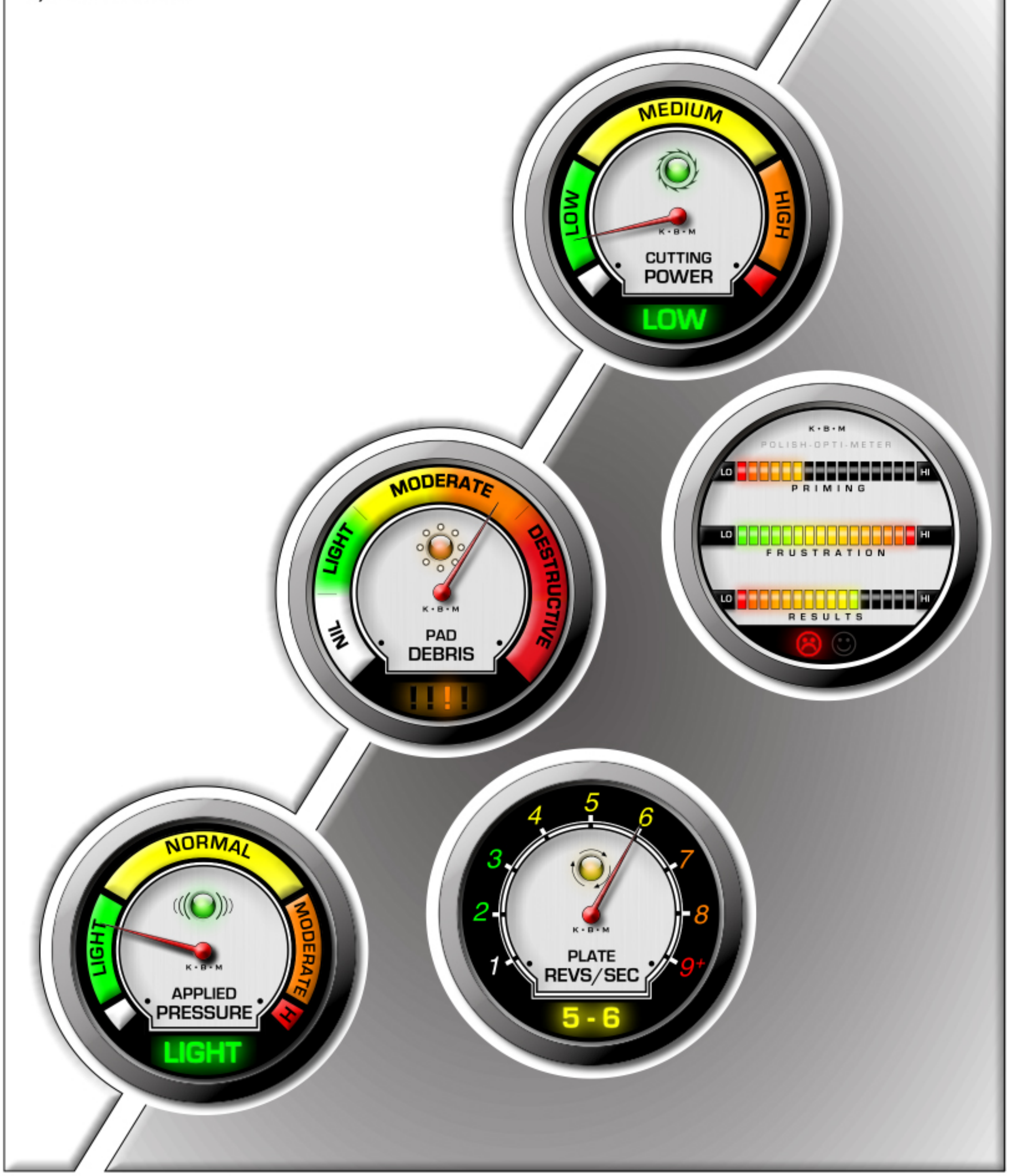
Pad Priming and Supplemental Wetting Agents

KBM - ***A Common Sense Approach To Efficient Paint Polishing***

By Kevin Brown



PAD PRIMING AND SUPPLEMENTAL WETTING AGENTS

Perhaps a more befitting title would have been:

"How rub polish into a pad and mist water onto paint, in 13,000 words or less."

*Thanks to **David Saunders** of Street Dreams Detail in New Jersey for sending me an e-mail about pad priming, and its effects on cutting ability. David's **passion for paint polishing** is unmistakable**,** and was **my catalyst** for writing so in-depth about the subject.*

Throughout the past several years I have answered questions about pad priming and the use of supplemental wetting agents, but I never really went into as much detail about the topic as I have writing this article.

If you are a paint-polishing enthusiast and wish to become a craftsman in the field, my hope is that this article will help you to more quickly achieve your goal.

Happy reading!

Kevin Brown

Mr. David Saunders-

Glad to hear you got the M205 to finish out to perfection.

Your e-mail about your recent polishing experience has inspired me to write more in-depth about the subject than I first anticipated. Perhaps this article can help other paint polishing enthusiasts to better understand the benefits and drawbacks associated with priming a pad, using the buffing liquid as the primer. I decided to discuss the benefits of supplemental wetting agents, too. When used together, the dynamic duo of pad priming and wetting agents can deliver ***stunning*** *results. But, as with most things, there are benefits and drawbacks to consider.*

When writing this tutorial, I had the random orbital in mind, but after reading through the content, I am confident that most of the information can easily apply to any polishing machine. This includes orbital, random orbital, forced rotation orbital, and rotary machines.

If I happen to cover some things you are already aware of through experiences of your own, deductive reasoning during your hundreds of polishing sessions, or via diligent research in your quest for knowledge, my apologies in advance. Much of the written information has been included for the benefit of much less experienced readers. I hope that at least some portion this article will benefit you, too. I appreciate the fact that someone with your talent and level of passion would ask for an opinion on the subject. With that said… ***happy reading****!*

Onto your two specific questions.

1. **Is it possible that a foam buffing pad, once saturated with buffing liquid, could deliver less cut, despite technically having more abrasive product in the foam to begin with?**

In my opinion, the answer to this question is a resounding yes.
It is definitely *possible* and *probable* that pad saturation *can* diminish the cutting power of a pad. Saturation is akin to using too much oil in an engine. Although the engine has ample lubrication, the splash and drag on the crankshaft counterbalances and other moving parts diminishes overall performance. Down the line a bit, this article delves into the nuances of pad saturation directly.

2. **Is it fair to say that in some cases, a properly primed pad cannot equal the cut of a non-primed pad?**

In my opinion, the answer to question two is I suppose, albeit rarely.
Unless I am completely missing something, or cannot recall the instance when I saw this to be true… I feel pretty confident stating that for the task of cutting, a non-saturated, properly primed pad will typically and easily outperform a non-primed pad of the same type.

That being said, I am certain that there will be **instances** when a primed pad will **outperform** a non-primed pad for certain tasks, **and vice versa**. In fact, I recently saw **Mike Stoops** of Meguiar's clear up some rather nasty hazing using a **non-primed** Meguiar's **W9207** 7" Foam Finishing Pad. The foam pad easily outperformed the **primed** Meguiar's **DMF5** 5.5" DA Microfiber Finishing Disc I was using. It wasn't even close: I was a beaten man! Truthfully, this was the *only* time I've *ever* seen a foam pad rival the Microfiber Disc so easily.

Instead of priming the pad, Mike used only three or four dots of Meguiar's DA Microfiber Finishing Wax to remove the hazing. After seeing the results, I was able to mimic his results by dialing back the amount of product used on the Finishing Disc. I still used a primed pad, but I minimized the amount of liquid on the pad **big time**- even more than I usually do. We had compressed air handy, which is by far the best way to clean the pad and control, and the amount of buffing liquid attached to it.

Throughout the polishing session, we had seen an **inordinate** amount of scouring, or hazing. In this case, neither the disc nor the liquid was responsible for the damage; the **abraded paint residue** was! The first time I encountered this phenomenon it was a real eye opener, and it taught me the value of keeping the pad **clean**. It also taught me to be on the lookout for this occurrence at the onset of all future polishing sessions (a rather tough thing to judge when polishing clear-coated paints).

Luckily, we realized early on that the paint residue was responsible for the hazing. After all, **soft** paint is one thing, but **soft and crunchy** is pretty rare, especially with paint jobs that aren't all that old. This paint was relatively new and our microfiber discs were fresh and fluffy, so the deduction was not all that hard to come by.

So, why did the two pads deliver such different results?

Background:
The paint we were working on was a soft, single stage, black. The brand was unknown to us. Truthfully, when dealing with any aftermarket paint job, the brand isn't all that important because the hardness of the finish will vary depending upon how accurately the painter adhered to the manufacturers mixing and drying recommendations. The amount of paint sprayed onto the car can vary from painter to painter, too, which can also affect the overall characteristics of a cured paint job.

Even if the model of car is familiar to you, the paint system can vary widely. **Claude Sevigny** of Meguiar's Canada, a man that I enjoy talking with and respect immensely, recently told me of a major European automobile manufacturing plant that was using three completely different paint systems (traditional, water based, and powdercoat)! So, unless you can decipher a vehicle's paint code *and* know the characteristics of each paint type *beforehand*, you might notice that a seemingly familiar paint type is reacting to polishing differently than before, but you won't know *why*. Consequently, you might chalk up the differences to changes in your technique, pad saturation, temperature and humidity, or a number of other things.

Back to the question: why did the pads perform so differently?

Pad comparison:
Both pads are designed for **final polishing**, and neither pad is known to cause marring when used on delicate paint surfaces. The 7" foam pad is **taller** and **larger in diameter** than the 5.5" microfiber disc, which could potentially absorb some of the machine's orbital motion via increased cushioning action.

The diameter discrepancy between the pads was pretty substantial. In general, a larger diameter pad offers improved stability as it glides across a surface. In other words, if the machine is inadvertently tilted one way or another during polishing, the pressure shift is more gradual. Subsequently, it is easier to regain control of the pad when its diameter is larger.

In addition, during that time, the pivot point (or fulcrum) does not receive as abrupt a concentration of pressure as it would on a smaller pad, so there would potentially be less scouring of the surface at the pivot point. These observations are perhaps hypothetical, yet sensible nonetheless.

Finally, **larger diameter pads** feature **more surface area**. But then, this is where our comparison gets complicated, at least when comparing these two pads. But first, let's run the numbers.

The 7" diameter foam pad features 38.48 in.^{2} of total surface area, while the 5.5" diameter microfiber pad features only 23.76 in.^{2} of total surface area. That's a difference of 61.9%, in favor of the larger pad. This means that if the same pressure is applied to the same machine, the smaller pad will have a larger concentration of weight and pressure placed upon it. This can change all sorts of things, *including* overall backing plate rotation when using a random orbital machine.

Additionally, a larger pad of the same type can be used longer before it accumulates the same percentage of potentially damaging residue and debris. Looking at things another way, you can use a large-diameter pad *longer* before cleaning is needed.

So far, it seems as though a larger the pad is the best choice for final polishing duties. Yet, we haven't taken into account how the buffing liquids we use are built and designed to interact with the pad, nor have we accounted for the fact that the DA Microfiber Disc features **thousands upon thousands of fibers** that are capable of holding loads of buffing compound and abraded paint residue.

In fact, if we were able to measure the surface area **in contact with the paint** at any given time, I believe that once its fibers had packed together due to compression, the smaller DA Microfiber Finishing Disc would offer up a **huge** surface area advantage. Perhaps, the difference would be a startling amount.

To be fair, we must also consider how the disc was prepared for polishing, and how well its cleanliness and fluffiness was maintained. Do you see where this is going? That's right- we have way too many unknown variables to form a tenable conclusion. So, where does this leave us?

The short answer:
In this case, it's quite likely that *initially*, the flat-faced foam pad offered up more immediately usable surface area, thus keeping the pad-to-residue ratio lower than that of the microfiber disc. Perhaps it's also true that the pore structure of the pad was able to store the damage-inducing paint remnants away. Maybe

the abrasive grains were able to attach themselves to the pad only briefly? If so, abrading action would have been short lived- much shorter than we realized. Finally, we should *at least* consider the possibility that machine movements and applied pressures were more evenly dispersed across the panel, and pad face.

But then, this is all conjecture, hypothesizing, theorizing. In short, it's a *guess*. We didn't end up having the time to discuss things, nor do any structured testing. Conceivably, it could have been Mike's polishing abilities!

After all, as of late, the glorious Mike Stoops has become quite the paint-polishing guru. ~~Perhaps it's not that at all. Maybe he's not that good, but instead failed to realize that the foam pad *shouldn't* have worked better.~~

Oh, how that Professor Von Stoops loves a good joke. Isn't that right, Mr. Mike?

The long answer:

Somewhere amongst the following 12,000 or so words is the *long* answer. I've tried my best to be brief, but obviously, it didn't quite work out as I'd planned. Regardless, I hope you'll stick with it and read my best attempt at writing what I *know* to be true. ***At least it's what I think I know.***

PAD PRIMING, AND HOW IT AFFECTS POLISHING PERFORMANCE

My theory as to **why** pad priming works so well is based mostly in deductive reasoning and comparative analysis of polishing results. Comparisons were made using primed pads and non-primed pads, and by employing various application methods on all sorts of paint types.

It has been my experience that **most** times a better result is achieved by priming the pad with the buffing liquid as opposed to using a non-primed pad. Certainly this may have to do with the way I handle my polishing machines, manipulate their speed controls, time my polishing cycles, and apply pressures and angles to the machine. There are lots of other procedural issues to consider, too.

One thing is for sure- I am definitely able to see the effects that priming has on a pad by magnifying the pad using my Radio Shack Handheld Lighted Microscope (Carson Optical makes the microscopes for Radio Shack):

http://www.radioshack.com/product/index.jsp?productId=2179604#

http://www.carsonoptical.com/Pocket_Microscopes/Pocket_Microscopes/MM-100

While I typically prime the pad and use additional product for the **defect removal** process, I use a different approach for **final polishing**. Although I still prime the pad thoroughly at the onset of the polishing session, **I minimize the amount of compound applied to the pad** by blowing the pad clean using compressed air prior to polishing. If I don't have air handy, I place the pad face into a microfiber towel and run the machine for 3-7 seconds, or until the pad is still moist but there's no obvious polish stuck in the pores of the pad. Then, I add small amounts of buffing liquid as needed. For delicate or hard to refine finishes, sometimes no added product is needed. Let's discuss final polishing and prepping of the pad for final polishing after we cover some benefits and drawbacks associated with pad priming, using the buffing liquid as the primer.

WHY PRIME A FOAM PAD IN THE FIRST PLACE?

Many polishing enthusiasts believe that pad priming will eventually happen on its own through the reapplication of product after several polishing passes, and I suppose it *might*. But then, the word *prime* denotes the word *preparation* in this case, so it should not be left to happen *consequently* or by *chance*. Besides, I much prefer to prepare the pad using fresh, non-contaminated buffing liquid.

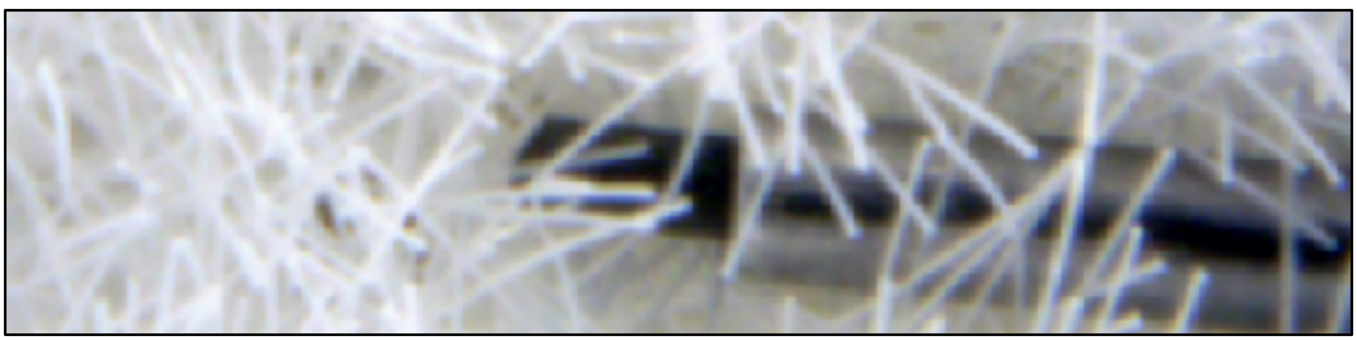
Pads that feature strands of material such as wool, microfiber, or micro fingers *require* manual priming in order to ensure a thorough coating of the individual fibers. Since there is no way to know which way the strands are going to bend, twist, or lay in relation to the surface (or each other), it is best to manually prime them prior to use.

That being said and unless otherwise noted, this discussion relates to **foam** pads. Don't misunderstand- there are large sections of this article pertaining to the **Meguiar's DA Microfiber Discs** as well as the **Surbuf Microfingers Pad**, but your questions were in reference to foam pads, so the primary focus is on them. Some close-up shots of the various pads discussed in this article:

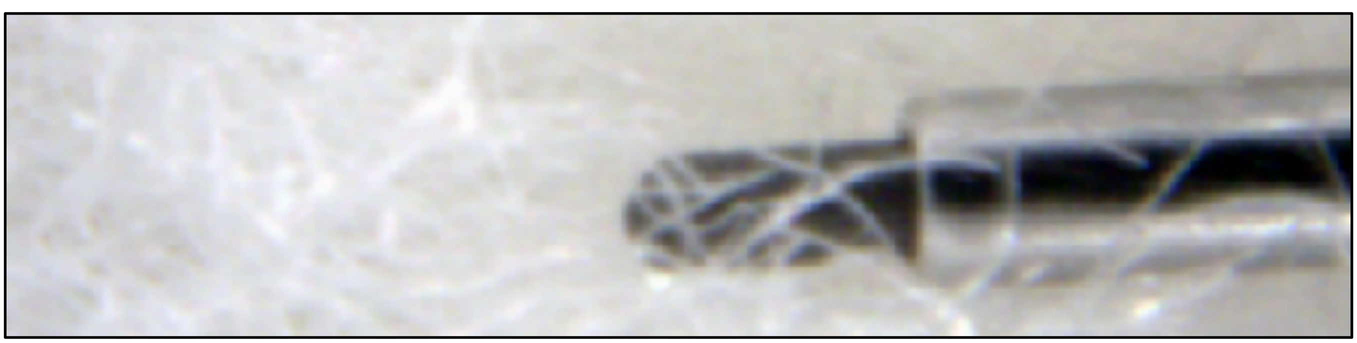
A Pentel P205 pencil with a 0.5mm lead was used as a pointer in the following photos.

Close-up shot of a Meguiar's W8207 Soft Buff Yellow Foam Polishing Pad

Close-up shot of the Meguiar's DMF5 DA Microfiber Finishing Disc



Close-up shot of the Surbuf R Series 00055R Microfingers Pad



Close-up shot of the Meguiar's W4003 Easy Buff Knitted Wool Pad

There are all sorts of foam pads available to choose from, and selecting one can be a hit-and-miss proposition. For this discussion, let's focus on the **structure** of a pad.

The **pad face** is the flat portion of the pad that is set upon the paint (no surprise there). Foam pads feature thousands of **air pockets** or **pores**. Between each pore resides the actual foam material. For the remainder of this discussion, we shall refer to the areas of foam as the **walls** of the pad. Finally, the portion of each wall that touches the paint surface when the pad is placed upon it is referred to as the **wall-top**. If we could somehow measure the surface area of each wall-top and add it together to determine the total area, we would know exactly the **net surface area** of foam along the face of the pad.

Manufacturers could possibly use this number to give us an indication of the abilities of their pad. But then, this figure would only be a starting point, because once the pad is put to use, everything changes. As the pad is shuttled across the paint, its walls shift and bend, constantly changing shape along the way. As an example, if the pad is compressed, the walls are going to either:

1. *Lay over on their sides.*
2. *Scrunch and fill the void area of the pores.*
3. *Move vertically into the pad, keeping the void area of the foam somewhat intact.*

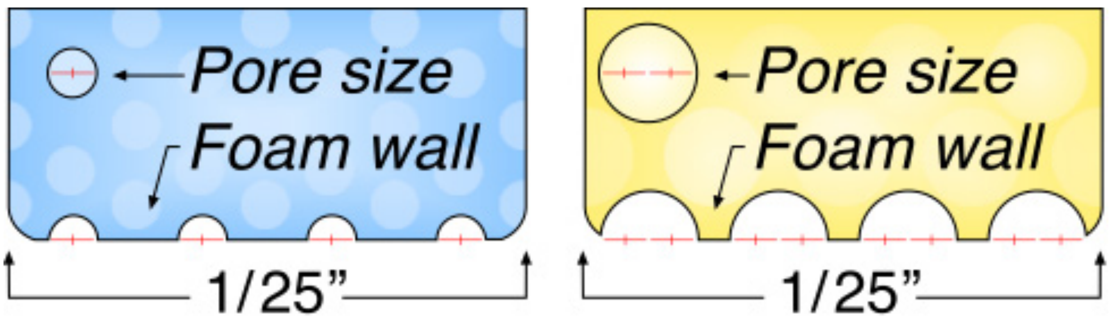
What likely occurs most of the time is a combination of all three. Depending upon what happens affects the **net surface area** of foam in contact with the paint. No big news there.

The amount of foam in contact with the paint at any given time is dynamic, and when we add a shot of buffing liquid into the equation, it’s virtually impossible to know whether the foam is contacting the paint surface, or simply moving polishing liquid across it. It gets more complicated as we continue!

In relation to the overall size of the pores, the walls can be thick *or* thin. Keep in mind that although pad manufacturers typically list a **pores per inch** rating (or PPI) of the foam used to make the pad, this rating by itself is not an accurate indicator of what should be expected in terms of cutting power from the pad.

Theoretically, two seemingly identical pads can feature the same PPI rating yet deliver much different performance. Even if the foam type and physical characteristics are identical by comparison, one pad might feature large pores and thin walls, while the other can feature small pores and thick walls. The following diagram illustrates this point:

Cross section of two foam pads featuring 100 pores per inch (100 PPI)



The pores dispersed throughout the blue pad are half the size of those dispersed throughout the yellow pad. Consequently, each pad's wall thickness varies proportionately.

I hope you don't mind if I stray even further from the *pad priming for final polishing* topic. It won't be much longer- I just think its important to preface *that* discussion with some facts that you probably already know, but may have not pondered.

PRIMING CAN DETER SATURATION OF A FOAM PAD

Pad priming, using an abrasive **buffing polish** to treat the pad, **slows the absorption** of the **liquid** components of the buffing polish into the membrane-like structure of the pad (as it is repetitively added during the polishing process).

As you know, buffing compounds and polishes use all sorts of hard materials to abrade paint (aluminum oxide is just one example). By stuffing the pores of the pad full of buffing polish, we've created a **hard barrier**. This is akin to damming a river using rocks and debris to slow or stop the movement of water. In our case, however, the hard barrier keeps the **liquid** portion of the buffing compound or polish from traveling throughout the foam pad with little resistance. What is the net result? **Pad saturation** is kept to a minimum! Why is this desirable?

To put it simply, **pad saturation is a performance killer**. While keeping the **face** of the pad moist, supple, and coated with buffing liquid can be beneficial, saturating other areas of the pad with buffing liquid almost always diminishes its performance. After all, if the majority of the pad is loaded with liquid and debris instead of air, the foam cannot respond or rebound quickly because these products do not easily compress, and are much heavier than air. The avoidance of pad saturation also keeps **mass out of the center of the pad**, so the pad can respond in an agile manner.

What are some other benefits to avoiding pad saturation?

The pad will operate at a lower temperature if air can travel through it. With liquid and hard material stuck in the membrane-like structure of the pad, airflow decreases, so heat cannot readily escape, causing the pad to run hotter. Higher operating temperatures can alter a pad's performance and dramatically shorten its life.

The pad can be used longer during the polishing session before it needs replacing. If we can avoid all of the aforementioned negative situations from occurring, there is no need to change the pad as frequently.

Pad longevity may be increased because there is not as much solvent, oils, paint residue, or abrasive material stuck inside the pad. All of this foreign matter can degrade the structure of a pad over the long haul, either by mechanical agitation or through the absorption of volatile liquids.

If the goal is defect removal, pad priming offers many benefits.

Pad priming increases the useable surface area of a pad. Filling the pad pores with hard particles and liquid allows additional polishing liquid to set upon those areas, effectively increasing the surface area of the pad.

Pad priming mass-loads the face of a pad. By keeping the polishing liquid located on or around the face of the pad, the only additional weight added to the pad is focused where it should be, not throughout the pad. Keeping the pad free of saturation allows it to compress and rebound as it was intended. In most instances, the additional weight along the face of the pad would be considered a plus. There's not a lot of weight difference, but there **is** a difference.

Pad priming stiffens the face of a pad. For defect removal, this can be a **huge** asset because it accomplishes so much. Consequently, this is a **big** section to read.

Imagine that we are able to visually magnify a single point of a paint surface, and at this point, there are several crisscrossing, sharp-edged canyons. They appear to be formed by rivers, but in actuality, they're simply scratches in the paint! Some of canyon-like scratches aren't too deep, and grinding the protruding paint residing between those scratches will be rather easy to accomplish. Removal of the paint protrusions leaves a smooth paint surface.

The remaining canyon-like scratches are very deep. Rather than eliminate the paint residing between these scratches, you decide to smooth away the uppermost edges of the scratches via repetitive polishing. The smoothing effect will improve the reflectivity of the surface, and the scratch will be less noticeable. Besides, the abrasive action of the polishing compound and pad **will** remove some of the finer scratching that is present along the canyon-like walls, if the polish or pad comes into contact with them.

As the foam walls of the pad shuttle polishing liquid across the paint surface using a squeegee-like action, some of the scratch-edge is scrubbed away. Inevitably, there will be loose abrasive particles rolling across the paint surface as the walls of the pad sweep them along. In addition, there's undoubtedly going to be an abundance of abrasive particles physically attached to the foam walls (and the top edge of the walls), and those particles will be moving at the same rate of speed as the foam. A-ha! This is likely where we will realize maximum cutting power. However, if the wall flexes and bends as it contacts the scratch, what happens to our cutting power?

Recall that we previously discussed the membrane-like structure of a foam pad, and how it might deform its shape under pressure. A recap of the statement:

If the pad is compressed, the walls are going to either:

1. *Lay over on their sides.*
2. *Scrunch and fill the void area of the pores.*
3. *Move vertically into the pad, keeping the void area of the foam somewhat intact.*

*What likely occurs most of the time is a combination of all three. Depending upon what happens affects the **net surface area** of foam in contact with the paint.*

If the pores and walls are coated with abrasive polishing grains, then polishing performance should be pretty good. However, if there is an absence of abrasive grains, then the abrasive action of the foam must be relied upon to scrub paint away. The probability that **any** foam buffing pad would feature the same amount of cutting power of **any** cutting compound is pretty small. Therefore, we could reasonably conclude that there would be a decrease in defect removal capability. This statement could also apply to polishing pads and liquids, and finishing pads and liquids.

What happens if we fill the pores with buffing liquid? Instead of the pad walls readily deflecting their shape (consequentially changing the shape of each affected pore in the process), wall shape should remain mostly intact, especially if the pad is moving at a high rate of speed. There's a lot to discuss in regards to that statement, but in my opinion, the laws of physics would support the premise.

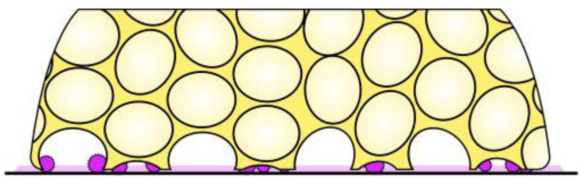
With buffing liquid now supporting the pad walls, would they still deflect or change shape as they contacted the edge of the canyon-like scratch? It's highly likely that the answer is **yes**, but not nearly as much as they would without the added support. Essentially, by priming the face of the pad, we've made the pad face stiffer to some degree.

This **may** or **may not** be a desirable effect, but it comes in handy if you find yourself working on a complex-shaped panel. Whereas we would normally reach for a typically dense or firm foam cutting pad to remove harsh defects, pad priming and its stiffening effects *could* allow you to use a rather pliable polishing pad in place of a *firm* or *hard-to-compress* cutting pad.

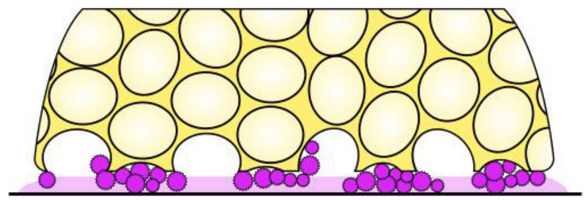
As long as the pad you choose can squeegee the paint surface clean during polishing, the pad will perform impressively. However, if the abrasive particles stick to the paint surface and the mechanical action of the pad cannot budge the abrasive residue, the surface may become coated with abrasive particles or gummy residue (a mixture of spent polishing liquid and abraded paint).

PAD PRIMING, AND HOW IT RELATES TO DEFECT REMOVAL

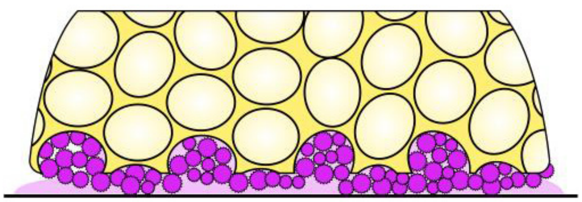
When the goal is defect removal, pad priming can do wonders. Some of the benefits are seemingly small, but as their benefits accumulate, the difference is quite substantial. In a way, it's a lot like the tuning of an engine or the balancing of a rotating device; infinitesimal adjustments, when combined, make all the difference! This diagram shows how pad priming and added downward pressure might cause the abrasive grains in the buffing liquid to interact with the pad:



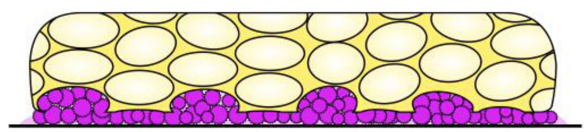
Non-primed pad, lightly applied polish



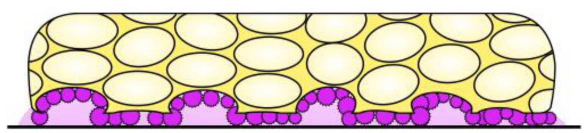
Non-primed pad, moderately applied polish



Primed pad



Compressed and primed pad



Compressed and primed pad, abrasive minimized

A quick recap of the benefits of pad priming:

When we pack the pores tight with compound, to a large degree we've filled in the void areas across the face of the pad. This effectively creates more surface area on which to place a layer of buffing compound. As a result, we realize faster cutting of the surface. Since the pad pores have been packed with **hard** particles, the fluid portion of the buffing compound cannot easily travel upward through the pad, so saturation has been hindered. This "damming effect" also helps to keep the fluid-to-particle ratio of the buffing liquid close to optimal, or at least close to what the manufacturer intended it to be. We've also stiffened the face of the pad (so machine motion transfers much better), and mass-loaded it too, so momentum and force increase compared to a non-primed pad. So far, so good!

To better visualize these benefits, imagine that we've built a structure to resemble a BIG foam pad. The walls are not made of foam, but are instead made of heavy yet flexible cardboard tubes. Instead of buffing liquid, we're using uncured fresh cement.

To simulate pad priming, we fill the tubes with the uncured cement, and seal the ends with massive flat saltshaker tops. Next, we strap the tubes together using a sturdy circular band around the perimeter of the grouped tubes (think hula hoop, only a lot bigger). The tightly grouped cardboard tubes now resemble a giant honeycomb-like structure. Finally, we employ a giant machine to clasp onto and shake and spin the entire circular structure, moving it in a manner similar to the motion a random orbital creates.

As the machine moves the structure, the cardboard tubes may move and flex, but they won't collapse because the circular band binds them together. Since the tubes are filled with hard-to-compress material (water, rocks, sand, and cement), the honeycomb shaped cardboard walls flex, but remain intact. The saltshaker tops allow some cement to escape as the unit is moved. Some splashes out the top, and even more falls out the bottom, sprinkling material on the ground as it moves.

We've just created a situation that is similar to what happens when we prime a buffing pad, and use it to polish paint. The cardboard walls and outer hoop mimic the action of a foam pad, storing polish and moving it about. The saltshaker tops allow liquid and abrasive grains to travel out of the tubes, much like what occurs as the buffing pad oscillates and rotates. Some of the polish travels upward and sideways through the pad, while most of the polish falls out of the pad as it wiggles and shakes across the paint surface.

Once again I am getting off track. You asked about pad priming in regards to final polishing.

PAD PRIMING, AND HOW IT RELATES TO FINAL POLISHING

Some of the benefits attributed to pad priming become liabilities during the final polishing process. Although a thorough priming of the pad is still helpful, excessive amounts of polish should be removed **prior** to buffing. Before we explore the reasons why it is important to minimize the amount of polish covering the pad, it might be a good idea to review the *priming procedure* as described at the very beginning of this article. If it's all still fresh in your mind, then read on!

WHY PRIME THE PAD AND THEN IMMEDIATELY REMOVE THE POLISH?

It certainly *seems* wasteful to prime the pad using a generous amount of polishing liquid, only to immediately remove the majority of it. As previously mentioned, the word *prime* denotes the word *preparation* in this case, so it should not be left to happen *consequently*, or by *chance*. Priming the pad increases the likelihood that if any portion of the pad contacts the paint surface, there will be abrasive particles attached to that area of the pad.

Although priming is important, it is **imperative** that coverage of the pad be **consistent**. After all, we wouldn't want some areas of the pad face to have little or no particle coverage, with other areas featuring clumps of abrasives. Besides- as grippy and tiny as some of these abrasive grains are nowadays, there is a high probability that they would fail to disperse in an even and timely manner.

To better understand how inconsistent pad priming can lead to poor polishing results, imagine that we are creating a sheet of ultra-fine finishing sandpaper to sand a freshly painted panel. To guarantee a consistent sanding result, the paper must have consistently-sized particles that are placed equidistant from each other.

As luck would have it, we've located some pyramid-shaped abrasive grains that are non-wearing (very durable), and their dimensions are exactly the same. We decide that we shall place each grain right next to each other, bases touching, and glue them to the paper. By positioning our grains in this manner, the sandpaper will cut its way through the paint surface, leaving evenly spaced and consistently shaped v-grooves atop our paint surface.

Once the paper building process has been completed, we sand the surface using perfect sanding etiquette. Time to break out the polishing machines!

As we buff, we realize that something has gone terribly wrong during our sanding session. Unfortunately for us, *somebody* double-stacked and even triple-stacked abrasive grains on top of other grains! Due to this incompetence, our paper created some rather deep gouges in the paint. It gets worse! Our gluing efforts were less than extraordinary, so an *uncountable* number of grains broke loose during sanding. Would you care to guess the damaging effects of *this* blunder? Right- even more gouges, and an inconsistently leveled surface because the loose grains acted as casters or rollers that did not allow the paper to glide atop the paint surface.

This is not a perfect analogy for several reasons, but it does paint a picture of what can happen if our abrasives are inconsistently positioned across the pad face. Although our paint surface would not be affected to the same degree if we had clumping of our compound or an inconsistently coated pad, we would likely see at least some scouring or swirling effects across the paint surface. A soft and pliable foam pad may also eliminate the some of the negative effects of clumping by allowing the abrasive grains to move upward into the soft pad material, as opposed to being forced into the much harder paint surface.

Let's get back on track again.

Once a pad has been primed, **minimizing the amount of polishing liquid present on the pad** gives us more control over how the pad is going to work with the polishing abrasives. In other words, when we use polishing liquids featuring abrasive grains (or particles), and we move those particles across a paint surface using any particular foam pad, there are a few possibilities as to how they might work together.

Realistically, it is likely that any one of these possibilities occur **independently** for only brief moments because the interaction between the pad and polishing liquid is very dynamic, meaning that change is never-ending as the buffing cycle advances.

At some point, most of the abrasive grains will either become trapped in the pore structure of the pad, attach to the pad or paint surface, float or be flung away from the polishing area, or be pulverized to the point of becoming useless in terms of their ability to further refine the surface in a positive manner.

In the case of polishes featuring diminishing abrasives, the abrasive structures crumble apart as they are worked, and eventually reach the limit of disintegration. It is likely that not all of the structures fully diminish as we polish (for one reason or another), which is why we often see a lower degree of refinement compared to a non-diminishing abrasive of the same quality. Even if the structures do fully diminish (or disintegrate), we cannot be certain how quickly this occurs. Imagine a finishing polish that initially cuts relatively aggressively into the paint, and then diminishes very rapidly. In this case, we might not be able to refine the finish to the highest degree.

Lately, compounds and polishes featuring non-diminishing abrasives have been very successful. One of the most popular, Meguiar's M105 Ultra-Cut Compound, uses very hard and durable abrasive grains. Still, many polishing enthusiasts believe that the compound "breaks down too quickly". This is an understandable yet incorrect assumption. Since the particles are so small and aggressive (or sharp), they attach rather easily to the buffing pad. Although the cutting ability of the abrasive particles remains high, most of them are positioned in the pore structure of the pad, and therefore cannot easily contact the paint surface. This brings us to the possible ways that the pad interacts with an abrasive buffing polish:

1. **The pad will move the polishing liquid across the paint by encapsulating it within the pore structure.** In this scenario, if we assume that **no** abrasive grains are attached to the wall-tops, we can surmise that the pad will affect the paint in a manner independent of the encapsulated polish. In other words, the pad and polish will not create a combined polishing effect. Instead, the pad would act as a squeegee of sorts, scuttling the polish across the paint surface as it moves.

   Of course, the pad would also have some effect upon the paint. The extent of its effect would depend upon the abrasiveness of the pad, and the level of lubrication between it and the paint surface. If the surface were already in very good condition, the imperfections would be small in size, so very little friction would be needed to show an improvement upon the surface. Given the right circumstances, the potential for a high level refinement via burnishing might exist.

2. **The pad will move the polishing liquid across the paint by constantly shifting and tumbling the abrasive particles trapped between the pad**

and paint surface. Imagine the particles to be very small barbed ball bearings, and you'll better envision their movements across the paint surface. As the pad moves, the wall-tops roll the particles over imperfections in the paint. If the particles happen to be small enough to enter a surface defect (such as a scratch), minute amounts of paint would be removed in the process. This would effectively alter the shape of the scratch by replacing large imperfections with smaller ones. In addition, a smoothing or burnishing of the scratch edges would make the imperfection less noticeable.

It is likely that maximum **polishing** or **refining** ability would occur during tumbling, as the individual particles could feasibly enter any scratch they could physically fit into. Some particles might roll across the paint surface, as would a tire across the pavement. In this case, the abrasives would create little more than a micro pockmark trail (if that). It seems reasonable to assume that most of the particles would roll, then drag (as they attached to the pad or were pushed), then repeat the process over and over again.

Thinking things through, it seems to me that free-rolling particles would be able to follow the nuances of a surface better than attached particles, so they would therefore refine the finish best.

3. **The pad will move the abrasive grains across the paint as they attach to the wall-tops.** When this happens, **leveling ability** increases because the particles are moving in tandem with the pad, so speed of movement is at its peak. However, if there are no **free-rolling** abrasive grains present between the pad and paint surface (as discussed in the section immediately above), **polishing** results will suffer.

   Therefore, when using foam pads in the manner outlined (the abrasives grains are attached to the pad face), thorough **polishing** of the surface requires that multiple passes be made. Oftentimes, the abrasive particles must be **forced into** scratches and defects via user applied downward pressure. This is especially true if the abrasive grains are of a smaller size than the overall depth of a defect.

Even the softest foam pads available to us cannot readily contour to every surface detail. Think of a tire rolling across a pebbly road for a visual of what I mean: although the tire would have an ability to contour to the overall shape of the road, (the degree would be dependent upon the tread design and characteristics of the rubber), it is very unlikely that it could precisely match every topography detail.

*Note: **Meguiar's® DA Microfiber Discs** and **Surbuf® Microfingers Pads** feature vertically placed fibers across the pad face. The fibers used on both styles of pad are very pliable, and rather unique.*

*The structural design of **Meguiar's Microfiber** material is flexible yet crushable; each strand can bend, yet collapse in diameter and length (similar to the pile of fuzzy shag carpeting, while they're being stepped on).*

*While the **Surbuf's Microfingers** are also flexible, they retain their cylindrical shape and length, even under pressure (bending in a manner similar to the bristles of a toothbrush).*

*Both types of pad enable **attached** abrasive particles to **enter** very small nuances of the paint surface. In the case of the Meguiar's discs, the microfiber material can accommodate a massive amount of buffing liquid, and since the fibers are so fine, its **polishing ability** is unmatched when used with **ultrafine** abrasive compounds.*

"HEY, I'M JUST GETTING STARTED HERE!"

Since we're on the subject of attached abrasives, let's discuss the misconceptions that arise when this happens across the entire face of the pad. When all of the abrasive grains have attached to the face of the pad, polishing enthusiasts tend to think that the polish has run a very short work cycle. To explain this phenomenon, phrases often bantered about include:

- *"The polish broke down too quickly."*
  The user thinks that the abrasives became unusable due to mechanical destruction or disintegration.

- *"The lubrication evaporated too fast. It flashed off… it soaked in."*
  The user thinks that the lubricating agents or liquid ingredients used in the compound have evaporated, or soaked into the pad.

Essentially, the impression is that the compound has either worn out or dried very quickly. Most times, this is not the case… so spread the word!

There are plusses and minuses to “loose” grains, “attached” grains, and a combination of the two. Hopefully, this information helps to point these out.

“THE REASON I PULLED YOU OVER TODAY, SON…”

At this stage of the polishing session, the liquids we use typically feature very fine abrasives, while the pads we outfit our machines with are chosen to gently apply the liquids in an oh-so delicate manner. It makes sense that in order to further refine the surface, paint *must* be removed using a gentle approach. Besides using slow and deliberate motions to control the machine, one of the best ways to achieve stellar results is **to lower the machine speed**.

We already know that, **for the most part**, higher machine speeds will remove paint more rapidly than slower machine speeds. The primary reason is obvious: an increase in repetitive scrubbing of a section of paint for a given amount of time. In addition, the **faster** the pad is moving, the more likely **leveling** ability is going to increase.

It is important to mention that *leveling* refers to a minimizing of height variations across the paint surface. Leveling makes a surface appear *smooth*, and reflections upon that surface will appear more accurate to the object being reflected. Examples? The reflection cast off of a still body of liquid, or a high quality glass mirror.

All that being said… once we’ve sufficiently removed defects or leveled the surface, there’s **no real benefit to using high speed for final polishing**. In fact, there are a lot of negatives associated with moving the buffing pad at a rapid clip.

SLOW AND LOW IS MELLOW

There are many benefits to using a slow speed setting for the task of final polishing. Some of the most important ones are listed below:

- Slower operating speeds lessen the need to control the machine using a heavy hand, so edge digging and uneven compression of the pad is kept to a minimum.

- Pads maintain a higher level of pliability when used at lower speeds. This allows them to more accurately contour to complex shapes and the small nuances of a surface (such as orange peel). A pad that has become effectively stiffer due to an increase in speed is beneficial for the task of defect removal or surface leveling, but for final polishing it can leave scour marks, or light hazing.

- When using very soft and pliable foam pads, too much speed can cause the pad to ride atop the buffing polish rather than move it across the surface.

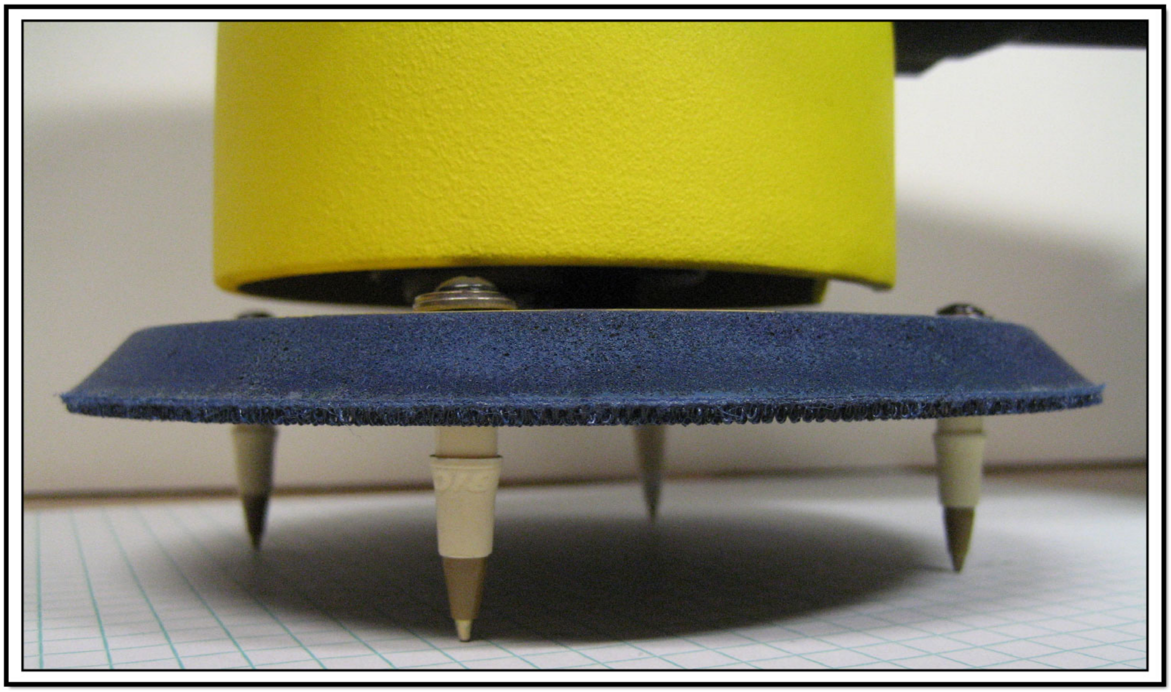
- Slower operating speeds curtail the generation of friction induced heat. This has all sorts of benefits. Lower operating temperatures keep paint characteristics stable, so the potential for paint swelling may be minimized. Fluids evaporate at a slower pace, so polishing liquids last longer and perform as intended. Fluids efficiently transfer heat, so polishes and pads can help to keep paint surfaces cooler during the buffing process.

- Buffing pads and backing plates can wear quickly as the adhesives warm to the point of failure.

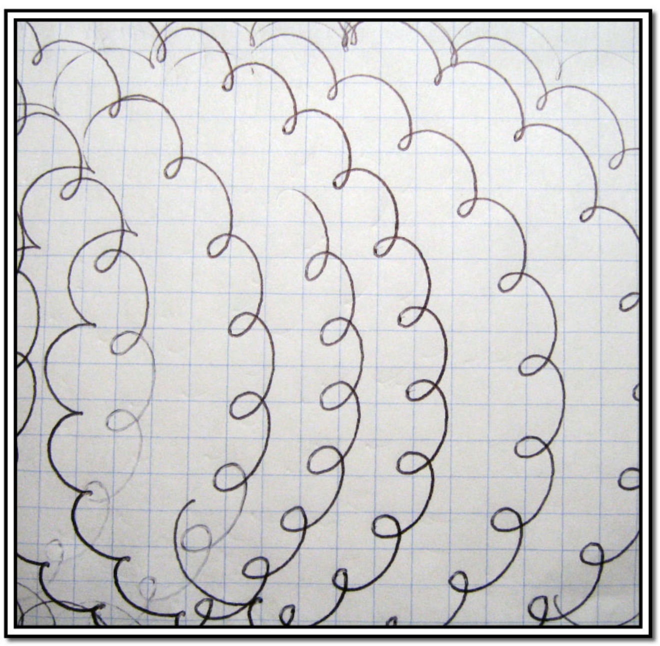
- Foams, fibers, and attachment materials weaken or can be damaged by overly aggressive machine movements.

- Rapid evaporation of lubricants and liquids can even cause buffing cycles to be dramatically shortened.

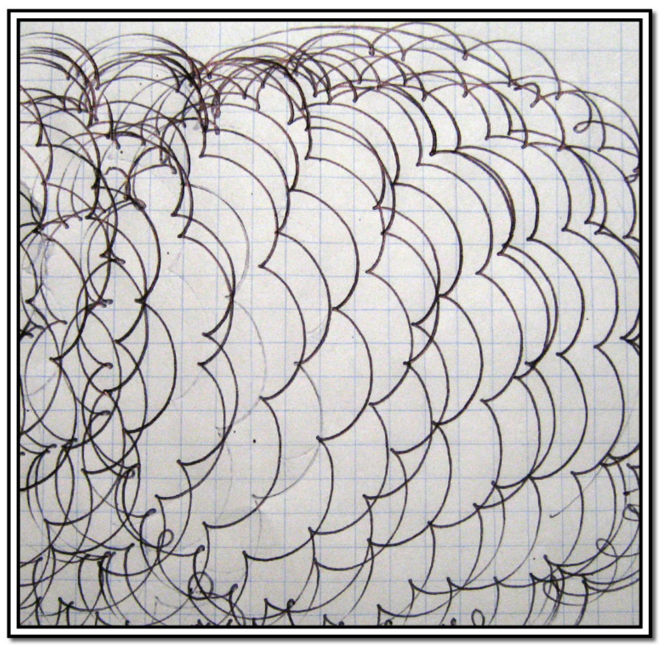
- The smooth and curved motions made by the random orbital change to motions that are aggressive and pointed when operating speeds are increased. This can lead to less than perfect polishing results. The following pictures illustrate this point:



A Meguiar's G110 Dual Action Polisher was outfitted with a backing plate using four modified ballpoint pens in place of a typical buffing pad. The circle created by the rotating pens measures 4-3/8" (or 111.125mm) in diameter.



This pattern was created using the machine on speed setting 1, which equates to approximately 2,560 orbits per minute (OPM).



This pattern was created using the machine on speed setting 6, which equates to approximately 6,700 orbits per minute (OPM).

The list of reasons why using slower machine speeds can improve final polishing results goes on and on. Bottom line? If there's no need to finish a job in a hurry to meet a deadline… and you're not attempting to level a surface… and you're not trying to maintain a specific amount of random pad rotation (or increase it)… then **lower the machine speed setting for final polishing**.

Side note: Another simple yet highly successful way to improve final polishing results is to use ***large diameter pads*** *as opposed to equivalent small diameter pads. Large diameter pads provide a much more stable platform, which helps to minimize machine wobble and user-applied pressure variances across the face of the pad. In addition, larger pads feature more surface area, so they can be used longer before cleaning is needed.*

A CLEAN SWEEP…

Since today's polishing technology does not allow us to eliminate abraded paint residue from the buffing liquid after each cycle, it is important to keep our pads clean. Sometimes the residue's effects are negligible, but other times it can wreak havoc on a paint surface. In fact, this type of contamination can cause scouring so fine that it seems *no* pad & polish combination will deliver stellar polishing results. When this occurs, it can really shake your confidence!

This sort of thing happens any time we use one item to remove material from another. A rake that becomes clogged with leaves can no longer gather them efficiently… a file clogged with shavings can no longer remove material in an even manner (if at all). In most cases, the tool is still usable, but contamination slows or halts progress altogether. Stuck-on debris can even ruin a surface. Can you imagine the damage caused by a file that has become loaded with aluminum shavings? How about a piece of sandpaper packed with pills of freshly sanded paint?

In the case of buffing pads, once they have become clogged with abraded residue and spent abrasives, we tend to see a less than perfect finish. When using rotary machines, we see **swirls** in the paint surface: these are scratches that are long and curved. When using dual-action or orbital machines, we see **scouring** or **hazing** of the paint surface: this is simply caused by an accumulation of scratches that are short and curved, and layered upon each other.

Wouldn't it be nice to know whether the residue featured sharp, hard points and edges similar to the type found on shards of glass? What if instead it was pulverized into a soft, powder-like substance? If we had this sort of information, perhaps it would help us to make choices as to the type of pad we should use and how often it should be cleaned. We might even get some insight as to which buffing liquid would work best for the situation.

On that note, I'll leave *you* to ponder whether or not the solvents and other liquids designed into a buffing liquid help to dissolve the abraded paint remnants. At the minimum, they likely coat the residue and other contaminants, perhaps curtailing some of their negative effects. For now, we'll have to rely upon common sense cleaning of our pads.

USE A RAKE TO COMB YOUR HAIR? I DON'T THINK SO!

Imagine having to remove some sort of gritty, oily, caked on goop from your hair using nothing more than a common leaf rake. For guys like me, *imagining* a full head of hair is merely a harsh reminder of what once was, but I digress. For the hairy-headed among us, think about how futile such an attempt might be.

Unless the rake's teeth were able to force their way between the hairs and strip the goop away, all that would likely occur is perhaps a haphazard *redo* of your *'do*! I think it's pretty safe to say that most of the hair on your head would stay packed tightly together. The probability of cleaning and separating thousands of hair strands using the comparatively thick and flimsy raking teeth is undoubtedly very low.

Yet, in the midst of a polishing session, many of us attempt to clean our buffing pads using nothing more than a run of the mill, nylon bristled brush. Unless the pad is coated in dry or crusty residue, agitating the fibers or pores of a pad won't do a whole lot of good. In fact, other than seeing some foam or fibrous pad remnants and a few crusty residue bits, I don't recall seeing any oil or grease droppings oozing from the brush. Isn't there a better way to clean **foam**, **microfiber**, or **microfinger** pads on the fly?

Back to the hair: I suppose that if we didn't have shampoo and water handy, most of use would reach for a towel in an attempt to wipe the goop away. Perhaps we would first wipe our hair with the towel, then agitate it with a brush, and repeat both steps until we were satisfied that we had removed all we could. In fact, lots of us use this exact method for cleaning our pads when we are polishing paint using **random orbital** machines. First, we agitate the pad with a brush. Then, we place the face of the pad against a towel and run the machine until the pad looks pretty clean. Some guys will go one step further and mist the pad with water, then repeat the towel step (I do this while cutting, but never for finishing). Three steps later, the pad usually looks pretty darned good! Sounds like a lot of work, and it is. Luckily, there is a **much better way**.

The **best** way to clean a buffing pad in the midst of a polishing session is to **blow it clean using compressed air**. A high-pressure blast of air aimed directly at the pad's face loosens stuck-on contaminants, and will have no problem separating fibers or cleaning pores with ease. Compressed air works incredibly well on wool pads, so the need to spur a pad is virtually eliminated. With air, there's *no way* I'm transferring trace amounts of plastic or metal onto my pads as I clean them. One less thing to worry about.

Most detailers and paint polishing enthusiasts don't keep a portable air compressor in their polishing kits, so perhaps it's not a reasonable option for most folks right now. But rest assured, as our pads become more fibrous and our compounds feature finer and more capable abrasives, you're going to need an air compressor.

So the next time the desire hits to buy that "must have" polishing machine, consider purchasing a small air compressor instead. Once you make the switch, you may just realize that you didn't *need* that new machine after all.

"I'VE GOTTA HAND IT TO YOU…"

A good way to test the effects of paint residue is to polish a section of paint **by hand**. A few rubs of the paint using a high quality foam or microfiber applicator and some polish will give you an idea of what to expect from the polish itself. It's best to compare the resultant finish using different applicators to determine whether or not a particular type is affecting the paint surface. It might even be a good idea to rub the paint surface using *only* a clean applicator to determine its effects beforehand. If you can get a similar result using various applicators, there's a pretty good chance that the residue will not create a lot of problems.

Once you've got your base, try another similarly sized section using the same polish, applicator, and pressure, but double the rub time. Obviously, you've got to be reasonable because as paint is removed and the polish dries out, the residue can build to the point that it engulfs the surface of the applicator. In terms of the detrimental effects caused by dried polish and abraded paint residue rubbing against the paint, expect to see a magnification of the results you've achieved *by hand* when using *a machine*.

Paints that are seemingly impossible to dial-in often respond well to soft and pliable non-marring pads, and a minimum amount of polish. Sometimes priming as specified for final polishing works well, but other times a non-primed pad and a minimal amount of polish delivers the desired result. More times than not, when using high grade, non-diminishing abrasive compounds and polishes, additional downward pressure can work surprisingly well.

Patience and methodical analysis is often the only way to form the optimum finishing method. In the end, the best advice is the obvious advice: to avoid contamination-induced swirls, scouring, and hazing… keep the pad clean!

“CUT ME, MICK. GO ON, CUT ME.”

Some paint polishing enthusiasts argue that final polishing should be done using ***“non-abrasive”*** polishes and pads. Perhaps the term *“non-abrasive”* should be substituted for *“the least abrasive”* or *“the least friction inducing”*. Regardless the term, the idea is to use products that affect the surface slowly by removing miniscule portions of paint in a *non-encroaching* manner. In other words, their goal is to modify the paint surface without ***cutting*** new grooves *into* it.

The idea is to mimic the burnishing technique used by barbers to perfect the blade of a straightedge-shaving razor. For this task, a strap of leather called a **strop** is employed as a burnishing tool. Using a specialized technique, the barber rubs the razor back and forth across the strop. The repetitive rubbing motion eliminates inconsistencies along the blade’s edge. As long as the strop does not accumulate blade residue (and proper technique is used), the strop will slowly refine the edge. Interestingly, strops are often used with a lubricating substance that *may* or *may not* contain abrasive particles!

In most cases, through all my years of polishing paint, “honing” the surface using only a buffing pad (and perhaps some sort of “non-abrasive” lubricating substance) generally resulted in a fine hazing of the surface. Could dry buffing, relying upon a super-refined pad (such as the new D/A Microfiber Discs) actually create a perfect finish? I’m not the guy to say NO, but usually the results are less than perfect.

When dealing with scratches that are as fine as those left behind when using proper polishing etiquette and premiere polishing equipment, most pads cannot deform or conform to the degree needed to affect the scratch. This was already covered in the *"Why prime the pad and then immediately remove the polish?"* section of this article.

All this being said, there *are* trustworthy, world-class detailers among us that take pride in their ability to fine hone a paint finish using a rotary polisher, a soft and pliable foam pad, and a long lasting, minimally abrasive polish. I have little doubt that their efforts *do* result in the creation of a very nice finish; it is, however, an *extremely* difficult technique to master.

Perfection is not supposed to a subjective term, but when it comes to judging the finish of a paint surface, it is. One man's idea of perfection is not necessarily another's because lighting can make a tremendous difference in the appearance of paint. So too, can paint color, paint swell, and products lying upon the surface in the form of fillers, resins, polymers, silicones, solvents, and waxes.

It is *very rare* to see perfection in the paint-polishing world, *regardless* the technique. In terms of getting *closer* to perfection, it has never been easier thanks in large part to advances in abrasives, buffing pads, and techniques (especially those designed to work with the random orbital polisher).

"IF YOU CAN'T STAND THE HEATNIKS…"

When the discussion turns to heat and its positive or negative effects on paint polishing, things can become *heated* rather quickly! The pro-heat crowd (the Heatniks) insists that the heat generated by pad friction as it rubs against the paint is the ultimate polishing medium, never accounting for how the friction was created in the first place.

Heatniks often mention that high operating temperatures help to **break down** the abrasives in our compounds and polishes. This to me is interesting, considering the hard and durable composition of the abrasive grains used in buffing liquids these days. Commonly used materials include varieties of aluminum oxide, silicon carbide, diatomaceous earth, clay, and silica. While these materials vary in hardness, none of them would be terribly affected by the temperatures generated by the typical buffer, pad, and compound.

Heatniks have even been known to boast that a specific amount of heat further hardens a paint surface, effectively making the paint more durable and less susceptible to scratching. I suppose the effect is akin to the shot peening of metal parts to improve stress crack resistance. With no actual scientific data to back this up, nor any other convincing evidence that a fully cured or catalyzed paint system will further harden with the introduction of heat after the fact (or any paint type, for that matter), I have nothing positive to say about this unproven premise.

WATER SPRITZING… THE NITROUS OF PAINT POLISHING?

A large portion of this article touts the benefits of pad priming. However, once a pad has become **excessively** packed with abrasive particles and abraded paint residue, cutting power can decrease *rapidly*. Not only is cutting power affected, so too are all other positive aspects associated with having a clean buffing pad. Rather than having to constantly clean the pad or exchange it for a fresh one, what is a buffing guru to do?

What if I told you that by spritzing a bit of water onto the paint, you could:

- Thoroughly clean the pad
- Use less compound
- Extend the buffing cycle by 200-300%
- Increase cutting & leveling ability by 30-50%
- Increase pad rotation when using a random orbital machine

It ***sounds*** too good to be true, but it ***is*** true, and it works with all types of pads!

Supplemental wetting agents, or wetting agents, are liquids that are sprayed onto the paint surface **during** polishing to moisten the pad and paint surface. They are used in addition to buffing compounds or polishes, and can be used when polishing using any type of buffing machine.

When used correctly, a wetting agent can dramatically increase cutting power and extend the amount of time an application of buffing liquid can be used before additional liquid is needed. A wetting agent can also help to keep buffing pads clean. In fact, it can clean a pad much better than agitating it using a nylon bristled brush, or rubbing a towel against it.

Wetting agents can be used with all types of pads including foam, wool, wool blends, Surbuf® Microfinger Pads, and Meguiar's® DA Microfiber Pads.

Although a wetting agent *could* be categorized as a lubricant, in this case its **intended purpose** is to control the bond between the abrasive grains and the buffing pad, not to increase slipperiness between the pad and paint surface. Regardless the *intent*, a wetting agent will serve double duty, working as an "abrasive grain bond controller", and as a surface lubricant.

Purified water is probably the most popular wetting agent, but a paint maintenance spray can also be used. Although a paint maintenance spray may *seem* to be the natural choice for this task, it may not always be the *best* choice. Some maintenance sprays are designed to evaporate more rapidly than plain water, while others contain ingredients that can help to clean, beautify, or protect a paint surface. Oftentimes, these additives can form a barrier, making it more difficult for abrasives to scrub paint away. For these reasons, purified water is an ideal supplemental wetting agent because it can evaporate from the surface completely, leaving nothing behind that could affect polishing performance.

Note: Occasionally, an added bit of slipperiness can be a benefit. I have used Meguiar's Last Touch Detail Spray (1:1 dilution) in conjunction with Surbuf pads and various Meguiar's compounds to pick up a bit more backing plate rotation, thus improving leveling ability when using my random orbital.

Compared to lubricants that are typically used in buffing compounds and polishes, most wetting agents tend to evaporate rather quickly. Plus, since they are usually very thin in viscosity, wetting agents can fling or splatter, especially if there happens to be a lot of pad rotation. For these reasons, the lubrication supplied by a wetting agent can be very short lived.

Perhaps it is best to think of a wetting agent as being similar to a lubricant that has been designed for use during the drilling or sawing of metals. These types of lubricants are commonly used to minimize the damaging effects of friction-induced heat. They are also used to keep metal shavings from packing into the drill shank or saw teeth by flushing them away.

Although we are not necessarily trying to control the level of heat generated by polishing, we are concerned with maximizing the pad and compound's cutting power. In order to keep cutting power at the highest level, sometimes the pad must be purged of the abrasive grains and paint residue that have become tightly packed onto the pad. If the compound is fresh and has some obvious cutting ability left, there is no need to waste it by blowing, scrubbing, or rubbing it away. A wetting agent will help to loosen and then redistribute the compound.

*Note: If the pad has become **laden** with debris, you should consider cleaning the pad before using a wetting agent. Do not use a wetting agent at the onset of the buffing cycle because it will dilute the buffing liquid and cause it to splatter. It can also rinse away precious lubricating agents… in a hurry!*

It's pretty easy to tell when it's time to use a wetting agent. Usually, the polish seems to "flash" or disappear from the paint surface, and cutting ability diminishes almost completely. After cutting stops, scouring of the surface sometimes begins. When this occurs, our natural inclination is to add more polish or increase downward pressure on the machine. Adding more product can help initially, but the excess polish inevitably clumps onto the pad and then rolls off, forming spheres of compound and paint residue that can become trapped between the pad and paint surface. This can really make a mess of a freshly polished surface, especially if you've increased downward pressure.

A pad face that is completely covered in tightly packed compound loses its ability to squeegee away compound and abraded residue from the paint surface. Instead, the pad rides atop it. Known as **gumming**, this phenomenon can be very frustrating to deal with because it continue occur until the pad is cleaned or replaced, or the gumming is manually wiped away.

Fortunately, a wetting agent can also help to eliminate gumming issues. As the wetting agent loosens excess buffing compound and residue from the pad, the pad face becomes exposed once again, thus allowing its pore or fibrous structure to whisk the gummy stuff away.

After the **face** of the pad has been purged of excess buffing liquid, there will very likely be a lot of polish sitting atop the paint surface. It is therefore important to carefully inspect and regularly clean the **edge of the pad** to make sure it doesn't become laden with an excessive amount of **debris**. This happens as the pad moves across the paint and its edge works as a squeegee, gathering up whatever happens to be in its way. The accumulation of spent abrasives, buffing liquid, and paint residue can clump along the pad's edge, potentially scouring an otherwise pristinely polished surface.

When using buffing pads featuring **strings** or **fibers**, a wetting agent can help to loosen stuck-on buffing compound and paint residue. It can also find its way **into** and **between** each fiber, effectively making the fibers more pliable by breaking the friction lock they have on each other. With the newfound wiggle room created by the liquid, the fibers are able readjust positioning in relation to each other.

As the wetting agent becomes displaced via pressure, evaporation, or by absorption into the pad, the fibers are able to pack tightly against each other. This phenomenon effectively creates a pad featuring a higher density of fibrous material, if only for brief periods of time. As the pad once again scrubs material from the paint surface and becomes coated with buffing compound and paint residue, it must be cleaned again.

Although the benefits of a wetting agent can be short lived when used with these types of pads, *what a difference* it can make! The increase in cutting power and leveling ability can be *jaw dropping*; this is especially true when a rotary machine is paired with a wool buffing pad, or when a random orbital machine is outfitted with either a **Meguiar's DA Microfiber Cutting Disc**, or a **Surbuf Microfingers Pad**.

Another *huge* benefit: wetting agents can help to keep pads **clean**. This is especially true when the pad is rotating at a high rate of speed. As the pad rotates, attached compounds, liquids, loose fibers, and debris are essentially flung from the pad. Although this can create a messy environment at times, pad debris, compound splatter, and dust can be minimized through diligent pad cleaning, and adjustments to the amount of compound being added between cleanings.

"WOULD YOU PREFER THIN OR THICK NOODLES WITH YOUR SAUCE?"

Lets discuss the benefits and drawbacks to using **thin** or **thick** fibers. It's a bit of a long read, so fair warning!

To begin, imagine that we are using a pad featuring long, **rectangular** fibers. Regardless the length, each fiber features four long sides and an end tip (the other end is attached to the pad). Since the surface area of a tip is tiny in comparison to the combined surface area of all four sides of the fiber, let's not figure the surface area of the tips into our equation. Besides, wool pads, Surbuf Microfingers Pads, and the Meguiar's DA Microfiber Discs all feature fibers that are positioned vertically in relation to the face of the pad, but tend to bend horizontally when in use.

If we apply buffing compound to a pad featuring just one fiber, each side of the fiber would have the potential to abrade the paint surface as the pad, twists, bends, and spins the fiber across the panel.

If we add another fiber, we would have eight sides in play. Three fibers give us twelve sides, four fibers give us sixteen sides, and so on. For this equation, we'll hold at four fibers. Now, what would happen if all four fibers stuck together, forming one larger four-sided, single-tipped fiber?

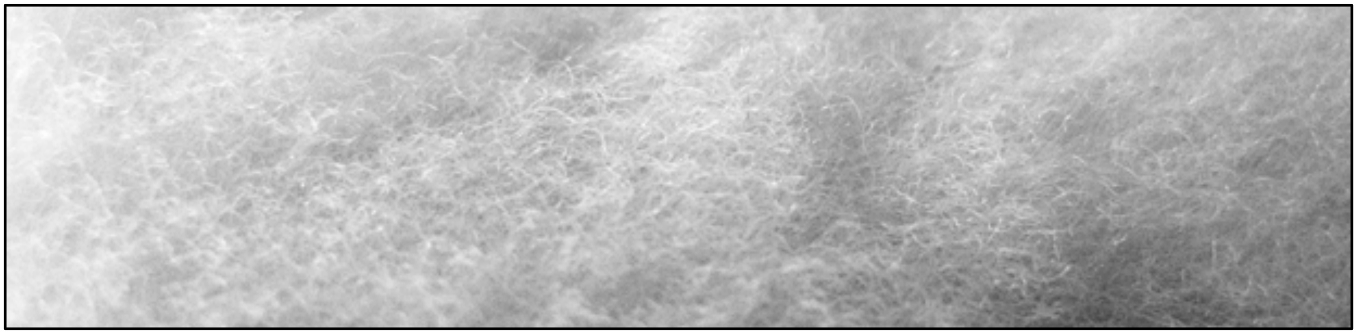
With two sides of each four-sided fiber stuck to another fiber, only 50% of the surface area of all four fibers would be available to scrub paint away. Not only that, but the combined size of the fiber would measure double in thickness and width.

Consequently, the thicker 4-ply fiber would not be able to contour as well as a single fiber, so although we might see an increase in leveling ability, there might also be a decrease in the ability of the fibers to follow the finer nuances of a surface. In other words, if the fibers cannot physically scrub the entire paint surface because they are either too **stiff** or too **large**, and the fibers cannot **force** the buffing compound *into* or *across* the deeper defects in the paint (this is what buffing pads truly are designed to do), then polishing results could be disappointing.

Undoubtedly, with enough scrubbing time or applied pressure, we could eliminate the fine scratches, or polish the deeper defects without completely eliminating them, but then we run the risk of removing an unnecessary amount of paint. Why try to force a large diameter fiber to do the work of a small diameter fiber, unless we have no other option?

Of course, the buffing pads we use feature fibers that are closer to cylindrical in shape as opposed to rectangular, but the same principle applies. If the fibers stick together, they will undoubtedly offer less surface area, less pliability, and be **misshapen** to boot. I say misshapen because there is no way to control the shape or the quantity of fibers that stick together. A pad featuring inconsistently sized fibers is bound to wreak havoc upon an otherwise pristinely polished paint surface.

A great example showing how single or grouped fibers can affect the abilities of a buffing pad compares a **knitted wool pad** to a **twisted wool pad**. For this comparison, let's assume all parameters of the pad are the **same**, with the exception of how the wool is configured before being attached to the pad.



Close-up shot of a knitted wool pad.

Close-up shot of a twisted wool pad

Both types of pads feature groups (or bundles) of wool, commonly referred to as **tufts**. To make a tuft, imagine laying out a **dozen** strands of wool, side by side. If you were to grab the strands mid-length and fold them in half, you would have a tuft featuring **two-dozen** strands of wool. One end of the tuft would be bunched together, while the other would not.

If you then attached the bunched end of the tuft onto a fiberboard disc by stitching it into place (and repeating the procedure over and over until the disc was full), we would have the makings of a wool pad.

A knitted wool pad typically features tufts of thin wool strands that have been knitted or stitched onto a simultaneously stitched backing. If you've ever seen an embroidery machine work its magic, or a yarn-knitting guru turn a continuous string of yarn into a blanket or sweater, you'll have a good idea of how knitted wool pads are created.

Each individual tuft can be placed tightly or loosely together, helping to control the characteristics of the pad. Knitted wool pads are known to have good cutting ability compared to **foam** pads. They tend to cut well initially, but because the individual fibers are thin and lack rigidity, they tend to pack full of compound and debris rather easily. Because of this, knitted wool pads must be cleaned often to achieve satisfactory results.

When used correctly, knitted wool pads cut well and leave a pretty nice finish. They are generally very comfortable to use, as there can be a lot of air residing between each fiber. This allows the fibers to remain flexible (or pliable) during use. In most cases, knitted wool pads do not offer the leveling ability of a twisted wool pad. The exceptional case might be one that requires leveling of a surface featuring a dramatic curve or bow. In this instance, the fibers could unintentionally be **forced** to contour to the panel, creating a pliable yet dense grouping of dynamically shifting wool fibers. Loads of surface area, fantastic contourability, and non-rigid fibers… the best of all worlds!

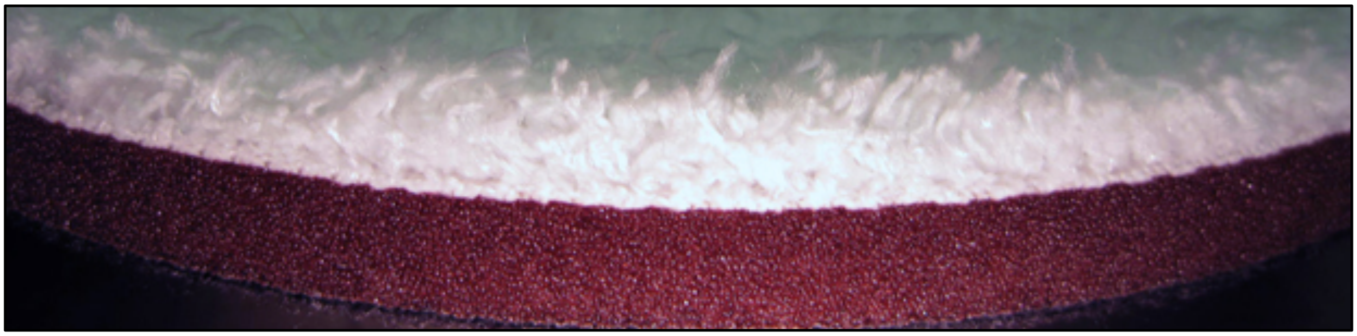
A twisted wool pad features tufts of wool that are pressed *through* and stitched *onto* a backing disc. However, before the tufts are mounted onto the backing, they are twisted or weaved together, forming a thicker strand of wool. By combining multiple tufts or by using more strands of wool per tuft, the fibers can be made as thick as desired. Thick, stiff fibers offer less total usable surface area compared to knitted wool pads, but there are some big benefits to this design.

First, it is important to mention that twisted wool pads tend to be less susceptible to having its fibers stick to each other. After all, it's not that easy to bind large fibers together using nothing more than a concoction of abrasive particles, goopy buffing liquid, and paint residue. In this regard, a pad featuring twisted wool fibers beats a knitted wool pad, hands down. Less time spent *cleaning* the pad means you can spend more time *buffing* with the pad.

Since the fibers are thicker in girth, less individual strands can fit onto the same size pad. This means that although there is *potentially* less wool contacting the paint at any given time, the pressure placed upon the pad and force generated by its movement is more focused onto each twisted wool fiber than it would be on the multitude of strands used on a comparably sized knitted wool pad. Thick fibers, and lots of pressure applied to those fibers means that **leveling ability** is going to very high when compared to a knitted wool pad.

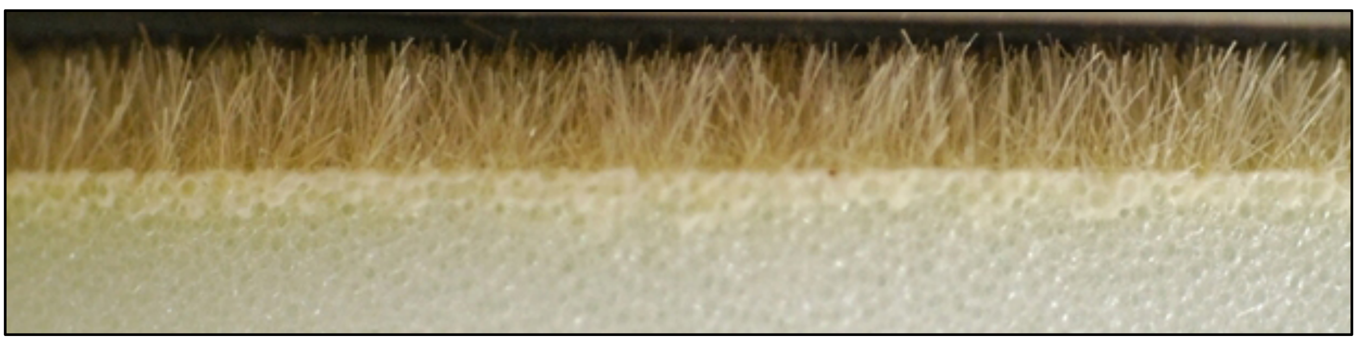
A lot of the discussion comparing knitted and twisted pad designs is theoretical. In the real world, overall pad performance depends so much upon the type and amount of wool being used, the length and stiffness of the fibers, and how tightly the fibers are packed onto the pad. Keep this in mind when choosing a new pad, or when analyzing the performance of a pad during use.

How about a comparison of two very distinct pads that use fibers to do their work, but are very different by design? Let's once again compare the **Meguiar's DA Microfiber Cutting Disc** to the **Surbuf Microfingers Pad.**



Close-up shot of the Meguiar's DA Microfiber Cutting Disc

The Meguiar's DA Microfiber Cutting Disc features tufts of microfiber strands. The face of the pad is similar in design to a knitted wool pad. The microfiber strands are not stiff like the type used on the Surbuf pad. Instead, they kink, crush, and bend very easily when pressure or force is applied to them, and respond in a manner similar to the pile of shag carpeting as it is stepped on.



Close-up shot of the Surbuf R Series Microfingers Pad

The Surbuf Microfingers Pad touts a very unique design. It uses non-tufted, individually placed fibers that are mounted vertical to the pad face. The microfingers maintain a constant length, and don't kink or crush easily when pressure or force is applied to them. Comparatively, microfingers react to pressure in a manner similar to the bristles of a toothbrush.

Using typical machine operating speeds, **and with all other parameters being equal** (pad priming, machine type, buffing compound, applied pressure, backing plate rotation, paint type, panel shape, etc.), a Surbuf Microfingers pad will generally **level** a surface to a truer degree, while the Meguiar's DA Microfiber Pad will typically deliver a glossier finish.

Before we confidently claim that one pad is more **capable** or **versatile** than the other, remember that by changing machine speed, altering our technique, or swapping the backing plate for a different one, we can **dramatically** change the performance characteristics of *any* pad.

"YAWN... IS THERE ANYTHING ELSE I SHOULD CONSIDER, KEVIN?"

Yes! Just a little more.

1. There are advantages and disadvantages that go along with using supplemental wetting agents. Although they can be used with any type of machine or pad, wetting agents work best for the task of defect removal, **not final polishing**. Since there is almost always an increase in scouring of the paint surface when using a wetting agent (the reasons have been discussed), it is wise to anticipate having to re-polish the area with a fresh buffing pad and the same (or a finer grade) of polishing liquid.

2. The first thing you may notice is that the wetting agent releases the buffing polish from the pores or fibers of the pad. With so much polish present, there is a potential for a lot of cutting power, assuming the pad can cut through the build-up (as opposed to riding atop it). If you've recently primed the pad, expect to see an incredible amount of polish upon the paint surface (probably too much). If there is too much buffing liquid present, simply wipe the excess from the surface, and continue polishing.

3. As the buffing pad glides across the paint surface, it gathers up and moves the polish and abrasives that are lying upon the paint surface. Since the polish has by this time lost some of its lubricating ingredients or **buffering agents*** via evaporation, through absorption into the pad, or by friction, expect to see an **increase** in cutting power (sometimes, a whole lot more!)

** **Buffering agents**, as they are known in the abrasives industry, are ingredients that are sometimes used to keep debris from attaching to the abrasive grains, and to keep the abrasive grains from attaching to each other. Buffering agents can also curtail the formation of oxidation, and provide lubrication while acting as a sacrificial barrier. Buffering agents are sometimes used on sanding sheets and discs to minimize abraded materials from attaching to the abrasive grains.*

Here's a non-industry example: bakers use sifted flour to act as a buffering agent when kneading dough. The flour keeps the dough from sticking to rollers, boards, pans, and hands.

4. Don't be surprised to see an increase in scour marks or fine scratches to go along with all the extra cutting power. The potential lack of lubrication means that the abrasives may cut deeper and stick to the paint momentarily before becoming dislodged and continuing on their way. They may also more easily clump together.

IN CLOSING…

Advances in pads, compounds, and techniques have delivered high-end paint polishing to the masses. The beginner of today, armed with a random orbital and the latest compounds and pads, can literally rival the results achieved by the rotary wielding, paint-polishing guru of only a few years ago. I never thought I would claim such a thing, but its true. Sure, it's not a slam-dunk, and there's still a learning curve, but the curve is much shorter. Heck- it's not even a curve anymore… it's a direct line!

For polishing enthusiasts that don't know how to use a rotary buffer or prefer to use any variation of an orbital machine, supplemental wetting agents and pad priming can make all the difference. When paired with a Meguiar's DA Microfiber Cutting Disc or a Surbuf Microfingers Pad, a random orbital can rival the cutting and leveling results delivered by a rotary buffer and a wool pad. This is not always the case, and the process is not necessarily faster, but the potential certainly exists.

For the **rotary** users among us, pad priming and supplemental wetting agents can increase **cutting power** and **leveling ability** by a substantial amount. Although the orbital has closed the gap on the rotary, there are still a lot of fans of the rotary, and definite benefits that go along with using a rotary polisher.

So choose your polishing weapon, and get to polishing!

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