

Machining

The Delicate Art of Grinding Parts

Don Sears | May 28, 2019

Learn all about the process of grinding parts in metalworking in this must-see infographic.

Surface, centerless, cylindrical and creep-feed grinding are some of the most common types of finishing and smoothing used in today's metal parts making. But there are many factors that need to work together in harmony to achieve consistency and quality—especially for large-batch, high-volume metalworking.

One challenge that sometimes happens in grinding is waviness—which can be problematic. Peter Zelinski, executive editor of *Modern Machine Shop*, puts it this way in the article “Keep Calm and Continue Grinding,” where a technique called “contact-length filtering” developed by Saint-Gobain Abrasives, owner of the Norton brand of abrasive products, is highlighted:

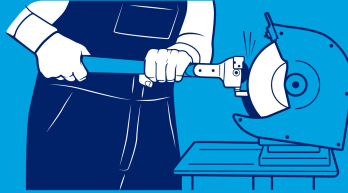
“In a production-grinding operation, waviness on the part surface is a potential clue that the machine or process has developed a vibration problem. The effect might be seen in inspection, or if there is a lapping or polishing step, the effect might be seen in the increased time spent removing the waves.”

Learn more about this technique, along with the factors for selecting a grinding wheel and other details surrounding grinding, including wheel dressing and coolant systems, in today's advanced manufacturing environments.

To learn more about grinding, see below the infographic.

The Delicate Art of Grinding Parts

Surface, centerless, cylindrical and creep-feed grinding are some of the most common types of finishing and smoothing used in today's metal parts making. But there are many factors that need to work harmoniously together to achieve consistency and quality—especially for large batch, high-volume metalworking. See the factors that matter most.



1 Machine and Tools in Harmony

Goal: Control the accuracy of wheel and workpiece for peak efficiency

Factors:

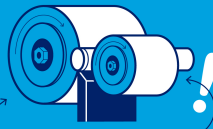
- Available power and speed
- Slide movement
- Mechanisms for truing and dressing
- Cooling system

2 Material and Product Shape in Harmony

Goal: Enable consistency to ensure quality parts

Factors:

- Thermal stability
- Abrasion resistance
- Microstructure
- Chemical resistance
- Shape
- Tolerance
- Surface finish



Look out for:

May need special wheel and dressing

Sharp edges or tight radius?

3 Which Wheel Should I Choose?

Goal: Select the right profile based on all factors

Factors:

- Proper grain type
- Size
- Distribution
- Properties
- Concentration

Major Factor: Wheel Bond

Grouped by:

- Type
- Hardness
- Stiffness
- Porosity
- Thermal conductivity



4 Predict and Optimize Grinding: Systems Process

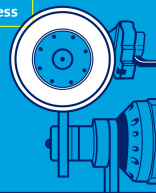
Goal: Accuracy in the process

Factors:

- Wheel balancing
- Fixturing
- Frequency of truing and dressing
- Coolant application

Best Method:

Systems process: Focus on a few specific factors and measure changes



5 Technique: Contact-Length Filtering

Problem

- Vibrations are blocking smooth surface finishes
- No time to fix underlying machine problem
- Have to avoid material burn and deflection

Solution

$$2 \times \text{Contact Length (lc)} \geq \text{Chatter Wavelength (}\lambda_{\text{chatter}}\text{)}$$

Contact-length filtering achieves a smooth surface when double the wheel-to-work contact length surpasses the wavelength of the chatter



Caveat: It won't work in every situation, so root cause has to be addressed

Spotlight on Tooling

Here are the top articles on the choice of tools and productivity on Better MRO:

How to Improve Your Machine Shop's Grinding Operation

IMTS 2018: Advanced Grinding Wheels in Aerospace

How to Master Your Surface Grinding Machining Operation

How to Maximize Machine Productivity: Chip Thinning

Video: How to Measure a Milling Machine for a DRO Unit

Milling Techniques to Improve Metal Removal Rate

8 Facts You May Not Know About ... Milling Titanium

Aerospace in Focus: Drilling and Milling CFRP Composites

IMTS 2018 VIDEO: Success—High-Feed Milling Cuts Machining Time by 78%

How to Maximize Throughput and Part Quality When Threading

Optimizing Tool Life: The Effect of Lead Angles on Turning Operations

What are your best practices in grinding? Share your experience in the forum [registration required].

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