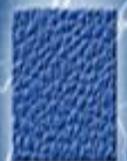


# Texturing In Depth: Everything You Need to Know About Texturing Your Mold



**Mold-Tech**  
A Danex Group Company

## TABLE OF CONTENTS

Reasons To Texture A Plastic Part .....	01
Visual Effect .....	01
Improving Moldability .....	01
Tactile Qualities .....	01
Funtional Textures .....	02
Summary .....	02
Pricing and Timing for the Texture Process.....	03
How is Texturizing Priced? .....	03
Accugrave Engraving Pricing .....	04
Timing.....	04
Pre-Texturing Mold Finishes Required .....	05
About EDM Scale.....	05
Welding.....	05
Use of Different Metals .....	06
Surface Finishes Required .....	07
Pre-Texture Plating/Coatings.....	08
Texture Process Information .....	09
1. Vertical Walls .....	09
Draft Requirements .....	09
Undercuts .....	09
Metal Removal vs. Finished Depth.....	10
Deep or Blind Ribs.....	10
2. OEM or Program Work .....	10

## TABLE OF CONTENTS

3. Parting Line Treatment .....	11
Parting Line Protection .....	11
Flat Seal-Offs .....	11
4. Post Texture Plating-Triocoat .....	12
Post Texture Plating .....	12
Tribocoat .....	12
5. Post Texture Painting .....	12
6. Marked Parts and/or Prints .....	13
7. Quality Systems .....	13
8. Molding Processes .....	14
Blow Molds .....	14
Rolls .....	14
Compression Tooling .....	14
Vacuum Form Molds .....	15
Electrodes .....	15
9. Gloss .....	15
Determining Factors For Gloss On A Part .....	15
Determining Factors For Mold Surface Gloss .....	16
10. Engraving .....	16
Artwork .....	16
Depth & Clarity With Accugrave .....	16
Pricing .....	17
Embossing vs. De-bossing .....	17

## TABLE OF CONTENTS

11. Pattern Development.....	18
Texture Plaques.....	18
Texture Pattern Creation.....	18
12. Repairs to Damaged Texture .....	19
13. How Do I Prepare A Mold to Ship to Mold-Tech? .....	20
<b>Handling Information.....</b>	<b>21</b>
Eyebolt Holes Required .....	21
Mold Disassembly and Reassembly.....	21
<b>Shipping Information .....</b>	<b>22</b>
Packing for Shipping to Us .....	22

# Reasons To Texture A Plastic Part

## Visual Effect

- To give a part the appearance of leather, wood, stipple, sand, or whatever effect you are simulating.
- To give parts a more even, planned effect, or to get rid of a glossy appearance and change to a matte finish. This can add richness to a part's appearance, therefore making the part more marketable, and giving it a perception of higher value and quality.
- To build a company's logo or a pattern into the appearance of the part that immediately identifies the part as belonging to that particular corporation.
- To diffuse light on clear parts, such as serrations or frosting on a lens. Texture can also be used to make a clear part translucent.
- For visual contrast - through the use of two different textures on one part or by frosting the background or foreground of a logo, for example.
- Texture can provide visual improvement on a difficult part to mold. Certain textures can hide splay lines, flow lines, knit lines, blush marks, and other molding flaws. Even sink marks can sometimes be disguised by the application of texture.
- Accugrave engraving to add logos, part numbers, designs, instructions for consumers, or part identification, thus eliminating secondary processes such as hot stamping or applying of labels.

## Improving Molding

- Adding texture to a core can help to hold the part onto the tool without manual undercuts which could create sink marks. The texture disperses the pressure over a larger even area, lessening the likelihood of sink marks and yet still holding the part, allowing the mold to eject properly, thus lessening the potential for drag or scuff marks on the Class "A" surface of the molded part.
- Texture applied on the core side and across lifters and/or slides, for some materials, can hide the shadow marks which sometimes will show through from the front of the part when the Class "A" side is polished.
- Texture applied to some molds will allow trapped gasses to escape more quickly, by venting to the parting lines from within the cavity.
- Texture can be applied to hold paint better during a secondary molding operation.
- Texture applied in the correct design and location can help to minimize turbulence created by plastic flow.
- Texture can provide a functional rough surface finish, on a roll, for example to help the roll stock through the rolling process.

## Tactile Qualities

Some textures just feel good to the touch or provide "grip," such as on a handle of a power tool, handles for ski poles, traction on rubber mats, plastic shower bases, etc.

## **Functional Textures**

- Texture adds thickness to the parts. On occasion, we have used the texture process to "chemically mill" out from .030" to .100" of metal evenly over the surface of a mold component. This can be a cost effective way of removing unwanted metal on an otherwise finished cavity or core. Please contact us to see if this would be a practical application for your requirements.
- Texture adds strength to parts
- Non-slip textures can be applied to add safety measures to a part that requires that particular quality.
- Texturing a fine texture on label areas of a part can help the labels to stick to the finished part. This same idea is useful when you want to be able to write on the part in pencil once it is molded.
- On satellite dishes, texture is applied so that the receiver mesh is held in place by the molded plastic as it is molded.
- Texture creates more surface area. This can be useful in a fan blade (for example), since you don't change the size of the part, but you do push more air with the same blade. This principle could also apply in situations where more surface area will draw heat or cold away from the surface.
- Glue application textures are used everyday to help films adhere to hard plastic substrates more effectively.

## **Summary**

These are only some of the many uses for texturizing that we have developed through years of experience. We believe that there are many other applications and we are continually running into new ideas, and have had some presented to us through the imagination of creative customers. If you have a process problem - visual, functional, etc, that you have been unable to solve, give us a call?

# Pricing and Timing for the Texture Process

## How is Texturizing Priced?

As there are many factors in the designing and building of your new tooling, so there are many factors that contribute to the price of texturing that tool.

### Some of the factors that can affect texture pricing are:

#### 1) The complexity of the mold:

- The areas to be textured.
- The areas that will NOT be textured.
- Size of the tool.
- Molding Process: Blow mold, Vacuum mold, Injection mold, Rubber mold, etc.
- Tool Components: Cams, Cores, Lifters, Pins, Inserts, etc.
- Additional disassembly of the mold.

#### 2) The complexity of the surface:

- Contours.
- Accessibility of textured areas.
- Tool Characteristics: Ribs, Pockets, Vents, Standing Bosses, etc.
- Polished surfaces.

#### 3) The complexity of the texture pattern:

- Random or geometric pattern.
- Pattern depth.
- Even or gradient application for low draft sidewall.
- Number of pattern levels or applications.
- Tolerance allowed in the pattern.
- Pattern fit to the tool.
- Number of different patterns in the tool.
- Pattern intricacy or boldness.

#### 4) Material of which the mold is constructed.

We have experienced sales engineers on staff that are always ready to help you with your texturing needs. Please be ready to supply us with as much information as possible so that we can be as accurate as possible with our quote.

With the many new patterns coming out, especially for automotive companies, we strongly recommend that you request a quote as soon as you know texturing will be involved in your tool build. Many of the newer textures are 3 dimensional in nature, involve longer lead times for processing and are much more costly than conventional textures. Protect yourself by getting a quotation.

Letting us quote your project as soon as possible also gives an opportunity to be sure that we have the data for the pattern.

We do have sales engineers that routinely cover the major tooling centers of the world. If you have a project that you require us to look at in your facility, call us and one of our engineers can visit you either on a regular trip to your area or on a special basis if need be.

## ACCUGRAVE ENGRAVING PRICING

### Accugrave is priced based on:

1. The size of the graphics that are being Accugraved.
2. Whether or not the artwork is available or must be drawn by our artist.
3. The type of steel being processed.
4. The number of pieces being processed at one time.
5. The number of areas being Accugraved on one piece.
6. The depth required.
7. Whether or not polish exists that has to be protected.
8. The size of the mold.
9. Timing required.

Accugrave is especially cost effective on curved surfaces, hardened tooling and graphics with a large volume of text.

### Timing

Many texturing jobs can be completed in a matter of a few days. However, there are many factors that can impact deliveries. With the vast resources available within the Mold-Tech group, we will make every effort to accommodate your delivery needs. Please discuss all timing concerns with us as early as possible so we can plan to facilitate optimum timing.

## **Pre-Texturing Mold Finishes Required**

### **About EDM Scale (Electrical Discharge Machining)**

EDM scale is resistant to the etchants we use to perform the texturing process. If it is present, even in small amounts, on the tool's surface the area affected will either not etch at all or may etch only intermittently. Neither of these conditions will give your mold component an acceptable visual appearance. It is much simpler and drastically more cost effective to bench or polish out the EDM scale prior to attempting to texture the component. The areas that are the toughest to polish - the radii and tight corners - are the most notorious for finding EDM scale that has not been eradicated by polishing; however, it is not uncommon to find EDM scale on other areas of the cavity as well. If EDM scale is noticed once the tooling is in our facility, it can create delivery and cost issues that may delay the processing of your tooling.

A highly polished finish does not guarantee complete EDM removal. If you have used the EDM process to cut your tooling, or areas of your tooling, be sure that your benching source vigorously attacks the EDM scale first, then applies the finish (stone or emery) that is required. Simply going to emery paper only disguises the EDM Scale within the emery finish - it is usually still there. EDM scale causes needless delays and extra costs since it must be removed in order to properly process the tooling with a texture. This is one of the most common problems we encounter, and our sales engineers are more than ready to show you how to identify the problem in your own shop so as to ensure that your project is not delayed.

EDM SPARKS OR "ARC OUTS" EDM cause a different problem from scale. Since they are so hard - often up to 70 Rc, and so deep into the steel surface, they usually cannot be polished out. They will not etch at all and due to their hardness, it is very difficult to repair them after texturing. This condition can often only be resolved by drilling out the spot, then pinning it or welding it and then repairing the texture by hand. This becomes a larger problem if the spark is located in an area of the cavity that is inaccessible, as in a rib or deep pocket, where the condition most often occurs. Try to avoid this condition at all costs as it is very difficult to repair.

### **Welding**

If the component (cavity, core, slide, etc.) is going to be welded before texturing, it is of the utmost importance that it be welded using the proper welding procedure and welding rod that is 100% compatible with the parent material. Steel suppliers and/or tool welding specialists can advise you regarding the proper procedures for welding the particular type of steel you are working with.

Even a weld that have been processed according to proper procedure may still have variations in its chemistry and/or hardness which could become apparent during the texture process. We have developed etchants which can be used in some circumstances to minimize the negative effects of welds in some steels on some texture patterns; however, welded areas may still stand out (visually) after texturing the component. Usually, these welds can be "hand repaired" after texturing to blend the welded area into the surrounding original material very successfully.

Should the component be H13, S7, stainless steel or another hardened steel, it becomes even more important that proper welding procedures are used. Hardened steels that are improperly welded are often very difficult or impossible to repair to a level of visual acceptability.

When welding is required on textured molds, be sure that the welded area is not porous, or flaky. These conditions will severely compromise the ability of any texture source to properly etch the steel, and subsequent repairs to the welded areas will be much more difficult. Porosity in a welded area usually necessitates peening, pinning, or re-welding of the area. Some pin holes or porosity, if located in tight corners or inside ribs, can be inaccessible for repair so it is imperative that this condition is avoided by using a reputable welding source and proper procedure.

Under NO CIRCUMSTANCES should you ever use stainless steel, nickel or copper welds in P20 tooling. Although it is often simpler to weld with stainless steel rod, it is virtually impossible to etch and/or repair it in a way that provides visually acceptable results in most cases. Hardened steel welding rods should be reserved for those situations where the steel manufacturer recommends them for the texturing process, and should only be used in accordance with proper procedures for welding that particular steel.

Welds in aluminum are also a situation that need to be handled carefully. Since the welds will almost always etch at a different rate than the surrounding aluminum they will require hand repairs after the texturing is completed.

Use caution when you weld a surface that will be textured and always try to let Mold-Tech know when you have welded and where the weld is. If we know in advance that a piece is welded we can often suggest alternative etchants (but not in every situation it depends on the pattern being textured and the type of steel), or modify our process slightly to do the best possible job on the welds. Be sure that the welds are "color matched", which means you may have to anneal them before texturing, as the color of the weld can show up as a difference in gloss on the part, even if the weld itself matches the appearance of the texture pattern.

Post textured weld repairs may be an additional charge over and above any texturing quotation you may have received. We would usually call you once a welded area is discovered and it has been determined that the weld is in need of hand repair after texturing, in order to discuss cost and timing issues.

Please call us if you have any questions about texturing and welding, preferably BEFORE you proceed to do the welding, as we may be able to advise you regarding the best combination of weld and texture in order to save you time and money.

### **Use of Different Metals**

With few exceptions, texture masters from texturing companies in North America or from major OEM's are developed in P20 steel. Most plastic injection molds are built out of P20 steel. At Mold-Tech, it is our goal to match the texture on a mold, to the texture on the master unless otherwise instructed by the customer.

When molds are built out of H13, S7, A2, D2, 420 stainless steel, or other pre-hardened steels, the differences in hardness and/or chemistry provides a resistance against the texturing process. Although we can and texture most tool steel types successfully, subtle variations can occur in some steels as a result of the processing differences made necessary by their hardness and/or chemistry that will result in minor differences when compared to a P20 master.

Steel hardness is a consideration to keep in mind when a mold is built out of P20, and slides, lifters, inserts or other components fall within the texture zone that are built of hardened steels. Through years of experience, we have developed methods of processing that minimize these differences; however, different metals within the same mold can create other differences not as easy to alleviate. Due to cooling rate differences, the gloss of the resultant part could vary from cavity to insert to slide, creating minor variations in appearance. These variations, once identified (after a production mold trial), can usually be adjusted with surface re-glossing.

Since we are aware of these various differences, we attempt to adjust our process to allow for most of these variables so that we can be sure we will match the master, regardless of the metal you've selected to build your mold. We do ask that you identify metal types to us when you send the mold to us or when requesting a texture quotation, so that we can put that experience to work for you.

Although there are very few metals we have come across that we cannot process, on occasion, we do encounter some that defy our attempts to texture it. Should you be planning to use a metal that you are uncertain of regarding its texturability, please call us to ascertain whether or not it is a metal that processes well for texturing. Be sure to mention to your steel supplier that the mold you are building is going to be textured, as most reputable steel manufacturers can advise you with regard to the etchability of their metals. Call us if you have any questions.

It is not only the hardened metals that promote minor texture variations, but some of the softer ones do as well. Tooling built out of Aluminum, Kirksite, BeCu, Copper, etc, will also vary slightly from P20. Once again, we use our experience with these metals to provide you with as close a match to the master as possible.

Molds constructed from cast materials, especially aluminum, etch satisfactorily and are textured on a regular basis; however, it must be noted that castings exhibit varying degrees of surface and subsurface porosity that can affect texture appearance.

There are many different metals in the marketplace already, and new ones are being developed all the time. Not all of them have desirable properties for the texturing process, so it would be in your best interest to call us if you are the least bit uncertain that the metal you plan on using to build your mold is going to be a potential problem for texturing.

### **Surface Finishes Required**

Certain textures will hide or disguise molding flaws such as surface scratches, minor imperfections in radii, flow marks, etc. However, many of the lighter textures such as MT 11000, MT 11010, MT 1055-2, etc. are very subtle and shallow, and their fine grained characters are not designed to hide these types of imperfections in either the cavity or in the resultant molded part.

Texture finishes in general require a basic minimum of a 240 stone finish. This finish will suffice for most patterns that have a depth of .0025" or deeper.

When your texture needs are for finer depth patterns with depths of .0015" or less, we advise that you finish the surface of the mold to 400 emery paper or SPI B2. Although a 240 stone finish may seem smooth enough, it often leaves behind minute surface scratches that may show up through a fine texture once the process is complete. Once those scratches show through, repairing them is difficult, so it is much more expedient to ensure that the surface finish is fine enough before texturing begins. It is our practice to alert our customers when they may require a better finish before texturing once we receive the mold and inspect it.

On rolls that require texture, a minimum recommended surface finish is a # 32 Microfinish. This is important, since the fine striations often seen once rolls have been on a lathe can be visible after texturing and striations are not visible in a # 32 Microfinish.

In regards to the MT 1055 / Series '93 Plaque, the backside of the plaque contains a number of "Microfinishes" (not to be confused with the "Microfinish" noted above), which are numbered from MT 11001 to MT 11007. The successful applications of these finishes requires some basic minimums. They are designed for P20 steel and we cannot guarantee identical results in any other steel for these particular patterns; and a pre-texture finish of SPI A2 is essential. These finishes are so subtle that any finish rougher than an SPI A2 will distort the texture appearance to an unacceptable level for most applications for which these textures were designed.

If you have any questions regarding surface finishing pre-texturing, please call us.

#### **Pre-Texture Plating / Coatings**

If the mold you are going to have textured is presently plated with Nickel, Hard Chrome, Teflon or any other secondary surface coating designed to improve the wear and/or corrosion resistance of the mold, the coating must be removed completely in order to successfully texture the mold. The properties of chemical and physical resistance that give these types of coatings their value, effectively resists our efforts to texture or chemically engrave the surface beneath the coating. Even in cases where the requirement is to repair the texture on a local area of the mold, we recommend that the plating be entirely removed first. We advise that you contact the plating company prior to making that decision to ensure that they are comfortable with committing to a successful local re-plating job.

Gas nitriding and similar processes of surface hardening can also create texture quality problems. If you plan on applying any pre-texture surface coating, it is usually best to do so after texturing. If that does not seem to suit your needs, please call us first to discuss the viability and review options. We want to help you avoid needless costs and delays that could occur if a mold arrives for texturing and needs to have some coating removed first.

# Texture Process Information

## 1. Vertical Walls

### Draft Requirements

One of the most common questions we are asked is "How much draft do I need to put the texture on my mold?"

The general rule of thumb is that we require 1-½ degrees of draft for each .001" of texture finish depth. However, there are other considerations that must be taken into account, due to the many new resins and polymers, molding improvements, and various other factors that come into play in modern plastic molding. Examples of situations that require additional draft are thin wall part design and high pressure molding.

Some important considerations to keep in mind are :

- Is the vertical wall in question an inside or outside wall? If it is an inside wall, the part will shrink onto it during molding so you will need more draft in order to apply a texture, or you will need to apply the texture at a lighter depth.
- Certain plastics have very little shrinkage and will therefore not shrink away from outside walls as easily as other plastics. Thermosets, Ryanite, Glass Filled Nylon, Glass Filled Polypropylene, ABS, Polycarbonate, etc. will usually require more draft in order to mold parts without scuff or drag marks.
- If the core is very simple, and there is nothing on the core to hold the part in place during ejection, the part will tend to hang onto the cavity, creating scuff marks. The part may require more draft, or perhaps texture could be applied to the core side. This helps hold the part onto the core during ejection. This method has been used very successfully to solve this sort of problem.

In cases where it may not be possible to build in the necessary draft for the texture required, we have developed the technology necessary to gradually change the depth of the texture from full depth on the horizontal areas to a very low percentage of depth on the vertical areas where the draft is severely reduced. This can usually be accomplished in such a subtle way that the change in depth is not obvious or even noticeable, yet it accomplishes better moldability. If you require this technology, planning is required, so please get us involved as early as possible in the project so that we can plan together to give you the very best combination of moldability, aesthetics and delivery on your textured parts.

### Undercuts

During the texturing or Accugrave processes, metal is always removed from the tooling. In some cases, on a vertical wall in the texture zone when there is a seal off above or within the zone, or if you require a band left un-textured above the texture at the parting line. These situations create an "undercut" condition or a condition where negative draft has been created due to the metal removed during texturing. This condition can cause scuffing, dragging, sticking of the part, or in a worst case die lock.

This condition can be difficult to address once the mold is ready to texture, so it is therefore best handled at the design stage if at all possible. One of the best methods would be to consider setting your vertical seal-off areas back away from the vertical wall being textured by a distance equivalent to the expected metal removal of the texture selected. This would alleviate undercut concerns in those areas, regardless of the amount of metal removal. Please call us as soon as possible to help you plan for the proper distance required to move the seal-offs back prior to texturing, as each texture has a different metal removal factor. Some are minor, but many of the newer automotive textures require significant metal removal in order to satisfy the visual appearance requirements of the OEM's master for the texture. It is not uncommon to see a texture that finishes at .002" or .003" with .015" metal removal, so it can be a major issue.

### **Metal Removal vs. Finished Depth**

It is very important to note that the finish depth of any texture pattern does not necessarily indicate that only that much metal has been removed to arrive at that depth. This is especially true of Automotive textures, many of which have significantly different metal removal amounts as compared to their finish depths. Since a visual standard must be matched for Automotive approvals, many patterns require many stages of etching to make the molded part look like the master. Each stage removes metal, and even areas that are at a lower depth percentage on the part to accommodate draft considerations have significant metal removal. This factor needs to be addressed for potential undercut situations, for matches from a P20 cavity to an H13 slide or insert, and for potential post-texture hand work to hand blend areas that have been treated defensively during texturing to keep metal removal to a minimum. If you have a concern regarding this condition on your mold, please call us to discuss solutions.

### **Deep or Blind Ribs**

Some parts have a strengthening rib, fin or flange that is formed by a slot or groove in the cavity. When these grooves or ribs are thin and deep (1/8" wide by 1/2" deep for example), it can be very difficult, if not impossible, to texture inside the rib or groove. If at all possible, identify this condition at design stage, and if the mold will be textured, design a slide or other component to move away from the zone, allowing access to the walls of the groove or rib for texturing.

We often encounter this condition, and will try our best if it is at all borderline, but cannot guarantee results. There is no way to inspect or predict the accuracy of our work inside such a rib, and the results of our efforts will only become apparent at the post-texture tryout of the mold. Even then, if the texture is not satisfactory in the rib, the options for repair are slim. Try to avoid this situation when designing the mold if it is going to be textured.

## **2. OEM or Program Work**

It has become an increasingly popular practice for OEM's (Original Equipment Manufacturers) to select one source for their texturing needs on a specific program. Their reasoning is that all parts within the program will then match each other.

Mold-Tech is particularly proud of our participation in many significant automotive and non-automotive programs over the years. Along with the other sister companies The Mold-Tech group, has participated in many programs where work was coordinated within many of our facilities with very successful results, not only quality but also in delivery.

Mold-Tech has access to worldwide texturing facilities, with plants in North America, Europe, Singapore, China and Australia, including licensees in Hong Kong, Brazil and Japan.

We specialize in program coordination and can guide multiple tooling projects through our plants with the very best quality in the business. Our tracking process for programs has been developed and tested for years. It is a tool well received by the OEM's we have dealt with, and helps to plan multiple tooling texturing.

Many OEM's have their own established texture standards and quality expectations. We are aware of and approved on most patterns for the major OEM's and know what they expect. Occasionally, a pattern will be specified that we are not locally familiar with. Because of our worldwide network of texture facilities and contacts, we can often get texture information together very quickly. Give us as much notice as possible, however, as some patterns are very complex. We made need time to gain an OEM approval to do the texturing.

Further to this, most major Automotive and other OEM's require proof of a texture company's ability to match one of their masters. We are approved on hundreds of texture patterns for many automotive OEM's, but new patterns are being created every month. We have an in-house R&D Department that stays current on new patterns. We have a strong investment on pattern R&D and endeavor to keep ourselves current, but when you are quoting a job with a texture unfamiliar to you, please call us to confirm our approval to do it, and to advise you as to the complexity and thus, the cost of the pattern.

No texture source can texture automotive parts without approval on that texture, and in fact, Ford Motor Company, Daimler/Chrysler and General Motors require that we ask for a completed Appearance Approval Report before beginning any texture job for them. This is an item that you, the customer, must supply to us. We are positioned to be your texture source for any program, regardless of the size or complexity.

### **3. Parting Line Treatment**

#### **Parting Line Protection**

Different types of parts require different methods of parting line treatment. We can apply texture right up to your parting line or can leave a blank of .005" to .750" at the parting line if that suits your requirements. We can leave an undercut if required (and some PVC molds do require that), or leave a blank without an undercut if that is preferred. Either way, we fully understand the importance of the parting line to the quality of the finished part, and we stand ready to discuss it with you and to offer advice if you are uncertain as to how best to address this concern on your tool. In many cases, the pattern chosen will dictate the best way to protect the parting line.

#### **Flat Seal-off**

More and more tooling is being built using "Flat Seal-offs". A flat seal-off occurs when the core side of the tool shut off on the cavity surface. Flat seal-offs create a hole or opening in the or can also define a parts edge. Since texture removes metal, this can pose a problem if the seal-offs cannot be accurately located on the cavity in order to protect them during the texturing process. It is imperative that you, the tool maker, locate these areas on the steel for the texture source. The most accurate way to do this is by scribing the seal-off areas with a Cordax machine or some other digital gauge that scribes exactly where the part ends.

There is usually a temptation to simply use a part to layout the flat seal-off. We do not recommend this since the part is a different size from the steel due to the material shrinking as the part cools. Use of a part often means that the line is not accurate to begin with, and the likelihood of either texture over-grain or under-grain is almost assured. An over-grain can cause flash; while an under-grain leaves un-textured areas that would require hand repairs to add the texture that is missing.

Do not trust witness lines from the core side bumping into the cavity, as these can be misleading if subtle changes have been made during spotting/matching of the tool before texturing.

#### **4. Post Texture Plating / Tribocoat™**

##### **Post Texture Plating**

Once the texture process is complete, many textures can be plated without affecting the integrity or function of the texture itself. The usual thickness of "flash" hard chrome or nickel plating is minimal - at .0003" to .0005" - and does not shallow the texture depth or effectively alter the appearance of the texture. It is usually best to let us know before texturing if you plan to plate the mold after texture, as we may be in a position to offer advice regarding plating over texturing.

Whenever possible, we recommend that you try out a mold after texturing, and before you plate it, since occasionally, a textured mold may need a slight tune-up to deal with scuffing, drag, or gloss issues. These items are much simpler to deal with before the surface has been plated.

##### **TRIBOCOAT™**

*If you do require a secondary coating after texturing, In North America we recommend an excellent Nickel-Teflon coating called "TRIBOCOAT™". This process is also available for un-textured molds, so if you believe that you have a need for this, call us.*

#### **5. Post Texture Painting**

Some parts are painted in a secondary process after molding. If the parts being painted happen to have been textured, the paint may very well affect the finished appearance of the texture - with regard to depth, granularity, and gloss.

If the textured part is going to be painted please let us know before hand so that a determination can be made as to whether the texture depth should be modified to accommodate painting. Certain types of paint do not have a large effect on the texture, whereas other paint processes will virtually wash out any appearance of texture on the part.

It is especially important to be aware when painted parts mate-up with unpainted parts. These two parts will not look the same without some modifications to the texture of one or the other parts.

## **6. Marked Parts and/or Prints**

Although we can, and do, work from verbal lineups on texture jobs, there are much better ways to provide us with the information that is essential to providing you with quick, accurate, quality texturing service. Many texture jobs are relatively simple to describe over the phone, while others require a meeting to go over draft angles, molding conditions, gloss requirements, etc.

A blueprint or mylar marked up accurately and completely is one way to instruct us as to how you want the texturing done. Be sure that the drawing shows a cross-section for all different areas, otherwise there may be questions as to what to do regarding areas not shown on the drawing. (Assumptions are dangerous.)

Without question the best way to provide us with a texture lineup is to supply a sample part with the areas to be textured defined. This allows us the opportunity to see the part, identify its function and interpret the design intent for the texturing selected.

Basic, necessary information that is beneficial to us includes: What is the part? What is its function? Who is the end run customer (OEM)? Who is molding the part? Is it part of a program? Are there other parts already textured that mate with this one?

While these questions may seem needless, they help us do a better job in identifying your needs relative to texturing. If we are aware of who the OEM and / or molder are, we are often familiar with subtle variations they require to mold acceptable parts due to years of experience with these companies. We can often recommend things that will enhance the texture job if we are aware of functional or visual intent of the part design. Supply us with information and let us put our experience to work for you.

If you are uncertain how to mark a part for us, let us know. Our sales representatives would be more than happy to assist you in marking parts up for texturing, or discuss any of your texture questions. On automotive programs, time is usually set aside to mark a number of parts for texturing well before the jobs start to arrive. This saves everyone time and last minute confusion.

## **7. Quality Systems**

Quality has always been the highest priority at Mold-Tech and we do have quality systems in place related to the texturing business. We use the newest technology available for measurement, etching, photography, and we are constantly on the leading edge of new technological developments designed to do the job better and faster and to provide you with top notch service.

It is our aim to stay on the leading edge of this industry and our investment in cutting edge technology is second to none. Our goal is to be the texture leader for many years to come and establishing stringent quality policies is a big part of the plan to achieve that goal.

## 8. Molding Processes

In our many years in business, we have experienced texture projects in all types of tooling, not just in plastic injection molds.

### Blow Molds

Although today's blow molding process is much improved, blow molds still do not pick up 100% of the texture detail. We have found that many of the texture definition problems associated with blow molding are related to venting. We can (within limits) apply the texture into the mold components slightly deeper than normal so that more definition can be picked up when parts are molded. We have also developed patterns for blow mold applications - samples of which can be acquired from your local Mold-Tech representative.

When the vents are brass and the mold is aluminum, you'll want to decide whether or not you want texture on the vents. Since they are a different metal than the surrounding cavity surface, they need to be etched separately. Many customers elect to not texture blow mold vents.

Some toolmakers use steel or copper inserts in their tool design. If these inserts are going to be textured, they will have to be textured separately, (or isolated from the aluminum cavity), and they may have a slightly different appearance than the aluminum due to differences in the metals. We can make some pattern adjustments if you let us know in advance that this situation exists, however, this may impact delivery.

### Rolls

We have textured hundreds of rolls over the years for all types of applications: vertical blinds, wallpaper, furniture edge veneers, automotive trim, vinyl flooring, etc. It is important that you give us some idea what type of material you are extruding or rolling. One important factor to keep in mind regarding the texturing of rolls is that the texture on the roll may not reproduce at 100% on the stock you are running. Since the plastic, rubber or steel being rolled is not molten, it may only pick up a partial impression off the roll. For that reason, most texturing on rolls is processed at an increased depth.

There are many parameters that affect the look of the texture applied to the roll. The construction of the roll and its substrate have an impact on the performance of the roll. These issues should be addressed with the texturing source before the roll is built, if possible. Since rolls are often etched deeper, the material chosen for the roll construction is an important consideration.

### Compression Tooling

Compression tooling can be textured much the same way as injection molds. The resins pick up virtually 100% of the texture applied to the cavity.

Locating the end of the part at the shear edge before texturing by a scribe is important. On many compression tools, we are instructed to stay a certain distance away from the shear. The shear edge is often flame hardened when we receive the job for texturing and this can create differences in the texture as the flame hardened areas will etch at a different rate than the rest of the surface. Try to confine the flame hardening to the shear itself, and not out onto the class "A" surface of the part if at all possible.

Please remove all wear plates from the block before sending it for texturing. Also, since many compression tools are oil cooled, please be sure that all openings into the cooling system holes are plugged. Otherwise, oil could leak out into the etchant and cause contamination.

### **Vacuum Form Molds**

The vacuum form process has a tendency to pick up only a percentage of the depth and visual appearance of what is applied to the mold itself. We can often texture deeper than the part is to be molded, within the structural limits of the actual pattern chosen.

The vacuum holes require unique processing techniques to assure the protection of your tooling during texturing. Please discuss the protection of the vent holes with your texturing source. It is also important that you remove any vacuum lines, electrics, etc. from the mold before sending it in to us for texturing.

### **Electrodes**

There have been occasions when we've been called upon to etch a pattern or a logo into a copper electrode. Since it is an electrode, the texture will need to be applied in the "positive" and any logos, etc. will need to be readable in the copper and de-bossed. We can texture copper, but NOT copper-tungsten or graphite, for these applications we offer Laser Engraving.

## **9. Gloss**

The gloss of a part is an important factor in the visual appearance and perception of the quality of a part. It also affects the look of the texture, especially on fine matte finishes. If the gloss of the part is dull, the texture may appear shallow and if the part is glossy the texture may appear deeper than it really is.

There are a number of factors which have an impact on gloss. We've assembled the information found below over the years, and through testing, and are supplying it here to help guide you in assessing what can or cannot be adjusted to alter the gloss of your part.

### **Determining Factors For Gloss On A Part:**

1. Type of plastic being processed.
2. Cavity temperature.
3. Core temperature.
4. Material temperature.
5. Material composition.
6. Pack pressure (hard pack) - this is a major factor.
7. Material color.
8. Texture type - leather versus matte.
9. Cycle time.
10. Material thickness.
11. Transfer point from high to low pressure.
12. Clamp pressure.
13. Gating.
14. Material weldments and knit lines.
15. Venting (and lack of it).
16. Part design.

### **Determining Factors For Mold Surface Gloss:**

1. Mold material (type of metal).
2. Mold hardness.
3. Blast media (glass bead, aluminum oxide, size of blast media).
4. Pre-gloss mold finish (polish, texture matte, etc.)
5. Mold finish pre-etching.
6. Welded areas.
7. Porosity in the steel.
8. Cutter marks, cutter burns, EDM scale.
9. Steel streaks or segregation lines.

Although only a small portion of the factors that affect gloss are within our control, we need as much information as possible from you regarding the gloss you want to achieve. OEM's often supply a gloss number related to a 60° gloss meter. If we know the type of plastic being molded we can usually supply a gloss on the surface of the tool that will approximate the correct gloss specification.

If you mold a part and the gloss is not exactly what you want, it is possible to adjust it. The data provided above indicates that the molding parameters chosen have a lot more impact on the gloss than most aspects of the texturing process do.

## **10. Engraving**

Accugrave is the patented Mold-Tech process used to chemically engrave logos, intricate designs, part numbers and extensive copy or graphics into mold surfaces regardless of mold size, shape or hardness. Accugrave is an excellent solution for contoured surfaces, for deep and hard to reach areas and for critical surfaces near parting lines, ribs or bosses. The process can be very cost effective for the difficult engraving applications described above, as well as, for molds with multiple inserts.

### **Artwork**

The process requires "camera ready" artwork. If you do not have the availability of "camera ready" artwork, we have artists on staff who can draw the art or copy it from a business card, sketch, print, or whatever is available. In some cases, the artwork can be developed before the tool arrives for processing.

If the surface to be Accugraved is a compound curve, (where the curvature is in more than one direction), the artwork will need to be adjusted to follow the contour to attain the desired look. This particular type of artwork is complex, so a sample cavity or cast of a cavity may be required to help fit the artwork onto the shape of the surface of the mold, before the mold arrives.

### **Depth & Clarity With Accugrave®**

The achievable depth of the Accugrave process varies depending on the size, boldness and intricacy of the graphics being Accugraved as well as the type and hardness of the steel. The maximum depth that can be achieved in Accugrave is approximately .015" with bold type or artwork. Deeper etches are possible, but there are certain limitations to the clarity of the final artwork result that would need to be discussed beforehand.

On our Accugrave plaque, there is a section called "Copyguide" which shows a series of type sizes that are etched to the maximum recommended depth for those type styles and sizes. They are :

6 point @ .001" deep.  
8 point @ .002" deep.  
10 point @ .003" deep.  
14 point @ .004" deep.  
18 point @ .005" deep.  
24 point @ .006" deep.

These are recommended depths only. As you can see on the plaque, these are all quite visible on the part. We can sometimes go deeper, but this should be discussed, since minute changes in the appearance of the artwork can take place as we attempt to deepen the etch. Keep draft considerations in mind as they also apply to Accugrave.

We have developed methods for Accugraving part numbers, etc. on multi-level areas such as flutes for automotive lenses, and continue to refine and broaden the use of Accugrave in molds.

### **Pricing**

Accugrave costs are very reasonable compared to the other methods of engraving graphics into molds. We are especially competitive on hardened steels, compound curves or on graphics with a large number of characters needing reproduction. Artwork costs are comparable to or better than most commercial artists.

### **Embossing vs. Debossing**

Most of the Accugrave requested of us is engraved into the mold which makes the Accugrave stand up in the part. We refer to this as "embossed" and an example is found on the Accugrave plaque. In the few cases where you want the actual artwork to remain as original surface and etch the area surrounding the artwork, this is referred to as "de-bossed". There is an example of this on the Accugrave plaque as well.

The artwork goes into most molds in reverse - or mirror imaged - so that the copy is readable on the part. There are a few exceptions, however, so it is best to clarify this to us for each job. For example, in a situation where the Accugrave is on the core surface of a part being molded in clear plastic, and you want consumers to read the copy from the front of the part or through the cavity surface, you would require the Accugrave to be "readable" in the steel.

We are always ready to provide you with technical support and quotations for all Accugrave needs. Perhaps there are applications for this inexpensive alternative to mechanical engraving or EDM burning that you have now. Please give us a call or fax us your graphics for a quotation.

## **11. Pattern Development**

### **Texture Plaques**

Mold-Tech plaques represent only a sampling of the type of textures available to you. The plaques give a fairly broad range of pattern types and depths, but they are not comprehensive. There are virtually no limits on what can be done with a texture. These plaques are molded in black polystyrene for general distribution but some are available in white (plaque "A") or in clear acrylic (Accugrave, and some of the others) on a request basis. We also have blow molded plaques available on request with patterns developed especially for that sector of the industry. Please call to request a set.

Should you decide you like the appearance of a particular texture on the plaque, but would like it deeper, or lighter in depth, or in larger figures, we can usually accommodate those requests within the actual technical limits of the pattern structure. Note that some very fine patterns cannot be increased in depth to a very large amount - the pattern structure would break down; call us and we can discuss it and advise what is available.

### **Texture Pattern Creation**

Our in-house pattern development department is constantly developing new patterns for customers from all industries. If you have a need for a special pattern or you want to develop a texture to match a piece of wood, cloth or any sample created elsewhere contact us so we can help. There may be a development fee involved if the pattern is being developed for your job exclusively.

We also develop and cross reference patterns to match an OEM or competitor's pattern. This work is ongoing, as we attempt to keep current on any new corporate texture masters. Since these patterns are generated by OEM's or competitor's, the textures do not appear on our Mold-Tech plaques, however, the equivalents of those patterns sometimes do. If you do not see the desired pattern, call us and we can discuss the status of the pattern you need information about. Automotive companies do require that the texture source be approved on the pattern before being allowed to process any jobs with it. We are approved on almost every current OEM and continue to work on new ones every day.

In addition, we have contacts all over the world, so we have thousands of patterns available to us with one phone call.

Mold-Tech has invested substantially in pattern development in order to remain the industry leader of texture technology. At our central R&D facility, located in Fraser, Michigan, Mold-Tech operates a very powerful system of computers used to generate, modify, stretch, expand, shrink, or otherwise provide the textures that the industry wants. This system has helped develop numerous patterns and has a limitless possibility range. Call us to see if we can put this tool to work for your applications.

## 12. Repairs to Damaged Texture

Mold-Tech has been a major force in perfecting the art of texture repair for years. When damage to a texture occurs, it is usually best to call us as soon as possible. On-site hand repairs by an unqualified technician to a damaged texture can make a bad condition, worse. It is usually better to get the tool to us in damaged condition, as we have the facilities and people available to do the entire repair. Improperly attempted "rush" texture repairs can make actual texture repairs more difficult, costly, and time consuming.

Texture damage can usually be repaired by an experienced repair source. In some cases, the damage is so extensive that the only viable course of action is to polish out the texture entirely and re-texture the mold. This can usually be determined by examining a sample part that shows the actual damage, or by discussion between the texture source and a representative from the molder who can describe the damage effectively and accurately. If damage is minimal, it may be possible to perform a patch repair. The decision, which is the more viable course of action can be made once discussion and inspection of the mold and / or parts has taken place.

Engineering changes involving textured molds are also very common and can often be done in a timely manner with excellent results, thus eliminating the need to polish the entire mold. Get us involved early in this type of project. Certain textures require that the surface be prepared in a way that will maximize results and minimize delivery time.

On-site repairs can sometimes be accomplished at your facility, but, it is almost always better to get the mold to our facility where all of the repair tools necessary can be brought into play in repairing the texture on your mold. We understand how expensive down time is to a molder, so repairs are always treated as emergencies, and processed as a high priority. Although we do not normally provide an on-site repair service at your facility, such a service can sometimes be arranged if discussion or part inspection indicate that the repair needed is feasible as an "on-site" repair.

Costs vary based on the number of areas involved, type of texture needing repair, type of steel, etc. Timing also varies based on the same factors. Call us for a quotation anytime.

Often, the tool shop that had the mold textured is hundreds of miles from the molder. There is often a Mold-Tech close to the molder in those cases and by contacting the original texture source, the data can be shared with the appropriate Mold-Tech facility and they can effect repairs without moving the mold long distances. We can usually repair molds textured by competitors as well.

### **13. How Do I Prepare A Mold to Ship to Mold-Tech?**

- 1) Be sure that all pertinent information is sent with the mold:
  - a shipper listing of everything being sent
  - a marked part or blueprint showing the exact areas to be textured
  - note type of steel
  - a Purchase Order #, if required for billing
  - a textured sample if available
  - gloss requirements
  - any other requirements or instructions
- 2) Be sure that any flat seal off areas are scribed carefully and accurately on the steel.
- 3) Remove and disassemble any unnecessary items such as:
  - waterlines
  - electrics
  - sprue bushings
  - hydraulics
  - core
  - slides
  - hoses

If you don't need it textured, then don't send it to us. Conversely, be sure to send all components that will need texture including: ejector pins, slides, inserts, etc.

- 4) If you are sending the mold via carrier, make sure that all components are packaged in such a way that it is not possible for them to be damaged by knocking together or into another box on the carriers truck. Wrapping pieces in bubble-foam is usually NOT enough protection. Use wood, or layers of cardboard, or plastic sheeting to protect sharp edges against damage. You and the texture source realize that the pieces must be handled carefully, but the carrier may not.
- 5) Be sure to label the packages clearly, and include your company name and contact name and phone number so that questions can be directed to the right person at your company.
- 6) If a carrier is being used, to protect larger molds against surface damage by covering them with a part, wood, canvas, etc. so that nothing can be dropped into the cavity.
- 7) Be sure that the pieces will not rust by coating them with a rust inhibitor.
- 8) If timing is critical, please call in advance so we can plan for the arrival of your mold.
- 9) If you have a large number of components for a single project or the project is complex, it is usually best to call us and meet with one of our sales engineers before sending in your components.
- 10) Consider insuring your shipment with the carrier.

## Handling Information

### **Eyebolt Holes Required**

When a mold cavity, core, slide or other mold component is textured, it must go into an etchant bath or be positioned in front of an etchant spray through the use of an overhead crane. In order to safely and effectively process these components, we require a minimum of two and an ideal number of four Eyebolt holes of a size and threading compatible with the weight of the component being handled.

In the case of smaller components, for example those that can be carried in one hand, eyebolt holes are not required, as we can place those pieces on a rack designed to carry them.

In the case of aluminum, even though weight is a less important factor, any piece of a size over 18" X 18" X 12" approximately should have eyebolt holes for proper processing at our facility.

This is a very important factor in the timing of processing your mold, since a lack of these holes forces us to either return the mold to you for holes or enlist the aid of a local tool-shop to cut and thread the holes for us. Obviously, this slows down the process and adds extra costs not covered in the original quotation. (Please note the photo where we have attempted to show the proper position of eyebolt holes for purposes of texturing.)



### **Disassembly and Reassembly**

In order to process most texturing jobs, the mold component involved must be submerged into an etchant bath. Therefore, any area of the component that does not require texturing must be masked off by the use of various tapes, waxes, inks or paints. These masking tools protect the non-textured areas from etchant damage. In order to properly mask the non-textured areas, we have to be able to access them.

Therefore, in almost every texturing situation, it is best to send us only the component(s) that actually require the texture. This means that the mold should be disassembled, leaving those pieces, such as the core, slides or lifters, etc. that do not need to be textured, at your facility. This not only cuts down on unnecessary extra shipping costs due to weight, but reduces time delays.

We strongly recommend that you remove any back plates, electrical or hydraulic components, waterline connectors, horn pins, wear plates, guide pins, retainer rings, side locks, ID plates, limit switches or any component that would interfere with our ability to properly seal the mold piece for a dip into an etchant.

## Shipping Information

Shipping to or from our facilities is normally at your cost. Many customers, especially if they are local, use their own vehicles to bring in jobs.

There are a wide range of trucking companies who carry packages or skids for the mold industry on a daily basis. If you do not have a preference, we can advise you as to recommended carriers or couriers based on our history with them.

Deliveries run anywhere from "door-to-door" or expedited services. They will come into a facility any time of the night or day and deliver directly to another destination but they are relatively costly.

Small couriers (UPS, Purolator, FedEx) have a 150 lb. maximum per box limit, but do allow you to send multiple packages. One caution: be sure to label each package in a shipment, and note on the label: i.e.) Box 1 of 2, Box 2 of 2, etc. so that there is less likelihood that part of the shipment will be misdirected or lost. If requested, they will insure your shipment.

Larger carriers will move larger molds of almost unlimited size, but we recommend that you request a flat bed for molds larger than 4 tons so that they can be unloaded with an overhead crane at this end. Putting molds this size or larger into a covered trailer makes removal of the mold unsafe and awkward. Most of them will also insure your shipment.

Most small package couriers have established rates based on weight. Larger carriers are somewhat more competitive. If we can make a suggestion, it would be this: get a quote before arranging your larger shipment - you will get a better rate.

### Packing for Shipping to Us

Be sure to package all of the pieces you send us in a foolproof manner. You understand the value of your mold components, as we do, but the carriers do not always recognize how easy it is to damage mold components. Bubble foam wrapped around inserts or small pieces is often not enough protection. Wrap additional layers around the bubble foam with cardboard or similar material. Also, be sure there is no air space left in a box. Fill all open space with foam "peanuts" or bubble foam or similar. If there is air space, there is room for pieces to move around and to bang into each other, leaving nicks, dings or worse.

If you are placing your shipment on a skid, use a skid heavy enough and in good enough shape to support the weight. Be sure to firmly strap and block all components onto the skid so there is no chance of movement off the skid. Label all skids, referencing other skids or boxes that are in the same shipment. Do not leave any pieces loose, even if they are just samples.

Please include a packing slip that details all pieces you have sent to us. This way, our initial inspection on receipt of the shipment can identify if anything is missing so it can be traced quickly. Without this important list, we can only assume that we have received everything you sent.

If the components are ferrous (P20, H13, S7, or similar), be sure to apply a rust inhibitor on all surfaces. **Please contact us for international shipping protocol and customs assistance.**