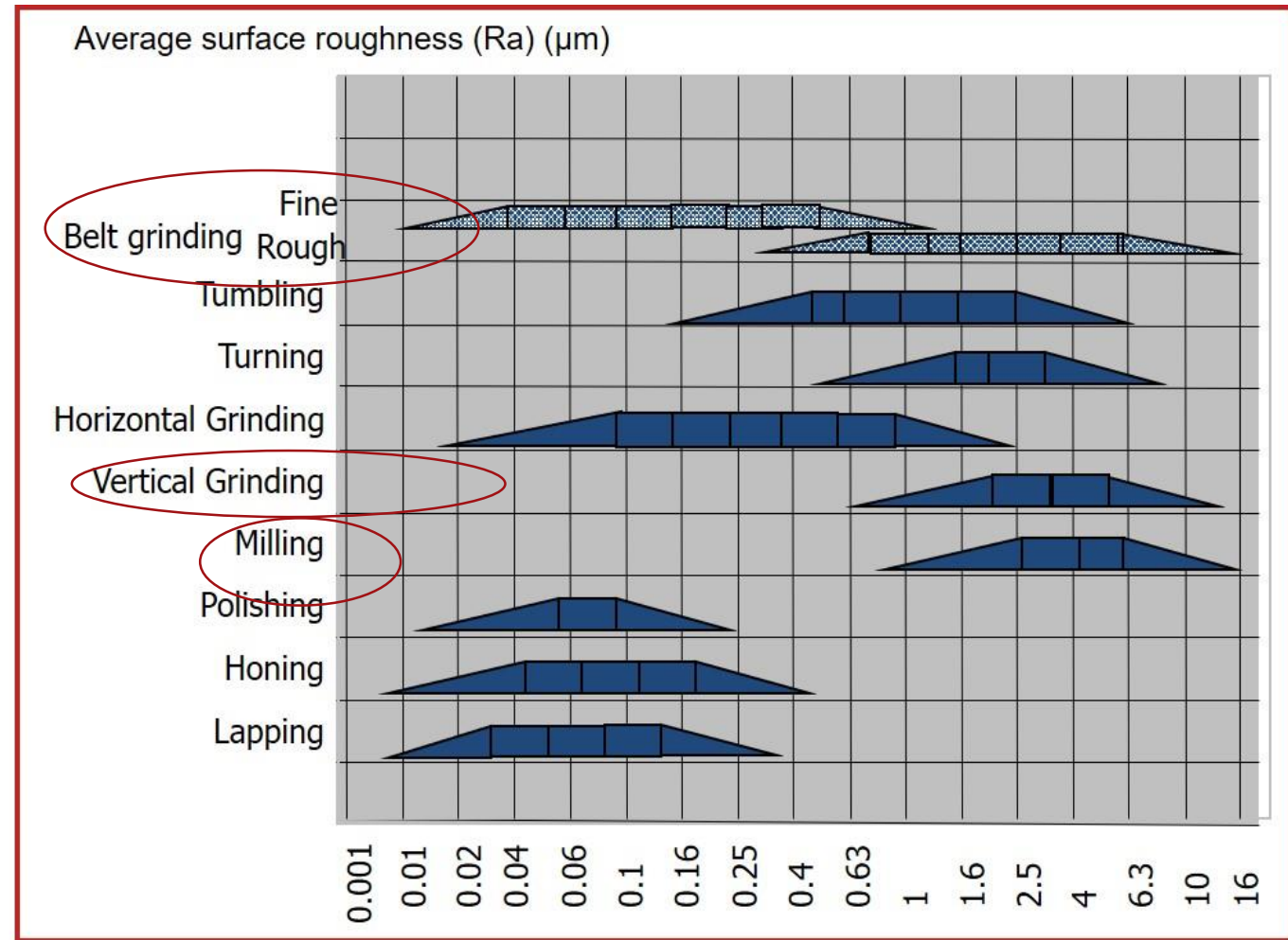
4

▪ Specific energy



# SURFACE QUALITY

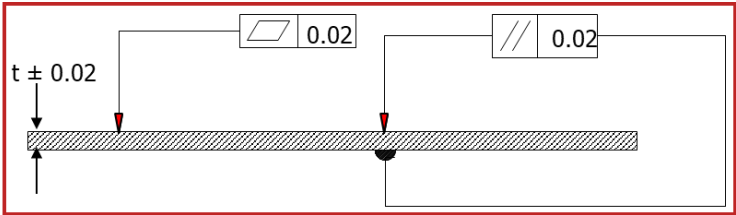
- Finish judged on following areas
  - Roughness
  - Visual
  - Metallurgical damage
  - Micro cracks
  - Residual stresses





# TOLERANCE



- Wheel grinding is the most accurate way of machining a flat surface, closely followed by belt grinding



*Cross reference of tolerances for various production technologies*

	High stock removal		
	Wheel grinding	Belt grinding	Milling
 Flatness (mm)	0,02	0.02	0,2 – 0,5
$t \pm 0.02$ Thickness (mm)	0,01	0,02	0,1
 Parallelism (mm)	0,02	0,02	0,2 – 0,5

Sheet – 1000x800 (mm), According to DIN 876



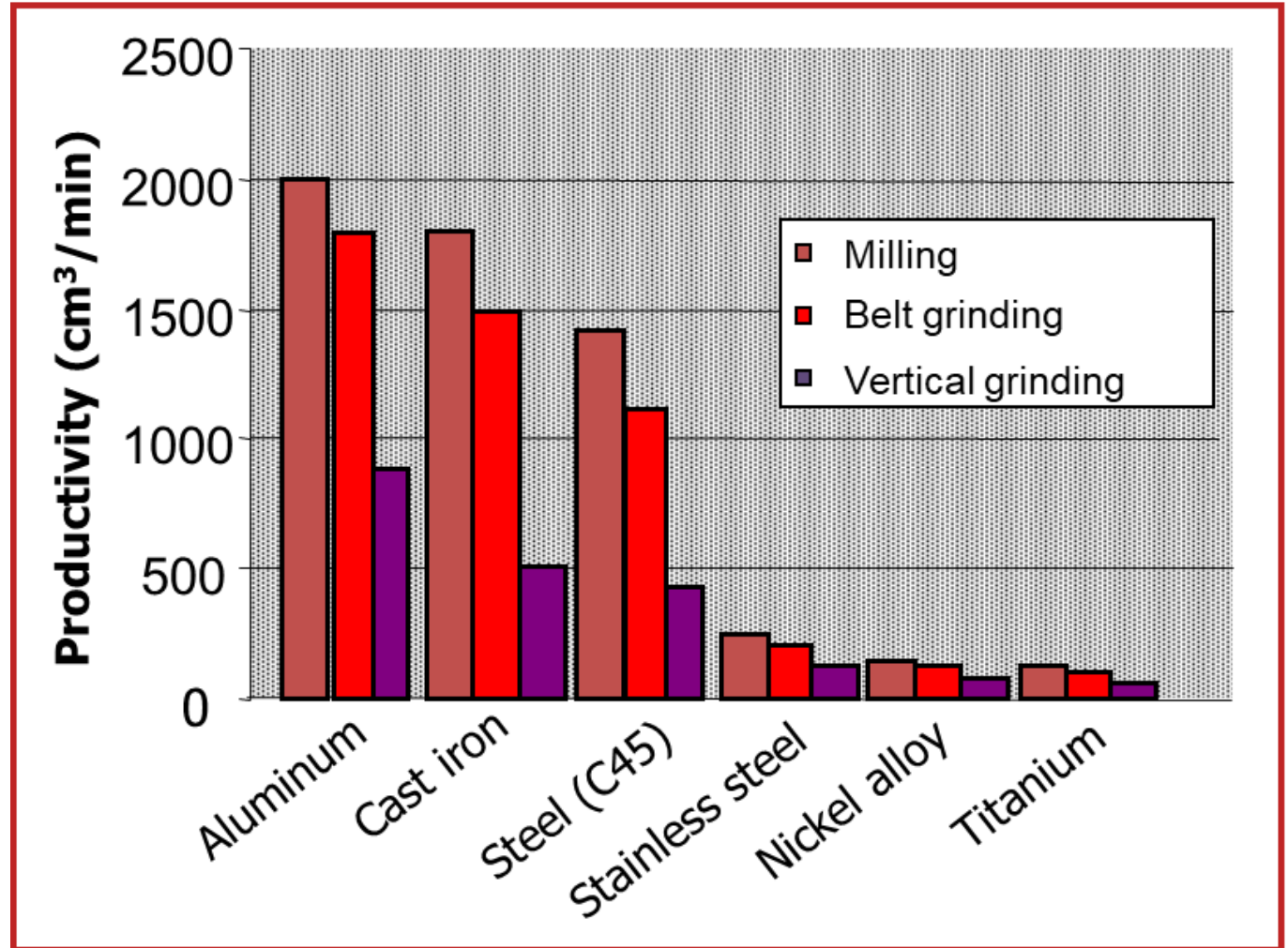
# PRODUCTIVITY

1. Mechanical properties

2. Physical properties

■ Machinability of:

1. **SS, Nickel- Titanium-alloys** limited by: Generation of heat
2. **Aluminium, cast iron** limited by: Clearance of the chips





# SPECIFIC ENERGY



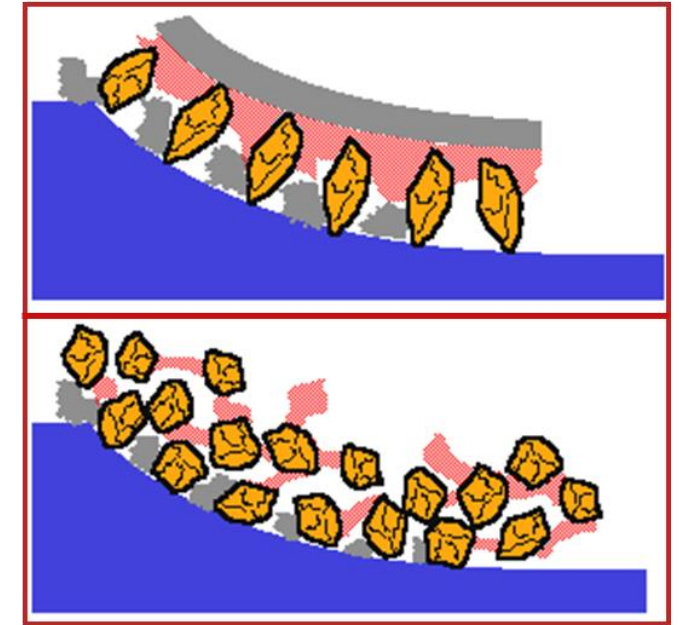
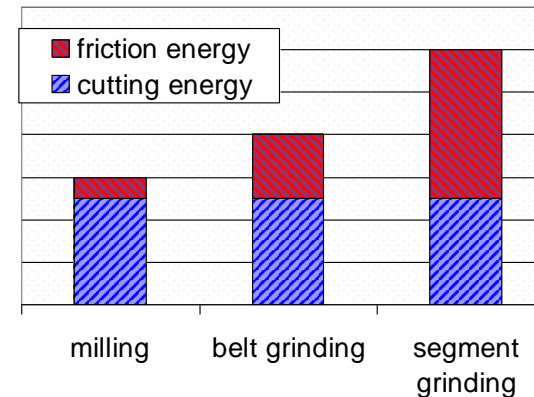
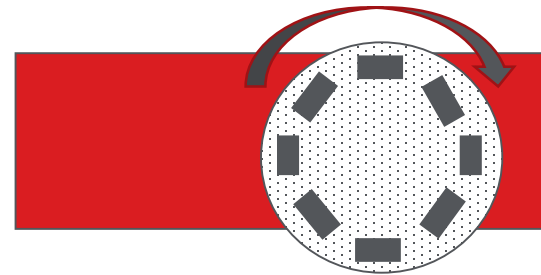
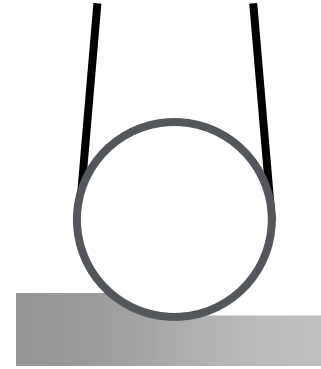
- Specific energy is of **major importance**
- Belt grinding is a **cool cutting process**

Cross reference of specific energy for various production technologies and materials ( $\cdot 10^{-07} \text{ kWh/mm}^3$ )

Yield strength (MPa)	Material	Wheel grinding (kWh/mm <sup>3</sup> )	Belt grinding (kWh/mm <sup>3</sup> )	Milling (kWh/mm <sup>3</sup> )
97	Aluminum	37,5	6,0	3,8
370	Cast iron	60,0	6,8	4,2
480	Steel (c45)	68,2	9,0	5,4
630	Stainless steel	214	43,3	30,0
690	Nickel alloy	375	77,4	53,5
750	Titanium	441	90,3	62,5

# LOWER ENERGY USE WITH COATED ABRASIVES

- **Chip chamber**
- On coated abrasives the **orientation** and **distribution** of the abrasives are controlled
- On grindingstones the **orientation** and **distribution** of the abrasives are random
- **When chip production volume > space between grains, then:**
- Chips get involved in cutting process
- Decrease of surface integrity
- Increase specific energy



# PROCES PARAMETERS



	Milling	Belt grinding	Wheel grinding
Surface quality	0	++	+
Tolerances	0	+	++
Productivity	++	+	0
Specific energy	++	++	0
Operating cost	++	+	+

# ADVANTAGE WIDE BELT GRINDING PROCESS



## **Advantage wide belt grinding process compared to vertical stone grinding :**

- Quick change from course grinding to fine grinding, belt change only takes 2 min.
- Lower tooling cost.
- Cheaper on wider machines.
- Higher productivity.
- Flexible with difficult materials, like titanium, molybdenum, zirconium, stainless steel, etc



# VIDEO OF PRECISION GRINDING SOLUTION



## TIMESAVERS DEVELOPS AND MANUFACTURES A WIDE RANGE OF DEBURRING-, FINISHING AND HIGH-PRECISION GRINDING MACHINES WITH:

### 80 YEARS

of experience in  
surfacing  
equipment  
to the wood &  
metal industries



Turnover of more  
as **60 MLN USD**

US head office in  
**MINNEAPOLIS**  
(U.S.A)

International  
head office in **GOES**  
(Netherlands)

### LOCATIONS:

**Minneapolis**  
USA

**Goes**  
The Netherlands

**Kruiningen**  
The Netherlands

**Taipei**  
Taiwan

**Shanghai**  
China

**WORLD WIDE**  
dealer network

MARKET  
**LEADER**



# WORLDWIDE EXHIBITIONS

Last slide, go back to the menu

