1. PrepStart w/ PowerPlus
   Danville Engineering

2. RONDOflex
   KaVo
Air abrasion is a technology that was revived in the early 1990s from its early roots in the middle of the 20th century. During its revival, it was heavily promoted along with expensive, canister-like units, which were rolled into the treatment room when they were needed. However, it has definitely been on the decline in recent years. If it is used, a small, relatively inexpensive instrument is more likely to be employed compared to the large units of yesteryear.

Nevertheless, proponents of this technology are still enthusiastic about the technical as well as the financial boost it can bring to a dental practice. The technical aspects relate to being able to treat many types of lesions in a manner that is, perhaps, kinder to the tooth than a high-speed handpiece and, in many instances, without an injection. That latter advantage opens the doors of dentistry to many people who just shudder at the unpleasant whirl of a high-speed handpiece and/or the dreaded "needle". So, even though dentists should be able to profit handsomely by using one of these machines, the patient wins too.

On the other hand, the opponents criticize this technology as just a messy fad. They argue that you can still treat most patients with conventional instrumentation, so why bother.

We feel the technology has merits, but the character of your practice will really decide if you should buy into it.

There are two main considerations:

- Should you consider buying an air abrasion unit?
- Can the newer, less expensive equipment match the performance of the larger, expensive units?

**Should You Consider Buying into this Technology?**

There is no doubt that these machines give you the ability to treat patients in a less threatening way, which is a real quantum leap when dental phobics are considered. In addition, simple lesions, discovered during routine recall (recare) visits, can be prepared and restored immediately. With this technology, local anesthesia can probably be eliminated and, in combination with a flowable composite, the restoration can be completed in as little as 10 minutes. Not only do patients appreciate the fact that they do not have to come back at another time for the restoration, you can also earn unscheduled income. This is truly a win-win scenario.

However, none of these units are designed for precision indirect procedures, such as veneers, inlays, onlays, and crowns. Therefore, the decision to buy into this technology still really depends on the character of your practice. Furthermore, with the emergence of hard tissue lasers, the future of this category is increasingly cloudy.
Can the Low End Machines Compete with the High End?
Actually, it is becoming increasingly more difficult to even purchase a large, canister-style unit with an onboard compressor. One manufacturer of these larger units recently announced that it modified its full size model so it can abrade teeth using water, instead of air, as the vehicle for the abrasive agent. This particular manufacturer has chosen not to participate in our evaluation process, so we can’t comment on the efficacy of this approach. But one thing is for sure. If this concept becomes popular, this category will no longer be able to be called “air” abrasion.

Nevertheless, with the “low end” products, “you get what you pay for” when it comes to features and ergonomics. They are very capable of doing simple air abrasion tasks. If you are willing to dispense with the bells and whistles, an “economy” model just might meet your needs.

Basic Issues
Indications
The most common use of these machines is to prepare various types of cavities to be restored with an adhesive material. Even though simple occlusal preparations are most prevalent, experienced users can perform just about any type of cavity preparation destined for a direct restoration. In addition, restoration repairs can be facilitated using this equipment.

As an example, a patient presents with a small cervical fragment of a porcelain veneer fractured, leaving a defect where the resin cement is still bonded to the tooth. The procedure to repair the veneer includes masking the unaffected porcelain except for about 1.0mm at the junction of the veneer and fracture site plus covering the gingiva with a resin block-out material. Air abrasion can then be used to remove the remaining resin cement and to prepare a chamfer on the exposed porcelain adjacent to the fracture site. During the preparation of this chamfer, the porcelain is automatically microabraded for the repair procedure to follow. Thus, it is possible to remove the remaining resin cement and sandblast the porcelain all in one quick procedure.

Besides using these machines for cavity preparations and special repairs as described above, they can also perform all the duties of the small handheld sandblasters including the roughening of the inside of restorations prior to bonding. Our tests showed there is no difference in bond strength when sandblasting composite or porcelain all in one quick procedure. Whenever possible, especially posteriorly, use a rubber dam. For Class V restorations, cover the gingiva with a resin block-out material.

Contraindications
The two main areas where this technology comes up short are indirect restorative preparations and amalgam removal. Even though it had been suggested by at least one manufacturer (now out of business) that amalgam can be removed with these products, we urge you to resist using it for this purpose due to the dust generated. And, despite the initial claims that the abrasive action of these machines on enamel and dentin can eliminate the need to acid etch, most research has found just the opposite. It is still necessary to follow the same steps in placing an adhesive restoration as you would if a cavity was prepared with a highspeed handpiece and bur.

Air Abrasion Units

Patient Comfort
Even though patients do not react to air abrasion in the same manner that they react to having their teeth prepared with a high-speed handpiece, it is not universally painless. There is still an air stream, just as if you used your air syringe to dry the tooth. Nevertheless, patients generally prefer air abrasion to conventional cavity preparation due to the lack of the highspeed whirl and vibration.

Patient Protection
Eyes Patients should wear protective goggles that seal the eyes.
Soft Tissue Whenever possible, especially posteriorly, use a rubber dam. For Class V restorations, cover the gingiva with a resin block-out material.
Adjacent Teeth During cavity preparation, adjacent teeth must be protected from the abrasive. Rubber dam material is helpful but can get in the way. Metal and plastic matrices are less obtrusive, but can be penetrated by the abrasive. Therefore, we recommend trying rubber dam material first and only using a matrix if the rubber dam obscures your visual access to the preparation. If you use a matrix, be very careful with proximal preparations.

Dental Team Protection
Besides a well-fitting mask, both the operator and assistant should use a facial shield to protect their own glasses or magnification loupes. If you do get the abrasive on your loupes, rinse with water first and then wipe dry.

Use
When you first begin using an air abrasion unit, you should stop frequently to check your progress. With an adjustable unit, it is always best to start with low pressure and low powder flow, increasing one or the other or both as you become more experienced. After using it for a while, you’ll know when to stop, when to cut, and the best pressures and powder flow for specific procedures. Hold the tip of the handpiece about 1–2mm from the tooth and activate the unit. Always have the tip moving as if you were using a highspeed handpiece. If you hold the tip stationary, the abrasive stream can cut a hole that is narrow and deep very quickly. Be aware that any of these units will ruin your dental mirrors, so having a supply of inexpensive disposable mirrors on hand is prudent.

Marketing Tips
If you invest the time to learn how to use air abrasion and money to purchase a unit, you should make a point of telling patients about its benefits. Even if a specific patient cannot benefit from it, the patient will still spread the word. Be enthusiastic, but resist the temptation to overhype it.

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continued on next page...
**Items to Consider**

**Base Unit**

You have three choices: floor-standing console on wheels, countertop model, or no base unit, where the handpiece incorporates the abrasive reservoir. As noted previously, floor-standing models are also usually the most expensive and cumbersome to use. On the other hand, the countertop units reduce available horizontal work areas and their weight sometimes limits their mobility. However, the very small units are much lighter, making portability much more feasible.

**Source of Air Pressure**

Four different options: integral compressor, portable compressor, compressed air tank, or air line to dental unit. Units with an integral compressor are the top-of-the-line, expensive models and are typically consoles mounted on wheels for easy movement between treatment rooms. The other end of the continuum are the models that plug into your dental unit via a quick disconnect or handpiece line, which allows them to use air pressure from your central compressor. These models are usually countertop or handpiece-only types. You can save money by mating a countertop model with a portable compressor on a cart for easy movement and more power, but this combination is typically less elegant and noisier than a unit with an integral compressor. And finally, compressed gas, usually nitrogen or CO2, can be used to power these units.

**Range of Air Pressure**

For the models with integral compressors or compressed air tanks, the air pressure options have been preset, usually ranging from 40-160psi. If you are operating off a connection to your central compressor, your top pressure will be whatever your compressor generates. This is typically 80psi, although at least one unit can increase this pressure by using a booster. Higher air pressure can help cutting efficiency but can also cause more patient discomfort.

**Air Pressure Gradient**

In addition to the range of air pressure, the other convenience factor is the jump between settings. For example, a machine that allows you to increase or decrease pressure in small increments (5psi or less) is more versatile than one that has large jumps between settings.

**Handpiece Tips**

There are different sizes and shapes to accommodate different treatment situations. For example, if you want to sandblast the inside of a veneer, the best option would be a tip with a relatively large orifice since you want to cover a broad area. On the other hand, for more precision cutting, a small tip would be necessary. Different shapes for anterior and posterior teeth can definitely help in accessing hard-to-reach areas. Even though you will probably settle into using one or two tips, having the extra shapes and sizes on hand is a nice option.

**Size of Abrasive**

Even though some machines have dual chambers, one for 27μ and one for 50μ aluminum oxide, our tests suggest that the smaller size of the 27μ particles is more than adequate for roughening composite and porcelain when completing repairs and seems to cause less pain for cavity preparations.

**Abrasive Flow Control**

Some units allow you to increase or decrease the powder flow based on the specific procedure. Turning down the powder flow can minimize the mess and help with sensitivity.

**External Suction Device**

Even though the EPA rates airborne aluminum oxide as a "nuisance dust" and not hazardous, it is still prudent to take reasonable measures to keep this dust out of your lungs as well as those of your staff and patients. In addition, these machines have a potential to be very messy due to overspray.

Therefore, the use of an external suction device in addition to your high volume evacuator helps to keep the overspray to a minimum and protects everyone’s lungs. Some machines have their own suction devices, which should be used, along with your high volume evacuator, as close to the operative site as possible. Be aware that the effect of the aluminum oxide abrasive on your central vacuum system has not been thoroughly researched. It could be causing damage that may not be apparent for several years and could be expensive to repair.

**Adding Abrasive**

For heavy users, the ease of refilling the unit with abrasive could be important.

**Maintenance**

All machines require some maintenance. However, less is always better in this case.
Base Unit
Totally powered by air—has no electrical connections. Cream-colored plastic box, not offensive but not particularly high tech. Measuring 6.5in/16.5cm wide x 9.0in/23.0cm deep x 5.5in/14.0cm high, including the overhangs on both sides for the handpiece docked in the holder and the cord for the foot control, and weighing 4.8lbs/2.2kg (without abrasive), this unit is small and light enough to fit on a countertop in the treatment room and can easily be moved from room to room. When the PowerPlus pressure booster is added, the weight jumps to 8.7lbs/3.9kg, while the height goes to 9.0in/22.9cm.

The top of the unit has a magnetized groove for the handpiece and, toward the rear, the powder fill knob. The rear of the unit has the footswitch connector, the air line connectors, and the powder fill switch.

The bottom has the water trap valve, powder overflow cap, the desiccant cap, and the service wrench that sits in a bracket on the bottom of the unit.

Control Panel
Located on the front of the unit. On the left are two rotary dials: the top dial controls the powder flow, while the bottom dial controls the pressure. On the right is the analog needle gauge, indicating your operating pressure in both psi and bar. On the bottom right of the front panel is the connection for the handpiece.

Footswitch
Small, silver and black, easy to operate. Plugs into rear of the base unit via a dual air line. The connectors on the hoses as well as the unit itself are color-coded for easy identification.

Source of Air Pressure
Operates on air pressure from your dental unit. The blue-green transparent quick disconnect hose emerges from the rear of the unit and measures about 6.0ft/1.83m in length.

The air pressure requirement is 80psi minimum.

PowerPlus Air Booster
Basically an inexpensive way to boost the power of your PrepStart without having to buy an auxiliary compressor. Optional unit that is even smaller than the PrepStart, which sits on the PowerPlus using four rubber prongs for stabilization. There are two quick disconnects on the rear panel. One is for the air line to your dental unit quick disconnect, while the other is for connecting the PowerPlus to the PrepStart. This latter function is accomplished via a very short air line. These disconnects are now plastic and make it much easier to connect and disconnect the hoses compared to the more conventional metal type.

With the pressure set as high as it would go, we air abraded an extracted tooth for 10 seconds with and without the help of the PowerPlus. The amount of the tooth structure removed with the help of the PowerPlus was significantly more than that removed without its boost.

Range of Air Pressure
40–140psi (w/PowerPlus).

Air Pressure Gradient
Unlimited selections by turning control knob.
Handpiece
Measures approximately 5.5in/14.0cm long with one of the tips attached. Very light in weight (0.9oz/25.5g with tip attached), fully autoclavable. Fits into a magnetized groove on the top of the unit. The gray straight handpiece hose is 60.0in/152.5cm long and is attached to the base unit in the lower right corner of the faceplate. This screw-on attachment allows easy removal for cleaning.

Handpiece Tips
Autoclavable, screw onto the handpiece. Available in three bore sizes: 0.015in/0.038cm, 0.019in/0.048cm, and 0.026in/0.066cm, and four angles: 45°, 80°, 90°, and 120°. The sizes are distinguished by grooves at the base: none for 0.015in, one for 0.019in, and two for 0.026in.

Size of Abrasive
Available in 27µ and 50µ particle sizes. The unit comes set up for the 50µ particles, but can be converted to 27µ by changing the cap inside the abrasive jar. The quick startup sheet refers you to the manual for more information, but we could not find anything on this subject in the manual, except a brief mention in the "Abrasive Fill" section.

Abrasive Flow Control
Rotary knob, but no settings. Turn clockwise to increase and counterclockwise to decrease.

External Suction Device
None.

Use
Merely attach the air line to your quick disconnect in the treatment room, set the pressure to 80psi, press on the footswitch, and that’s it. You can adjust the air pressure and powder flow as you go.

Adding Abrasive
Open the screw-type lid on the top of the base unit and add powder to within 20mm of the top. Quick and easy.

Maintenance
Desiccant Replacement Every few weeks, turn the unit over and check the color of the desiccant beads. If they are clear and blue, you’re OK. If the blue turn white, they are contaminated. You will need to open the desiccant lid with the service wrench, discard it, and replace with new desiccant.

Draining Water Trap Filter Moisture from compressed air is trapped in a filter in the unit. Every few weeks, hold the unit over a sink and push the valve on the bottom of the unit to drain any water.

Draining Powder Overfill Filter Needs to be emptied periodically. Using the service wrench, unscrew the cap to the filter and dump the powder into a trash can.

Cleaning and Sterilizing
The handpiece and tip are autoclavable, while the handpiece hose should be disinfected.

Installation
Mail order. No special expertise needed.

Training
Nothing specific except for some written information.

Directions
Nine pages, plain paper operating manual. There is, however, absolutely no mention of the PowerPlus Air Booster in this booklet, but there is a small, auxiliary folded sheet on the installation and operation of the PowerPlus. The information is well-presented and easy to understand.

Marketing Materials
A glossy paper brochure entitled "Relax" can be purchased for $5.00 (100 brochures per package). The brochure touts the advantages of air abrasion (no drill, no shot, less time in the dental chair, etc.) and shows pictures of kids, a couple, a single male, a single female, and a family all smiling, in different panels of the brochure. This brochure would serve as an impetus for patients to at least ask about the possibility of air abrasion as an alternative treatment method. However, the brochure lists the product name several times, although PrepStart is spelled PrepStar throughout the brochure.
**RAVES & RANTS**

- Can’t get more portable than this
- Relatively inexpensive
- Very messy
- Not very easy to remove tips

**Base Unit**
None.

**Control Panel**
None.

**Footswitch**
Same one you currently use for your handpieces.

**Source of Air Pressure**
Since it operates like a handpiece, it operates on air pressure from your dental unit.

**Range of Air Pressure**
The psi recommended by the manufacturer is 46. There is no way to change this pressure.

**Air Pressure Gradient**
None.

**Handpiece**
Handpiece-like device with a bulbous back end. Made of black thermoplastic material (PEEK) with an opaque gray powder chamber attached via a screw-on/screw-off mechanism on the back end. Measures approximately 8.7in/22.0cm long with one of the tips attached. Very light in weight (5.7oz/161.6g with tip attached), fully autoclavable. Snaps right onto any existing Multiflex coupler that is used for most of KaVo’s handpieces. No additional equipment or connections are needed.

Eliminating the base unit is a very nice convenience. However, due to this all-in-one design, it is larger than handpieces from most other air abrasion units and, with much of its weight at the back end, not balanced very well. On the other hand, the swivel built into the midpoint of the shaft compensates somewhat for this imbalance and expedites the correct positioning of the instrument.

**Handpiece Tips**
Available in two diameters (0.018in/0.046cm and 0.025in/0.064cm) and two angles each (90° and 120°). Made of tungsten carbide steel. They attach to the handpiece by pushing into the recess at its front end and turning them slightly clockwise using the supplied mini-wrench. Reverse the process to remove them. While this function is not difficult to perform, the tips tend to require some pulling force for removal.

**Sizes of Abrasive Particles**
27µ and 50µ.

**Abrasive Flow Control**
None, except by varying the pressure you apply to the footswitch.

**External Suction Device**
None. You use your dental unit’s HVE. However, it is highly unlikely you will be able to control the overflow of dust without an auxiliary piece of equipment.
**Air Abrasion Units**

**Use**
Merely snap the air connection onto the Multiflex coupler, select and place the tip, and press on the footswitch. It doesn't get any easier than this.

**Adding Abrasive**
Unscrew powder chamber at the rear of the handpiece. The chamber for 27µ powder is marked clearly in green, while the chamber for the 50µ powder is identified in red. Fill the chamber halfway, screw it back onto the handpiece, and you're ready to go. This is fast, easy, and uncomplicated.

**Maintenance**
Other than routine cleaning and sterilization, there is no other maintenance required.

**Cleaning and Sterilizing**

**Cleaning**
Outside is merely wiped with an alcohol gauze. Use the endodontic files to unclog the tips and the long pin with a twist drill design on its end to unclog the body, followed by blowing out any residual sand with an air syringe. You can also place an empty powder chamber on the end and activate the handpiece. Do not place it in an ultrasonic cleaner.

**Sterilizing**
After completely purging the handpiece of residual sand, autoclave as usual.

**Installation**
Other than filling the powder containers, attaching the tip, and snapping it onto the Multiflex coupler, there is no installation.

**Training**
Nothing specific except for some written information.

**Directions**
Plain paper sheet and 39-page, coated paper booklet. The paper instructions cover basic technique and maintenance functions such as cleaning, sterilizing, filling the powder chambers, etc. If you are an experienced air abrasion user, this is all you will need. For these functions, the directions are fairly clear and easy to understand.

The booklet, however, is excellent and covers many aspects of air abrasion in general as well as the operation of this instrument. Included are eight color clinical photos and five for assembling and filling it with powder.

**Marketing Materials**
None.
The **PrepStart** is a small, portable machine with surprisingly good performance, probably the best of the smaller units. At just over $3,000 (including the PowerPlus), it won’t break the bank. Being petite, it won’t take up much counter space either. Its cutting effectiveness with the PowerPlus booster will match the units with built-in compressor, when you are cutting at the same pressure and are using similar tips. What’s more, the handpiece is very light and its tips are available in the largest variety of sizes and angles in this category. If this instrument doesn’t have a tip you can use, no other one will. However, despite its portability, it still cannot match the convenience of the all-in-one units.

The **RONDOflex** shatters one of the main barriers to incorporating air abrasion into virtually every restorative procedure you perform, namely inconvenience. With its simple connection to your dental unit (assuming you are already using KaVo handpieces and thus have its Multiflex coupler already attached to your air line), it is no more difficult to install than a conventional handpiece.

Operationally, it doesn’t get any easier either. No dials, no pressure adjustments, no powder regulators, no additional footswitch. Just fill it, attach the tip, snap it on the coupler, and you’re ready to perform by simply retrieving it as you would a handpiece, applying pressure to the footswitch, and voila, you are an air abrasion maven.

However, it’s not quite that simple. Although its performance will come close to matching other small devices, it still falls short in the performance category. And, since it’s an all-in-one design, the weight and balance can’t replicate the light, pencil-like handpieces of those products with base units. One evaluator commented that his hand seemed to be too large to effectively hold it. Additionally, since there are no powder flow regulators for you to adjust, we found it to cause a bigger mess than the other units we have tested, depending on the air pressure used.

To control the mess and conform to the 46psi recommendation by KaVo, you need to check the air pressure at the terminus of the coupler. If it’s too low, cutting will be excruciatingly slow. On the other hand, if it’s too high, you’ll have a beach in your treatment room very quickly. Since the pressures used by our evaluators ranged from 40-80psi, checking your air pressure should not be overlooked.

The shorter, larger diameter tips definitely worked better than the longer, small diameter ones. We did not find the 120° very useful — the angle is too obtuse. A 45° tip, in addition to the current 90°, would have significantly better access to hard-to-reach areas. And removing the tips can be a struggle if the recess where the tips insert is not kept scrupulously clean.

If you have been waiting for an air abrasion device that doesn’t require rolling a large console on wheels into your treatment room or even a smaller one that still has a base unit taking up valuable real estate on your countertops and you don’t mind compromising on performance, this is the instrument for you. What’s more, the price is reasonable compared to other similar units.

### OTHER PRODUCTS IN THIS CATEGORY

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