

Why make an abrasive from insulation?

Answer:

High work energy
Verifiable safety
Ultra-low dust



**10X ENGINEERED
MATERIALS**

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**10X ENGINEERED
MATERIALS**

10X Superoxalloy Abrasives

Made from mineral wool insulation

SUPEROXALLOY ABRASIVE

(soo-per-ox'-uh-loy)

an engineered alloy of oxide minerals created through highly controlled formulation and tempering (high heat + rapid cooling). The process creates non-crystalline (amorphous) particles that resist breakage under stress of high-speed mechanical impact.

[From metallurgy/minerology: superalloy + oxide]

About the cover: An engineered mix of mineral oxides – heated to 2400°F and then rapidly cooled – gives birth to patented 10X superoxalloy abrasive particles.



OXIDE

hard, strong mineral compound consisting of elements bonded with oxygen.

ALLOY

integrated solid made of two or more elements. Mechanical properties differ and often exceed those of its components.

SUPER

OX

ALLOY

SUPERALLOY

enhanced alloy exhibiting superior properties over conventional alloys.

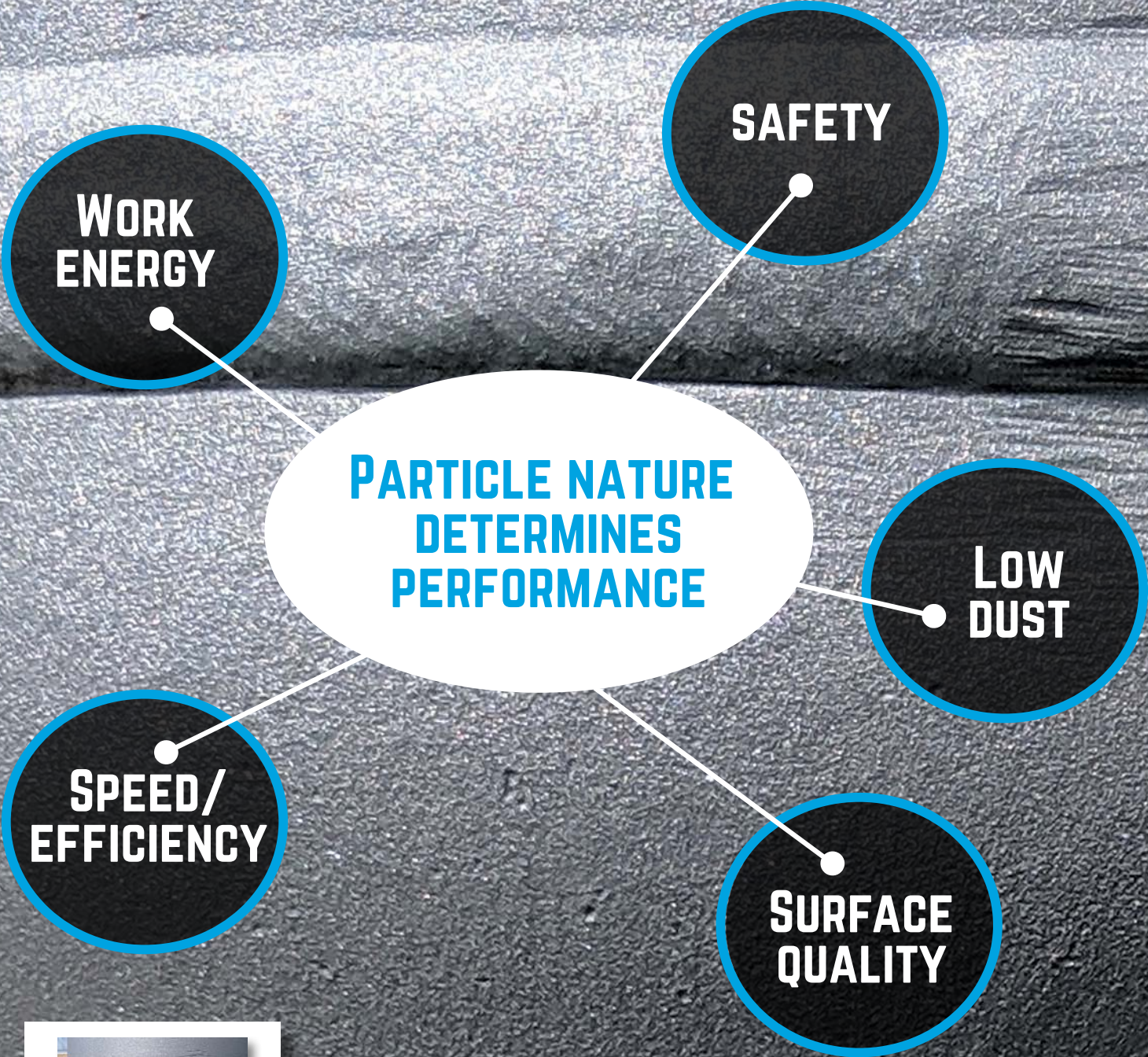
Why do blasting abrasives all perform so very differently?

KEY POINTS

- A particle’s nature determines how safely and effectively it will perform as a blasting abrasive.
- Performance among the various categories of abrasives varies widely because the nature of their particles varies widely.

Abrasive safety and performance

IT’S ALL ABOUT THE PARTICLE



Background photo: close-up of this pipe flange surface, blasted with 10X abrasive. Note the quality of finish on welded area.

Do you know how your blasting particle is made? You should.

KEY POINTS

- **Particle nature** – its molecular structure, physical shape, and chemical composition – determines performance potential and safety of a blasting abrasive.
- Particle nature is established by its origin: how it's made.
- Particles can be formed in the earth, formulated, manufactured, or even grown. A combination of processes can also create a particle.

Understanding abrasive particles

**HOW IT'S MADE
DETERMINES
ITS NATURE**

PARTICLE NATURE: 3 KEY FACTORS



**MOLECULAR
STRUCTURE**



**PHYSICAL
SHAPE**



**CHEMICAL
COMPOSITION**

Summary: particle nature determines performance potential and safety

BACKGROUND PHOTO: KINETIX
20/70 AT 7X MAGNIFICATION.

Understanding the *superoxalloy* particle

How it's made – raw materials and process

As with any engineered product, the materials from which a *superoxalloy* particle is made and the processes used to make it govern its safety, utility, and value.

The journey to a finished 10X *superoxalloy* particle involves multiple raw ingredients, multiple steps, and precision manufacturing contributions from two different industries: mineral wool and abrasive manufacturing.

Step 1:

Where *superoxalloy* molecules become engineered, formulated, and tempered for safety, strength, and performance

Mineral wool is a premium insulation material that has been produced, improved, and used safely and effectively for over 100 years. The materials used to make it in fact yield two primary output streams: 1)

mineral wool and 2) a granular by-product called shot. Both are formed at the same time in the same process and their chemical compositions are identical.

Today, mineral wool is the #1 insulator used in building construction worldwide and the safe and super-strong mineral wool shot is what 10X manufactures into abrasives.

The origin of the *superoxalloy* particle begins with a precisely engineered mix of mineral oxides, a carefully designed formula and closely guarded trade secret. The formulation's purpose is to produce high-performing heat and sound insulation that can be processed efficiently to extremely strict quality and safety standards.

The process begins as a high-temperature furnace melts and blends the mineral mixture at 2400°F. For comparison, flowing volcanic lava averages 1600°F and the hottest it has ever measured is 2120°F. Once completely melted, the molten mixture flows into a spinning chamber.

Here, a rotating disk hurls molten liquid outward, rapidly cooling and stretching it into long, wool-like fibers. Heating plus rapid cooling is called tempering, a process which strengthens particles by rearranging molecules into a more durable, fracture-resistant form.



High-heat tempering melts together the 10X oxide mineral formulation to create toughened, amorphous *superoxalloy* particles.

In the spinning chamber, the lightweight, sturdy fibers are blown into a production line where they will become insulation, soundproofing, fire-proofing, and granulated fiber products.

But not all of the melt stretches into fiber. The spinning process also creates and rapidly freezes tempered particles that settle to the bottom of the spinning chamber as by-product shot. For just about a century, these amazingly strong and fracture-resistant particles were discarded or used in low-value construction filler applications. The scientists and engineers at 10X Engineered Materials recognized the high value that these particles could bring as a blasting abrasive. Not only do they possess a high-strength molecular structure, but also an array of unique shapes that makes them perform differently, and at a higher level, than other abrasives.

Step 2:

Where safe, strong, tempered mineral wool molecules become 10X *superoxalloy* abrasives

Several years ago, the engineers, now at 10X Engineered Materials, began to study the novel properties of mineral wool shot particles. Intrigued by their strength and the well-documented safety attributes of mineral wool material, they began testing its performance as a blasting abrasive.

Early tests brought a series of surprises and insights. It could efficiently remove coatings and corrosion that most, if not all, existing abrasives could not. Far less dust was produced during blasting. The material left a noticeably brighter and cleaner finish than other abrasives. Blasted surfaces held, without the appearance of rust, for as long as weeks. It also cut faster and required far less material to complete blasting tasks. The key question: why? The answer: no other abrasive is formed this way.

What makes the material different, and better, is that it comes from the mineral wool process. The raw material rocks are selected and combined for both durability and safety. It is a well-known fact that exposure to mineral wool, whether by handling it or breathing in the little dust that it generates, causes no long-term harm. Melting of the selectively chosen rocks removes defects. Re-freezing makes the material exceptionally strong and fracture resistant. A step in the melting process separates and removes free iron. And the simultaneous high-speed flow and freezing of the melt in the spinning chamber creates a set of shapes unlike any other particle mixture on earth. All of these attributes combine to provide unmatched value in abrasive blasting.

To unleash the potential of the mineral wool material, 10X engineers developed methods to extract, refine, purify, de-dust, and precisely classify the particles into consistent size ranges. They devised a way to remove any residual free iron left over from the mineral wool process. This means blasters can confidently use all grades of 10X abrasives on aluminum, stainless steel, and other non-ferrous materials that cannot tolerate iron contamination. 10X designed, engineered, and built an energy-efficient and sustainable *superoxalloy* abrasive manufacturing process from the ground up. This clean-tech facility finishes what was started in the mineral wool process and produces an all-new, patented, and higher-performing class of blasting particles.

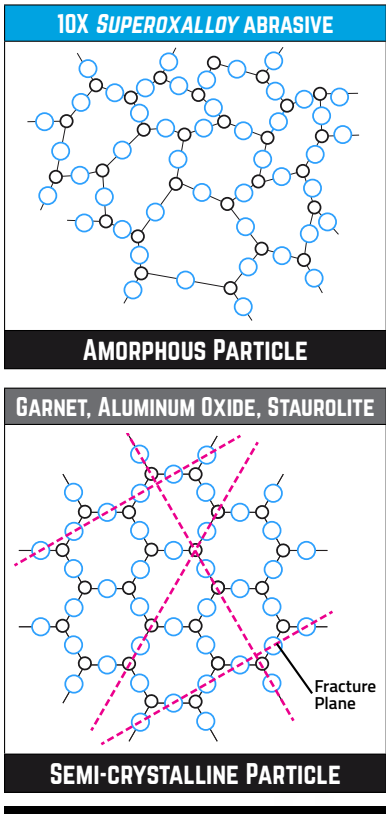


10X *superoxalloy* abrasives pass the pour test...virtually no dust when you pour it out of your hand or bag

Examining the 3 Key Factors

1.

Molecular Structure – amorphous for strength



In the mineral wool process, tempering – high heat plus rapid cooling – rearranges mineral oxide molecules into a random, amorphous pattern. Imagine a three-dimensional jigsaw puzzle that contains no lines or planes along which the puzzle could easily break apart. The rapid cooling produces this arrangement and prevents the formation of organized crystalline domains that would create planes of weakness.

The amorphous nature of *superoxalloy* particles arranges atoms randomly as shown in the illustration. This random atomic arrangement makes the particles equally strong in all directions. They resist breaking no matter where on the particle force is applied. Chemists use the term “isotropic” to describe this beneficial phenomenon. Amorphous, isotropic particles are why 10X *superoxalloy* abrasives resist fracture up to 130 PSI or higher, produce very little dust, leave a bright and clean surface, and can be reused many times.

Many other abrasive materials, especially those that are formed in and mined from the earth, are semi-crystalline in nature. They contain regions of highly ordered patterns at an atomic scale. Planes of weakness on the edges of these regions make semi-crystalline particles prone to break, or cleave, when they strike a surface. These particles are more fragile and less durable than an amorphous particle because of these built-in planes of weakness. Particles of this nature can pulverize on impact with a surface and deliver less work energy, produce much more dust, and create fragments that can become embedded in the surface. Together, all of these issues reduce working speed, increase the amount of abrasive needed to do useful work, impair surface quality, and decrease the number of times a semi-crystalline abrasive can be reused.

PARTICLE HARDNESS OR PARTICLE STRENGTH?

WHY IT PAYS TO KNOW THE DIFFERENCE

Which is more important...hardness or particle strength? Are they the same? Can a hard material be easier to break? For instance, the Mohs hardness of glass is around 6 and a steel butter knife is about 5.5. Which is more fragile, more prone to breaking? Of course, the glass, even though it may be harder than the butter knife. This is why strength is far more important than hardness, especially in abrasive blasting. More fragile semi-crystalline particles contain pores or cavities. So, no matter how hard they are, they can shatter on impact. Shattered particles create dust, accomplish less work, and leave residues on the surface – which adds time and extra cost to every blasting job. This also decreases the working life of the coating or asset being built or refinished. High strength *superoxalloy* particles get more work done with less abrasive and produce a high-quality result in one pass. That’s why strong 10X *superoxalloy* abrasives bring entirely new benefits to both the owner of the asset and the blaster doing the work.

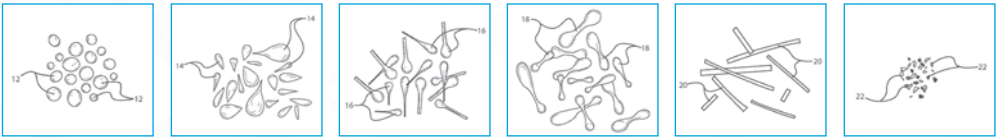
2.

Physical Shape – multiple shapes = multiple steps in one blast

Nearly all abrasives show a consistent, relatively similar shape from particle to particle. Garnet, aluminum oxide, staurolite, and glass abrasive particles, for instance, tend to be angular and sub-angular.

Because of how they are made, *superoxalloy* particles are very different. In fact, every 10X *superoxalloy* abrasive product contains six different particle shapes that fall into four abrasive categories: angular, sub-angular, sub-rounded, and rounded. The polymorphous (many shapes) array, along with the chemical composition and other properties, is so different from other blasting abrasives that the inventors of 10X *superoxalloy* abrasives were granted a patent after only one patent examiner review (US 11,155,734). And because both mineral wool and 10X abrasives are produced in controlled, repeatable processes, the particle shape distribution within and between lots is also highly consistent.

The unique set of particle shapes in 10X abrasives brings additional benefits beyond just strength. The six shapes create a blasted finish with high surface area, especially important for coating adhesion. The angular and sub-angular particles deliver high cutting speed while the more rounded particles clean up the profile. All of this happens in one pass. With 10X abrasives, there is no need for secondary blasting to achieve the desired finish. An SSPC-SP5 finish (100% clean white metal) almost always results, even when the specification doesn’t call for it.



Every lot of 10X abrasive contains particles with these six unique shapes – some with sharp, angular edges, others more rounded. This is so unique to the industry that the makers of 10X abrasives were granted a U.S. patent based on this novel particle geometry (U.S. 11,153,734 B1).

3.

Composition – oxide mineral-based, highly safe & consistent

Every mineral wool manufacturer in the world formulates mineral oxide blends to accomplish two key objectives: 1) bio-solubility for worker and consumer safety and 2) material performance. Bio-solubility means a material dissolves in bodily fluids and is eliminated by the body’s natural processes. The material used to make mineral wool and *superoxalloy* abrasives is among the most studied in history from a health and safety standpoint. The World Health Organization International Agency for Research on Cancer (IARC) determined, after reviewing decades of human and animal exposure studies, that inhaled mineral wool dust is bio-soluble – it dissolves in the lungs and is quickly cleared without causing long-term harm. No regulating body in the world considers mineral wool material to be a possible carcinogen, including in the United States. The mineral wool industry used the learnings from these studies to formulate the material composition so that it is bio-soluble in the lungs and safe for workers and consumers.

Mineral wool and 10X particles are both manufactured in highly controlled environments under strict quality control. As a result, mineral wool material and *superoxalloy* abrasives exhibit extremely high consistency of composition from lot to lot and year to year.

While the precise ratios of mineral oxides used by mineral wool makers are a closely guarded secret, the composition of *superoxalloy* abrasives has been studied extensively and quantified to be identical to mineral wool.

Performance of 10X *superoxalloy* abrasives

Safety and Environmental Benefits

10X SUPEROXALLOY ABRASIVES ARE A RESPONSIBLE CHOICE FOR PEOPLE AND PLANET.

Three important factors should be examined when evaluating safety of blasting abrasives:

- **How much exposure could workers face?**
 - *Superoxalloy* abrasives produce far less dust than competing nonmetallic abrasives, dramatically decreasing exposure to inhalable particles.
- **Does the material persist in the lungs when it is inhaled?**
 - *Superoxalloy* abrasives are bio-soluble and do not persist in the lungs. (Dust particles that cannot be dissolved and cleared from the lungs cause long-term inflammation and damage that can ultimately progress to cancer).
- **Has the toxicity of the material been tested directly?**
 - *Superoxalloy* abrasive material is proven from direct toxicological studies, both in living lungs and in the laboratory, to be dissolved and removed without long-term harm.
 - No other abrasive material has been assessed to this degree or can claim this level of proof.

Composition of 10X *superoxalloy*

- Precise formulation of mineral wool material ensures solubility and clearance from the lungs.
- Composition of 10X *superoxalloy* abrasives is identical to mineral wool.
- Safety of mineral wool material has been studied extensively for decades.
- Mineral wool has been safely manufactured, installed, and used around the world for 100+ years.

Worker exposure potential of 10X *superoxalloy*

- From a safety perspective, less dust means less exposure for workers.
- Due to their strong, amorphous molecular structure, *superoxalloy* particles can remain intact at blasting pressures up to 130 PSI and beyond.
 - Weaker particles would shatter and become pulverized at these pressures, producing greater dust and inhalation exposure risk.

SAFETY STATEMENT:

- 10X *superoxalloy* is the industry's most safety-tested abrasive material.
- No other blasting abrasive has achieved 10X *superoxalloy's* validated high level of safety for people, air, water, and wildlife. None.

- 10X *superoxalloy* particles produce very little dust even in high speed, high nozzle pressure, high-throughput work settings when compared to weaker, dust-prone blasting abrasives.
- Less dust also creates better visibility, another important safety and ease-of-use benefit for workers.

Human safety testing and validation of 10X *superoxalloy* material

- The World Health Organization (WHO) and the U.S. Environmental Protection Agency (EPA) do not classify 10X *superoxalloy* material as hazardous or carcinogenic based on decades of human and animal toxicity studies.
- As of publication date, 10X is the only abrasive manufacturer that has voluntarily completed Appendix B of the SSPC-AB-1 certification standard which requires measurement and reporting of hazardous metals and radioactivity.

References:

- Man-Made Vitreous Fibres, Vol 81, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, 2002.
- McConnell et al, "Chronic Inhalation Study of Size-Separated Rock and Slag Wool Insulation Fibers in Fischer 344/N Rats," Inhalation Toxicology, 6:6, pp 571-614, (1994).
- Castranova et al, "Critical roles of fiber length in the bioactivity and cytotoxicity of glass fibers," Soc. of Tox. Annual Meeting, March 20-23, 2000.

Environmental testing – environmental benefits of 10X *superoxalloy* abrasive

- **Air:** 10X abrasives are approved by the California Air Resources Board (CARB).
- **Water:** Toxicity Characteristic Leaching Protocol (TCLP) testing shows that 10X *superoxalloy* abrasives are compliant with EPA regulations.
- **Wildlife:** 10X *superoxalloy* abrasives have passed Washington state environmental testing specification, publication # 80-12.

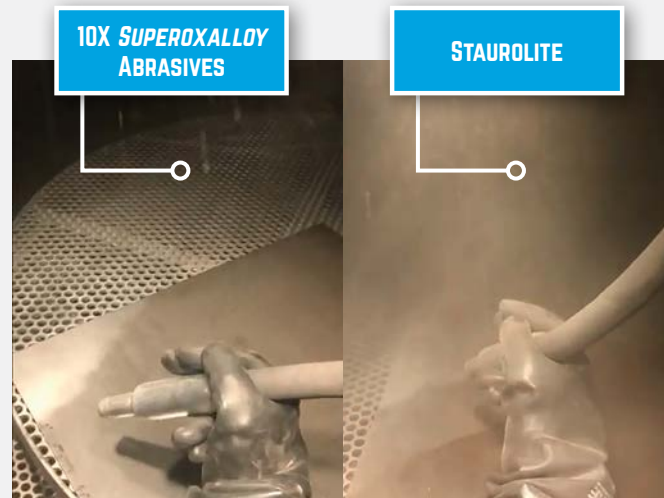
Testing resulted in zero fish fatalities at 10 ppm and 100 ppm of *superoxalloy* abrasive in the water. (Rainier Environmental, 2021).
- **Disposal:** 10X *superoxalloy* abrasives are not regulated for disposal and not subject to regulation as a hazardous material for shipping. Disposal should be in accordance with applicable regional, national, and local laws and regulations.
- **Environmental Sustainability:** 10X *superoxalloy* abrasives are made from a 100% recycled mineral wool material produced during manufacturing. This valuable mineral wool material might otherwise have been destined for landfill. Since entering the market, 10X Engineered Materials has recycled tens of thousands of tons of mineral wool material in its sustainable clean-tech manufacturing facility.

Low Dust / Cleanliness

10X SUPEROXALLOY PARTICLES RESIST FRACTURE TO DELIVER CLEANER, SAFER, MORE PRODUCTIVE WORKING CONDITIONS.

- Ultra clean, amorphous 10X *superoxalloy* particles resist breakage and produce very little dust.
- Low dust delivers multiple new benefits including:
 - A safer work environment with higher visibility and lower dust exposure
 - More nozzle on time because blasters don't have to stop to restore visibility
 - A cleaner work environment
 - Elimination of neighbor complaints
 - Cleaner, higher-quality finished surfaces and enhanced coating performance

HOW DUST-FREE? THE 10X DIFFERENCE IS CLEAR.



Looking for a cleaner, dust-free work site? 10X *superoxalloy* abrasives create a low-dust work environment. The clear view with 10X helps operators deliver higher quality results in less time.

High Work Energy / Low Consumption

STRONG 10X SUPEROXALLOY PARTICLES DO MORE WORK THAN WEAKER PARTICLES, SO YOU'LL USE LESS ABRASIVE TO DO THE JOB.

Due to their high isotropic strength (equally strong in all directions), amorphous 10X *superoxalloy* particles resist breakage and deliver more work energy to the surface than more fragile abrasives. That's why they work faster and get more work done per unit of abrasive when compared to nearly all others.

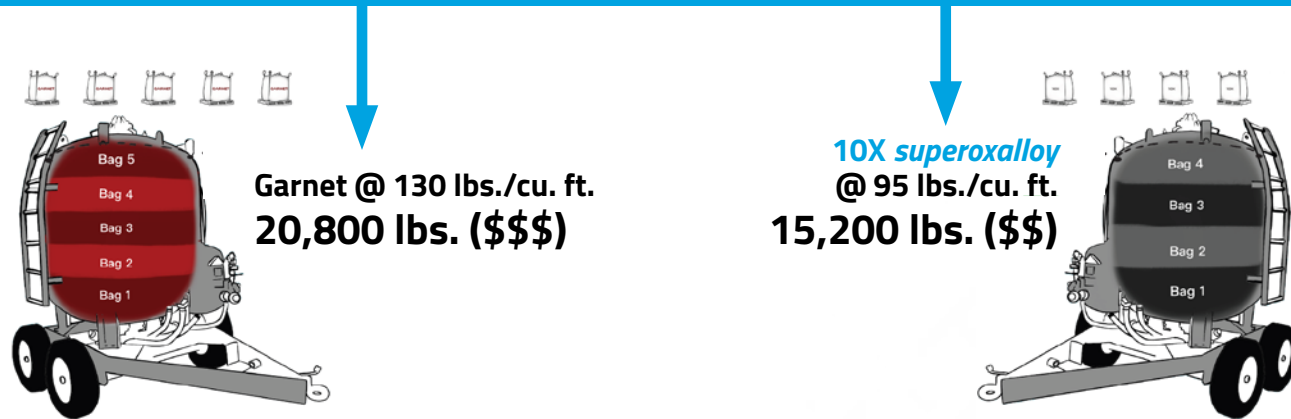
- **Higher blasting pressure**
 - 10X *superoxalloy* particles can be blasted at higher pressure than other abrasives – up to 130 PSI and more – and still resist fracturing and breakage while producing very little dust.
 - *Superoxalloy* particles can stand up to the pressure needed to remove the toughest coatings – thick powder coatings, elastomers, plural-component epoxies – with no burning, hand-scraping, or chemical treatments.
 - Stronger particles deliver the extra work that higher pressures provide. Weaker particles are more prone to fracture and embedment and generate dust at higher pressures.
- **Faster**
 - Less particle fracture means less particle energy is wasted and more work is delivered to the surface. This dramatically increases productivity and reduces the time to complete tasks.
 - On-the-job case studies have shown speed improvements as much as 40% vs. garnet (see pg. 22), 67% vs. silicon carbide (see pg. 29), and 87% compared to aluminum oxide (see pg. 28).
- **Ultra-low consumption**
 - Since each particle does more work, far less abrasive is needed to complete a task.
 - Consumption savings as high as 80% have been achieved in the field compared with coal and copper slags.
 - Lower consumption yields many additional benefits – less unproductive vacuuming and cleanup time, lower cleanup costs, fewer time losses for pot refills, and higher productive blasting time.

SAFETY OF MINERAL WOOL MATERIAL – WHAT DOES THE WORLD HEALTH ORGANIZATION SAY?

Because **composition of mineral wool and *superoxalloy* abrasive particles are identical**, blasters can feel confident that the safety of the material has been extensively studied and understood for decades. No other engineered abrasive material has been as extensively tested, studied, and verified for safety.

The World Health Organization (WHO) IARC Agency reviewed decades of animal and human studies of long-term exposure to high air concentrations of mineral wool material. This important safety fact means if a worker should become exposed, according to WHO IARC, the material quickly dissolves in the body. WHO refers to this safety characteristic by its scientific term: bio-solubility. From an additional safety perspective, the mineral wool material is not considered a possible carcinogen anywhere in the world.

How much abrasive will you buy to fill a 160 cu. ft. pot?



Bottom line: In this comparison, you'll buy 5,600 lbs. *less* 10X abrasive to fill a 160 cu. ft. pot. And because you buy abrasives by the pound, you'll be making a sound financial decision every time you purchase 10X.

- The lower bulk density of *superoxalloy* compared to other premium abrasives offers additional economic and handling advantages.
- In the illustrated example, assuming a pound of each abrasive does equal work (and it doesn't), 10X *superoxalloy* particles would consume 5,600 less pounds each time a 160 cubic foot pot of material was used.
- Case studies have shown a reduction in abrasive consumption of up to 80% compared to other abrasives.
- The combination of multiple particle shapes in 10X *superoxalloy* abrasives also creates a mixture with better flowability.
 - In most cases, users can dial the abrasive metering valve back significantly and achieve stable abrasive flow, higher productivity, and dramatic consumption savings.
- **Reusability**
 - Due to their extraordinary strength and fracture resistance, 10X *superoxalloy* abrasives can be reused many times.
 - Reuse can range from 2-4 times in larger grit sizes up to 8-15 times in precision grades.
- **Multiple steps in one blast**
 - The six unique *superoxalloy* particle shapes mean 10X abrasives can perform multiple tasks on a surface in a single pass.
 - Users report achieving an SP5 finish in one step, often eliminating secondary blasting and cleaning steps.

High Surface Quality

10X SUPEROXALLOY PARTICLES MEAN LESS EMBEDMENT, SIGNIFICANTLY DELAYED RUST BLOOM, AND HIGH SURFACE AREA FOR COATING ADHESION.

Due to molecular structure, composition, and patented particle shape geometry, no other abrasive delivers the surface quality blasters get with 10X *superoxalloy* abrasives.

▪ The right profile, consistently

- 10X manufactures multiple *superoxalloy* abrasive products designed to produce surface profiles from 1 to 4+ mil.
- Extremely tight quality control and particle size tolerances of 10X abrasives allow users to achieve consistent, repeatable, tight-tolerance profile results.
- 10X *superoxalloy* abrasives can be used in wet or dry blasting in both coating removal and new steel applications.

▪ One-of-a-kind satin finish

- Users report no other abrasive delivers the look, beauty, and performance of a 10X *superoxalloy* surface finish.
- Each of the six 10X *superoxalloy* particle shapes performs different tasks on a surface to produce a unique appearance that no other single abrasive can duplicate.
- Produces a high-surface-area, angular surface profile despite its rounded particle content.
- Depending on the application, 10X *superoxalloy* abrasives can do the work of multiple surface preparation steps and produce an SSPC-SP5 white metal finish in one pass.

▪ Less embedment; resists rust bloom

- Abrasives prone to shattering or primarily angular shapes often embed in blasted surfaces.
- Embedded abrasive material contains salts and sometimes iron residues that accelerate corrosion and the appearance of rust (AIC – Abrasive Induced Corrosion).
- Users report that the *superoxalloy* finish holds for up to two weeks without rust formation, even in challenging outdoor and high-humidity conditions (see U.S. Navy case study on pg. 25).
- The rounded particle content of *superoxalloy* abrasives helps clean up any embedment that does occur.

What customers say about 10X *superoxalloy* abrasives

"Not only did I get my job done faster, it makes a lot less dust."

"We tried it and swapped out our aluminum oxide. We will only run this from now on."

"Gives me a better profile...for a more durable, longer lasting finish."

"I get a quicker outcome. Doesn't take nearly as long to do."

"Look at that surface. Look at how nice and clean."

"10X removed powder coating...yes, thick and cured."

"It is so clean. Makes blasting so much nicer."

"Works very well...better than expected."

"Little to no dust. Doesn't seem to break down as easily..."

"Lasts far longer than aluminum oxide."

"Best I've ever used. I use nothing else now."

"Every single thing I blasted, I had quicker cut time. The kicker was the final finish."

"Once you go to 10X, you will never go back."

"I'm using 10X blast media and it works very well...better than I expected."

Summary - 10X Process Improvement Abrasives

World's first affordable *superoxalloy*

- Formulated, tempered
- Unique particle shapes and form

Ultra high-performance

Reduces surface prep cost, improves quality

- Ultra-efficient: increased throughput
- Ultra-effective: better results
- Ultra low-consumption: economical

Safety

- Clean health and safety profile for workers and environment
- Extremely low dust
- Sustainable
- Bio-soluble for fast clearance from the lungs with no chronic health effects

Certified

- SSPC-AB 1
- California Air Resources Board (CARB)
- MIL-A-22262B
- Department of Transportation (for a full list of states see [10XEM.com/DOT](https://www.10XEM.com/DOT))

DID YOU KNOW?

10X *superoxalloy* abrasives are approved under MIL-22262B Naval Sea Systems Command (NAVSEA) and are listed in the Department of Defense Qualified Products Database.

10X *SUPEROXALLOY* PRODUCT LINES

KinetiX[™]
Superoxalloy Abrasive

HIGH-PRODUCTION GRADES

EpiX[™]
Superoxalloy Abrasive

PRECISION GRADES

Super-fast, cost-effective abrasive for demanding, high-volume blasting jobs

KinetiXTM HIGH-PRODUCTION GRADES
Superoxalloy Abrasive

Solves big, complex production challenges...



KinetiX high-production grade *superoxalloy* abrasives: super-fast, cost-efficient abrasive for demanding, high-volume blasting jobs



Need for speed in volume

- Big projects with tight, demanding production schedules
- Blasting plans with no time allowance for post-blast cleaning or rework
- Settings where poor worker visibility caused by abrasive dust reduces speed (and quality)
- Critical assets back online faster
- Eliminate hand-tooling ahead of blasting



Reducing total job cost

- Jobs of sufficient scale – where increased speed and reduced abrasive consumption can deliver payback in reduced cost per sq. ft.
- Reduce rework from embedment, rust bloom, and coating failure
- Less cleanup and disposal costs



Difficult-to-remove coatings

- Remove thick coatings, elastomerics, multi-layers, two-part epoxies, fusion bonded, polyurea, tank liners, marine coatings, and more



Quality & results

- Consistent surface profile across expansive areas
- Environments where low visibility from abrasive dust could compromise craftsmanship
- Ultra-clean jobsite required
- Delayed rust bloom; low-to-no embedment
- Prevents Abrasive Induced Corrosion (AIC)
- Tackle more jobs per year through increased productivity



Strict environmental, health, and safety (EH&S) blasting requirements

- Exceptional worker safety
 - A 100+ year safety track record for mineral wool
 - Nothing is added to mineral wool material in its conversion to *superoxalloy* abrasives
- The composition of mineral wool and *superoxalloy* abrasives is identical
 - Decades of human and animal safety study of mineral wool material
 - Large-scale, safe use of mineral wool by workers around the world for more than a century
- Exceptional environmental safety
 - 10X abrasives are California Air Resources Board (CARB) certified

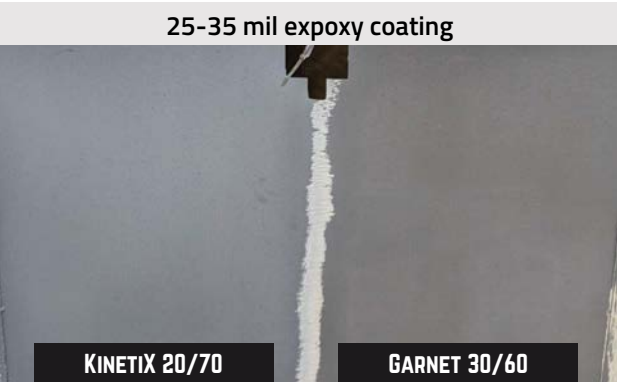
Super-fast, cost-effective abrasive for demanding, high-volume blasting jobs

KinetiX on the job...

Difficult coatings



A painting contractor put KinetiX 20/40 *superoxalloy* abrasive to work at 125 PSI to remove multiple coating layers from this paint rack. It immediately cut through roughly 250 mil of coatings. The contractor reported no other abrasive in the shop had been able to remove this ultra-thick coating.



KinetiX 20/70 *superoxalloy* abrasive blasted through this 3.54 sq. ft. area of epoxy (25-35 mil thick) nearly 40% faster than garnet 30/60. In addition, the KinetiX test area consumed about 1/3 less abrasive vs. garnet test area. Bottom line: compared to garnet, KinetiX *superoxalloy* abrasive delivered a 23.6% reduction in total job cost vs. garnet.

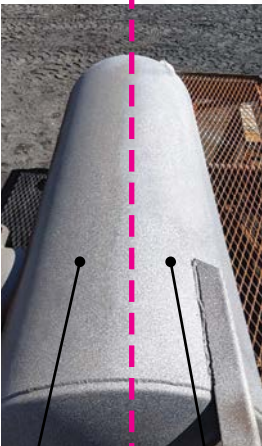
Ultra low-consumption

KinetiX: 74% less blasting media consumed with KinetiX vs. copper slag

The contractor on this job blasted through 50 lbs. of copper slag 20/40 in 2 minutes 43 seconds to remove 5 sq. ft. of rust from this tank. When the blasting media was switched, 50 lbs. of Kinetix 20/70 *superoxalloy* abrasive finished the rest of the job in 10 minutes 8 seconds. The copper slag area showed visible signs of embedment. The KinetiX area? A brighter, cleaner, ready-to-coat surface with no embedment.



Bottom line: less KinetiX abrasive use and an increase in speed produced a 33% cost savings for the job compared to copper slag.



Copper slag

KinetiX

Delay rust bloom

KinetiX: prevents flash rusting without chemical inhibitors

Flash rusting is a common headache when blasting with traditional abrasives. Embedded abrasive particles accelerate the corrosion process resulting in increased prep time and shortened useful coating life.

With KinetiX, blasters can say goodbye to rust bloom. There's no need for extra steps, like chemical treatment, or extra equipment, like dehumidifiers.

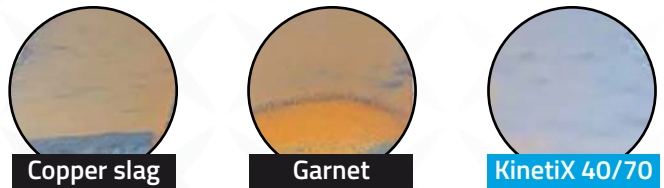


Ship hull blasted and left fully exposed to humidity for 2 weeks. Maintained SSPC-SP10 outside the rain runoff areas.

Up-close look at blasting surfaces



24 hours after blasting, areas blasted with copper slag and garnet begin to show signs of rust bloom. Area blasted with KinetiX shows no signs of rust. Ready to coat.



48 hours after blasting, rust continues to develop on areas blasted with copper slag and garnet. Areas blasted with KinetiX show no signs of rust bloom. Ready to coat.

Super-fast, cost-effective abrasive for demanding, high-volume blasting jobs



U.S. NAVY photographs used with permission via document tracking number 21-326.

KinetiX on the job for the U.S. Navy

High efficiency / clean finish

Kinetix: high-quality, labor-saving finish for U.S. Navy

When the U.S. Navy has a job to do, they do it right. And when it comes to preparing surfaces of seagoing vessels, 10X *superoxalloy* abrasives have delivered for the Navy. Detailed analysis of blasting and surface preparation with KinetiX *superoxalloy* abrasive has shown:

- Improved speed – complete tasks faster
- Lower dust
- Significantly lower abrasive consumption
- Significant labor savings

Test results have shown, when compared to coal slag, KinetiX delivered:

- Labor savings of 488 hours
- 73% faster job completion
- The highest quality surface ever achieved in this application: SSPC-SP5 in one pass
 - SSPC-SP5 finish on day 3 – 100% clean white metal
 - SSPC-SP10 near white metal finish on day 14
 - No rust bloom during the hot, humid, 14-day test period with no ventilation or dehumidification

10X *superoxalloy* abrasives are approved under MIL-22262B Naval Sea System Command (NAVSEA) and are listed in the Department of Defense Qualified Products Database.

See the difference with 10X abrasives

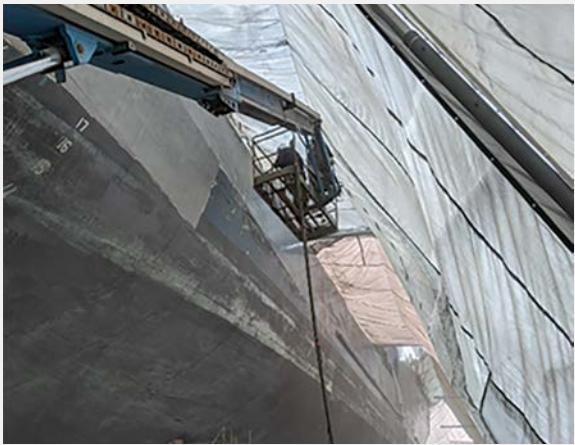


Day 3, after blasting with KinetiX:
graded SSPC-SP5 clean white metal finish



Day 14, after blasting with KinetiX:
graded SSPC-SP10 near white metal finish

HOW DUST-FREE? THE 10X DIFFERENCE IS CLEAR.



In this shipyard operation, four blasters remove old hull coating inside containment – and the air is virtually clear. With 10X abrasive, operators experience a cleaner work environment and get to see and enjoy the results of their craftsmanship while blasting.

Ultra high-performance for
demanding manufacturing applications



Solves “Pursuit of Excellence” Challenges...



When surface quality matters

- Exacting surface quality, profile, appearance, and uniformity requirements
 - Look and performance – the choice for high-end finishes and coatings
- Zero tolerance for iron contamination or embedment
- Ultra-low blasting abrasive dust for a super-clean work environment
- Ideal for non-ferrous metals
 - Aluminum
 - Inconel
 - Tungsten Carbide
 - Brass
 - Titanium
 - Exotic Metals
 - Stainless Steel
- Unique satin finish
 - Stunning look for bare metal finishes



High-efficiency manufacturing and fabrication processes

- Speed: reduce time required for surface preparation
- Produce clean, finished surfaces in one step with no secondary finishing, cleaning, or polishing required
- Reduce blasting media consumption
 - Best choice when goal is to contain and reuse abrasives
- Reduce/eliminate throughput disruption caused by rework
- Eliminate time and cost of chemical pre-treatment



Efficient precision coating removal

- Remove thick, tough powder coatings, elastomerics, multi-layers, two-part epoxies – with no burn off or scraping



Strict environmental, health, and safety (EH&S) blasting requirements

- Exceptional worker safety
 - A 100+ year safety track record for mineral wool
 - Nothing is added to mineral wool material in its conversion to *superoxalloy* abrasives
- The composition of mineral wool and *superoxalloy* abrasives is identical
 - Decades of human and animal safety study of mineral wool material
 - Large-scale, safe use of mineral wool by workers around the world for more than a century
- Exceptional environmental safety
 - 10X abrasives are California Air Resources Board (CARB) certified

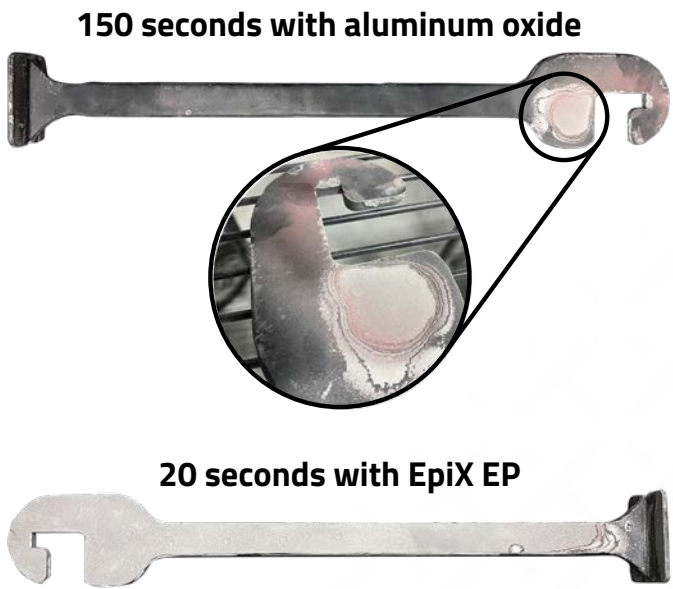


EpiX precision grade *superoxalloy* abrasives: Ultra high-performance for demanding manufacturing applications

REPLACES ALUMINUM OXIDE, SILICON CARBIDE, AND CERAMIC AT A LOWER COST.

EpiX on the job...

Ultra high-performance



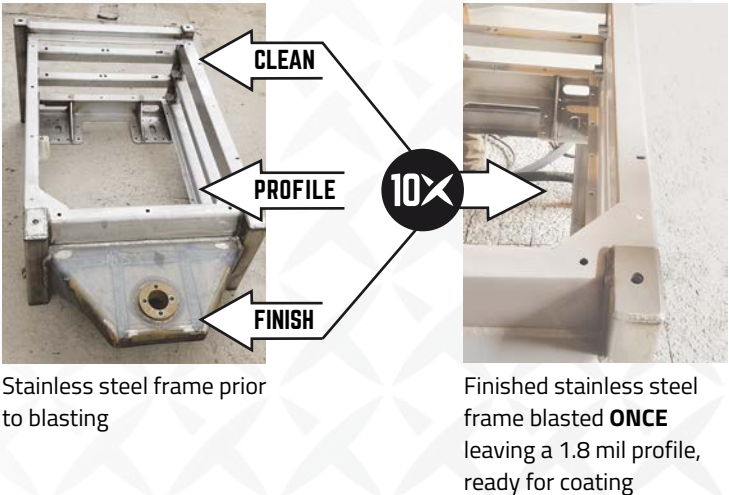
With Aluminum Oxide
At 2 minutes 30 seconds: less than 10% of powder coating removed.

With EpiX EP
At 20 seconds: entire part cleaned and restored, leaving a profiled surface ready for use.

Process improvement

EpiX: does the job in 1 step vs. 3

For this maintenance job, the contractor normally performed three separate blasting steps: 1) silica sand to clean frame and weld marks, 2) glass beads to reduce profile, and 3) fine media to achieve an aesthetic finish. **One blasting step with EpiX superoxalloy abrasive performed all 3: clean, profile, and finish** – and delivered a ready-to-coat surface profile of 1.8 mil. Effective and efficient. And EpiX performed the job faster while using dramatically less abrasive vs. the old three-step method.



Superior bond strength

EpiX: Quantum leap in productivity, quality, manufactured part yield, and profitability

Asphalt milling and removal bits are submitted to extreme pressure (up to 8,000 PSI). Bits are formed from tungsten carbide and require blasting to remove a carbonized coating left over from the manufacturing process.

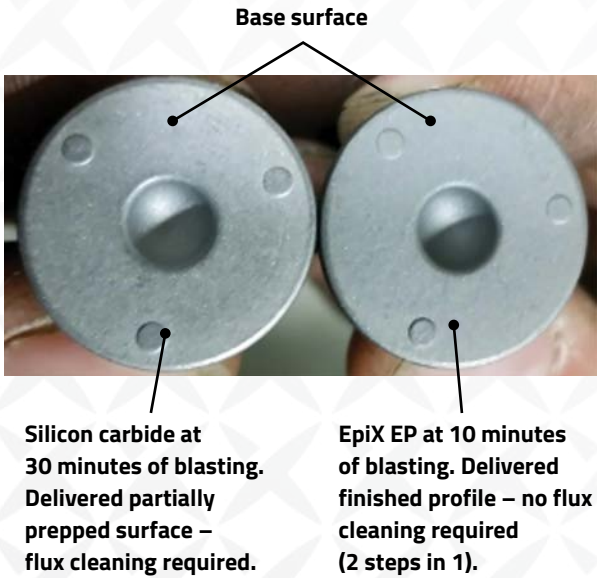
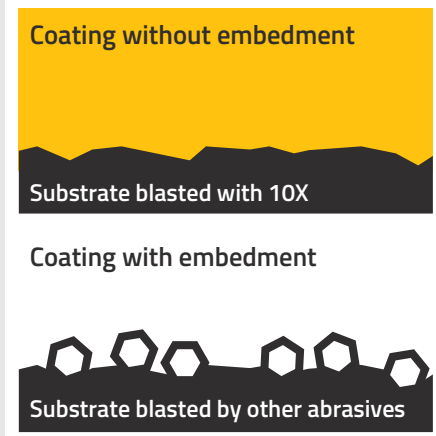
Using silicon carbide, blasters would spend 30-60 minutes cleaning the surface before treating the underside of the tips with flux cleaning agent and then brazing the tip to the base of the part. Often the brazed bits would fail in testing and require rework.

With EpiX EP, 10 minutes of blasting delivered the desired surface profile and eliminated the need for flux cleaning, reducing surface preparation time by 67%. The brazed bond, tested without flux, did not fail. At 18,000 PSI, the tungsten carbide tip cracked. EpiX EP delivered a clean bond that exceeded the strength of tungsten carbide.



The Importance of an Embedment Free Substrate

Embedment blocks a coating from creating a complete bond with the substrate. *Superoxalloy* abrasives are tempered so they resist breaking upon impact and do not leave behind embedment, yielding a cleaner surface for coatings to adhere to.



Test results:






Bond failure @ 5,000 PSI with silicon carbide surface preparation.



Bond withstood 18,000 PSI with EpiX EP surface preparation – the tungsten carbide broke before the bond.

Super-fast, cost-effective abrasive for demanding, high-volume blasting jobs

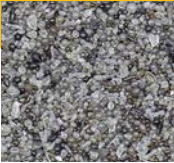



	KINETIX 20/40	KINETIX 20/70	KINETIX 40/70
			
ABRASIVE CLASS	Superoxalloy	Superoxalloy	Superoxalloy
GRIT SIZE	20/40 Mesh	20/70 Mesh	40/70 Mesh
DESCRIPTION & APPLICATIONS	<ul style="list-style-type: none">▪ Coarse abrasive▪ Thick or hard coatings▪ Deep profile▪ Corrosion & coating removal▪ Oil, dirt & grease removal	<ul style="list-style-type: none">▪ All-purpose abrasive for speed & profile▪ Thick or hard coatings▪ Medium profile▪ Corrosion, coating & mill scale removal▪ Oil, dirt & grease removal	<ul style="list-style-type: none">▪ General all-purpose abrasive▪ Medium-to-thick coatings▪ Medium profile▪ Corrosion, coating & mill scale removal▪ Oil, dirt & grease removal▪ Stone cutting & engraving
SURFACE PROFILE*	2.5-4.0 mil	2.5-3.5 mil	2.0-3.0 mil
RECOMMENDED PRESSURE AT THE NOZZLE (PSI)	>100	>100	>100
MOHS HARDNESS	7-8	7-8	7-8
REUSABILITY @ 100 PSI	2-4 times	2-6 times	4-6 times
WORKING SPEED	Very fast	Very fast	Very fast
DUST RATING	Low	Low	Low
SPECIFIC GRAVITY	2.7-2.9	2.7-2.9	2.7-2.9
BULK DENSITY	90-95 lb/ft³	93-103 lb/ft³	95-105 lb/ft³
MELTING TEMPERATURE	1,150°C / 2,102°F	1,150°C / 2,102°F	1,150°C / 2,102°F
SSPC-AB 1	Certified	Certified	Certified
CARB	Approved	Approved	Approved
MIL-A-22262-B	Listed	Listed	Listed

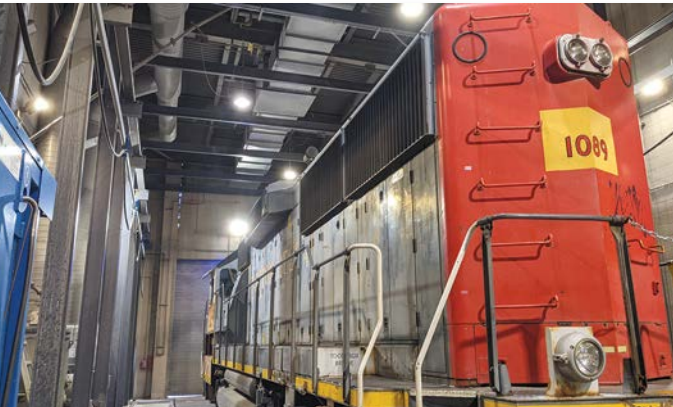
*Expected surface profile ranges on mild steel. Results may vary.

Ultra high-performance for demanding manufacturing applications



	EPIX EP (ENHANCED PROFILE)	EPIX MP (MEDIUM PROFILE)
		
ABRASIVE CLASS	Superoxalloy	Superoxalloy
DESCRIPTION & APPLICATIONS	<ul style="list-style-type: none">▪ Enhanced, uniform profile▪ Extra hard or tough coatings▪ Mill scale removal▪ Weld cleaning▪ Oil, dirt & grease removal▪ Stone cutting & engraving▪ Safe for stainless steel▪ Clean, bright, SP5 finish	<ul style="list-style-type: none">▪ Uniform, medium profile▪ Extra hard or tough coatings▪ Mill scale removal▪ Weld cleaning▪ Oil, dirt & grease removal▪ Stone cutting & engraving▪ Safe for stainless steel▪ Clean, bright, SP5 finish
SURFACE PROFILE*	2.0-3.0 mil	1.5-2.2 mil
RECOMMENDED PRESSURE AT THE NOZZLE (PSI)	Application dependent	Application dependent
MOHS HARDNESS	7-8	7-8
REUSABILITY @ 100 PSI	6-10 times	7-15 times
WORKING SPEED	Very Fast	Very Fast
DUST RATING	Low	Low
SPECIFIC GRAVITY	2.7-2.9	2.7-2.9
BULK DENSITY	100-110 lb/ft³	100-110 lb/ft³
MELTING TEMPERATURE	1,150°C / 2,102°F	1,150°C / 2,102°F
SSPC-AB 1	Certified	Certified
CARB	Approved	Approved
MIL-A-22262-B	Listed	Listed

*Expected surface profile ranges on mild steel. Results may vary.



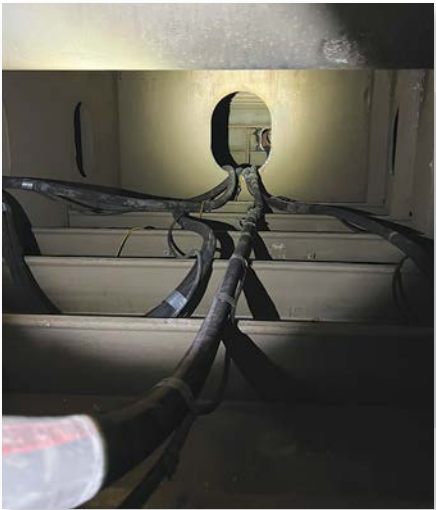
KinetiX 20/70 customer switched from crushed glass and improved speed and productivity by more than 60% on locomotive blasting



KinetiX 20/70 removing tough, high solids epoxy from a rail car



EpiX MP is used by powder coater that provides parts for racing industry



KinetiX 20/70 helps to complete ballast tank in large marine vessel ahead of schedule



EpiX MP removing urethane-based coating from Pilatus PC-12 composite aircraft engine cowling without causing damage



EpiX MP leaves an exceptional surface finish, ideal for high-performance powder coating

A LOOK AT COST

HOW IS IT POSSIBLE THAT ULTRA-PERFORMANCE 10X *SUPEROXALLOY* ABRASIVES CAN BE PRICED SO FAR BELOW THEIR TOTAL COST TO MANUFACTURE?

Users are often surprised to learn that the cost to produce *superoxalloy* abrasives is many times the price they pay for the product. In fact, the cost to make *superoxalloy* abrasives is many times what high-volume blasters pay for the most expensive, premium-priced blast media. But how can that be?

Consider this: the hundreds of millions of dollars in capital equipment, plus the labor required to make the material 10X manufactures into *superoxalloy* abrasives, is covered by mineral wool makers. And because we upcycle a by-product for these large mineral wool manufacturers, we improve their sustainability. This delivers tremendous economic value to these companies. In exchange for this, 10X and its customers pay nowhere near the actual cost incurred to create *superoxalloy* particles. Of course, there's still expense in capital equipment, labor, and knowhow to extract, refine, process, size, package, and transport 10X abrasives. But rather than pay the full expense of producing them, customers pay only a few pennies on the dollar of the total cost incurred to produce safe, innovative, sustainable, high-performing *superoxalloy* abrasives. And that's how 10X abrasives can be priced far below their cost to make.

Superoxalloy solves threat of shipyard shutdown due to dust

Complaints from shipyard neighbors about abrasive dust threatened to end blasting operations during daytime hours. In search of a solution, the shipyard implemented two ideas from the 10X technical support team:
1) try 10X *superoxalloy* abrasive and 2) slightly modify the blasting process. The results:



80% less dust

Shipyard operations saw an estimated dust reduction of up to 80%. Neighbor complaints ended. And blasting operators enjoyed cleaner work conditions and improved visibility.



79% less abrasive consumption

Over a period of one year, usage decreased from 3,700,000 lbs. of the previous mineral abrasive to 770,000 lbs. of 10X *superoxalloy*.



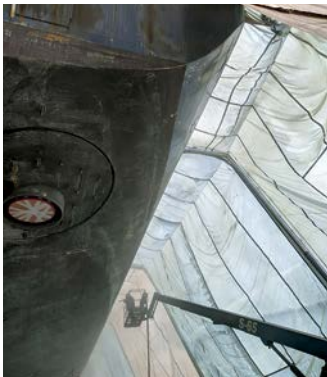
40% increase in speed/efficiency

Average working speed increased from 200 sq. ft./hour with the previous mineral abrasive to 280 sq. ft./hour with 10X *superoxalloy* abrasive.



Delayed rust bloom

Superoxalloy finished surfaces in the seaside environment now remain free of rust bloom for more than two weeks in rain-free conditions.



Even with multiple operators blasting, dust problems have been eliminated. And blast operations can continue during daytime hours.

Simple enhancements to blasting process

1. Switch from older abrasive to 10X *superoxalloy*
2. Blast at 100 PSI or higher
3. Use plunger-style metering valves to allow fine-tuning of flow to low levels (where *superoxalloys* perform most efficiently)
4. Regularly check all nozzles for wear and replace when worn
5. Check air dryers regularly to ensure surface finish quality

The Bottom Line

Here's what the switch to 10X *superoxalloy* and simple minutes-a-day enhancements to blasting procedures added up to for the shipyard:

\$200,000 to \$300,000 per year in additional bottom-line profit

And this doesn't include additional hard-to-measure benefits: more efficient use of dock space, less rework from rust bloom, and added profit from finishing boats in less time.

10X ENGINEERED MATERIALS

ABOUT THE COMPANY BEHIND THE BREAKTHROUGH

Not so long ago, a team of scientists and engineers set out to unleash the benefits of a unique material – one with a 100+ year track record of safety and performance – into the industrial abrasive market.

To achieve this, that group, plus many others, built a new company and all-new manufacturing methods from the ground up. And in just a few short years, innovative *superoxalloy* abrasives from 10X Engineered Materials have become the fastest-growing new category of abrasives in the industry.

Three principles stand behind this effort:

Innovation: based in engineering, manufacturing, and sound science

Breakthrough performance: centered on productivity, efficiency, and output quality for customers

People: upholding the health, safety, and environment of those who use, distribute, and make 10X *superoxalloy* abrasives

To customers, colleagues, and partners – all those who have joined in the quest to help the industry achieve all new levels of safety and productivity – we say thank you. And here's to the next breakthrough...

THE 10X TEAM



10X clean-tech manufacturing facility in Wabash, Indiana