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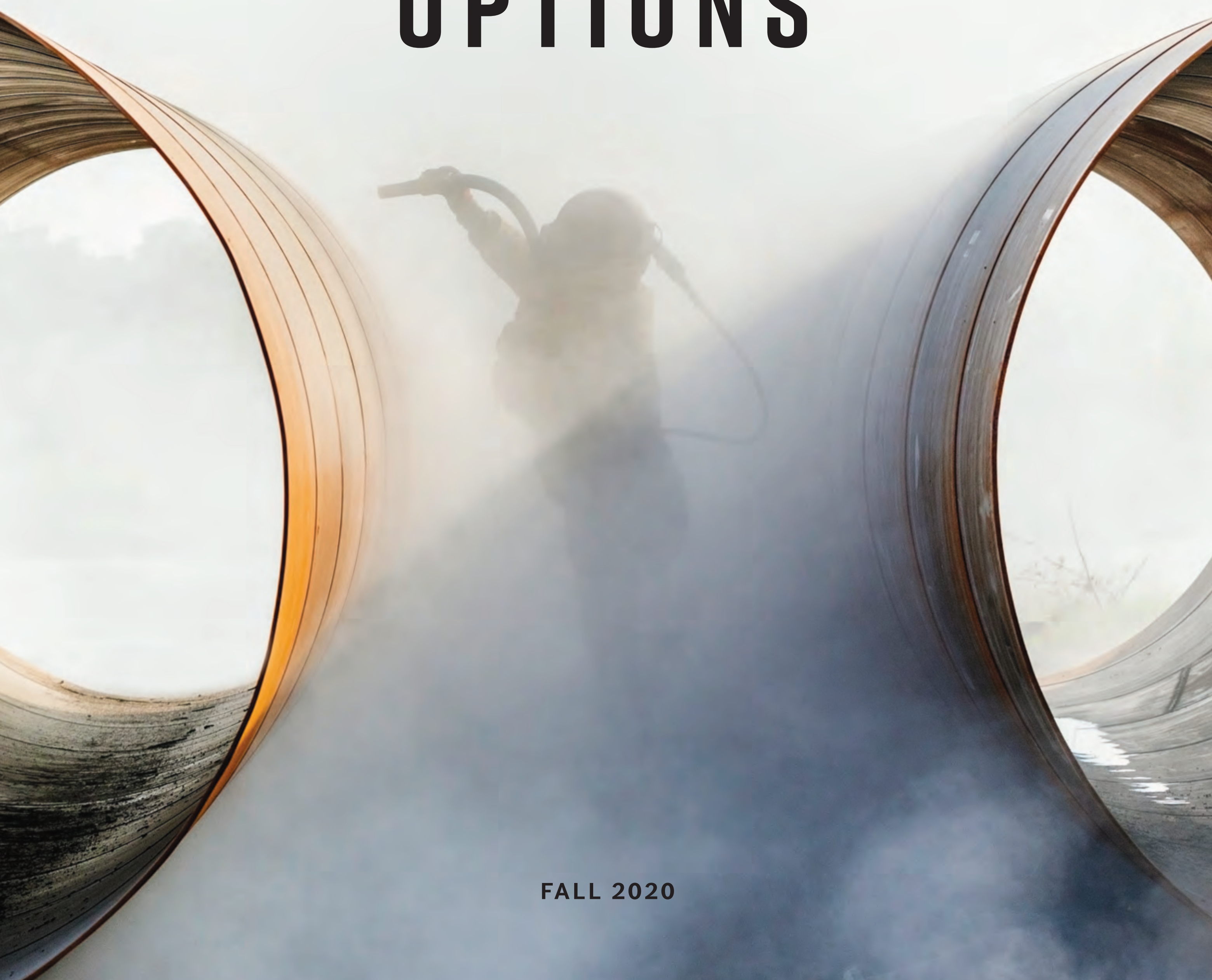
SURFACE PREPARATION

OPTIONS



FALL 2020

INSIDE

SURFACE PREPARATION OPTIONS

You've likely heard it a hundred times, but it bears repeating. The first step in any successful coating project is performing proper surface preparation. Sounds simple, but it can get complicated out in the field, as an effective surface prep job depends on numerous key factors, from equipment selection to safety considerations to spec requirements and more.

If you're blast-cleaning, you'll need to decide which abrasive material is right for your project, considering not just traditional mineral abrasives, but also new alternatives that can offer performance benefits and cost savings. Further, you'll have to select the equipment that best fits your job. Choosing the correct hoses and nozzles, compressors, blast machines and all of the other components that make up your blasting system will help you achieve efficiency and profitability.

Concrete surfaces present their own surface prep challenges, and when prepping a floor for an epoxy overlay, specialized equipment such as a concrete grinding machine can make meeting the spec a smoother process. And when you're adding water to the mix, such as when performing wet abrasive blasting or waterjetting, you may want to consider rust inhibitive additives to prevent the common, dreaded occurrence of flash rusting.

This *PaintSquare Press* supplement includes technical and practical guidance from surface prep experts on these topics and more. We hope that the advice contained within can be applied successfully on your next surface prep project.

— Charlie Lange, Editor-in-Chief,
PaintSquare Press

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STAINLESS STEEL GRIT

A VIABLE ALTERNATIVE TO MINERAL ABRASIVE

JOE McGREAL, ERVIN INDUSTRIES

Mineral abrasives, such as aluminum oxide and garnet, are popular with traditional users for general cleaning and in applications that require a specific surface roughness. Though aware of metallic options, these users tend to resist change and stick with the familiar.

Progressive end users who have tried steel abrasives are likely to report benefits such as increased recyclability, productivity and savings in operating costs. With the escalating costs of mineral abrasives, transportation and disposal, more customers are looking at steel abrasives for their cleaning operations.

Steel abrasives such as conventional shot and grit work well for most cleaning applications, but their inherent chemistry stops short of addressing transfer corrosion, an aspect that's critical when transporting automobiles and other vehicles. Conventional steel shot and grit abrasive retained in the crevices of a blasted component will rust when exposed to commonly encountered corrosive environments. Transference to the surrounding space then becomes a risk. If, for example, that space is occupied by a new car in transit to the dealership, the exposed auto parts are subject to this corrosion. Therefore, there was a clear need to identify abrasive options that provide superior recyclability and the ability to mitigate corrosion risks.

ALUMINUM OXIDE AND ITS USE IN GRIT BLASTING

Aluminum oxide (AlOx) has desirable properties that make it a popular choice for grit blasting. Its angular shape and hardness (9 on the Mohs scale) easily impart an etch on the blasted surface. However, the very same desirable characteristics also make it brittle, causing early disintegration and reduction in durability.

An acknowledged advantage of AlOx is its propensity to maintain its angular profile even after repeated impacts and breakdowns. At some point, the breakdown leads to angular but smaller-sized particles that no longer possess the initial energy to impart the intended surface roughness. In critical applications, where maintenance of a consistent profile is critical, a vibratory classifier separates the smaller-sized angular AlOx from the work mix.

The breakdown of this abrasive not only requires the system to be constantly replenished but also creates a dusty environment for the operators to work in. The dust in turn gets ventilated to a dust collector, where the user has to contend with the inconvenience of disposing high volumes of dust and fines. Other intangibles, leading to a drop in productivity, include operator discomfort, vision issues in a perennially clouded and dusty blast environment and repeated maintenance for all wear components that come in direct contact with the abrasive.

Faced with the above challenges, Ervin Industries was approached by a trailer manufacturer to identify an alternative to AlOx. Given the requirement for a corrosion-resistant abrasive, the logical suggestion was stainless steel grit.

THE CHOICE OF ABRASIVE

The two main aspects determining the choice of abrasive are (1) its ability to create a surface profile comparable to that created by AlOx, and (2) corrosion resistance. These aspects are, in turn, determined by the characteristics of the abrasive—its physical properties and chemistry. Stainless steel grit provides a rough surface profile instead of denting the surface like stainless steel shot. The stainless steel grit manufactured by Ervin is a contaminant-free, inert metal abrasive with a martensite/chrome carbide microstructure. Its hardness is at a minimum 57 HRC, giving it the power to etch. In terms of chemistry, it has a high degree of chromium (30%), in addition to 2% carbon, 4% silicon and 2% manganese.

The chromium content gives the abrasive its non-corrosive property. Parts blasted with stainless steel grit and tested in a 24-hour salt spray display no signs of corrosion. This means the fugitive grains of stainless steel grit, if and when left behind in the part intricacies, no longer pose the threat of corrosion and its transference onto automobiles and railcars that the frame might transport in its useful life.

Surface Roughness Comparison

Surface roughness achieved is a function of several factors such as the blast (air) pressure, hardness of the substrate,

Use of Amagrit results in an operating environment with minimal dust *(top),* while using mineral abrasives such as AlOx results in a dusty room *(bottom).*

type of nozzle (venturi/straight bore), nozzle distance from the substrate (ideally 4 to 6 inches) and blast angle (90 degrees provides the maximum impact). A combination of these parameters will effectively determine and help alter the profile obtained. AlOx typically provides a surface roughness of 0.5 to 1.0 mil using a 120 mesh size sample. In comparison, a larger-sized sample, 60 mesh, could result in a surface roughness of 2.0 to 3.0 mil. Larger mesh sizes of AlOx could increase the profile to as high as 6 mil.

The target of our case study was in the range of 1.5 to 3.5 mil.

As a general rule, the size of the stainless steel grit selected has to be one size smaller than the equivalent AlOx grade. Selection of the same size as AlOx will result in a surface roughness value that is at least 1 mil greater than obtained with AlOx. This is due to the stability of stainless steel grit and smaller percentage of smaller particles than AlOx. Due to its lower durability, AlOx is likely to have a relatively wider sieving range.

This prompted the end user to use SSG50 as their choice of abrasive to obtain surface roughness in the above range. In theory, the air pressure would also need to be reduced with the use of stainless steel grit. AlOx has a specific weight of 125 lbs/cft, compared to 280 lbs/cft for stainless steel grit. The end user continued to blast at the same air pressure—more on that discussion in the paragraphs that follow.

Statistical Measurement

An offline lab test was conducted on three different sizes of AlOx and stainless steel grit to determine the consistency of surface finish over seven blast cycles, under two different air pressures. Lower standard deviation is considered to be a process with better stability (values are closer to the mean). It was found that smaller abrasive sizes, AlOx and stainless steel grit, deviated the lowest from the value. Larger sizes, in both cases, showed high deviation, signifying reduced consistency. In general, larger sizes of AlOx (AlOx 30 and 46) showed greater standard deviation than their stainless steel grit counterparts. Further studies, such as a review of the surface topography, are required to ascertain uniformity of finish over a fixed area in order to determine suitability for higher precision applications such as aerospace and medical.

Air Pressure, a Critical Process Parameter

Common practice is to blast with as high a pressure as available in the plant. This could be in the range of 90 to 120 psi. The fact is that, at this pressure, AlOx faces rapid disintegration. Air pressure values below 50 psi are not even taken into consideration by most users, with the common complaint that “it takes too long” when blasted at

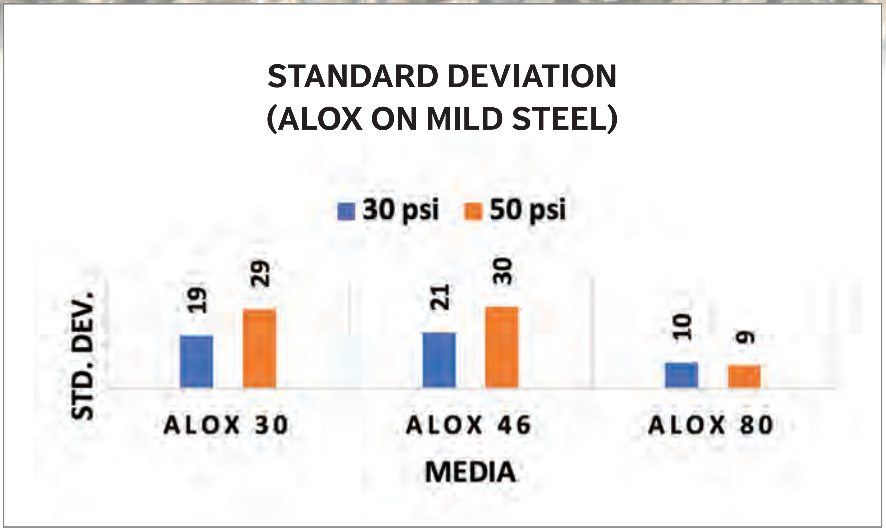

FIGURE 1: Variability of finish with AlOx

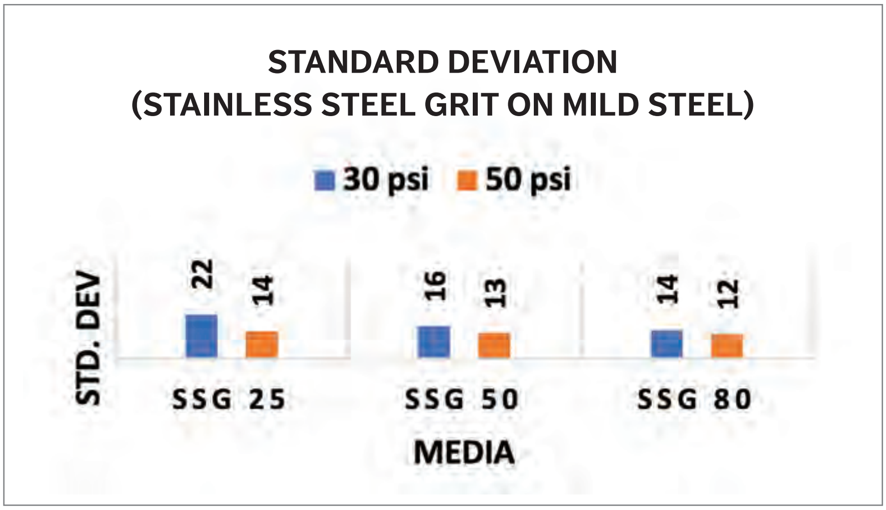

FIGURE 2: Variability of finish with SS grit

this pressure. This statement can only be validated by reviewing all other factors at that time. For example, nozzle design—venturi or straight bore—will determine media dispersion and uniformity of surface profile. If a lower profile is desired and if lowering of pressure continues to provide a rougher profile than anticipated, the culprit might be the nozzle design.

The end user in our case study continued to blast at 90 psi, albeit with greater durability values of stainless steel grit than they experienced with AlOx. Let us assume that the application does allow for a reduction in air pressure—the economics of the operation will be significantly different.

For instance, consider the blast pressure dropping from 80 psi to 50 psi with stainless steel grit compared to AlOx. The difference in consumption of compressed air, by a 3/8-inch diameter nozzle, at 80 and 50 psi is about 50 cfm. This amount of compressed air will require a 10 HP compressor, which translates to a 7.5 kW savings per hour—not including breakdown costs and longevity of consumables such as nozzles and hoses.

Even at this pressure, due to the reduced breakdown of stainless steel grit, the end user started working in a blast environment that was significantly less cloudy (dusty), to the extent that their frequency of changing dust collector filter cartridges went from monthly to once a quarter.

Equipment Design Changes

The blast facility that blasts with stainless steel grit should have a robust media recovery system, as this media is highly recyclable. The operating costs can be kept in check because the media is 100% recoverable and reusable (after cleaning). The customer in our case study had a mechanical recovery system, which was agnostic to the type of media being reclaimed. Therefore, they had to make minimal modifications to adapt the system to stainless steel grit.

At the time of purchase, vacuum recovery systems are sold and designed for the media proposed for the project. If this media happens to be AlOx or glass bead discharged from a single nozzle, the blast machine will be supplied with a vacuum recovery system. This means that the exhaust fan located downstream to the machine will need to be re-evaluated for its capacity to move the normal amount of abrasive discharged from the nozzle(s). Most often, this could be an easy modification, such as a larger fan and/or motor sized to handle heavier steel media. The most important aspect of using stainless steel (or for that matter, any abrasive that has higher durability and recyclability) is that blasting is conducted in an enclosed environment with a functional recovery system.

Transmitted Energy

An offline test was conducted with three different sizes of AlOx and stainless steel grit. These tests were carried out at two different air pressures, 30 psi and 50 psi. Though such pressures are notably lower than the 90 psi at which the end user was blasting, these values were selected to define this material property and gage its suitability for other applications—such as in aerospace prior to thermal spray.

The results that followed were interesting but not surprising. Given comparable cleaning properties, albeit with a smaller-size stainless grit, the transmitted energy was the same with both abrasive types. This was

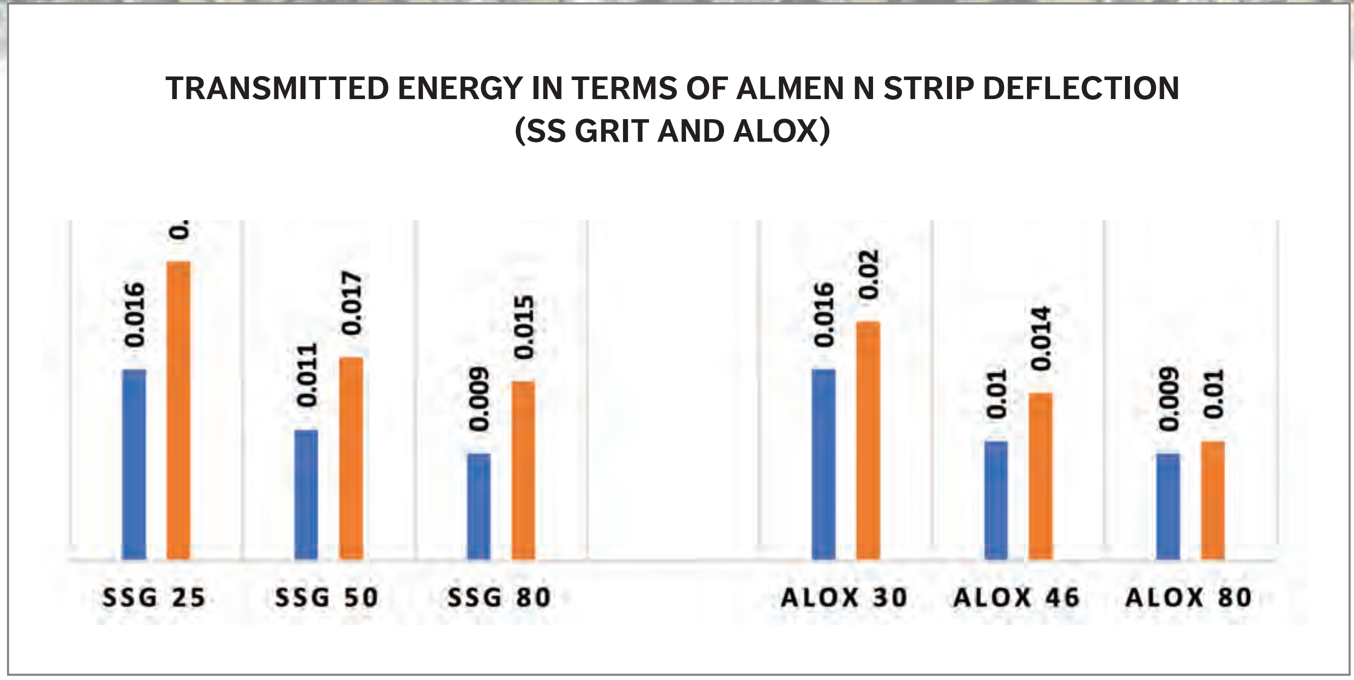

FIGURE 3: Transmitted energy with AlOx and stainless steel grit

checked by using an Almen N strip (thickness = 0.031 inch) commonly used in shot peening applications. Transmitted energy was checked in terms of deflection of this strip when exposed to similar time cycles.

ECONOMICS OF OPERATION

Several factors influence the economics of the blast operation. These factors are identified earlier as those affecting the surface roughness. Here we will evaluate the tangible aspects of using stainless grit, considering a blast system with a single blast nozzle.

Using conservative estimates, the cost of blasting with AlOx is twice that of stainless steel grit. The other aspects that haven't been quantified above include:

- Enhanced productivity due to clear visibility of the product being blasted (User statement: "Over-blast and re-blast are reduced, as are areas on the part that were missed out due to prevailing dust environment.")
- Reduced machine maintenance cost
- Dust disposal costs (e.g., transportation, landfills)

CONCLUSION

Mineral abrasive such as garnet and AlOx continue to be popular choices. Is the switch to stainless steel grit for all applications? Probably not. As we discuss this, each of us is are aware of at least a dozen installations that blast in the open, in environments that cannot physically contain the abrasive, and at times without proper ventilation. These are the limitations, and the looming capital expense of an airblast room, even if it were just a freight container, and proper media recovery system, could be deterrents.

Most blast equipment companies have a cost-effective solution to this. DIY rooms and standard, plug-in recovery systems are not very expensive and within the reach of most finishing operations. Building an enclosure to contain and recover the blast media might sound daunting, but the payback will be quite rapid (in certain cases, less than a year).

TABLE 1: Operating Cost Analysis, AlOx and SS grit

OPERATING COST ANALYSIS		
AIRBLAST OPERATING DATA For 5/16-inch nozzle (qty 1) @ 60 psi	**ALOX**	**AMAGRIT**
Media flow rate (pounds per hour)	960	1200
Field consumption data (cycles)	10	100
Consumption per hour (pounds)	96.00	12.00
Abrasive cost per pound (USD)	$0.60	$3.00
Abrasive cost per hour (USD)	$57.60	$36.00
Per 8-hour shift (60% blasting)	$276.48	$172.80
Annual cost (USD per 2000 hours)	$115,200.00	$72,000.00
Abrasive dust (tons per 2000 hrs)	96.00	12.00

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ABRASIVE BLASTING

12 TIPS FOR CHOOSING THE RIGHT EQUIPMENT

LANE BARNHOLTZ, SENIOR EDITOR,
CLEMCO INDUSTRIES CORP.

It's a cliché, but it's true: To do a job right, you need the right equipment. This is especially true of abrasive blasting. But before choosing equipment for an abrasive blasting job, it is critical to examine the target surface and the work site environment, perform a job hazard analysis and assess the goals of the job. After thoroughly considering these criteria, you will be ready to select the proper equipment for a job. This article outlines the equipment needed for most abrasive blasting jobs and offers tips for making the best choices.

1. AIR COMPRESSOR

Use an air compressor that is large enough to produce the air volume and pressure required to adequately and safely pressurize the blast machine, convey abrasive to the blast nozzle, provide breathing air and operate valves and accessories.

To determine the compressor size needed for a job, add the air requirements of all the equipment that the compressor will supply and then add a 50% reserve, which will be needed to keep productivity high as the blast nozzle wears—and it will wear. To maintain peak air supply, the smallest internal diameter (ID) of the compressor air outlet should be at least four times the size of the nozzle orifice. ***(See Table 1.)***

2. BLAST NOZZLE

Replace a blast nozzle after its orifice is worn to 1/16 in (1.5 mm) larger than its original size. A worn nozzle not only wastes air, but also may lower productivity and even cause injury if the liner fails. Carbide nozzles—tungsten, silicon and boron—are the most popular for the majority of blasting applications because of their longevity.

3. AIR LINE

The air line ID should be as large as possible and at least four times the nozzle orifice size. This principle applies to air lines up to 100 feet. With longer hoses, especially longer than 200 feet, check the air pressure at the blast machine while blasting to determine if the air hose ID is sufficient. Air flows best through unrestricted fittings and straight air lines, so lines should be laid out in as short a length and with as few bends as possible to reduce pressure loss. ***(See Table 2.)***

4. AIR-PREPARATION COMPONENTS

Moisture in the compressed-air supply can travel into the blast machine. If this occurs, abrasive may clump, which can cause stoppages in abrasive flow. Air-preparation components help prevent these stoppages. Depending on the humidity level of the air where operators are working, varying levels of air-preparation equipment may be needed. Coalescing filters provide the minimum level of moisture removal. They collect some of the water vapors that have formed into small droplets before the droplets enter the air filter. Aftercoolers cool air to condense even more moisture and then trap the moisture before it is conveyed to the blast machine. Air dryers are the most effective option for removing moisture and also oil from air.

5. BLAST MACHINE

A well-engineered blast machine allows smooth air and abrasive flow throughout the system. An industrial-quality blast machine features a concave head for easy filling, and it seals automatically with a pop-up valve. Place a recessed, steel screen over the machine's filling portal to keep out debris, and cover the machine when it's not in use to keep out rain and condensation. Make sure the pressure vessel has National Board approval, an indication that it meets American Society of Mechanical Engineers (ASME) specifications.

Choose a blast machine that can hold enough abrasive for 20 to 30 minutes of steady blasting. Consider the effects of compressor and nozzle size on blast machine productivity. ***(See Table 3, next page.)***

6. PRESSURE REGULATOR AND GAUGE

These components enable operators to monitor and adjust air pressure. (**TIP:** Use a hypodermic-needle gauge to check pressure at the nozzle.)

7. ABRASIVE METERING VALVE

In a well-engineered metering valve, abrasive flows into a stream of compressed air at a steady, uniform rate via the pull of gravity. A well-designed valve also permits precise flow adjustments. Metering valves that feed abrasive at a 45-degree angle facilitate the natural pull of gravity and promote a smooth abrasive and compressed-air blend, while metering valves that feed abrasive at a 90-degree angle create erratic abrasive flow, abnormal wear on piping and inaccurate mixing of air and abrasive.

8. REMOTE CONTROLS

OSHA requires that blast machines be equipped with remote controls that quickly halt blasting after the control handle is released. Pneumatic remote controls work well at distances up to 100 feet. Electric remote controls are recommended for distances greater than 100 feet and are mandatory for distances of 200 feet or more.

9. BLAST HOSE AND COUPLINGS

Always use appropriately sized, good-quality, static-dissipating blast hose, manufactured for abrasive blasting and rated at the appropriate working pressure. The blast hose ID should be at least three times the size of the nozzle orifice.

TABLE 1: Minimum Compressor Air Line Diameter

NOZZLE NUMBER	NOZZLE ORIFICE SIZE	MINIMUM AIR LINE ID
3	3/16 in (5 mm)	1 in (25 mm)
4	1/4 in (6.5 mm)	1 in (25 mm)
5	5/16 in (8 mm)	1-1/4 in (32 mm)
6	3/8 in (9.5 mm)	1-1/2 in (38 mm)
7	7/16 in (11 mm)	2 in (50 mm)
8	1/2 in (12.5 mm)	2 in (50 mm)
10	5/8 in (16 mm)	2-1/2 in (64 mm)
12	3/4 in (19 mm)	3 in (76 mm)

TABLE 2: Approximate Pressure Loss Caused by Common Fittings

Calculations are based on 100 psi (7 bar) in 1-inch (25-mm) pipe.

FITTING	PRESSURE LOSS	
45 degrees pipe elbow	1.5 psi	0.1 bar/10 kPa
90 degrees pipe elbow	3 psi	0.2 bar/21 kPa
Pipe tree	5 psi	0.3 bar/34 kPa
Swing check valve	18 psi	1.2 bar/124 kPa

TABLE 3: Compressed-Air and Abrasive Consumption

Consumption rates are based on abrasives that weigh 100 pounds per cubic foot.

Nozzle Orifice	Pressure at the Nozzle (psi)								Air, Abrasive & HP requirements
	50	60	70	80	90	100	125	140	
No. 2 (1/8 in)	11	13	15	17	18.5	20	25	28	Air (cfm)
	.67	.77	.88	1.01	1.12	1.23	1.52	1.70	Abrasive (cuft/hr)
	67	77	88	101	112	123	152	170	Abrasive (lbs/hr)
	2.5	3	3.5	4	4.5	5	5.5	6.2	Compressor HP
No. 3 (3/16 in)	26	30	33	38	41	45	55	62	Air (cfm)
	1.5	1.71	1.96	2.16	2.38	2.64	3.19	3.57	Abrasive (cuft/hr)
	150	171	196	216	238	264	319	357	Abrasive (lbs/hr)
	6	7	8	9	10	10	12	13	Compressor HP
No. 4 (1/4 in)	47	54	61	68	74	81	98	110	Air (cfm)
	2.68	3.12	3.54	4.08	4.48	4.94	6.08	6.81	Abrasive (cuft/hr)
	268	312	354	408	448	494	608	681	Abrasive (lbs/hr)
	11	12	14	16	17	18	22	25	Compressor HP
No. 5 (5/16 in)	77	89	101	113	126	137	168	188	Air (cfm)
	4.68	5.34	6.04	6.72	7.40	8.12	9.82	11.0	Abrasive (cuft/hr)
	468	534	604	672	740	812	982	1100	Abrasive (lbs/hr)
	18	20	23	26	28	31	37	41	Compressor HP
No. 6 (3/8 in)	108	126	143	161	173	196	237	265	Air (cfm)
	6.68	7.64	8.64	9.60	10.52	11.52	13.93	15.6	Abrasive (cuft/hr)
	668	764	864	960	1052	1152	1393	1560	Abrasive (lbs/hr)
	24	28	32	36	39	44	52	58	Compressor HP
No. 7 (7/16 in)	147	170	194	217	240	254	314	352	Air (cfm)
	8.96	10.32	11.76	13.12	14.48	15.84	19.31	21.63	Abrasive (cuft/hr)
	896	1032	1176	1312	1448	1584	1931	2163	Abrasive (lbs/hr)
	33	38	44	49	54	57	69	77	Compressor HP
No. 8 (1/2 in)	195	224	252	280	309	338	409	458	Air (cfm)
	11.60	13.36	15.12	16.80	18.56	20.24	24.59	27.54	Abrasive (cuft/hr)
	1160	1336	1512	1680	1856	2024	2459	2754	Abrasive (lbs/hr)
	44	50	56	63	69	75	90	101	Compressor HP

10. OPERATOR SAFETY EQUIPMENT

Personal protective equipment (PPE) is necessary for blasters and everyone in the work area, especially NIOSH-approved respiratory protection. No dust is safe to breathe! Use an air-fed helmet that not only furnishes breathing air but also protects the operator's head and face from rebounding abrasive, muffles noise and allows an unobstructed field of vision.

11. CARBON MONOXIDE MONITOR ALARMS

These devices trigger audible, visual and/or vibratory alarms after they detect unsafe levels of carbon monoxide (CO) in the breathing-air supply of a supplied-air respirator. CO can be produced by oil-lubricated compressors or by motor or engine exhaust that enters the intake of a compressor or ambient air pump.

12. PROPERLY PREPARED OPERATORS + THE RIGHT EQUIPMENT = SUCCESSFUL ABRASIVE BLASTING

Just like any other task in life, experience, knowledge and proper training are essential to abrasive blasting. OSHA regulations state that employers are responsible for training operators and for supplying all necessary PPE. Employers must also establish a safety program and ensure their workers follow safe practices on every job. OSHA's regulations reinforce that the best way to guarantee a safe, efficient and productive abrasive blasting operation is to use properly trained, properly protected operators who have the right equipment for the job. ■

PREPARING LARGE SURFACE AREAS FOR AN EPOXY COATING

ERIC MYERS, EQUIPMENT DEVELOPMENT COMPANY

Epoxy coatings are a leading option for garage floors, shop floors and other large areas because of their ability to withstand the effects of stains, abrasive impacts, traffic and heavy equipment. But for the coating to be truly effective and hold up against the normal rigors of life and work, the entire epoxy overlay installation must be done correctly.

This can seem daunting, especially when large areas must be completed in a limited time. The process for properly retrofitting a surface with an epoxy coating comprises several steps.

First, make sure you have or can get all proper equipment—from machines to accessories. Using the proper equipment, such as a concrete grinder, substantially expedites the process and makes the surface preparation step a much easier undertaking.

EDCO's 9-inch Magna-Trap Turbo-Lite Grinder (model TL-9) is especially convenient for large, open areas. The TL-9 and other turbo grinders allow users to grind hundreds of square feet per hour, working at a rate five times faster than traditional grinding machines.

But a complete surface preparation project includes tight areas where the floor meets vertical surfaces, such as beams, steps, walls and corners. For those areas, some think their only option is a hand grinder. Instead of getting into an uncomfortable kneeling or sitting position for hours of work with a hand grinder, turn to an edge grinder.

EDCO's 7-inch Magna-Trap Turbo/Edge Grinder (model TMC-7) has a three-position articulating frame, giving users the ability to work in a right-angle, left-angle or straight position. Its adjustable tubular handlebar provides maximum grinding flexibility from a standing position and allows for complete clearance of any vertical surface.

When renting or buying machines, don't forget to consider what power option will work best for the jobsite. If electric outlets won't be available, propane or gas are acceptable alternatives.

SELECTING THE PROPER TOOLING

The tooling is an essential part of the operation, and the concrete dictates the bond and grit of the accessories needed to equip a grinder. There are three main considerations for choosing the proper accessories for the job — surface, desired texturing and application.

To evaluate the concrete and ultimately choose the proper tooling, the first step is to determine the age of the concrete. If the concrete is less than 28 days old, it is considered "green" concrete. That fresher concrete can be soft and abrasive, and it eats up the diamond tooling quicker. Therefore, a hard bond is the best option for new concrete.

Any concrete older than four weeks is considered "cured" concrete, which can be soft, medium or hard. There are two primary ways to find out. The first involves taking a core sample and sending it off to be tested, while the second is through a self-administered Mohs hardness test. That test kit includes three scratching tools that indicate different hardness levels.

After determining the hardness of the concrete, you can choose the proper bond for the accessories. Soft concrete requires a hard bond diamond, medium concrete requires a medium bond diamond, and hard concrete requires a soft bond diamond.

Another component of accessories is the grit. Diamond grits are similar to wood sandpaper grit; a lower number represents a coarser grit and a higher number denotes a finer grit. EDCO's accessories come in 18 grit, 30 grit, 70 grit and 120 grit, with 18 being the coarsest and 120 being the finest.

Grit is a key factor in determining how much scratching is left behind after grinding. Lower grit accessories that are more coarse leave more scratches, which is oftentimes most conducive for the coating to adhere to the concrete effectively. Meanwhile, using higher grit accessories will leave a smoother finish with minimal scratching.

Another factor that dictates the texture that the grinder leaves behind is the type of accessory used. EDCO offers a variety of accessories for several applications that leave different concrete surface profiles (CSP). A CSP gauges how smooth or rough the surface will be, with lower numbers on the one-through-nine scale representing

The model TMC-7 Magna-Trap Turbo/Edge Grinder in action

smoother textures and higher numbers indicating rougher finishes.

If a project requires the removal of another coating first, users may need to start with a more aggressive accessory—depending on the original material. However, it is still imperative to consider how much scratching or gouging is desired, if any at all.

For a low CSP, which indicates little to no texture left, the Dyma-Dot accessories are an ideal option. Dyma-Segs and Dyma-Arrows can also achieve a low CSP while removing general or abrasive coatings. Dyma-PCDs can be used for industrial-strength coating removal but will result in a surface with more texture, thus a higher CSP. Magna-Blades accessories leave a smooth surface and should be used to remove flaking paints, industrial buildups, soft thin-set, foam-rubber carpet backing, glues and adhesives.

For the application of installing an epoxy coating on a concrete surface, check the coating manufacturer's instructions to find the desired surface texture for their product to adhere properly. But, typically, this application calls for a smoother surface.

Should the user remove a preexisting material first, it may be necessary to add a step to ensure the surface is smooth enough for that new coating by grinding the surface further with an accessory that will leave a lower surface profile. Even if another accessory grouping is necessary, the Magna-Trap tooling can be easily rotated quickly by sliding right into the disc.

DUST PREVENTION

Dust prevention is a vital part of any job where the user is grinding or cutting concrete, because it ensures safety and compliance with the respirable crystalline silica dust standards from the Occupational Health and Safety Administration (OSHA).

The Magna-Trap Turbo-Lite Grinder TL-9, folded for transport

Not to mention, it eliminates time dedicated to cleaning up any dust left behind.

Grinding and cutting concrete or stone produces extremely small respirable silica dust particles that can cause serious long-term health risks from silicosis, an incurable lung disease that can lead to death. Ensuring that workers are compliant with OSHA's silica dust standards can truly be a lifesaver.

A standard shop vacuum cannot contain the dust a grinder produces. Instead, use an industry-proven vacuum system such as EDCO's VAC-200. The VAC-200 features two high-efficiency particulate air (HEPA) filters and a MicroClean filter, which help the vacuum capture 99.97% of silica dust at 0.3 microns efficiency—well within compliance of OSHA's standards.

THE PROCESS

After securing the requisite machines, accessories and dust-prevention methods at the jobsite, the process is ready to begin. Start by clearing and surveying the jobsite to ensure there aren't any hazardous areas that will damage the equipment or high spots on the surface.

If removing a preexisting coating first, equip the edge grinder with the necessary accessory and grind along vertical surfaces and tight areas to create the perimeter. Then, use the larger turbo grinder to remove the coating in the middle of the working area. Never push the grinder like a lawnmower; instead, move it side to side while working around the area.

Should the surface require further smoothing, or if starting from a bare concrete floor that needs to be smoothed out, repeat those steps with the Dyma-Dot accessories or another tooling option that leaves a low concrete surface profile.

After the smoothing process is complete using the grinders, the surface is ready for a primer coat. Use a small hand brush to work along the walls and other vertical surfaces before using a large roller with a long handle on the open floor.

Once the primer is set, examine the surface to identify and patch any cracks or pits before moving to the next step. Next, pour epoxy around the perimeter before using a small hand brush to apply epoxy around the edges and in those tight areas. On the open floor, use a squeegee to spread the coating evenly around the surface.

Then throw a copious amount of epoxy flakes around the surface. Epoxy flakes are beneficial because they are durable, easy to maintain, improve traction and create a decorative and abstract granite look.

Seal the epoxy and flakes with a urethane clear coat, using a long-handled roller around the surface. Last, finish the job by spraying or applying a coat of slip-resistant material. Once the transformative process is complete, your garage or shop floor is ready for heavy foot or machinery traffic, along with the everyday rigors of your operation. ■

The TMC-7 edge grinding


MAGNA-TRAP


MAGNA-TRAP
EDCO

BANKSPHOTOS / GETTY IMAGES

CAN RUST PREVENTER REALLY LEAVE NO RESIDUE?

The Great Struggle

Time is the blasting contractor's great nemesis. Blast quickly, then get the coating on as soon as possible. Why the rush? Why, the rust of course! That's what bare steel does if you let time do its work. It goes by many names: flash rust, rust back. Some of them even sound pleasant: gingering, rust bloom. Bloom? How ironic. Everyone knows it's an evil flower.

With the rise of wet abrasive blasting and waterjetting, the foe only seems stronger. He feeds on water. But a scrappy band of solutions have entered the fray and successfully fought back: rust preventers of varying compositions, some called inhibitors, some chemical rinse aids (CRAs), others surface passivators.

The makers of HoldTight 102, one of the aforementioned CRAs, have long been claiming that it leaves no residue; that you can apply coatings right over it or, rather, that there is no "over" it to speak of, since the surface is clean and non-reactive.

But skeptics would furrow their brows incredulously: Can a rust preventer or CRA really leave no residue? Hearing this objection so frequently, the research team at HoldTight never lost faith. But after many successful adhesion tests, conductivity tests and microscope analysis, they wondered, how could they clearly prove their claims?

The question was important, for if an inhibitor or passivator works by leaving a film or residue on a surface in order to prevent rust, then it must be removed prior to coating. Otherwise, the residue might react with the coating, potentially affecting adhesion or causing other problems for the coating's lifetime. This removal step would add more time and costs for contractors and operators who are already squeezed from many directions.

So the research team decided to do something about it and devised a test.

GAS CHROMATOGRAPHY

The testing method the team settled on was gas chromatography. This is a test method used to separate, analyze or identify the presence of chemicals in a sample. It is used widely in various sectors, including medicine and crime forensics.

When a TV detective instructs a subordinate to "get these samples back to the lab for identification," one of the gadgets he vaguely has in mind is chromatography equipment. It can also be used to analyze coating samples.

Gas chromatography works as follows: A small sample of a compound is introduced into an inert carrier gas, and both are then passed through a heating element, typically a flame. The heated gas is then passed through a long tube or series of tubes, called a column. Different compounds travel at different velocities through the tube, and, like runners circling a race track multiple

times, the faster compounds widen their lead over the slower ones. After adequate separation in this manner, the compounds exit the column into a detector, which identifies them separately.

The result is a graph, called a chromatogram. A chromatogram will have one or more lines running through it from left to right. The x (horizontal) axis is time—that is, the time it takes for different compounds to reach the detector. The y axis measures the abundance of a compound. A typical chromatogram will present a flat or gently sloped line, representing the inert carrier gas, with one or more pronounced peaks standing out at various intervals, each indicating the presence of a different substance.

USING CHROMATOGRAPHY TO DETECT RESIDUE

But how could the research team use such a method to detect the presence of residue on a bare steel surface after treatment with a CRA?

The method devised was as follows. The team, led by consultancy Woodson Engineering LLC, prepared two panels treated with HoldTight 102. After adequate drying time, the panels were submitted to an independent lab. Benchmark Labs in Houston, Texas, a reputable third party laboratory, was selected for the job.

The lab submerged the two panels it received in solvent (isopropyl alcohol) separately, and agitated them with sonication for one hour. These two solvent solutions, together with a sample of the CRA HoldTight 102, were then subjected to gas chromatography, producing three separate chromatograms, which were then compared against each other.

The reasoning was as follows: The chromatogram from the CRA would indicate one or more peaks along the x axis. If the chromatograms for the solutions extracted from the test panels presented similar peaks, this would indicate the presence of a residue. Even different peaks, if they indicated the presence of a substance other than isopropyl alcohol, might suggest a residue.

The team also decided that, while conducting this test procedure on HoldTight 102, they would also subject two similar available products to the same test.

PREPARING THE PANELS

The material for the panels was new AISI 1018 mild carbon steel. Six steel panels were first washed with a solvent (xylene) and then abrasive blasted with virgin garnet to SSPC SP5/NACE No. 1 White Metal, with a 2- to 3-mil anchor profile.

The applicator selected for the testing then obtained deonized (DI) water in order to power wash the panels using the

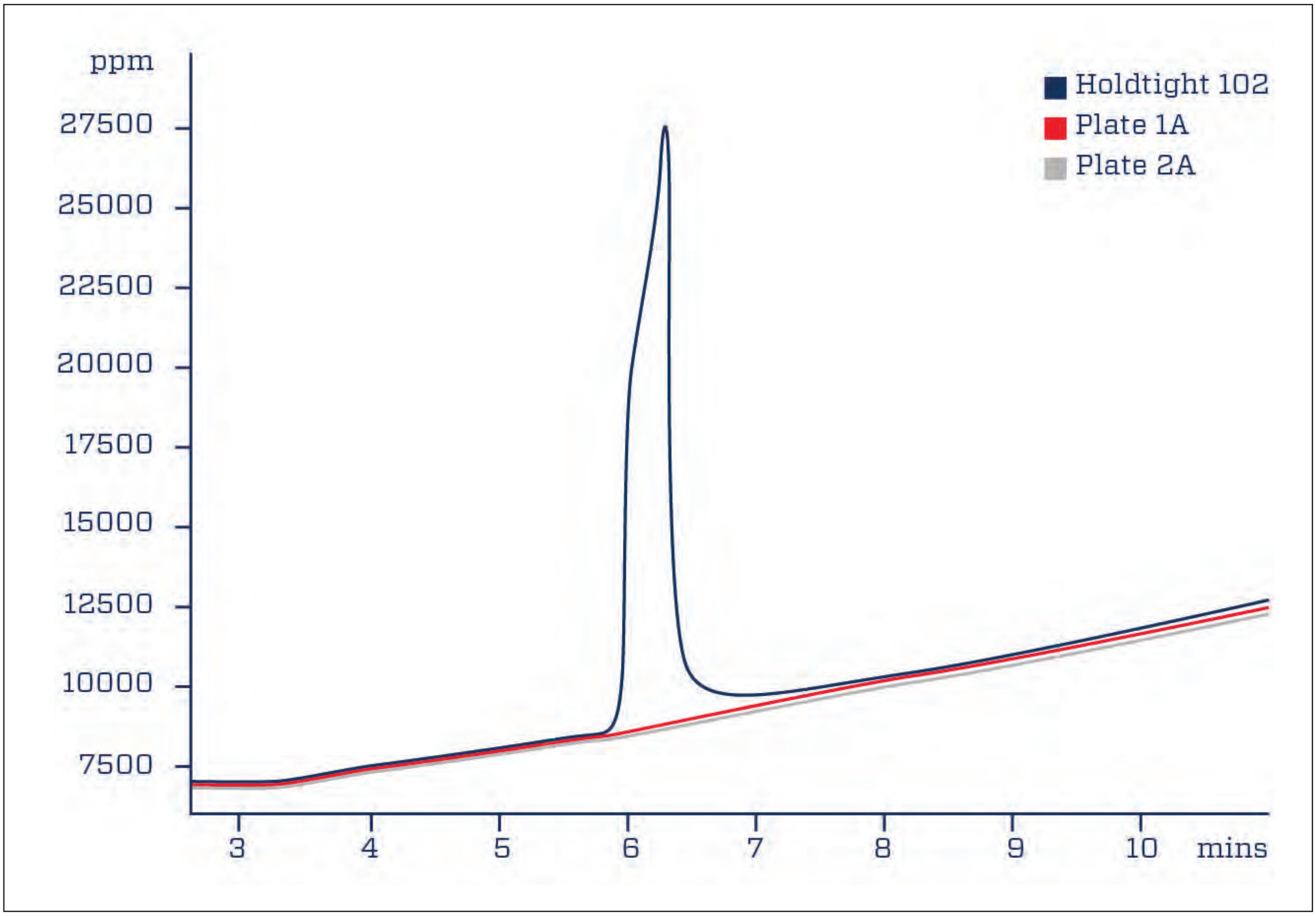

FIGURE 2: Chromatogram of HoldTight 102 and test panel solutions

different CRAs. The panels were then washed at a minimum of 1000 psi, using the different CRAs at the manufacturers' recommended dilutions. HoldTight 102 and Chemical A were diluted at 50:1 ratios (water:additive), and Chemical B was diluted at a 100:1 ratio.

With each separate chemical, the applicator treated two test panels. These were left to dry adequately (72 hours), and then all six were submitted to the lab for the chromatography protocol described above.

THE RESULTS

The chromatogram lab results for HoldTight 102 indicated a strong peak for the CRA itself around six minutes into the test; whereas, the solutions extracted from the two test panels treated with HoldTight 102 presented no peaks on the chromatogram.

To the HoldTight research team, this test provided the strongest confirmation they had ever received that the 102 product leaves no residue when applied according to the manufacturer's instructions. If there had been a residue, it would have produced a peak at some point along the plates.

Figure 2 illustrates the chromatogram of HoldTight 102 alongside those of the solutions extracted from the two test panels.

This provided, in their eyes, a definitive answer to the long-standing question, Can a rust preventer really leave no residue? The answer is a resounding YES indeed.

While the test results were encouraging with respect to HoldTight 102, they did not confirm the hypothesis that *all* such substances leave no residue. The chromatograms for Chemicals A and B, as well as the panels treated with them, were substantially different and indicative of the different chemistry of these other CRAs. They are shown in **Figures 3 and 4**.

The chromatograms from Chemical A and its test panels did not produce confidence that no residue was left on the surface. This substance merits further analysis and perhaps further testing. The chromatograms for Chemical B and its test panels indicated that there was a residue left on the surface.

CONCLUSION

The research team at HoldTight felt that the testing was conclusive enough with regards to HoldTight 102 to uphold the claim that their CRA leaves no residue. Their end users and strategic partners, who include contractors, specifiers, equipment manufacturers and coating manufacturers, can continue to use, specify and approve this rust preventer product with confidence. Flash rust can, and must, be stopped. ■

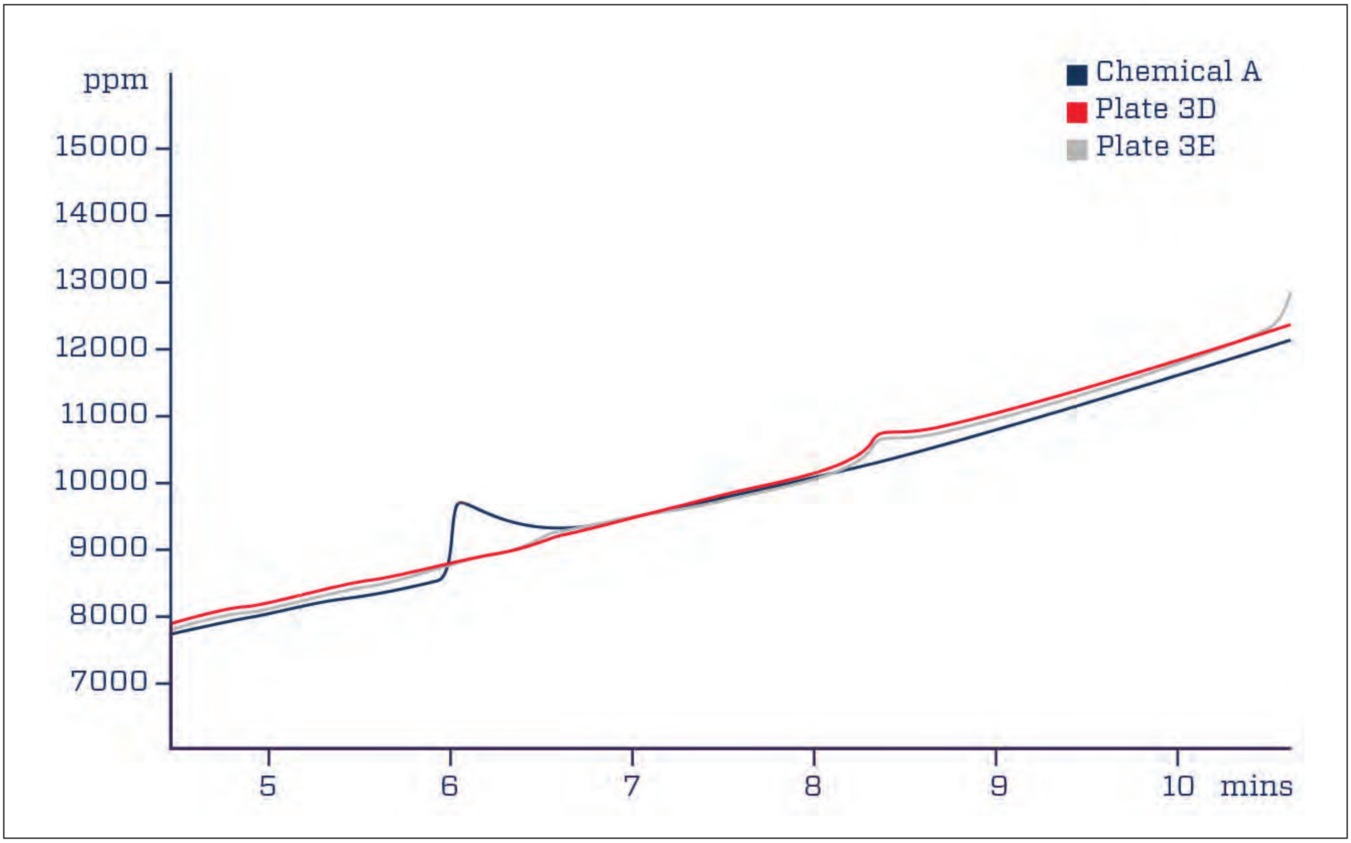

FIGURE 3: Chromatogram of Chemical A and test panel solutions

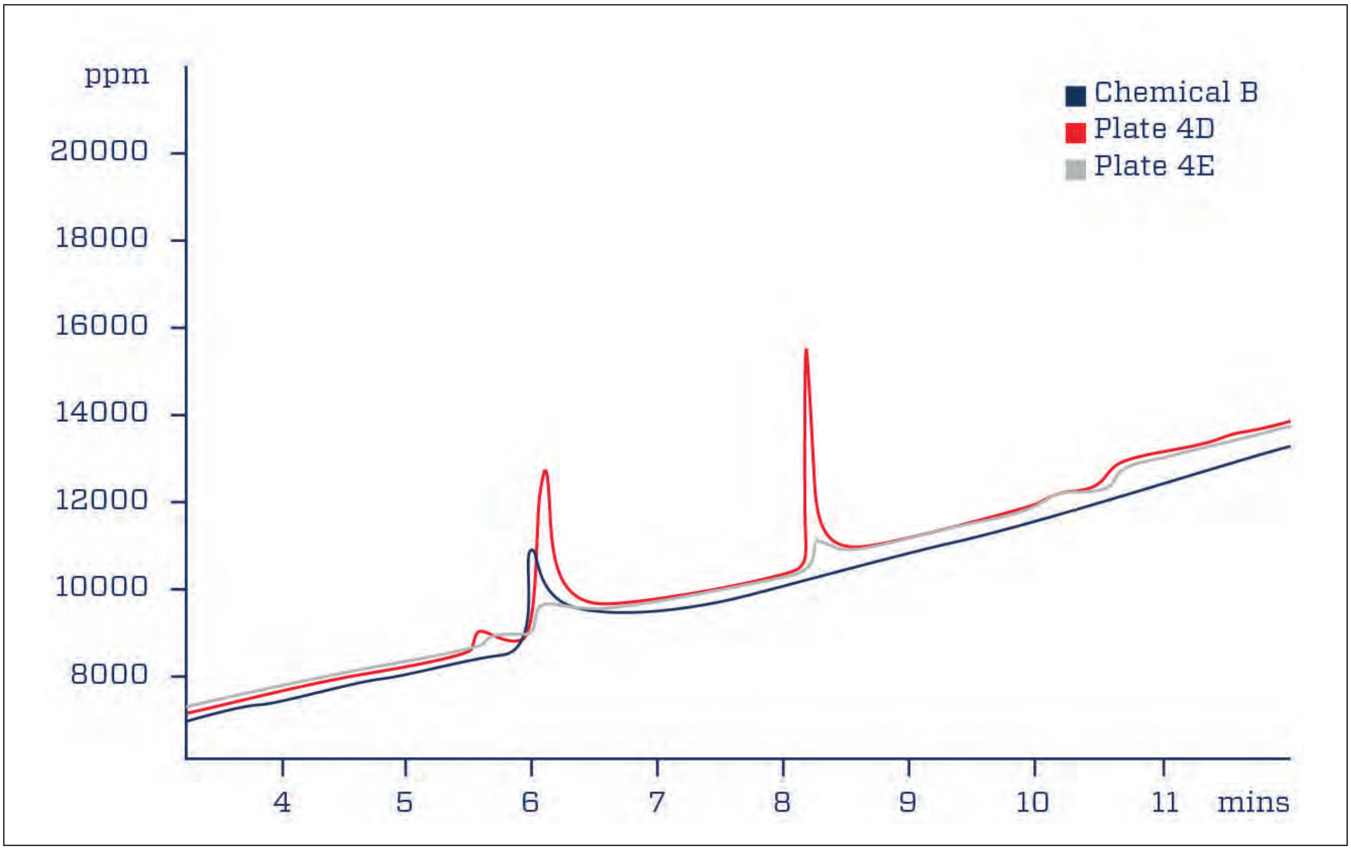

FIGURE 4: Chromatogram of Chemical B and test panel solutions