



Expert guide to effective resharpening of drill bits

Introduction to effective drill bit resharpening

The buttons on drill bits are made of an extremely hard and wear-resistant material called cemented carbide, which enables them to withstand the immense loads and stresses caused by drilling through hard and abrasive rock formations.

However, after a number of drilled meters the bit buttons become worn, their profiles become flat and the overall bit diameter decreases. This has a highly negative impact on drilling performance parameters like penetration rate, service life and cost per meter.

To maintain performance, you need to either replace the worn drill bit with a new one or sharpen the buttons, so they regain their original profile. Normally, a drill bit can be resharpened multiple times, which makes regular resharpening the best alternative in terms of cost reduction, drilling performance, resource effectiveness and overall sustainability.

In addition to our world-leading drill bits, we at Sandvik provide a range of modern, innovative machines and tools designed for safe and efficient drill bit resharpening. Thanks to our long experience in the field, we can also provide our customers with resharpening services performed by the industry's foremost resharpening expertise.

In this handbook we'll share some of our knowledge for the benefit of your drilling operations.

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Safety first when resharpening drill bits

The material in drill bit buttons – cemented carbide – is a compound consisting of tungsten (W) and carbon (C) with cobalt (Co) as binder. Cobalt is a metallic element that can cause poisoning and be carcinogenic at high exposure. When the drill bit is used as intended, the cobalt is not hazardous. However, resharpening the drill bit produces dust, mist, slurry or fumes containing tungsten carbide and cobalt which can be harmful if not handled correctly.

Therefore, you must avoid skin contact, inhalation and ingestion of dust, mist and fumes by wearing personal protective equipment (PPE) including work clothes, gloves, safety boots, eye protection, ear protection and respirator mask – and ensuring that all process controls, workshop ventilation equipment and other safety are in place and working properly.



Resharpening and cobalt: Health and safety procedures

Before starting the work, always check that the safety features on the resharpening equipment, such as emergency stop button, protective grid/splash guard, local air exhaust etc. are in good functional order. Make sure that you have the proper training and read the equipment's operators manual thoroughly.



Cleaning procedures

- Always shower after working with cobalt
- Change out of your work clothes when leaving work or before travelling in your personal vehicle
- Use separate lockers for clean and soiled clothes
- Always wash hands after working with cobalt
- Keep work area and vehicles free of dust
- Use approved HEPA filter vacuum cleaners
- Handle soiled workwear correctly and wash responsibly
- Use dust extraction systems where available
- Only use wet mopping to clean surfaces in work areas
- All cobalt contaminated filter cartridges should be disposed according to local country regulations
- Do not use a broom or compressed air when cleaning



Working procedures and correct Personal Protective Equipment

- Wear appropriate eye and ear protection at all times
- Wear appropriate P2 face mask at all times
- Wear long sleeved clothing and gloves to prevent skin exposure
- Wash hands/face regularly during the workday
- Use a hand cream to create a contact barrier for dust
- Cover any wounds with band-aids
- Store PPE away from dirty areas
- Ensure proper exhaust ventilation
- Always dispose resharpening sediments and contaminated water according to local country regulations
- Do not eat or drink in presence of cobalt, and wash hands prior to touching food or drinks
- Do not smoke in presence of cobalt



Health checks to perform regularly

- Urine sample test
- Breath test
- Monitor air quality for cobalt levels



How drill bits work

The common functional principle for both top hammer and down-the-hole drilling is percussive rock destruction. This means that every time the bit strikes the rock, the buttons are put under extreme load. At a certain stress level, the rock starts to deform. The way in which the rock is deformed, crushed and broken up by the buttons can be divided into three phases:



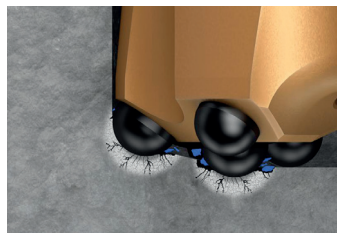
1. Elastic deformation

The rock yields to the pressure of the buttons.



2. Crack formation

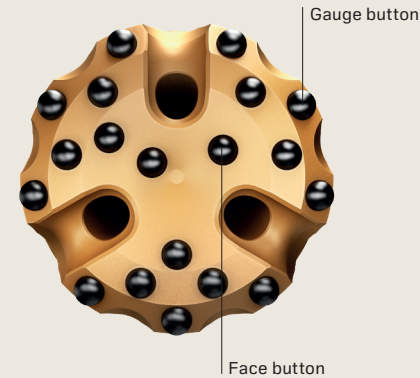
In the immediate surrounds of each button, a series of radial cracks are formed.



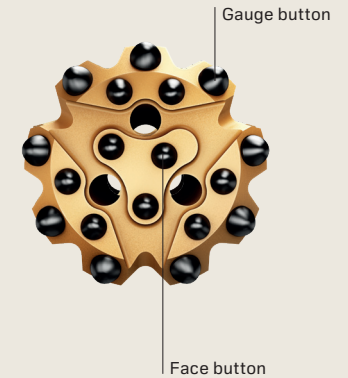
3. Chipping

Small pieces of the rock start to chip off, creating what are called drill cuttings.

DTH drill bit example



TH drill bit example



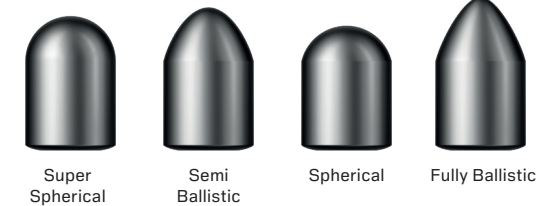
The carbide buttons on drill bits typically divide in face buttons and gauge buttons. The face buttons in the center only strike downwards, while the gauge buttons at the perimeter also create the side clearance needed for enabling the drill bit to rotate freely in the blasthole and allow evacuation of the cuttings.

Button profiles and carbide grades

The buttons on drill bits are made from cemented carbide that is specially designed for rock drilling. There are different grades of cemented carbide and profiles to suit different types of rock formations.

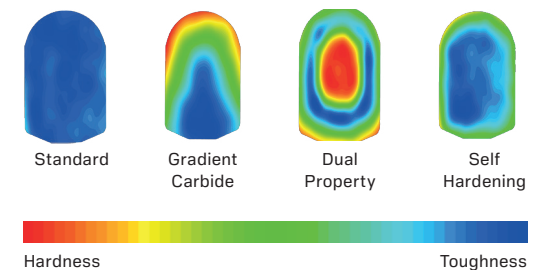
Profiles

The two main profiles of carbide buttons are spherical and ballistic. Spherical is a more robust shape for hard and abrasive rocks. Ballistic is a slimmer shape for higher penetration rates in soft to medium hard rocks. These can be used in abrasive rocks as well when speed is more important than bit life. When resharpener the buttons it's important to use the correct shape of cups for the button. Read more about our grinding cups on page 25.



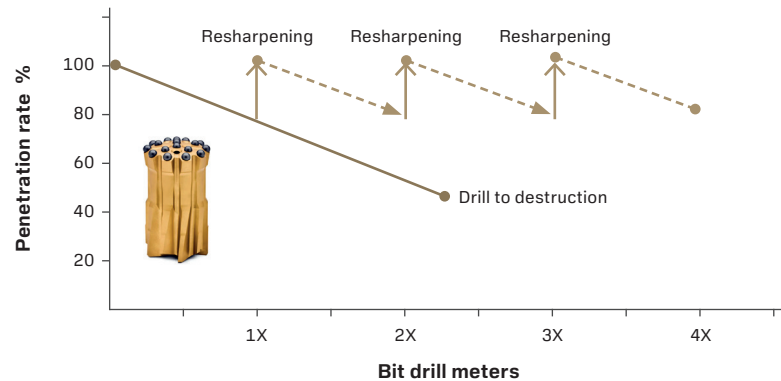
Grades

The carbide grade determines the strength, hardness, toughness and wear resistance of the button, to optimize any drilling application. PowerCarbide® is the collective name for the most powerful carbide grades, representing the very best materials technology from Sandvik. The innovative PowerCarbide® grades enable the buttons to retain their profile as long as possible. This ensures longer grinding intervals, fewer bit changes and improved safety. Both standard grades and PowerCarbide® grades can be resharpener to prolong service life.



Drill bit resharpening maintains drilling performance

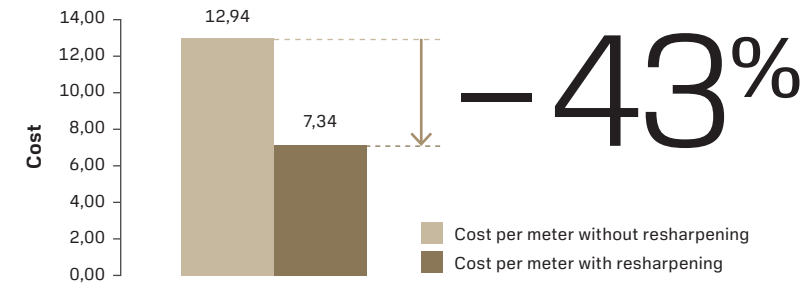
As the drill bit works through the rock, the profiles of the buttons will wear down and become increasingly flat. This reduces the bit's ability to drill quickly and efficiently while increasing the risk of damage to the buttons, the bit itself, and also to the drill string and rig. Since the drilling speed is lowered, it means reduced productivity and increased costs per meter as more machine time and fuel are consumed for each meter drilled. In addition, the bit's ability to drill straight is reduced. With intermittent drill bit resharpening, the negative effects of overdrilling can be reduced.



Resharpening can reduce the cost per meter with 40% or more

Regularly resharpening drill bits not only preserves drilling performance but also significantly extends the life of the bit. Our field tests show that switching from a "drill to destruction" approach to scheduled resharpening can reduce the cost per meter drilled by 43%.

The drill bit used without resharpening lasted for about 170 meters. In contrast, the same bit type – when resharpened three times using the latest high-end grinding machine and cup technology – achieved a total drilling distance of 340 meters.



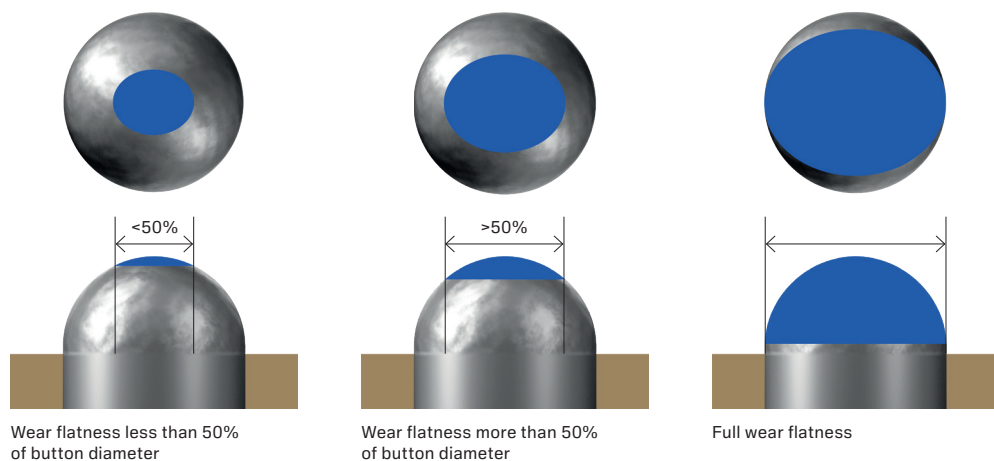
*Actual results may vary based on factors such as bit size, resharpening intervals, ground conditions, drilling parameters and other circumstances.



Restoring drill bit performance

By reshaping the buttons to their original profile, the drill bit regains its full performance and can continue drilling until it is time to sharpen the buttons again. This process can be repeated up to 10 times depending on rock type and how much wear you allow to occur before sharpening.

Wear classification face buttons



Grinding is recommended when the penetration rate begins to drop noticeably and before the wear-flat on the top of the button reaches 50% of the button's diameter.

If reshaping is delayed until wear reaches 50–60% or more of the button's diameter, significantly additional work is required to restore the original profile, including likely steel removal needs. This increases the risk of premature drill bit failure due to button breakage.

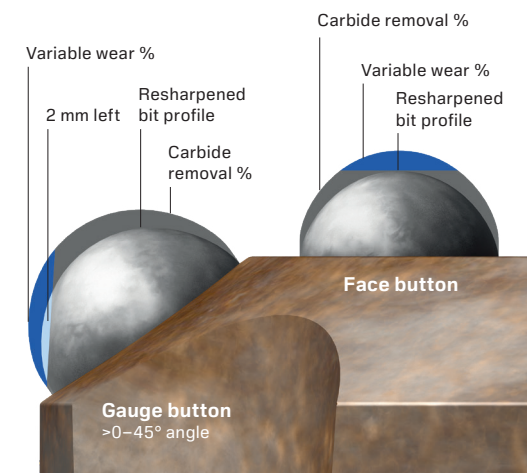
When is the bit due for reshaping?

- Before the wear flat on any button reaches 50% of the button's diameter.
- At the first sign of anti-taper of gauge buttons. (Anti-taper occurs when the drill bit head no longer tapers backward from the face, indicating excessive wear on the gauge buttons and a loss of the bit's original profile).
- When "snakeskin" surface cracks appear on the carbide buttons.
- When penetration rates drop noticeably without another clear cause.

Different wear flatness and handling of face and gauge buttons

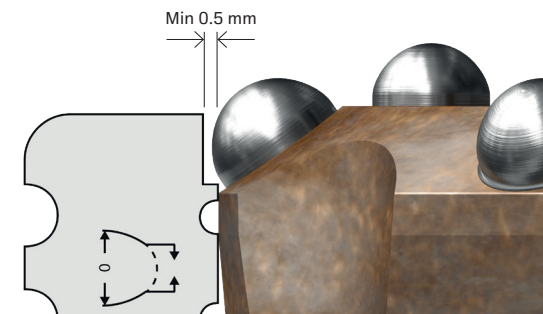
Anti-taper occurs when the gauge buttons are completely worn down. This means that the hole drilled in the rock gives no clearance between the bit body and the hole, leading to the risk of jamming the bit in the hole. If drilling continues, this action puts more load on the rig rotation motor.

Any anti-taper should be carefully ground away. However, avoid removing too much material from the outer sides of the buttons. It is recommended to leave approximately 2 millimeters of the original wear-flat intact to maintain proper overall bit diameter and extend service life.



Maintain clearance and remove steel if needed

To avoid Anti-taper, make sure to maintain a clearance of at least 0.5 mm between the button protrusion and the bit body. If necessary, remove some steel below the gauge to maintain the recommended clearance.



Keep correct button protrusion

Button protrusion is the height difference between the tip of the carbide button and the surrounding steel of the drill bit. It's a key parameter because it affects penetration rate, wear, straightness, and overall drilling efficiency.



Correct reshaping and profile result, spherical buttons



Correct reshaping and profile result, ballistic buttons

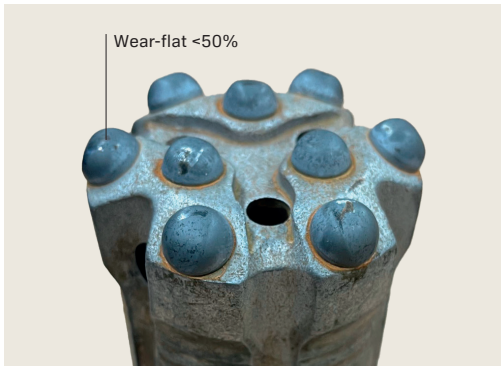


Incorrect reshaping results, too little protrusion

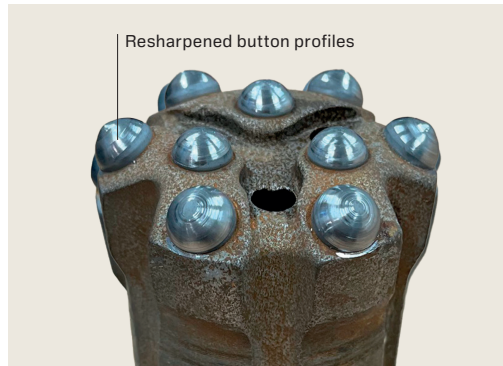


Too much protrusion and too much steel removal around button

Normal bit wear, before and after reshaping



Before



After

Prevent bit damage and failure

Timely reshaping is both practical and economical – it helps restore performance and reduces the risk of overloading the bit. Overloading can lead to premature breakage of both the buttons and the bit body steel. On the following pages we show different variants of bit damage with possible causes and solutions.

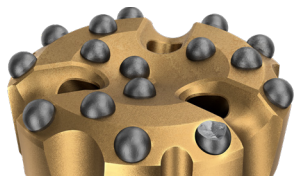


Analyzing drill bit damage and preventing failure

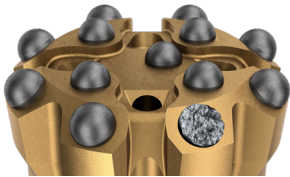
By avoiding overdrilling and applying correct resharpener procedures you can prevent many types of drill bit damage, including chipped, crushed, or sheared off buttons, and snakeskin.

When to discard broken button bits

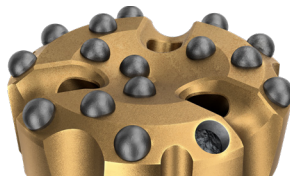
- Drill bits should be discarded once they reach their agreed minimum diameter or if they have button or other failures that make them unserviceable.
- For drill bits 45 mm and smaller: The recommendation is to discard the bit if 1 face button or 1–2 gauge buttons are damaged or missing (depending on the total number of gauge buttons on the bit).
- For drill bits sized 48–115 mm: The recommendations is to discard the bit if 2 face buttons or 2 gauge buttons are broken or missing.
- For larger TH and DTH drill bits: You may continue drilling if two buttons are broken or missing, provided they are not adjacent.
- However, always grind broken buttons flat to minimize further risks.
- Continuing to use broken bits without inspection and resharpener can lead to further failures, including damage to the entire drill string, resulting in unplanned stops and increased costs.



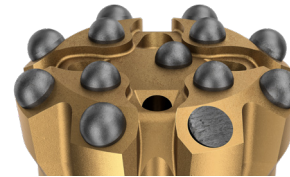
S3 Button chipped



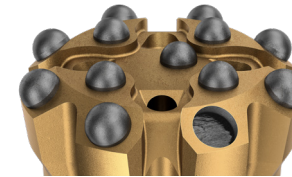
S4 Button crushed down to level of bit body



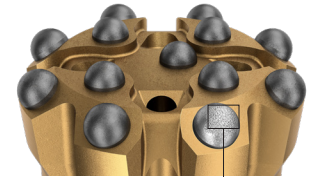
S4u Button crushed inside button hole



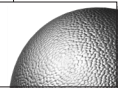
S7 Button sheared off down to level of bit body



S7u Buttons sheared off below steel body, inside button hole



S9 Snakeskin



S3	S4	S4u	S7	S7u	S9	Possible cause	Solution
x	x	x				Overdrilling	Resharpener before the wear flats reach 50% of button's diameter. Shorten grinding intervals. Employ wet grinding as dry grinding may cause fatigue (snakeskin).
	x					Snakeskin	Shorter grinding intervals will remove the micro-cracks forming. Testing a different carbide grade could be an option. Employ wet grinding as dry grinding may cause fatigue (snakeskin).
x		x				Incorrect (rough) collaring	Unlucky, rough, or incorrect collaring may put the button under uneven load and may result in failures like these. Ensure boom is securely seated on the rock and start the collaring with reduced pressures.
x	x					Incorrect grinding	Ensure correct resharpener procedure, avoid resharpener with a worn/damaged grinding cup which may cause a deformed button with different levels.
		x	x	x		Excessive button protrusion	When the protrusion exceeds three-quarters of the button's diameter, the risk of operational failures increases significantly. To prevent these issues, it's essential to maintain regular grinding intervals.
					x	Micro-fractures in the carbide surface	Ensure correct resharpener intervals (consider resharpener more frequently). Employ wet grinding.

Effective resharpener routines

Fixed resharpener routines encourage good working practice. You can, for instance, choose to examine and sharpen the bits after a specific number of holes, meters reached, or at the end of a shift. Premature resharpener is not necessarily uneconomical, since less carbide needs to be ground off. It is better to regrind sooner than affect productivity due to damage.

The basic measure for achieving the most effective resharpener routine is to define the proper interval. Begin by drilling and then sharpen before the wear flat on any button reaches 50% of its diameter. This point typically marks the effective interval for resharpener.

At this stage, inspect the entire drill bit – both steel body and buttons – to assess their condition. Evaluate the percentage of wear flatness and record it along with the total meters drilled.

Inspection tools

Drill bit diameter

Regularly check the full drill bit diameter to ensure continuous service life and performance of your used drill bit. Use the correct template for different bit sizes. If the bit passes through the template hole, its diameter is too small and should be discarded.



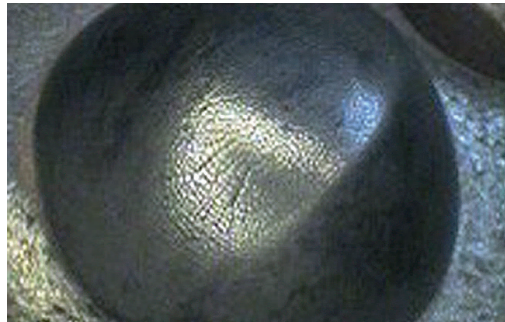
Button profile

Before resharpener, use templates to ensure the correct grinding cup profile for both face and gauge. After resharpener, use the same templates to verify that the buttons have achieved the correct profile. Templates are available for both Super Spherical and Semi Ballistic shapes.



Watch out for “snakeskin”

Microscopic fatigue cracks, known as “snakeskin,” can appear on the button surface. Snakeskin must be ground off as soon as it occurs; otherwise, the micro-cracks will deepen and may cause the buttons to break. Even if penetration rates remain normal and there are no visible signs of wear, the buttons should be resharpened at regular drill meter intervals.*



Leave a little flat on the top

Don't grind more than necessary. Leave a couple of millimeters of the old wear flat to remain on the top of the button to keep the proper button profile and performance.



Always grind broken buttons flat

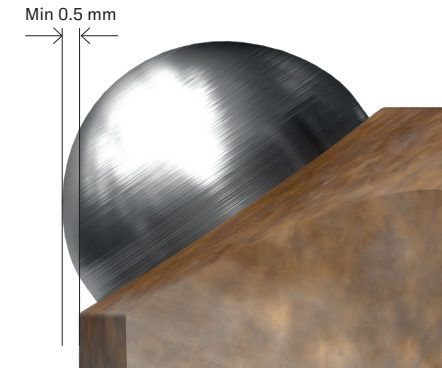
You can continue to use a drill bit as long as the gauge buttons retain the diameter of the bit. Fractured buttons must always be ground flat to prevent chips of cemented carbide from damaging the other buttons.



Gauge resharpening

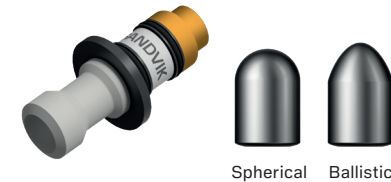
Anti-taper occurs when the gauge buttons are completely worn down. This means that the hole drilled in the rock gives no clearance between the bit body and the hole, leading to the risk of jamming the bit in the hole. If drilling continues, this action puts more load on the rig rotation motor.

To avoid Anti-taper, make sure to maintain a clearance of at least 0.5 mm between the button protrusion (the height of the insert above the steel body) and the bit body. If necessary, remove some steel below the gauge to maintain the recommended clearance.



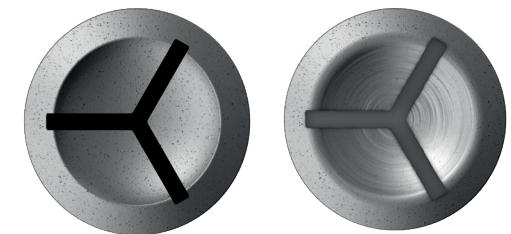
Use the correct resharpening tool

Sandvik supplies resharpening tools (grinding cups) in different sizes for both Super Spherical and Semi Ballistic buttons. The cup-shaped grinding surface is coated with diamonds, enabling it to restore cemented carbide buttons to their original profile.



Re-dressing the grinding cups

When the surface of a grinding cup becomes worn, its performance starts to decline. To restore efficiency, you can activate “Performance Mode” on the high- and mid-range machines (for 10–20 seconds) which remove debris from the cup surface and exposes diamond grits. This process cleans and renews the grinding cup, improving performance and extending its service life. If needed, use an appropriate tool to open the flushing holes



New grinding cup

Worn grinding cup – groove depth reduced, surface smeared

*Drill meter intervals differs depending on bit sizes and profile.

Resharpener equipment and tools for all operations

Designed with an operator safety-first approach, our range of innovative equipment and tools allow you to sharpen your drill bits with speed and precision, keeping your production rates high and your bit consumption low.

Thanks to the built-in connectivity in our top and mid-range models you get automatic tracking of all operational data needed for follow-up of machine uptime/runtime and use of tools. Each sharpening cycle is recorded, and each grinding cup is logged with RFID before use.



A complete and more streamlined assortment

Which type of equipment suits your operation? It depends on which production capacity you opt for. A centralized resharpener workshop serving an entire mine need equipment with higher capacity than equipment serving a single drill rig. But regardless of capacity, the quality of the equipment and the result it delivers should be equally high in either case.



RG600Pro

High-end variant resharpener machine

Premium stationary version for TH (bit skirt diameter up to 180 mm / 7") and DTH (bit shank diameter up to 180 mm / 7").

When to use

Resharpener of large tool volumes in stationary workshop environments. Suitable for operations with capacity more than 50–100* bits per shift.



RG550Be

Mid-end variant resharpener machine

User-friendly stationary and battery electric, non pneumatic rig mounted versions for TH (bit skirt diameter up to 140 mm / 5.5") and DTH (bit shank diameter up to 140 mm / 5.5").

When to use

Resharpener of mid-sized tool volumes in workshop environments or mounted on drill rigs or work containers in the mine or construction site. Suitable for operations with capacity of less than 50* bits per shift.



RG500Hh

Low-end variant resharpener machine

High powered, air compressor driven lightweight and ergonomically designed handheld grinder for both TH and DTH, all bit sizes.

When to use

Occasional resharpener of low tool volumes in workshops and worksites with access to compressed air. Suitable for smaller operations.

*Depending on bit sizes.

Follow up for improvement

High-end and mid-range machines enable you to track and monitor the data generated during resharpener operations. This information supports fact-based evaluations, including resharpener costs, performance across different bit profile sizes, and the total volume of buttons resharpener. It also provides insight into machine health and the key parameters that influence achieving the desired bit profile.

Operational report

- Machine productive hours
- Grinding cups performance report
- User machine hours reports
- Individual grinding cups consumption

User dashboard

- Track and records of operational data
- Monthly & yearly operational report analysis
- Data history to improve maintenance
- Digital operator manual & spare part

Extended data center

- Track and records individual parameters
- Accurate parameter fault identification
- Data for analyzing productive parameters
- Data evaluation for future grinding optimization





Premium quality grinding cups with RFID for effective resharpener – fast, precise and durable

Engineered for high performance

The RFID grinding cups are designed with superior diamond grit concentration, optimized bond hardness, and reinforced steel bodies – delivering unmatched grinding efficiency and extended service life. Built for demanding environments, these cups are the ultimate solution for high-performance grinding operations.

Smart technology integration

Each grinding cup is embedded with a unique RFID tag, enabling automatic identification when paired with the resharpener equipment. This smart pairing eliminates manual errors, accelerates registration of different cup sizes and profiles, and ensures correct cup-to-machine matching – streamlining operations like never before.

Real-time tracking and lifecycle monitoring

Track the lifecycle of each grinding cup in real time, including operating hours and usage cycles. The system automatically flags expired or worn-out cups, helping prevent performance issues and downtime. Gain insights into cup performance across global users – from mine sites to resharpener service stations.

Inventory and cost optimization

RFID integration provides real-time inventory visibility and data-driven insights into resharpener costs. This enables better usage control and helps maximize the lifespan of each grinding cup – reducing waste and improving operational efficiency.

Sandvik drill bit recycling program

Saving your drill bits' end-of-life value

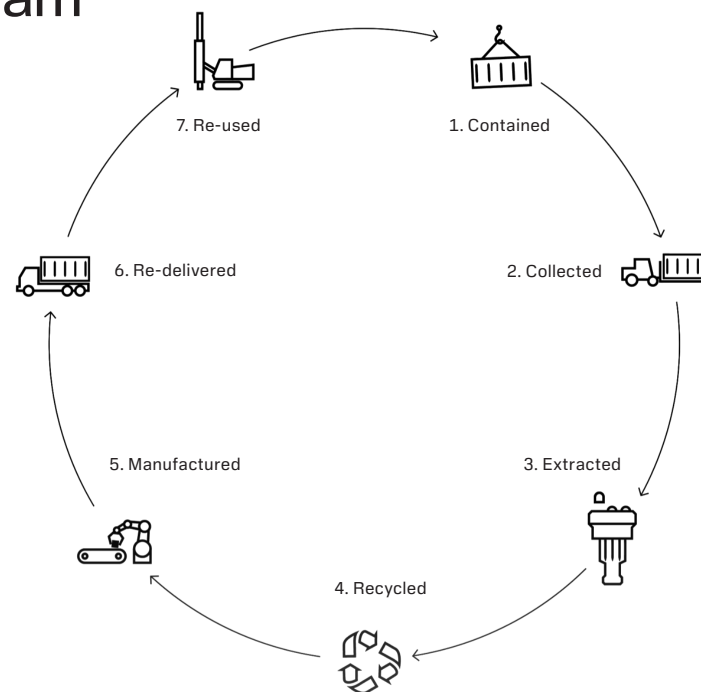
Extending the drill bits' service life through resharpener contributes to a circular, more sustainable economy. And so does material recycling at the end of the bit's service life. Sandvik drill bit recycling program is a system where customers return used drill bits for recycling.

The program aims to optimize the recycling of drill bits, which contain scarce minerals such as tungsten and cobalt. This initiative leads to significant enhancements in circularity and reductions in greenhouse gas and energy consumption.

Recycling included

Doing the right thing should be easy. That is why our drill bit recycling program is now included with all our carbide rock tools. It is completely free – you even get paid for the collected minerals.

When we get the used tools back, we can separate steel and carbide and put the materials into effective recycling loops. To avoid unnecessary heavy transports, the steel scrap is recycled locally while the carbides are transported to our recycling plants.



This is how it works

We provide containers for your site in which you place your worn-out carbide tools. The worn-out tools are regularly collected, and the carbide inserts are removed locally by using our unique local extraction units. The steel scrap is recycled locally, while the inserts are transported to our ISO certified factory, where the cemented carbide is recycled and brought back into production of new carbide rock tools.*

This is one important action of making sure that raw materials are used in an efficient and sustainable way, and that our products are recycled when they reach end-of-life.

*Please contact your local Sandvik representative for specific terms and conditions for your local market.

Watch one of the videos
on our recycling program



Our way of working for a more sustainable mining industry

By extending tool life, promoting circularity, and enabling recycling, we make sustainable choices both possible and profitable for our customers.

Sustainable solutions

– Products and services that deliver on sustainability values

Our Sustainable solutions include products that stand out from standard market offerings by delivering both higher performance and environmental benefits. These solutions help our customers reduce energy, fuel, and water use – proving that sustainability and productivity can go hand in hand.

Net zero

– Decarbonizing our supply chain

For many years, we have monitored our direct emissions (Scope 1) as well as emissions from our energy suppliers (Scope 2). With our commitment to the Science Based Targets initiative, we have also developed a methodology to calculate our indirect emissions (Scope 3). We have made significant reductions in both Scope 1 and 2 emissions, and our progress in reducing Scope 3 emissions is consistent with our planned targets.

Circularity

– Reduce, reuse, recycle

Circularity is a broad concept with its primary purpose in minimizing the use of materials in the first place, secondly optimizing the service life of the products, and then, lastly, ensuring that products are reused or recycled in the most effective ways. By rethinking how products are designed, used, and reused, we aim to minimize the use of finite resources, reduce waste and extend the product's lifecycle.



Learn more in
Our way report

