Machine Polishing by Rotary Polisher

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One of the best ways to take your car’s paintwork to the next level is to use a machine polisher to remove the swirl marks and enhance the gloss by burnishing the finish. Polishing can be done by hand or by a dual action polisher. However, the rotary polisher represents the next step in machine polishing: a tool highly capable of fast correction but also capable of very high clarity, sharp and deep finishes.

INTRODUCTION

The rotary machine polisher is a popular and well used tool by professionals and enthusiast detailers alike. Alas it is sometimes misused and as a result it can get itself a rather bad name as a dangerous, fire breathing monster that will burn your paint as soon as look at it! Used correctly however, the rotary is a safe and hugely effective machine which doesn’t deserve its reputation.

In this guide we look to put this myth to bed with a full run-down of the art of using a rotary polisher as safely as possible to create eye catching finishes with head turning clarity and depth. Machine polishing not only delivers correction of paint blemishes such as swirls. It also burnishes the paint finish to a very high gloss which will set your car apart from others at shows, or simply in the supermarket car park! Indeed it can happily be argued that this burnishing stage is more important to the overall result than the correction – as in most conditions it is the enhancement to the gloss that will be noticed most. Naturally, correction of blemishes is also very important and makes for another big advantage of machine polishing.

Please note: this guide is not product specific. The generic techniques that apply to all rotaries and polishes will be covered here along with hints and tips that can be adapted for use with a lot of products on today’s market. Polish specific guides for the most popular products on the market will be in a separate guide. It should also be noted that every detailer has differing techniques – the key to getting the best possible finish is to spend time practising with the polishes and pads that you have and see what works best for you. This guide is intended to get you started and share some possible tricks and methods for honing your finish to the best possible.
**ROTARY POLISHING: WHAT & WHY?**

Before getting started into the use of a rotary polisher, we have a look at what exactly the tool is and what it can be used for.

**THE ROTARY POLISHER**

Rotary polishers are the mainstay of bodyshops and professional detailers for paintwork correction. They can be used with either foam or wool pads, the latter giving rise to the commonly used term of “mopping”. Used correctly, a rotary polisher is capable of spectacularly good results: high levels of paintwork correction; super sharp clarity and depth in finishing. In the wrong hands, such a machine is capable of severe paint damage!

A rotary polisher differs from a Dual Action polisher by the fact that its pad spins only on a single orbit as shown below.
The single orbit nature of a rotary polisher results in a very consistent break down of polish abrasives. This opens up the rotary polisher for use with any polish from heavy cutting compounds to fine finish polishes. The rotary is a very flexible paint correction machine.

**WHY ROTARY?**

Before Dual Action polishers became widely available, rotary polishers were the only choice for detailers who wanted to perform paint correction by machine. However, with the advent of Dual Action polishers that make the paint correction process safer and more accessible for novice users, why would anyone want to use a more aggressive machine? There are many reasons!

In terms of cutting ability, the rotary polisher is more flexible than a dual action polisher. This is especially noticed at the higher end of the cutting scale. For severe marring where aggressive compounds are required, the dual action polisher can be seen to struggle with the correction – a lot of time and patience is required! A rotary polisher by contrast can cut faster and get more from the abrasives in heavier compounds.

Rotary polishers can also be used with wool pads for additional cut, something which is not possible with a dual action polisher. Extreme care must be taken with wool pads owing to the high levels of cut they provide – a brief introduction to wool will be given in this guide for completeness only. More detailed information can be found in the section “Serious Correction”.
Machine Polishing by Rotary Polisher

In addition to being serious correction machines, rotary polisher also excel at finishing. The constant radius of the pad motion results in the abrasives being broken down more evenly which has been demonstrated to give a slightly sharper finish than using the equivalent polish by dual action polisher. This is not to say the finish delivered by a dual action polisher will be a poor one in comparison – very far from it. You will only notice the “rotary enhancement” on certain paints, generally soft solid dark paints.

CHOOSING A POLISHER & PRODUCTS

As with all things detailing, there is now a huge array of machines and products on the market. Indeed, there are more rotary polishers on the market than dual action polisher which can make the choice of tool a harder one. Here we look at some specific requirements and recommendations for polishers and products. This is by no means an exhaustive guide, but rather a generic review of the products on the market.

THE MACHINE

Having been around for many years, there is a vast array of rotary machine polishers to choose from and a machine to suit every budget! A quick review of detailing forums reveals two machines in particular to be quite popular – the Makita 9227CB and Metabo PE12-175 as shown in the photographs above. Their popularity is in many ways down to their suitability for paintwork polishing and availability to the detailing market. However, many other machines on the market make an excellent choice.

Choosing a machine polisher very much comes down to personal preference. There are bigger differences between various rotary polishers than there are between dual action polishers. Speed ranges, machine weights, switch and control positions, general ergonomics and specifications can all vary widely across the board. From this perspective it is necessary to choose a machine which best suits your preferences. The easiest way to find this out is to try various machines and get a feel for what you prefer.

That said, the task of machine polishing by rotary can be made easy or difficult depending on the machine you choose. Certain genetic factors that are common to many machines and should be looked out for when
choosing a rotary are listed below. Confirm your potential machine choice meets these generic specifications to ensure the rotary polishing experience is an enjoyable and productive one.

- Variable speed with range of at least 1100rpm – 2000rpm.
- Electronic speed control to maintain constant pad speed regardless of pressure
- Comfortable ergonomics

Variable speed is crucial to making use of the flexibility of a rotary polisher, and the greater the range the better. Slower speeds are useful for finishing and refining, higher speeds are useful for aggressive cutting. An electronic speed control that ensures the pad rotates at a constant speed regardless of pressure is highly useful in making the rotary a predictable machine as well as guaranteeing that the pad does not bog down at slow speeds which can make finishing a less easy task.

Most importantly though is that the machine should be comfortable for you to use – and this will vary from person to person! Some machines are heavier than others, control switches are located in different positions and the shape of the tools is very different. Check to make sure that any potential rotary purchase is one which you are comfortable using.

### PADS & PLATES

Meguiars Soft Buff Foam Pads – a popular choice for rotary polishing

Rotary polishers can be used with both foam and wool pads. It is strongly recommended that for starting out with a rotary, wool pads are avoided owing to the high levels of cut they deliver. Both foam and wool pads are listed below. We will touch on wool pads only briefly in this guide for completeness (full discussion given in separate guide on “Serious Correction”).

Foam pads for use with rotary polishers come in a wide variety of grades and styles with sizes ranging from 4” right through to 8” diameter. Different pads use different grades of foam which affects the coarseness and hardness of the pad. This in turn varies the amount of cut a pad will deliver, and affect its abilities when finishing. It is a good idea when choosing a selection of pads to use with your rotary to choose a wide selection of grades of foam. This will give you a good choice to tackle everything from severe swirls and marring with compounds, to burnishing a finish to a high gloss with a finessing polish.
Listed below are the most popular foam and wool pads available from a selection of manufacturers.

### MEGUIARS

- W4000  Cut & Shine Wool  8”  Heavy Cutting
- WWHC7  Solo Heavy Cutting Wool  7”  Heavy Cutting
- WWLC7  Solo Light Cutting Wool  7”  Moderate Heavy Cutting
- W7000/6  Burgandy Foam  8 or 6”  Cutting
- W8000/6  Yellow Foam  8 or 6”  Polishing
- W9000/6  Tan Foam  8 or 6”  Finishing
- WDFP7  Solo Polishing  7”  Polishing
- WDFF7  Solo Finishing  7”  Finishing

### SONUS

- SFX-1  Yellow  6” or 4”  Cutting
- SFX-2  White  6” or 4”  Polishing
- SFX-3  Red  6” or 4”  Finishing
- DAS  Orange  6.5”  Light Cutting
- DAS  Green  6.5”  Polishing
- DAS  Blue  6.5”  Finishing

### MENZERNA

- Compunding  White  5”  Heavy Cutting
- Polishing  Orange  5”  Heavy Polishing

### LAKE COUNTRY (INCLUDING CCS)

- Cutting  Yellow  8” or 6” or 4”  Cutting
- Light Cutting  Orange  8” or 6” or 4”  Light Cutting
- Heavy Polish  Green  8” or 6” or 4”  Heavy Cutting
- Polishing  White  8” or 6” or 4”  Polishing
- Finishing  Black  8” or 6” or 4”  Finishing
- Finessing  Blue/Red  8” or 6” or 4”  Fine Finishing

This is just a small selection of a simply vast amount of pads on today’s market. It is wise when choosing foam (and wool) pads to get a good range cuts: at least one cutting, two polishing and one finishing to start off with is recommended. This gives you a wide range of products to choose from when you are working.

You will also notice that pads come in a variety of different sizes for the rotary, ranging from small 3 or 4” pads right through to large 8” pads. The varying sizes allow you to choose a pad which will best suit the panel you are working on. Large open panels such as roofs and bonnets lend themselves to bigger pads such as 6 or even
8”. Smaller, more complexly detailed panels such as bumpers and bootlids with badges are better suited to smaller 3 and 4” pads. The aggression of a pad is also linked to its size, as larger pads will move faster for a set rpm, resulting in slightly more cut from various polishes – we will see later in the guide why this is so.

You will also need a suitable backing plate to use with pads – smaller 3 and 4” pads require a 3” backing plate, while 6” pads will require a 5.5” backing plate for example. Most rotary polishers use an M14 thread so ensure that your backing plate is compatible with this. For further information, refer to your polisher specifications and operating manual.

### POLISH

**Meguiars #83 Dual Action Cleaner Polish and Menzerna PO106FF Final Finish**

A key component to machine polishing is the actual polish! A quick browse of online detailing retailers reveals a vast array of different machine polishes on the market. Some of the more popular products from some manufacturers are listed below:

<table>
<thead>
<tr>
<th>MEGUIARS #80-SERIES</th>
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<tbody>
<tr>
<td>#85</td>
<td>Diamond Cut Compound</td>
<td>Heavy Cut</td>
<td>10/10</td>
</tr>
<tr>
<td>#84</td>
<td>Compound Power Cleaner</td>
<td>Heavy Cut</td>
<td>9/10</td>
</tr>
<tr>
<td>#83</td>
<td>Dual Action Cleaner Polish</td>
<td>Medium Cut</td>
<td>6/10</td>
</tr>
<tr>
<td>#80</td>
<td>Speed Glaze</td>
<td>Light-Medium Cut</td>
<td>4/10</td>
</tr>
<tr>
<td>#82</td>
<td>Swirl Free Polish</td>
<td>Light Cut</td>
<td>2/10</td>
</tr>
</tbody>
</table>
It may be tempting when first starting out with a machine polisher to buy as many polishes and compounds as possible – but in truth, for most general defects on most paintworks, you only really need two products to get you started. One medium cutting polish (for example Menzerna PO85RD3.02 Intensive Polish), and one lighter cutting polish (for example Menzerna PO106FA Final Finish). As you build confidence with the use of a rotary polisher you can expand your range of polishes up to more aggressive cutting compounds which require greater care to work safely. This will expand your cutting capabilities to handle more serious paint defects. You can also expand your range down to very fine finishing polishes and explore the use of lightly abrasive paintwork cleansers as finishing polishes.

GETTING STARTED

Having chosen your machine, pads and polishes it is now time to start removing paintwork defects.

PREPARATION

Before starting to machine polish your car’s paint finish, you should ensure that it is fully washed and dried. Any dirt on the finish will embed in the foam pads and be ground into the paint finish resulting in scouring. Ideally, the car should also be clayed before machine polishing. This will remove bonded contaminants such as tree sap and rail dust which can be removed into the foam pad during the polishing process, adversely affecting the performance of the foam and the finish achieved.
When the car is prepared, try to get it indoors out of direct sunlight and away from the potential of being soaked by the Great British weather! Controlled conditions help when machine polishing to ensure consistency in the polish performance – this is particularly important with polishes such as Menzerna which were designed to be used in controlled environments.

It is a good idea to tape up textured plastic trim on the car before polishing – areas such as bumpers, vents, door rubbers that protrude outwards. This can be done using painter’s masking tape. You should use a low-tack masking tape which will remain in place even if a machine pad hits it, but yet is easy to remove when you are finished. An example of a suitable tape is 3M 3434 blue tape.

When deciding which areas to tape up: you are looking to protect textured plastics from having polish residue driven into them so these should all be taped; you are looking to prevent the pad coming into contact with regions trapping dirt so the pad doesn’t drag the dirt onto the paint so these areas should be taped. When taping, ensure the area you are taping is dry – particularly important around water traps such as underneath wing mirrors. The Mercedes in the picture below shows typical areas for taping up on a car:

![Mercedes C36 AMG showing typical “taping up” locations](image)

Protruding edges of the indicator repeater taped up as these could catch the pad causing it to jump and also be harbouring unseen dirt that could embed in the foam and be dragged across the paint. Along the styling line on the doors has been taped up – again we have a protruding edge here but also regions of textured plastic trim which we would want to avoid staining with polish residue. The door handles on this car are black textured plastic so have been taped to avoid staining.
SETTING UP THE MACHINE

This part of the guide is based on the Makita 9227CB Rotary Polisher. The generics here are applicable to all of the major rotary polishers however.

First of all, decide which size of pad you want to use. This will be determined in the main by the shape and size of the panel you are working on: small panels with complex details will require the use of smaller pads. You will then need to choose the appropriate backing plate.

Most rotaries have the “male” end of the connection, and the backing plate is the “female” end as shown in the picture below for the Makita 9227CB (M14 thread).

First of all, screw the backing plate onto the connection until you feel a notable resistance. Take care not to cross thread – it is a good idea to turn only very lightly to get the plate started on the thread as shown:

Fitting Meguiars backing plate to Makita 9227CB
Once you feel resistance, locate the spindle lock button – on the Makita it is the black button on the head of the machine as shown:

![Spindle lock button on Makita 9227CB](image)

Push this button down and then turn the backing plate until it clicks – the button will fall down at this stage and the plate will be locked. Tighten the plate with firm pressure at this point, holding the spindle locked with the button. Once secured, let the button go and turn the backing plate to make sure it is tightly fitted as shown:

![Makita 9227CB with backing plate fitted](image)

You can now attach a pad to the backing plate and the rotary polisher is ready to use.
UK Users Note: many polishers are designed to run on 240V and can be plugged straight into a UK mains supply. If your rotary is designed to run on 110V then it will require a transformer – do not plug it straight into the wall as irreparable damage will result.

ASSESSING THE PAINTWORK

With the machine ready to use, it is now time to assess the paintwork that you will be working on. This will allow you to begin to choose which polishes and pads you will be using to achieve the desired results on the paintwork.

PAINT CONDITION

A full description of the different paint defects that you may face is given in a separate guide. The aim of machine polishing is to correct paint defects such as swirl marks, etching, random deep scratches (rds), oxidisation, hologramming:
It is impossible to judge the severity of the paint defects by the eye to an extent where you can work out exactly what combination of pad and polish that you require. However, you can start to get an idea which will begin to help you narrow down the ideal combo for the car.

**LIGHT IT UP!**

Defects such as swirl marks also show themselves in direct sunlight. Or underneath the halogen lights in a petrol station. It is not always possible to rely on sunny weather to assess paint condition though, especially in the UK! It is also very bad for you eyes to stare at sunlight reflecting directly off of a paint finish! Please be careful!

A very useful tool to have in your detailing armoury is a suitable light source that you can use to highlight the swirls on the paintwork. Two examples of such tools are the Brinkmann Dual Xenon Torch and the 3M PPS Sun Gun shown below:

![3M Sun Gun &Brinkmann Dual Xenon Torch](image)

This hand held torch gives a light which is bright enough to highlight swirl marks and holograms on the paint finish. In order to use the torch to its maximum effect, hold it far away from the paintwork rather than close up as this will highlight more of the swirls that are present. Additionally, tilt the to a slight angle which can help pick up lighter marring than may be missed from the direct beam. Very light machine holograms can be found by sweeping the torch from side to side and looking for a “wave” effect across the paintwork which is indicative of a light hologram.

Not all paintwork marring is best seen using bright light however. Random deep scratches like the ones shown in the picture above are best viewed under a general garage strip light – the lower contrast of the dimmer light highlighting the softer and deeper scratches more clearly. A bright light would highlight all the swirls, masking the more spread out deeper marks.
HOW MUCH PAINT?

Most machine polishes use mechanical abrasives to remove the paint defects. This means that as you are polishing, you are eroding away a certain amount of paint, the exact amount depending on how harsh an abrasive you are using. Rotary polishers have greater power than their Dual Action counterparts and for this reason greater care should be taken with regards to paint thicknesses – especially with more aggressive cutting compounds!

If possible, before starting to use the machine polisher, it is a good idea to check the thickness of the paintwork on the car. This can be done by using a Paint Thickness Gauge (PTG):

![Positest DFT Thickness Gauge](image)

Most PTGs will measure to total thickness of paint on a panel. Paint generally consists of either two or three distinct layers: Base Coat; Colour Coat; Clear Coat (on most cars). It is the thickness of the top layer of paint which is of interest – going through this layer (strike through) will result in a respray being needed! So it is necessary to interpret the readings you see on the gauge and a certain amount of guess work will be required. Very generally speaking, you are looking for the paint thickness to fall between 100um and 200um. To give you an idea of how thin this is, the thickness of a human hair typically varies between 20um and 150um! So your paintwork is the thickness of a human hair!

200 MICRONS +

This level of thickness can be expected on older cars that have been hand painted – the Ferrari F355 for example. It is also indicative of the possibility of the car having been painted at some point in its life. This is something important to note as non-OEM paint can respond very differently to factory paint in terms of hardness and polish behaviour – so if any regions appear quite thick, make a mental note of this for when you come to machine polishing them.

An example of just how thick paint can be is seen in the picture below where a reading of over 1000um was taken – that is paint that is 1mm thick!
BETWEEN 100 AND 200 MICRONS

This is normal paint thickness. Reading in this range point to standard paint (generally speaking) and shows a healthy thickness that should present no problems when it comes to machine polishing.

BETWEEN 80 AND 100 MICRONS

For most cars with clear coats, readings in this range point to quite thin paint. Many newer cars give thinner paint readings, but reading in this region should raise caution. Think twice about using more aggressive polishes on thinner paints as significant amounts can be removed, resulting in strike through and the need for a respray. Paint of this level can still be machine polished – but greater care should be exercised in polish and pad choice.
LESS THAN 80 MICRONS

Now we are in the realm of very thin paint, especially if a clear coat is present. Care should be taken when choosing a polish for these thinner paints. A big consideration should be a filler heavy polish which can achieve correction by filling the marring rather than removing any further paint. Thin paint can be a result of aggressive machine polishing in the car’s past life.

LAYER THICKNESSES?

As said at the start of this section, it is the thickness of the top layer of paint which is of most interest for assessing the suitability of using machine polishes. But with a reading of only the total thickness, how can you know the thickness of this top layer? The answer is that, unless you buy a PTG that can measure the individual layers (expensive!), you cannot know to high accuracy – but you can give an educated guess.

- 50-25-25: Very generally speaking, on most cars the clear coat makes up 50% of the total thickness. This is a general approximation, and only a first very rough estimate.
- Inside of door: Measure in here. This will give you the thickness with much less clear coat sprayed and you can assume this to be the thickness with no clear coat to a pretty good approximation. The difference between readings inside the door and on the exterior paintwork gives the thickness of the clearcoat.

CHOOSING A PAD & POLISH COMBINATION

Once the paintwork condition and thickness have been assessed, it is time to choose a polish and pad combination for machine polishing. Before trialling combos for the removal of defects, consider the paint thickness you are dealing with – if it is low then this will limit how aggressive you can be, and if it is very low then it should beg the question: should I be using mechanical abrasives at all? Normal thicknesses should cause less worry but always check very carefully the amount of paint you remove with each combo tested.

There is much written about the relative hardness and softness of paints on various cars. Mercedes paint for example is typically considered to be amongst the hardest you will come across. By contrast, Vauxhall paint is generally considered to be quite soft, and Honda paint very soft. Alas there are a lot more factors to consider and at the end of the day, every car is different, even if it is from the same manufacturer or even the same model! It is also not possible to tell how deep general swirls are just by looking at them with the naked eye – they may be deeper or less severe than they appear.

For this reason, it is always good practice when machine polishing to choose a test section on the car and trial various combinations until you find the one that gives you the desired correction and finish. What we are aiming for is to get the desired correction by removing the least amount of paint possible (without using fillers, unless the paint is already very thin). In order to achieve this, always start by testing the least abrasive combination of pad and polish you have and work up until you get the desired correction – this ensures you don’t use an aggressive combo unnecessarily, which would remove more paint than is required.

For example, say you have all of the Meguiars #80-series polishes mentioned above, and the three Meguiars polishing pads and the W4000 Cut & Shine wool pad mentioned above. The assessment of which combo to use could be done as follows:
1. Start with #80 Speed Glaze on a W9006 Finishing Pad. Assess the results. If correction is of the desired level, continue with this combo. If more correction is required, proceed to step 2...

2. Now try #80 Speed Glaze on a W8006 Polishing Pad. Assess the results. If correction is of the desired level, continue with this combo. If more correction is required, proceed to step 3...

3. Now try #83 Dual Action Cleaner Polish on a W8006 Polishing Pad. Assess the results. If correction is of the desired level, continue with this combo. If more correction is required, proceed to step 4...

4. Now try #83 Dual Action Cleaner Polish on a W7006 Cutting Pad. Assess the results. If correction is of the desired level, continue with this combo. If more correction is required, proceed with caution to step 5...

5. Now try #84 Compound Power Cleaner on a W7006 Cutting Pad. Assess the results. If correction is of the desired level, continue with this combo paying very close attention to the paint thicknesses before and after treatment. If more correction is required, proceed with great caution to step 6...

6. Now try #84 Compound Power Cleaner on a W4000 Cut & Shine Wool pad. Assess the results. If correction is of the desired level, continue with this combo. If more correction is required after this, consider very strongly whether or not the defects can be removed!!

You can see that certain combinations above were missed out – #83 was not trialled on a finishing pad, and #84 was only trialled on a cutting pad or a wool pad. This is simply down to the styles of the polishes better suiting the more aggressive pads. For the same reason, #80 would not be trialled on a cutting pad.

Depending on the paint you are polishing, the use of a more aggressive polish may leave marring of its own which can take the form of either holograms or induced swirl marks as shown in the pictures below:

![Holograms](image1.png) ![Wool Induced Swirl Marks](image2.png)

The softer the paint, the more prone it is to machine induced marring. If necessary, you will need to follow your aggressive correction combo with a finishing combo to remove light machine marring and refine the finish to a deep gloss and high clarity. For example, if you found it necessary to go up to steps 5 or 6 above, it would likely be necessary to follow with something like #80 on a W8006 polishing pad to refine the finish. Always experiment with a finishing combo to see if you can enhance the overall result.

As we discussed earlier, there are a wide range of pad sizes to choose from. The main reason for choosing pads of varying sizes falls to the style of the body panel you are polishing. However the size of the pad also affects the aggression of the pad.
PAD SIZE FOR PANEL SHAPE

Before starting to work on a panel, examine it carefully. Look out for whether it is a wide flat area (most bonnets and roofs), or whether it has tight regions with lots of complex details and badges (most bootlids and bumpers). Pay particular attention also to creases and detail lines in the body panels which will affect the areas that you tackle.

For large wide areas, the largest of the pads can be chosen – 8”. An example of an 8” pad being used on a bonnet is shown in the picture below:

![8” Edge Pad being used with a Metabo rotary](image)

Medium sized 6” pads are the most commonly used on the rotary polisher and are useful for most areas on a car. They can happily be used to tackle large areas such as bonnets if you do not wish to use the bigger 8” pads, or for smaller areas such as wings as shown:

![6” Meguiars pad being used with a Makita rotary](image)
An advantage to the smaller 6” pads is that they can give more control over more “shaped” panels such as the bonnet of the Morris Minor below. This is because a greater percentage of the pad area can be in contact with the panel over the curved region.

*Meguiars 6” polishing pad used with a Makita rotary*

For tighter to reach areas, or around badges (such as on bootlids), 3 or 4” pads come into their own as they allow you to manoeuvre more easily around complex details.

*3” pad being used on tighter area on a bootlid*
PAD SIZE FOR AGGRESSION

The larger the pad on a rotary, the more aggressive it can be. This is due to the fact that a larger pad will be moving faster than a smaller one.

Imagine being a polish abrasive on the outside edge of a pad, as shown for 4”, 6” and 8” pads in the picture below.

![Rotary Pad Movement](image)

Pad movement of rotary polisher

The speed setting on the rotary polisher control the speed at which the pad rotates in revolutions per minute. So if this is set to say 1000rpm, the abrasive particle will go round the circle 1000 times in a minute... The bigger the pad, the bigger the distance it has to cover in a minute, hence the faster it must be moving. For this reason, larger pads are moving faster and are typically a little more aggressive than smaller pads.

CHOOSING THE CORRECT ABRASIVE LEVEL

Shown on the charts below are typical “routes” you could take when assessing which combo is right for the paintwork you are dealing with. Wool pads are not considered here. This is by no means an exhaustive guide, but rather a generic guide to show you possible combinations to try and in what order in increasing levels of aggression. Start at the top left, and follow the arrows: if the combo is successful follow the green arrow; if the combo is not successful follow the red arrow.
Menzerna

Machine Polishing by Rotary Polisher

Chemical Guys Diamond Cut

Dave KG – www.detailingworld.co.uk
THE THEORY OF ROTARY POLISHING

In this section we look at the theory behind the techniques used in rotary polishing and the effects that they have on paintwork and the results achieved.

PAINT SYSTEMS

Before looking at the theory of rotary polishing, it is prudent to consider the substance that we will actually be working on – the paintwork. Shown in the picture below are the two typical paint systems you are likely to encounter when detailing: “single-stage” and “clear-coated”.

When polishing cars with a clearcoat, you should not expect to see your pads turn the colour of the car as you will spend the whole time polishing clear paint which will not show... Evidence of pigment on the pad points to strike through – see later. When polishing cars with no clear coat then it is quite normal for the pad to turn the colour of the car as you are polishing coloured paint.
In all cases when machine polishing a car, you are working on the top layer of paint. You cannot remove more than this layer – indeed, you should always leave a healthy thickness of the top most layer. This puts a restriction on the defects which can be removed – any deep marks which go through the top layer of paint cannot be removed.

**PAINT DEFECTS**

The paint defects that you may encounter are shown in pictures earlier on. We look at these in a little more detail here – for full descriptions please see separate guide.

- Swirl Marks are light and shallow scratches covering large areas of the paintwork, typically inflicted by poor wash technique.
- Random Deep Scratches (RDS) are deeper scratches into the paintwork, typically inflicted by grit being dragged along the paint, or minor key scratches.
- Severe Scratches are marks which go through one or more of the paint layers, sometimes down to the bare metal – these cannot be sorted by machine polishing and require painting (minor filling or section respray) to fix.
- Etching from substances such as bird lime
- Oxidisation happens generally to cars with no clear coat and causes the paint to fade and look dry.
Shown in the picture below is a schematic of the typical paint defects.

**Removing Defects Using Abrasive Polishes/Compounds**

The most popular way of removing paint defects by machine is to use an abrasive polish. When worked into the paint, the abrasives cut away a layer of the paint where the defects are. Once the amount of paint removed is equal to or deeper than the defect, the defect will have been removed. It is like “re-flattening” the paint to a level where no defects exist.

As mentioned above, when first approaching a car, always start with one of the lightest polish and pad combination that you have. This will remove only a small amount of paint, but may be enough if you have soft paint or only light swirls. Shown in the picture below are the above defects after being tackled with a typical light polish and pad combination (for example Menzerna PO85RD Final Finish on a Meguiars W8006 Polishing pad).
A thin layer of paint has been removed with the light cutting polish and soft foam pad. The combination has removed a lot of the lighter swirl marks, but has left the deeper swirl marks and the RDS and severe scratch. It is clear that there is still a healthy thickness left (can be checked with a paint thickness gauge in practice). So we would progress up the ladder to a more moderate cutting combination now to see if we can get better correction. For example, we may step up to Menzerna PO85RD3.02 Intensive Polish on a Meguiars W8006 Polishing pad to get the results shown in the picture below.
A thicker layer of paint has been removed and we have no fully corrected the swirl marks, both light and deep. The RDS remain however as it is much deeper into the clear coat. If the paint thickness permits we may wish to tackle the RDS with a heavier cutting combination to remove yet more paint. An example of this may be Menzerna POS34A Power Gloss on a Meguiars W7006 Cutting pad, to get the results shown in the picture below.
We can see that yet more paint has been removed by this process, however the RDS has been successfully removed. Great care must be taken when using compounds and removing large amounts of paint as leaving the clear coat too thin can cause it to flake off. Clearly the severe scratch cannot be removed as it goes through both the clear coat and colour coat layers.

When working up through the abrasive scale to find the best possible combination for the paint it is worthwhile bearing in mind that some of the marks that may be in the paint are too severe to remove safely. Always aim to leave as much clear coat (or colour coat on a two stage paint job) as possible. There are many reasons for this, just a couple are: if the uppermost layer is too thin, it can flake off and the only repair is a respray; if only a thin layer of clear coat is left then it will not be possible to machine polish the finish again with abrasives top remove any marks that may be inflicted at a later date.

Perfection is a wonderful goal to aim for – but always bear in mind the safety of the combinations you are using for the finish you are using them on. This also applies if the paintwork seems soft – use of a compound on soft paintwork can remove large amounts of paint very quickly. So if you choose to use a compound on a car with soft paintwork, be sure to monitor the paint thickness regularly during the machine polishing process – after every few passes.

**REMOVING DEFECTS BY ROUNding EDGES**

This method is one which can be used with a moderate degree of success in situations where full removal of deeper marks is not possible for whatever reason (for example, paintwork is too thin). The machine polishing process can naturally round off the edge of marks on the paintwork as shown in the picture below.
The sharp edges of the deep mark catch the light and it is reflected back in an intense ray allowing you to clearly see the scratch in the finish. When the edge has been rounded off, there is no intense reflection of the light. It is instead spread over a wider area and it doesn’t appear as easily to the eye that there is a deep scratch there.

This process is not fully removing the marks in the paintwork. Instead it is making them harder to see by essentially softening the edges, which acts to scatter the light rather than reflect it. This in turn makes it harder for the eye to see the marks. They are not fully hidden, but they appear a lot less severe.

THE POLISHING PROCESS

Here we look at how the polishes work the remove the paint defects as discussed above, with a description of the best generic techniques to work machines and polishes.

Polishes which use a mechanical abrasive to remove the paint (most on the market including Meguiars, 3M, Menzerna, Poorboys, Optimum, Chemical Guys…) typically use a “powdered” abrasive carried in a solution with lubricant. The polish contains little abrasive particles which act under the action of the pad which moves them across the paint to slice off a little amount of the paint. It is quite similar to exfoliating the skin on your face with a facial scrub.
In many polishes which are widely available, the abrasives break down under the action of cutting to become finer and finer. This means that as you polish, the amount of paint removed gets less and less. Shown in the picture below is a schematic of how this works in practice.

With the first passes of the machine across the paint, the abrasives are cutting a large amount of the paint away. As the polish is worked, the abrasives break down and the amount of paint removed gets smaller and the finish finer. Towards the later stages of the polishing set the abrasives have broken down to a point where they are removing only a very small amount of paint with each pass. The finish is now also much finer than at the beginning. The abrasives have diminished from heavy cutting through to fine finishing.

It depends on the polish being used how aggressive the initial cut is and how fine the final refining is. Typically, a finishing polish (such as Meguiars #80, Poorboys SSR1) will have very light initial cut but a very fine finishing cut to deliver a sharp finish. An aggressive compound (such as Menzerna Power Gloss, 3M Fast Cut) will have strong initial cut but will not break down to a very fine finishing, thus resulting in a less sharp finish.

Not all polishes break down in such a fashion however. Some polishes remain aggressively cutting throughout the set and for this reason they will require to be followed with a fine cutting finishing polish. Other polishes rely more on the cut of the pad to determine the level of cut and quality of finish, an example of which is MarkV Mystique. These latter polishes can be used on wool pads on rotary polishers to deliver significant correction. By dual action polisher they can deliver high levels of correction on a cutting foam pad, and lower levels of correction but fine finishing on a polishing foam pad.

The use of different grades of foam pad will also affect the cut ad final finish delivered by a polish, the amount of which depends very much on the polish. For many light to medium polishes, the use of a polishing pad is generally sufficient and a more aggressive pad will not deliver that much extra. However for more moderate cutting polishes, the use of cutting foams can give a better cut and allow the abrasives to cut better. The flip
side is that the more aggressive cutting foams can also leave marring of their own on a paint finish necessitating a follow up with a finishing polish to refine the paintwork.

The levels to which pads and polishes cut and finish also depends greatly on the paintwork being tackled. Only by experimenting on a test section can you fully ascertain what each combo will do. For example, on some harder paints the use of a finishing polish on a finishing foam delivers very little if any discernable difference in quality of finish over the use of a medium cutting polish on a polishing foam pad. However on a softer paint which is more sensitive to the abrasives, it may be a completely different story, with big gains to be had by using a fine finishing combo to follow a more aggressive pair of products.

Not all polishes utilise a diminishing abrasive however. Some, such as MarkV Mystique and Meguiars Solo, use an abrasive that remains consistently cutting for the vast majority of the polishing process. These products are typically “one-liquid” system where the choice of pad has a large bearing on the amount of cut available and the finish achievable. They can typically be used on cutting an wool pads for aggressive cutting and removal of severe defects, or on a polishing pad as more mild swirl removers capable of sharper and higher quality finishes. The working of these polishes is different as will be discussed below.

THE ZENITH POINT TECHNIQUE

A technique coined by rotary polishing expert, Brazo, to work diminishing abrasive polishes to ensure as best a finish as possible. This technique has been used and adapted by detailers – both professional and enthusiast alike – for some time. Every detailer has their own take on the method, and all will vary it according the the polish being used and the paint being polished. Here we look at the generics of the technique and how it can be varied to suit possible applications.

The basic outline of the technique is shown by the diagram below, taken from Brazo’s guide to rotary polishing:
The idea of this method is to start at slow speed, and work up to the Zenith Point. During this stage, and the passes as the fastest speed, the original defects in the paint are being removed by the abrasives. However the abrasives of the polish are also causing their own lighter defects. These are removed by the right hand side of the above diagram, slowing the speeds back down from the zenith point. This removes the polish induced marring and holograms so that you finish with a crystal clear finish.

EXTENDING THE ZENITH POINT TECHNIQUE – THE ZENITH PLATEAU

Here we look at methods of extending the generic technique above to the working of various polishes on the market today. The guide is not polish or paint specific, and changing either will affect the choices of speed, number of passes and applied pressure. Typically when machine polishing, the majority of the work is carried out at speeds of 1500 – 2000rpm. Once you reach the “working speed”, you plateau at this point until the abrasives and worked, reducing speed only for the finishing passes to burnish the paint to a high gloss and remove any faint holograms that may be left.

Shown in the schematic below is a typical set of speeds and passes made to work a polish with diminishing abrasives, such as Menzerna PO85RD3.02 Intensive Polish:
This method works the polish through its various stages of abrasives described earlier:

- 2 passes at 600rpm to spread the polish ready for use
- 2 passes at 1200rpm to begin working the polish
- 4 passes at 1500rpm to work the abrasives to remove the defect
- 4 passes at 1800rpm to continue working the abrasives to remove defects
- 4 passes at 1500rpm to remove inflicted marring with the now lighter cutting abrasives
- 2 passes at 900rpm to burnish the finish to a high gloss

A total of 18 passes per section may seem like a huge amount! However, with many polishes on the market today, a large number of passes are required to fully work the abrasives and get the best out of what the polish has to offer.

Shown in the diagram below is a schematic of the abrasives in a polish cutting through the paint to remove a paint defect and then burnish the finish, using the number of passes above:

The importance of the large number of passes becomes clear – not enough passes will result in poor correction through not getting the full cut the polish has to offer. Additionally it will result in inflicted marring to the finish and poor overall level of gloss.

The above is simply a suggested example for a number of passes and speeds to use. Some types of polish will work better at lower speeds, others higher speeds. Different detailers will also favour different numbers of passes and different speeds. When testing out which polish and pad combination are required to deliver the correction required, it is also worthwhile spending some time learning what speeds and pressures you will need to use to get the best results from the polish. The paint also has an effect on this!
On the face of it, there are a huge number of possible variables on the table, each affecting the final outcome. This may now look very daunting. In practice however it will quickly become clear what methods will work for a specific paint type, and on some occasions it will be necessary to spend a little more time learning the paint to get the best results. The above should give you a starter from which to build and is only intended to be a generic guide.

**CONSTANT CUTTING ABRASIVES**

A more detailed guide to these types of polishes will be given in a separate guide, but a brief introduction will be given here for completeness.

While the majority of polishes on the market use a form of diminishing abrasive suited to the Zenith point technique, some products such as MarkV Mystique use a constant cutting abrasive that remains abrasive for the whole of the polishing set. They can be worked in a very different way for this reason. Unlike diminishing abrasives which require time to get the best possible finish, these polishes can be used to simply remove the defects with a cutting pad and then switch to a polishing pad to finish off.

To remove defects such as swirl marks, these polishes can be used with a cutting pad. Worked at a constant speed after spreading (of between 1500 - 2000rpm), the number of passes here is not as important as for diminishing abrasives. Instead, the polish should be worked for the length of time required to remove the defects (or until the polish goes dry). This will not produce an LSP ready finish however. To achieve this, it is necessary to switch to a polishing pad and polish again at slightly slower speeds (1200 - 1800rpm) to remove the light marks induced by the cutting process. Again, number of passes required is based on the length of time required to remove induced marks and refine the finish rather than the time to fully break down the abrasives.

In practice, it is also possible to use a Zenith Point style technique with these products using a polishing pad where correction is carried out at high speeds and refining at lower speeds - this does not get the full cutting potential of these polishes, but does allow for a single hit technique.

More details will be given in a later guide.
ROTARY POLISHING IN PRACTICE

Having discussed the theory of rotary polishing, we now look to put this into practice on a car. If you are new to rotary polishing, it is a good idea to source a scrap panel or two from your local bodyshop. This will give you an opportunity to learn the rotary and how it works in practice without any risk to the paintwork on your own car.

REMOVING DEFECTS BY ABRASIVE POLISHES

As discussed above, the use of abrasive polishes eliminates defects by removing a layer of paint. The more aggressive a polish and pad combination used, the more paint that is removed. Thus more severe defects can be removed by using more aggressive combinations. However with all paints, regardless of any reputation about hardness of finish, always start with a light cutting combination and work up through the abrasive scale until you get the correction required.

EXAMPLE – FERRARI 355

Shown in the picture below are light swirls evident in a Honda S2000’s paint finish. The finish does not contain RDS or severe scratches.

To remove the defects, a light polish and pad combination is tried first – for example Menzerna PO106FA Final Finish on a LakeCountry White Polishing pad. This will remove only a small amount of paint. However as the 50/50 picture below show, this was adequate to remove the marks from the paintwork:
Having found that this light polishing combination has delivered the required correction, the rest of the car can now be corrected in the same way to deliver the finish over the whole car:
Regions of more severe marring, if they exist, can be tackled either by repeating an application of the light combination or stepping up to a more aggressive combination on the local area.

**EXAMPLE: BMW E39 5-SERIES**

Now let us look at something a little more severe. Shown in the picture below are moderate swirls and RDS in a BMW E39 5-series finish.

*Moderate to severe swirls and RDS in BMW E39 paint*

Now BMW paint has the reputation for being hard. However, a light polishing combination would be trialled first just in case this was all that was needed – for example Menzerna PO106FF Final Finish on a Meguiars W8006 Polishing pad. The results of using this polish combination are shown in the picture below.
Clearly in this case the light polish and pad combination has not had the desired effect. The swirls are still evident, as are the deeper marks. Only an improvement to the gloss is really evident and this is only slight. So, presented with this, we can see it is necessary to step up to using a more aggressive pad and polishing combo. Before doing this however it is prudent to check the thickness of the paint to ensure that significant amounts have not been removed for little return – if this is the case, then chances are that to remove the marks will require too much paint removal and an alternative method would need to be looked into.

In this case we now move to trying out a more aggressive polish on the same pad: Menzerna PO85RD3.02 Intensive Polish on a Meguiars W8006 polishing pad. The results of this are shown in the picture below.
Light swirls removed, but more severe marks still remaining

The use of a more moderate pair of products has resulted in greater correction – the light swirls are now removed and the gloss more noticeably enhanced. But the severe swirls and RDS are still clearly evident suggesting that a more aggressive combo is still required. As before, the paint thickness should ideally be checked before stepping up the aggression scale to something more serious.

In this case, it is clear that the paintwork is quite hard and that the marring is severe which points to a compound being necessary. For example, Menzerna S34A Power Gloss on a Meguiars W7006 Cutting Pad. The use of an aggressive cutting pad and compound combination should be a last resort and the thickness of the paint should be checked before hand to ensure the safety of the method. Additionally the use of an aggressive compound can leave its own marks in the paintwork as discussed above. For this reason it should always be followed with a light polish and pad combination to refine the finish – for example Menzerna PO85RD Final Finish on a Meguiars W9006 finishing pad. Shown in the picture below are the results of using these combos on this paintwork.
This combined aggressive combination followed by a finishing combination has resulted in all of the swirls and RDS being removed from the finish and a high gloss and clarity being restored.

**REMOVING DEFECTS BY ROUNding EDGES**

As we have seen above, some marks are too deep to be fully removed. Either the mark is too deep or there is simply not enough paint. All is not lost however! Sharp edges on deeper marks catch the light and reflect it back in a beam which is easy to see with the naked eye. If these edges can be “rounded off” then they will scatter the light rather than directly reflecting it which will result in the mark looking less visible. This method does not remove the scratch, and it doesn’t make it invisible, but it does deliver a notable improvement.
EXAMPLE: JAGUAR S-TYPE

Shown in the photograph below is a deep scratch mark in the rear wing of a Jaguar S-Type. The area here has been polished already with a light abrasive to remove surrounding swirls and restore the gloss but the deeper mark is unaffected.

Confronted with this situation, the paint thickness should first be checked to ensure continued polishing is safe. Here, complete removal of the mark would not be possible owing to its depth and the thickness of paint available. So in this case, a medium abrasive polish and pad combination (for example Meguiars #83 Dual Action Cleaner Polish on a Meguiars W8006 Polishing pad). The results of two applications of this process are shown in the picture below.

Deep scratch clearly visible in Jaguar S-Type paintwork

Deep scratch still visible, but severity significantly reduced
The scratch is still visible, but its severity has been significantly reduced. The removal of sharp light catching edges of the mark have made it less visible.

**REMOVING OXIDISATION WITH ABRASIVE POLISHES**

As outlined earlier, oxidisation (or fading) of the paintwork is a result of the pigment in the upper most layer of paint “dying”. This causes the paint to fade and look dull.

**EXAMPLE: VAUXHALL ASTRA**

The rotary polisher can also be used in conjunction with abrasive polishes to restore a finish like this back to what it looked like when it came out of the showroom.

To remove the oxidisation requires the removal of the top layer of “dead” paint. This is the same as required for the removal of swirl marks. So a typical abrasive polish such as Meguiars #83 Dual Action Cleaner Polish can be used in conjunction with a polishing pad (Meguiars W8006 for example) to remove the faded paint. The 50/50 picture below shows the success of the technique in restoring the finish:
Machine Polishing by Rotary Polisher

This improves and freshens the overall appearance of the car, resulting in the complete finish shown in the picture below:

*50/50 picture showing restoration of the Astra’s paintwork*

*Restored – the faded paintwork of the Astra is now refreshed*
Oxidisation typically happens to paintwork with no clear coat as it has no defence against harmful UV rays. For this reason you will be polishing coloured paintwork to restore it – so expect your pads to turn the colour of the car!

**THE POWER OF THE ROTARY**

Having seen the effects of rotary polishing on general paintwork defects that you may come across, we now look at an example to show the power of the machine in restoring badly damaged paintwork. This is an introduction to the potential of the rotary – further details of the machine’s powers can be found in the guide on “Serious Correction”.

**EXAMPLE: JAGUAR XKR**

This car shows an example of severe paintwork defects. In natural light, the finish on the paintwork looms flat with poor reflections:

![Flat looking poor quality paint finish](image)

Under the lights it is clear to see why the paintwork looks this way – there are severe machine induced swirls and holograms in addition to poor finishing of respray work:
In order to rectify this by machine polishing, heavy cutting compounds would be required, followed with dedicated finishing polishes to refine the finish. For example, the defects could be removed by using a compound such as Menzerna Power Gloss on a LakeCountry Cutting pad. Then the finish could be refined with a finishing polish such as Menzerna Final Finish on a LakeCountry Finishing pad.

The results of using a rotary polisher in practice on the above finish are shown in the pictures below. The deep swirls have been removed, and the poor finishing has been resolved to restore clarity and depth to the finish:
Naturally when machine polishing, defect correction is at the forefront of your mind. However, just as important as this (if not more so) is the enhancement to the general appearance that machine polishing can generate. This Jaguar is a prime example of this if we consider the before and after pictures below:

While the defects have been removed, the most pronounced difference to the finish is an enhancement to the gloss and depth. Full correction is not required to generate enhancements like this, but time and effort in the finishing processes most certainly is! This highlights that chasing every last RDS on a paint finish is not necessarily going to gain you very much in real world terms, but will cost you a lot in terms of amount of paint removed.
The results on this car of dedicated rotary polishing are shown in full in the picture below:

![XKR with paint finish restored to give deep gloss and stunning reflections](image)

The depth and beauty of the paint finish has been restored.

### THE POLISHING PROCESS

Having seen the results that can be achieved by using a rotary polisher, we now look to the best ways to achieve this in practice.

### HOLDING THE POLISHER

There is a huge variety of rotary polishers on the market, all with different designs of bodies, heads and handles. However, the typical method of holding the machine remains consistent for most on the market, and also amongst most detailers. Finding the best way to comfortably hold your machine will take time and there is no right or wrong way providing a few basics are observed.

One of the most important things when machine polishing is to get comfortable! If you are tense or stretching awkwardly, you will find the machine polishing experience an uncomfortable one. Always ensure before you switch the machine on that you can easily reach all areas that you are planning to tackle, and that the pad is of suitable size. With a rotary polisher, which has the inclination to drive itself, you want to be as relaxed as possible to avoid inadvertently fighting with the machine.
You typically hold a machine polisher with two hands. One arm will be the driving arm, and the other arm will be used to help guide and control the pressure applied to the head of the machine. The most common choice of arms is that your writing hand is used as the driving arm.

Shown in the pictures below are examples of the popular Metabo polisher being held as described above. The users have their driving arm at the back of the machine and this is used to control its movement. Their other hand is on the head of the machine to help guide where necessary and also to adjust the pressure applied to the pad.

*Metabo PE12-175 rotary polisher*

In the picture below is a Rupes LH18 EN rotary which has a longer looking body than the Metabo shown above and a more square head to it. However, as can be seen, the method for holding the tool is practically the same: driving hand at the back, pressure hand at the front.

*Rupes LH18 EN rotary*
HANDLE – USE OR NOT?

Some machine polishers, for example the Makita 9227CB, are supplied with a handle which attaches around the head of the machine. The use of the handle is purely personal preference. When starting out with a new rotary, it is best to try it with and without the handle to see what you feel most comfortable with.

The picture below shows a Makita 9227CB being used without the handle in function – the method above is still in play, driving hand at the back and pressure hand over the head of the machine.

By contrast, the user of the Makita below is using the handle for their pressure hand:

As with most things detailing – there is no right or wrong answer to the specifics, only the general methods. Find what method is most comfortable for you, and run with that!
Another important point is to relax! Rotary polishers will want to drive themselves across the paintwork. This can be used to your advantage in getting the tool to do most of the work for you. However, if your driving arms are tense, you will be more inclined to fight this natural movement of the polisher which will end up in rotary hop and a poor finish. Additionally if your driving arm (arm at the back of the machine) is tense, you will be less able to easily follow the contours of the paintwork. It is necessary when machine polishing to keep the pad flat at all times – this will be much easier if your driving arm is relaxed as you will find yourself better able to follow the contours and shapes of the body panels you are polishing.

**DRIVING THE POLISHER**

As described above, the rotary polisher is inclined to move of its own accord across the paintwork. This can be used to your advantage as the tool is essentially doing a lot of the work for you. Rather than trying to drive the polisher in any direction you want, it is easier to move with the rotary – this will result in a smooth flowing motion that is required for the very sharpest and clearest of machine finishes.

Use your back arm to drive the polisher. When working on large flat panels, the natural motion that the rotary will want to follow typically is an arc. Try not to fight it back onto a straight line but allow the machine to do this arc and guide it backwards and forwards over the desired work area. For users coming to the rotary from a dual action polisher, this is quite different to normal – a DA requires driven and can be driven in pretty much any direction you like. The smoothest rotary operation will come from flowing with the natural movement of the machine.

On vertical panels which don’t have wide flat areas, like the Jaguar S-type shown in the picture below, the flowing arc movements will not be possible.

*Using a rotary polisher on a vertical panel*

When preparing to tackle a panel like this, examine it carefully and spend a moment planning the best flowing movements across it. Be aware that the forcing the machine across contours and edges should be done carefully and can cause a sudden change in direction from the machine. This can be avoided by carefully moving the machine across said edges. Where it is not possible to follow the natural movement of the machine, focus on making steady and gentle guidance movements with your driving arms. Avoid jerky movements and changes of direction where possible as this can lead to rotary hop in some cases.
Keep your driving arm as relaxed as possible at all times – this will allow you to flow with the rotary’s natural movements far easier and will aid the gentle and steady changes in direction. Additionally, keeping this arm relaxed makes it easier to keep the pad flat over contours and curves in a car’s bodywork.

Your pressure arm is typically placed over the head of the rotary polisher or on the handle to adjust the amount of pressure applied to a pad. The amount of pressure will vary from paint to paint, and polish to polish. Generally speaking, you will use lighter additional pressure with a rotary polisher than you would with a dual action polisher. Also, on horizontal panels, the weight of the machine (which is significant for models such as the Makita and Silverline) will contribute to the applied pressure. The effects of this are less on vertical panels where you will need to use your pressure arm to give the pressure required, and to ensure that the pad remains flat on the panel.

The speed at which the rotary polisher is moved across the paintwork will vary depending on what polish is being used, what paint is being polished, and also what speed the machine is set to. Faster movements than with a dual action polisher are quite acceptable – indeed moving the machine too slowly can result in high heat build up and the risk of burning the paint. For higher speeds, typical machine movement rates are around 2 – 4” per second, again depending on paint and polish. Ensure that the panel temperature does not get higher than warm to the touch – if so, either there are problems with the polish or you are moving the machine too slowly. Slower (1 – 2” per second) passes may be used for lower speeds on the rotary during the refining and burnishing stages.

Pay particular attention when polishing near panel edges and sharper contours in the bodywork. These regions can result in local high pressure points and high temperatures can quickly be generated. This risk of burning the paint on these regions is much higher than flatter panels when all other things are equal. It is a good idea to lift off the pressure a little going near edges and contours to help keep the heat and the risk of burn through to a minimum.

**WORKING AN ABRASIVE POLISH (DIMINISHING ABRASIVES)**

As discussed above, the abrasives in many machine polishes on the market are diminishing abrasives. This means that they need to be worked through their stages of cutting from high to finishing. Here we look at how this would be done in practice. This is just a generic technique, based on the Zenith methods, and guide to working such polishes – each polish will have its own characteristics and only through experimenting will you be able to find the best possible working methods that suit your technique.

Key to getting the best out of the abrasives in a polish, both in terms of cut and in terms of finish, is to work on a small area at a time – of around 12” – 18” square. Once the pad is initially primed with polish (a 3 – 4” line is enough for this), only a couple of skittle sized beads of polish are typically required as shown in the picture below:
Begin by spreading the polish at the lowest available speed on the rotary (600 – 1000rpm), making fairly fast movements of the machine to start with and then slower movements for another pass or two to evenly spread the polish. If the residue does not spread easily, this may be because the panel is cold – a few more passes at low speed will get a little heat into the panel and allow the easier spreading of the polish.

Once the polish is spread, the machine speed can be raised (to around 1000 – 1200rpm) to begin working the polish and cutting away the defects:

Once the polish is starting to work, the machine speed can be stepped up again (1500 – 2000rpm) to the Zenith Point. At this stage, the residue will be looking cloudy on the paint as shown in the pictures below, indicating that the polish has not broken down:
Once the abrasives in the polish have been worked after several passes at the higher rotary speeds, the residue will go clear looking on the paintwork as shown by the pictures below:

At this stage, work back down through the speeds to refine the finish by removing imparted marring and burnishing to a high gloss.

In some cases, when using higher cutting polishes and compounds, it is desirable to stop before fully working the polish. This will result in a poor overall finish, but this can be refined with a separate finishing polish. This technique is ideal when removing severe marring from paintwork with a high cutting compound that would not finish to a high gloss in any case. Using the compound only for its cut and the refining with a dedicated finishing polish results in a better quality finish typically, and lower losses of paintwork.

The amount of pressure to use during the polishing stage will depend strongly on the paint and the polish being used. Typically lighter pressure than for a DA, always ensure that if you are using pressure that you take care to keep the heat down – especially around panel edges. Some additional pressure during the work stage may help with the cutting process with some polishes – always trial this when assessing a paint and polish combination. Try anything from the weight of the machine, to an additional 10lbs, but heeding the warning about temperatures above!
KEEP IT CLEAN!

Clogged and dirty pads can result in poor quality finishes as the foam is not performing to its optimum and effectively breaking down a polish. It is important when machine polishing to regularly clean the pad surface to ensure that the foam can work at its optimum.

To clean a pad face, use a soft bristled brush on the face of the pad. Gently hold the brush on the pad with the machine polisher turned on at low speed as shown in the picture below:

![Cleaning a rotary machine polishing pad](image)

It is crucial to be gentle with the pad, especially soft finishing ones as bristles from the brush can cut into the foam and ruin the face of the pad. This will result in the pad not performing to its optimum and could result in holograms being inflicted in the finish.

You can also clean foam pads with the machine off and using a soft brush, gently brush the dust and caked on polish off of the pad.
PROBLEMS & SOLUTIONS

In this section we look at some of the most common problems encountered with rotary polishing and solutions for solving them.

POOR CORRECTION

When starting to machine polish a car, you should always test on a small area a group of combinations starting from the lightest first and work up to the required aggression to get the correction you want. Sometimes however, a polish and pad combination doesn’t give the expected results on paintwork. For example, if you have a car with a reputation for soft paint (Honda Civic) and a medium abrasive polish such as Meguiars #83 Dual Action Cleaner polish isn’t removing light swirls, you would be quite surprised by this. Also, if you get to the top of the abrasive scale and are not getting the desired correction then this is also a problem.

CAUSES

Poor levels of correction can be caused by a variety of things. One of the most common causes is not fully working the polish that you have (which can also lead to holograms in the finish – see below). Consider the typical working on a diminishing abrasive polish shown below.

If the polish is not worked for long enough then you stop before the abrasives have fully worked and the level of cut is not as much as is possible for the polish. Polishes with slower working abrasives (for example
Meguiars #80-series) take longer to cut, and require more passes to work them – not fully using the abrasives in them will result in a lower cut than expected.

Sometimes, the polish can dry out before the abrasives have been fully worked. The residue will look like it has gone clear at this stage, despite the fact the abrasives have not fully worked. This can be caused by working too large an area at a time, or by working in high temperatures or direct sunlight. Or it may be caused by issues relating to “sticky paint” which will be addressed in a separate section. Additionally, some polishes are naturally dry – for example Farecla G3.

In cases where the swirls and scratches are very deep, the level of correction may not be of the standard you would expect. As shown above, for deep scratches, a significant amount of paint must be removed in order to correct them with mechanical abrasives. To achieve this, especially on hard paints, requires a lot of time and aggressive abrasives (where safe!).

On rare occasions, you may find that some cars have swirls that are underneath the clear coat as shown in the picture below.

In the rare event of below clear coat swirls (generally a result of a poor paint repair), the removal of the top layer of paint by machine polishing will make no difference to the marks. In fact it will be impossible to correct these swirls without respray work!
SOLUTIONS

If you are faced with a correction level which is lower than you expect, first of all check that you are working the polish thoroughly to get the best of the abrasives. Ensure you are making enough passes to take the abrasives through from their initial cutting stage to their finishing stage – this typically takes between 10 and 20 passes at the higher speeds depending on the polish. Make sure that the residue goes clear before you stop the machine and assess the correction. Try increasing the number of passes with the polish to see if this improves the correction.

Check the area that you are working – it should be no larger than around 18” square. If you find the polish struggling with this size of area, try reducing to 12” square as this will focus the work down and work break down the abrasives more thoroughly. Too large a work area can also cause the polish to dry out too quickly, reducing the number of passes available to you so reducing this can increase the amount of cut (and improve the finish) from a polish.

If a polish seems to be drying out too fast, first of all ensure you are not working in direct sunlight and if you can avoid working in high temperatures where the body panels are hot. Reducing the work area can often help as if it is too large a polish can dry out as it spends too long untouched by the pad. In the case where a polish is drying out, try spritzing you pad with some water or quick detailer spray and then start to polish again as this will give you a few more passes to continue working the abrasives with most polishes. Some naturally dry polishes such as G3 require regular spritzes with water – when doing this, use light sprays of water often rather than lots of water irregularly. The latter method can lead to splatter and results in a lot of mess.

If a polish appears to be drying out very quickly causing the pad to squeal and the panel temperature is risking quickly, this points to problems with a reaction between the polish and the paintwork. For further details, see later.

Deeper marks are very tough to deal with by machine polishing. For very severe marks, it may be necessary to wet sand the paintwork to get the desired correction in good time. However, repeated hits with a compound will deliver the same result in a lot more time – so in some cases it is simply a case of being patient and repeating with multiple hits on a single area. The Slow Cut Method discussed below may come in useful here. However, this comes with a health warning! Remember that every time you polish, you are removing paint. Ensure that you do not remove too much paint in the quest for perfection as once the paint is gone, its gone! Much better to leave the odd deep mark here and there and have plenty of paint left than to risk striking through just for the extra little bit of correction.

In the case of swirls inflicted below the clear coat, the only solution here is to respray the car as to get to them, the top most layer of paint would have to be removed.

HOLOGRAMMING

Probably the most commonly known issue with rotary polishing is the infliction of holograms on the finish. Holograms looks like clouds on the paint surface that move as the light moves across it. Typical examples of holograms are shown in the pictures of a Peugeot 206 below:
While this looks very severe, the typical depth of hologramming is quite low — lower than standard paintwork swirls. The reason for the severity in appearance is that holograms are basically thousands of tiny little swirls tightly packed together and inflicted by abrasives in previously used polishes and compounds. Despite looking horrific, it is typically quite easy to remedy.

CAUSES

The reason that you see hologramming in a paint finish after it has been polished by rotary polish is down to the fact that the abrasives have not fully broken down, and were still cutting at the stage the machine was switched off.

The typical working pattern for a machine polish, using the Zenith method, is outlined in the diagram below:
As you can see, during the stages where the majority of the defect is being removed, the abrasives in the polish are cutting “roughly”. If you stop before reaching the refining and burnishing stages, you will be left with the results of polishing with rough cutting abrasives – holograms!

It is important to fully work a polish in order to avoid hologramming, and to achieve this the polish must be kept “alive” until it has been fully worked. Typical errors that can reduce the work time of a polish include: working at too high a speed (increases heat, dries out lubricant); working too large an area (polish can dry out too fast); too much polish which can take an impossibly long time to fully break down; “sticky paint” which can increase panel heat rapidly and dry out polishes.

The use of aggressive compounds on aggressive pads can also result in holograms being inflicted into the finish. Such compounds may not fully break down to a hologram free finish, especially on soft paints.

**SOLUTIONS**

In cases where an aggressive compound and pad combination is required, some light hologramming in the finish is inevitable on some paints. This can be remedied by following the aggressive cutting stage with a lighter cutting finishing polish to remove any machined induced marring and restore the finish to a high gloss. Ensure that the finishing polish is thoroughly worked to get the best possible finish.

If a light to medium abrasive polish on a finishing or polishing pad is causing hologramming then check to make sure that you are working the polish thoroughly to break the abrasives down fully. The holograms inflicted by the natural cutting of the polish into the paint are removed by the abrasives when they break down. The finish
is then burnished to a high gloss – stopping the machine early will cut out this final stage and result in a poorer finish. Key to knowing when the polish has fully broken down is watching the residue. It will go clear and for some polishes it will go dry and start to dust slightly. This can take a few minutes per section depending on the product being used – rotary polishing is not a fast job!

If the polish residue is going clear but hologramming is still being induced, first of all check the condition of the foam pad that you are using. If it is clotted with dried polish, clean the pad as described above. If the foam is damaged, discontinue use and use a new pad.

Next, check that the polish is not drying out too quickly. This can happen for a variety of reasons. A common one is using the rotary at too high a speed – this can dry out polishes too quickly, resulting in the abrasives not being fully worked and inflicting holograms. Keep the speeds below 2000rpm, and if this is still drying the polish too quickly, below 1500rpm. Working on too large an area can also cause the polishes to dry out too quickly – ensure your work area at 18” square or less.

Some polishes are naturally quite dry. Menzerna Power Gloss, Farecla G3 are examples of this. Regular spritzes with water throughout the polishing set will keep these polishes alive for longer and allow them to break down fully.

**DUST**

Large amounts of dust can be a problem when machine polishing, finding its way into every nook and cranny and leaving you with a large task to fully clean the car up!

**CAUSES**

Some products, especially heavier cutting compounds such as Menzerna Power Gloss and Farecla G3, are naturally quite dusty by nature. The polishes are quite dry and as a result they can generate a lot of dust when polishing, especially in hot and dry conditions. Some polishes will create dust in certain working conditions.

Large amounts of dust can also be caused by the use of too much polish. This can become clotted in the pad, dry up and product dust. Hot and dry conditions can magnify the effects of this.

**SOLUTIONS**

To help keep dust at bay with a dry polish, regularly spritz the pad with a little water or quick detailer. This keeps the polish wetter and for many will reduce the amount of dust produced. Be careful not to use too much water however as this can adversely affect the working of the polish and can also lead to splatter which is just as messy but harder to clean up!

Also ensure that you are not using too much polish on the pad. A couple of skittle sized beads of polish is typically enough for an 18” square area after the pad is initially primed. Keep the pad surface clean and free from dried residue which can cause dust in later polishing sets. If a pad becomes badly clogged during a detail, switch to a clean pad.
STRIKE THROUGH

So far, all of the problems discussed can be easily and inexpensively solved. Strike through is a different kettle of fish! Strike through is the term used to describe polishing through the top most layer to the underlying layer as shown in the picture below.

In this example, the clear coat has been fully removed in this area and the colour coat revealed. This is repairable only by respraying the paintwork!

EXAMPLE: PEUGEOT 307

Shown in the picture below is strike through of the clear coat on a blue Peugeot 307 door.
Clear coat strike through on Peugeot 307 door

In daylight, this damage is quite hard to see – the strike through area is slightly lighter than the surrounding paintwork (just above the finger) and lacks the gloss. The effects can be more clearly seen under a bright light as shown in the pictures below.

This is clear damage which requires an expensive repair. The first warning of strike through comes from visually checking the paintwork as you work – any evidence of a strange change in colour should raise the alarm bells! Also, the pad will turn the colour of the paintwork as shown in the picture below.
This pigmentation of the pad is normal for two-pack paintwork where there is no clear coat but is indicative of damage on a finish where there is a lacquer layer! Strike through can also occur on two-pack finishes where you would go through to the underlying base coat.

Checking the paint thickness on the struck through area we can see a reading of between 70 and 80um… While this thickness would still be okay for some cars, clearly for this Peugeot 307, this was too thin! Numbers in this region should also bring about caution when machine polishing!
CAUSES

Strike through is caused by using too aggressive a polish and pad combination on paint which is too soft. This results in the removal of too much clear coat. Do not panic however! Providing you exercise caution when machine polishing, strike through is a rare occurrence.

A high build up of heat will cause a strike through. This is at its biggest risk with the rotary polisher near paint edges and sharp creases where local “hot spots” can be created. Or if the polish is struggling with the paint in hand and resulting in high heat production, this will increase the risk of damage being inflicted.

SOLUTIONS

Prevention is better than cure! If possible always check the paint thickness on any vehicle you are planning on polishing. Be sure to take many paint readings, as a car can have local thin spots which are quite small in area and easily missed. In regions where the paint is thin, exercise a lot of caution and don’t use aggressive cutting combos. Always monitor the thickness of paint being removed during the initial testing to see who hard or soft the paint is which will give you an idea of which combos are safe on which thicknesses.

If you don’t have access to a paint thickness gauge, then take comfort in the fact that strike through is a rare occurrence. Exercise caution, and don’t use aggressive combos unless absolutely necessary. If the paintwork seems soft, the use of aggressive cutting compounds is not recommended. Obviously there will be a small risk as any local thin spots will go unnoticed with no thickness gauge, but they are rare and you should not encounter any problems.

Around paint edges and sharp creases, pay particular attention to the speeds of the polisher and the pressure applied. Do not apply heavy pressure to these regions and where possible avoid high speeds.

If a polish is behaving strangely or you don’t feel comfortable – STOP! With a rotary polisher, the chances are that if it feels right, it is right! If not, then there is a problem. Typically not a terminal problem but they can develop into strike through or other paint damage if not assessed and addressed.

In the event of strike through, there is only one solution – a respray!

BUFFER HOP

Buffer hop is an expression used to describe the effects of the machine polisher hopping across the paintwork in an uncontrolled fashion rather than gliding as you would normally expect. This will result in an uncomfortable machine polishing experience, and almost inevitably a poorer quality finish.

CAUSES

Buffer hop can be caused by a variety of problems. The most common cause is the use of too much polish. This will quickly clog pads and reduce their effectiveness. The polisher will no longer be able to move smoothly on the panel and buffer hop will be one of the results.
Buffer hop can also be caused by insufficient lubrication to the pad and paintwork. This is typically caused by the polish not being evenly spread, although reactions with the paintwork ("sticky paint") can also lead to this effect.

A further cause of buffer hop comes from not keeping the pad flat on the panel when polishing, or catching an edge inadvertently which can upset the flow of the machine.

**SOLUTIONS**

To ensure you avoid buffer hop, always use the correct amount of polish. Typically, only a couple of skittle sized beads as shown in the picture below is enough polish for a 12 – 18" square section:

![Small amount of polish required for 12 – 18" square area](image)

Ensure when you are starting to polish that the residue spreads evenly across the area. When cold this may take a few passes at slow (<1000rpm) speeds – take the time to spread the polish evenly before turning up the speed and this will ensure much smoother polishing.

Always pay attention to the contours of the body panel to ensure the pad remains flat on the surface. Keeping your driving arm loose rather than tense will help with this.
STICKY PAINT

One some paints, with some polishes, the rotary polisher can drag and hop and heat can build very quickly in the panel. This can happen with little or no warning, despite perfect technique. Polishes are very hard to work and break down, finishing is also very hard and takes a lot of concentration and learning to be able to conquer.

CAUSES

The actual causes of this problem are not yet fully known. It was believed that certain brands of polish, being designed to work in specific environments, were at fault when taken out of this ambient condition. However, more recent evidence suggests that the problem lies more with the paintwork which is being polished. The fast heat build up seems to come from a stickiness to the paintwork, which absorbs the lubricant and causes fast drying of the polish and heating of the panel. Once the heat has started to build, the polish will start to cake and even weld itself onto the paintwork making its very tricky to remove.

Another belief at this stage is that previously applied dealer coatings cause issues with polishing. There is some evidence to support this being the case, but also quite conclusive evidence against it.

Indeed, the cause of this exactly is unknown – it is likely to be a combination of factors. Over time it will become clearer what these are.

SOLUTIONS

With no definable causes as yet, solutions for the problem are hard to come by. The best solution is to persevere with various application techniques and methods to try and find a working solution for the polish.

The key is to keep the heat down. Starting with slow speeds and working more continually at slower speeds can certainly help with this in some conditions. Making multiple passes at 900, 1000, 1100rpm and so on and if the heat begins to build, slow down or stop to let the panel cool before resuming at higher speeds again.

The addition of water or quick detailer can sometimes help this problem, but it can ale make matters worse depending on the lubricants in the polish being used and how they react to it. An alternative is to add an oily product such as Meguiars Deep Crystal Paint Cleaner to add to the lubricants to help the polisher flow easily over the panel.

Reducing the pressure applied to the panel can help matters greatly by reducing the heat build up. Be prepared to slightly lift the machine up (keeping the pad in contact) to reduce the pressure applied to a minimum.

If all else fails, a trusty Dual Action polisher is a worthy option. If you are moving from DA to rotary, do not throw away your DA! It may just come in useful for a car where sticky paint is an issue.
Machine Polishing by Rotary Polisher

ROUNDING UP

We have seen that machine polishing can deliver significant improvements to a car’s paint finish – from removing swirls and scratches, to restoring the colour and giving the best possible depth and clarity from the paintwork.

In this guide, the basics of machine polishing by rotary polisher were covered along with generic techniques to get the best from the tool. Nothing can beat practice however, and as you learn machine polishing you will develop your own techniques that will get the best results for you. The methods discussed here are meant purely as a guide to get you started.

The biggest gains in quality of finish on a car’s paintwork can be made by machine polishing – this removes or reduces swirl marks, scratches, etching, oxidisation and staining. In addition to this, the abrasives refine the finish which allows for a deep gloss and high clarity to the paintwork that will turn heads at any car show. If you are keen to take your car’s finish to the next level, there is no doubt that machine polishing will deliver you impressive results.

The market is filled with loads of possible combinations of pad and product. As is quite often the case in marketed products, each one claims to be better than the next – this can lead to a lot of confusion! At the end of the day however, all of the polishes on the market are just as capable as the rest: what differs on the whole are the working characteristics. The differing characteristics of each polish result in personal preferences in brands – but this is more down to different people have different techniques than one product being significantly better than the other.

When starting out with machine polishing, you want to ensure that you have a suitable range of polish and pad combinations to achieve good results on the majority of finishes. Buying every polish and pad under the sun will allow just about every job to be tackled within reason. However you can also set yourself up for the majority of tasks with just a couple of polishes and a few pads!

To start out, a finishing polish and a medium cutting polish would be a good starting point, with finishing and polishing foam pads to go along with these in both 4” and 6” sizes. An example of possible good starting polishes would be Meguiars #80 Speed Glaze and Meguiars #83 Dual Action Cleaner polish (or equivalents from other manufacturers). The light cutting polish will serve as a polish for light swirls on all paints, and more moderate marring on softer paints. It will also serve as a finishing polish to follow the use of more aggressive polishes. The medium cutting polish will serve to remove more moderate marring from most paint types and on the harder ones it will also finish down ready for a wax. Combined, polishes of this type will give you a great base for tackling the majority of cars and you can then build from this as you experience the need for differing correction.

It is important to learn a polish. Best results will come with practice and learning the characteristics of how a polish breaks down and how many passes and at what pressure and speed are required. Experiment, and enjoy getting pursuing the best results you can achieve from a specific product rather than changing products in the quest for the holy grail of a perfect finish.

Machine polishing is a time consuming process. The polishes must be properly broken down in order to get the best from them and this takes time – typically a good five minutes per 12 – 18” square section. Don’t be tempted to rush your car when machine polishing. Take the time required and you will be rewarded with the finish you achieve.
If you are coming to a rotary polisher from a Dual Action then be prepared for some big differences in how the tool works! It will drive itself, and has notably more power than the DA – but it is not the fire breathing monster that internet myth will have you believe!

The most important thing with machine polishing is to relax and enjoy making your car’s paintwork look as best as it can. Using a rotary can become a chore if you are tense and worried about the finish you are achieving – and it is at this stage that mistakes and poor finishes are more likely to occur. If you relax you will find the task more enjoyable and your results will also likely be better.
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