OPTICS SURFACE GRINDING
OPTIMIZATION TIPS

DCM TECH
rotary surface grinders

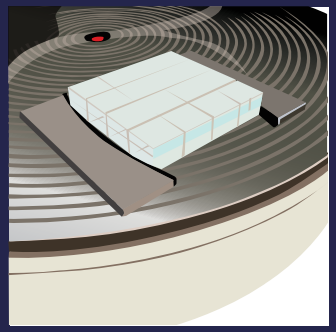
(800) 533-5339 | www.dcm-tech.com

THE USE OF SPACE & PROPER
FIXTURING

A simple way to increase your production time is to optimize the way materials are secured to your grinding machine. To get a start on this process, ask yourself the following questions:

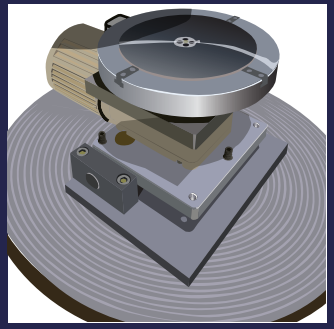
- Can I fit any more parts in the grinding area?
- Are the fixtures I am using causing any damage to my workpieces? If so, is there a better option that would be more reliable?
- What are the options for adding automation to your process?

FIXTURE EXAMPLES



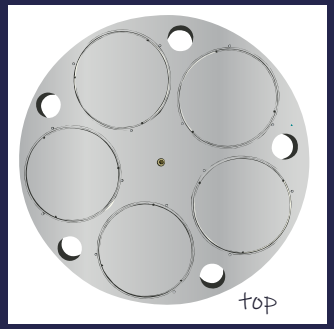
ELECTROMAGNETIC CHUCK

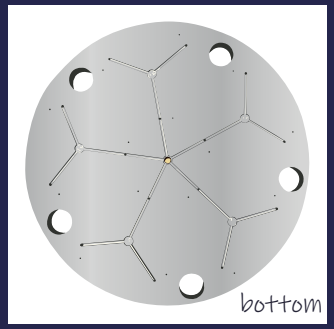
Magnetic blocking is often used to hold non-magnetic parts in place.



CUSTOM FIXTURES

Fixtures built for a specific part or purpose such as tilting the part on the table.

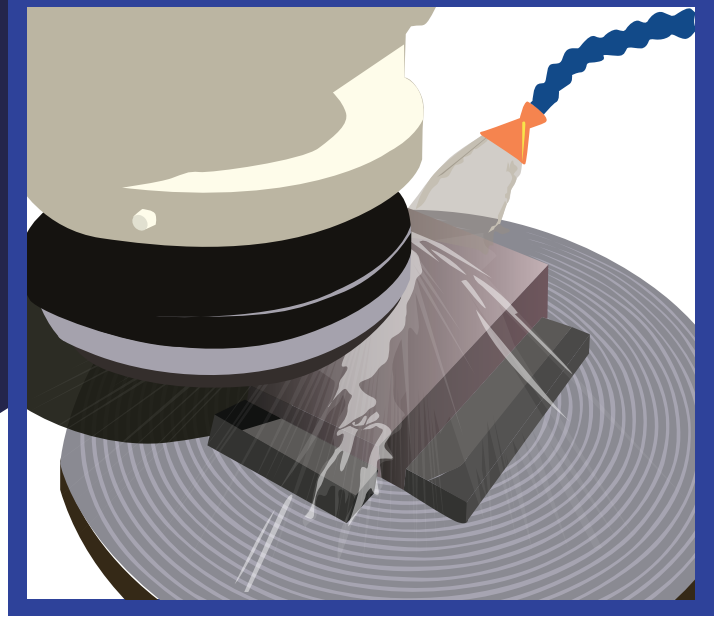




VACUUM FIXTURES

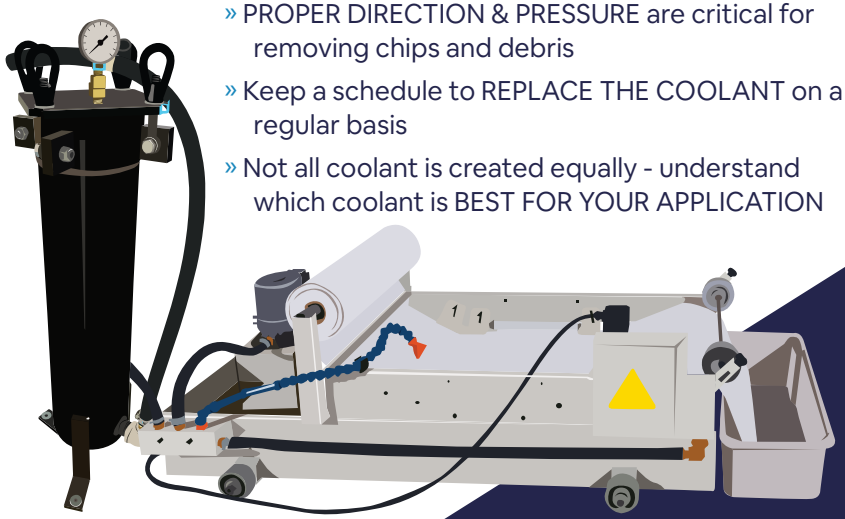
Some fixtures hold the workpiece in place using a ported magnetic fixture connected to a vacuum port in the table.

KEEP IN MIND YOUR COOLANT



Although abrasives tend to take center stage when it comes to grinding process optimization, coolant is another extremely important factor in obtaining consistent results. When it comes to your specific process, remember:

- KEEP YOUR COOLANT CLEAN and filtered to aid in producing consistent grinding results.
- PROPER DIRECTION & PRESSURE are critical for removing chips and debris
- Keep a schedule to REPLACE THE COOLANT on a regular basis
- Not all coolant is created equally - understand which coolant is BEST FOR YOUR APPLICATION



TAKE CARE OF YOUR EQUIPMENT

None of this matters without proper machine care and scheduled maintenance.

CHOOSING THE PROPER ABRASIVES

Abrasive selection is process-driven. Factors such as the shape of the part and desired finish will affect the choice you make. When choosing your abrasive, you must first think about the desired result, and then use the following characteristics of abrasives to start the selection process.

1 GRIT

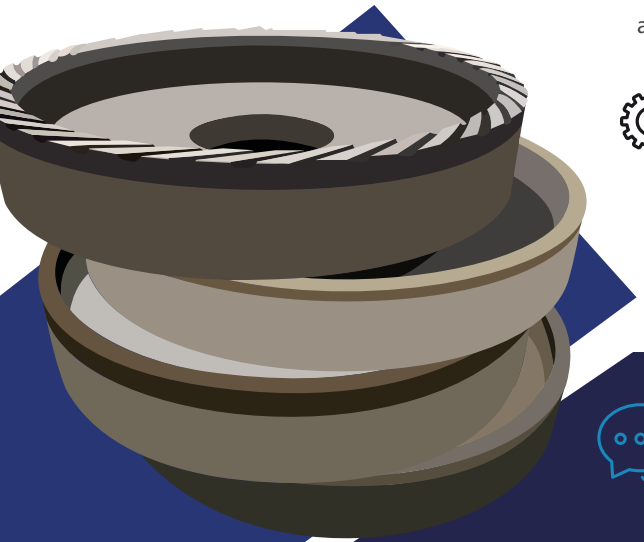
Grit refers to the size of the abrasive grains embedded into the wheel's bond. The material removal rate and surface finish are determined by the grit size of an abrasive.

COARSE

- The lower the grit, the larger the abrasive grain
- Fast removal of larger amounts of material
- Often used on thick glass/ceramic

FINE

- The higher the grit, the smaller the abrasive grain
- Smooth surface finish
- Reduced edge chipping and subsurface damage
- Can help minimize the need for additional finishing processes



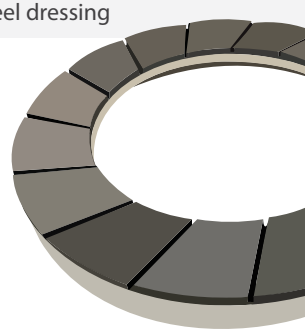
2 BOND

The bond of an abrasive refers to the material that holds the abrasive pieces in place. Metal and resin bond abrasives are the most popular among the glass industry for the following reasons:

- Resin bonds wear quicker but also produce a smooth and consistent finish that is suitable for many glass/ceramic grinding processes.
  - High grinding efficiency
  - Low grinding temperature
  - Reduced abrasive loading
  - Excessive heat may increase wheel breakdown
- Metal bonds have exceptional wear resistance and grit retention, this makes them well suited for glass/ceramic stock removal applications
  - Long service life
  - Withstands large loads
  - Good shape retention
  - Loads easily & may require extra wheel dressing

3 CONCENTRATION

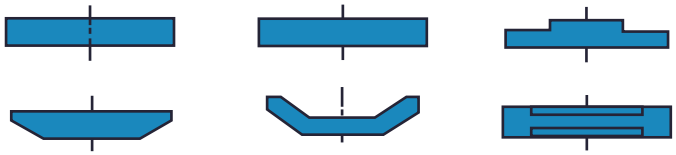
The concentration refers to the quantity of superabrasive grains per unit volume in the working layer of the wheel. The concentration directly affects grinding efficiency, consistency, and quality.



- Lower concentrations: Offer high precision & surface quality
- Higher concentrations: Best for heavy stock removal & fast production
- This attribute is often adjusted for processes with special requirements

4 SHAPE

Grinding wheels come in all shapes and sizes and each wheel has a different purpose. Some are wider to grind more surface area, while others have flutes cut into the abrasive to help with chip removal and coolant flow. Working with the abrasive supplier on wheel recommendations is the best way to start defining the shape of the wheel you need for your specific application.



DO YOUR RESEARCH

Abrasives are constantly changing and improving. It is important to stay up to date on new abrasive technology

REMEMBER

A good place to start is based on the recommendations of the machine and abrasive manufacturers.

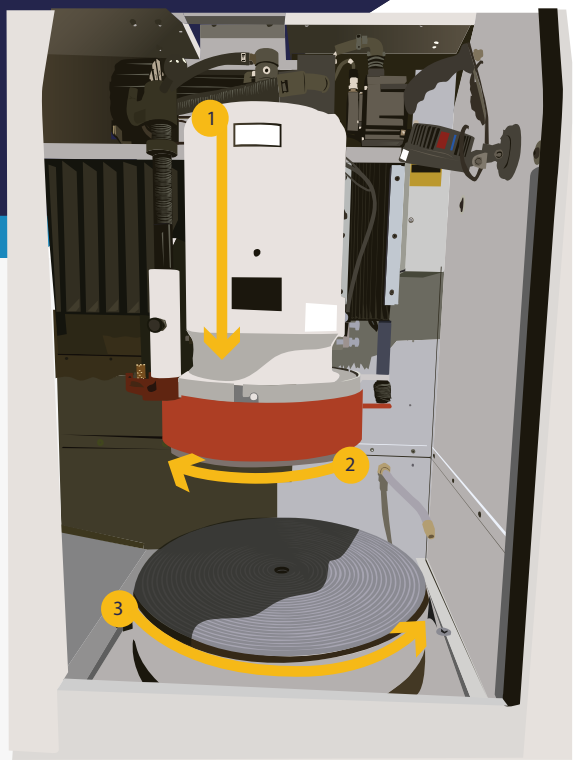
Make any changes one at a time and measure the results. This is the best way to identify the effects of each change you make.

Many customers benefit from an abrasive made specifically for their application. Your optimization does not have to stop with a wheel off the shelf.

UNDERSTANDING MACHINE
FEEDS & SPEEDS

Grinding can be a rough production process. Identifying the proper parameters for your application can prevent losses in productivity and scrapped materials.

The parameters identified here should be considered to fully understand your grinding operations.



1 FEED RATE

The feed rate for a vertical spindle rotary surface grinder controls how fast the spindle moves down into the part.

Higher feed rates remove material quickly and are typically used in the roughing process of a workpiece.

Lower feeds help reduce edge chipping and subsurface damage as less is being taken off per revolution, therefore applying less force to the part.

2 SPINDLE SPEED

The appropriate grinding spindle speed is first based on the proper working speed of the abrasive being used. Changing the speed of the spindle adjusts how fast the abrasive moves over the part and has a large affect the surface finish on the part.

SPEED TOO LOW
- » Rough surface finish
- » Excess abrasive wear
- » Abrasive loading

JUST RIGHT

Start by using the manufacturer's wheel speed guidelines & make small adjustments to optimize your speeds based on your surface finish requirements

SPEED TOO HIGH
- » Abrasive failure
- » Temperature increases
- » Workpiece damage

3 TABLE SPEED & DIRECTION

Both the speed of the rotary table and it's direction are variables that can be adjusted to optimize the results of a grind.

For example, in testing hard but delicate material such as silicon carbide, DCM's engineering team found turning the table in the same direction as the spindle creates less pressure on the workpiece resulting in less workpiece damage and a smoother finish.

4 WHY OPTIMIZE?

There is no grind recipe that will work for every application or part. However, taking the time to optimize your specific process can:

- » ELIMINATE SUBSEQUENT LAPPING OR POLISHING PROCESSES
- » ADD EFFICIENCY TO YOUR PRODUCTION
- » PRODUCE RELIABLE RESULTS

ASSESS THE FEATURES OF YOUR MACHINE

It is important to understand the capabilities of your machine. Pay attention to features such as:

MACHINE RIGIDITY

HORSEPOWER

GRINDING RESOLUTION

AUTOMATION