

COLORING CULTURED MARBLE

**Candid facts about the proper selection
and correct use of dry color pigments.**

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PREFACE

Having the latest “cutting edge technology” is important, but just having a revolutionary idea isn’t worth anything if you don’t apply it. When we started BroCom Corporation in 1985 most of the dry color being supplied to the cultured marble industry was being produced using technology that was already twenty years behind the times. That wasn’t good enough for us and we set out to make some changes.

BroCom’s approach to color technology has always been one of “practical application” and we have over thirty years of color know-how that we put to use daily. Our company was founded by Research & Development people, so it wasn’t unexpected when we began setting performance standards that other color suppliers found themselves having to meet.

BroCom’s approach to supplying color for Marble and solid surface applications can be summed up in one sentence:

“We don’t just follow quality standards, we set them.”

BROCOM CORPORATION AND MARBLE COLORS

Marble colors are unique because even though they're the most "visible" part of your product, they're relatively inexpensive. (In fact they could well be the *least* expensive component). Research indicates that an average size marble shop will only spend about \$3,350 on formulated dry color for every \$500,000 of marble they produce. That only comes to about 6/10ths of one per cent of sales!

Our research also shows that 73.6% of all marble shops have nineteen or fewer employees. We're that size too, so BroCom's operating structure is probably very much like yours. It's still personal with us.

We know that every time you produce a part you put your reputation on the line, and when your part contains Designer Marble Colors we put our reputation right on the line with yours. We take that responsibility seriously. Experience has proven that the more practical information we can give to (and get from) our customers, the better product we can all make. We know you agree.

Of course, we could bore you to death with volumes of technical jargon about color that only a scientist could truly understand (or care about). The simple truth is that color is just a visual "perception", about which we can all have an opinion, state our preferences and react accordingly. Most consumers are just ordinary folks who know what they like when they see it. The act of someone predicting that "reaction" is called *color marketing*. Our Marketing Manager is a member of the *Color Marketing Group*, a national multi-industry organization that projects upcoming color trends two to three years in advance. Employees of American Standard[®] and Eljer[®] attend their meetings, as do such diverse companies as Glidden Paint[®], Ford Motor Company[®], Formica[®], and DuPont[®]. We attend these meetings simply because we feel that the marble industry should be represented when decisions are made that will affect us. Our industry must be kept aware of where the future color trends in this country are headed.

Fortune 500 companies increase sales by selecting the right color for their product. Their research has proven that color plays a MAJOR role in marketing and in their case millions of dollars are at stake. Unfortunately, small privately held companies believe that they can't afford to operate on this level, because they think of themselves as "just a small family run business". Well, the big companies want you to believe that, but it simply isn't true.

While most of us might not be able to develop a polyester resin or build a tub mold in our garage, almost anybody can evaluate and choose colors. Customers know what they like when they see it and all you have to do is give them enough color options. Most of the time Marble shops have to offer the same colors as Kohler[®], Eljer[®] and American Standard[®], so the selection process is pretty straight forward. It's just that simple.

OK, assuming that color is a strong motivation for your customers and can help improve your sales, where can a marble manufacturer go to get the latest color information? Obviously, the answer is BroCom Corporation! We listen and respond to our customers needs. But there's one important thing that really sets us apart from ordinary color suppliers, and that's the fact that **Color is our only product!** Think about that for a minute. We don't divide our time and energies trying to sell you equipment, resin, or other supplies. We devote 100% of our attention to color. Hundreds of marble shops use our revolutionary Designer Marble Colors every day and we know which colors are "HOT", and which ones are not. The fact that we've already produced enough several million pounds of marble colors proves we must be doing something right !

What other things are different about the way we do business? Well, to start with we provide a visual color catalog specifically for the marble industry. Our catalog contains 2" x 3" removable plastic color plaques duplicating all the popular Kohler[®], American Standard[®], Eljer[®] and Universal Rundle[®] colors. Secondly we keep all these colors in stock for immediate shipment and almost every order we receive is shipped the same day we receive it. To make sure that our colors are available when you need them, you can now also order Designer Marble Colors from numerous distributor locations across the United States.

A lot of marble shops put one of our color catalogs in their showroom and let customers use it to select colors. For shops that have only offered a limited range of colors in the past, being able to offer their customers any color they want without having to worry about matching it themselves can be a great sales tool. Of course, we understand that not every order a marble shop receives can be a big one, so we do our part and we'll sell you as little as one pound of color at a time - even on custom color matched formulas! (Don't forget that when our stock colors just won't do we offer a **custom color matching service**. We don't charge for lab work and we only require a minimum order of one pound, but more about that later!)

Our color catalogs are expensive to manufacture and we do have to charge for them, even though we are committed to only charge our customers a portion of what they cost us to produce. Most customers understand this and not only have we sold over five thousand catalogs, but we continue to receive more requests every day. Active BroCom customers with catalogs are also eligible to receive new industry color standards when new colors are released. This way your color catalog should always be current. When the color sample in our catalog just won't do, we also offer **free** three ounce pigment samples to our customers. (To help keep our operating costs low we do ask that you only request three samples at a time.) Each sample is usually enough to color around thirty pounds of matrix.

BroCom uses the highest quality pigments available and our raw materials have been selected with our customers safety in mind. Every one of our formulas are computer generated, weighed up on incredibly accurate electronic scales, cross blended, synergistically ground to a cosmetic grade powder, dried, surface treated, and subjected to a series of exhaustive quality control steps. After each lot has passed all our quality control checks, it is packed in special water proof containers and then heat sealed "air tight" before leaving our plant.

We feel that our packaging is the best in the industry and when our containers are empty you can usually just throw them in the trash along with your other paper products. **This is because almost all of our colors are classified as simple nuisance dusts.** By comparison, if you are now using colors that contain LEAD pigments even the container they are packed in has to be classified as hazardous waste. Hazardous waste can only be disposed of by incineration or by burying it in special landfills. They never mentioned that to you, did they?

Fortunately, using the best doesn't cost any more because Designer Marble Colors are very competitively priced. Don't just take our word for it however - compare the quantity/prices you're paying now to the same quantity/price for Designer Marble Colors. It'll only take a few minutes to see how our lower prices would affect **your** monthly color bill.

Why are our prices better? The answer has to do with the way marble shops buy color. First, marble manufacturers usually use light colors as background or "base colors" and they frequently buy these light colors in larger quantities. By comparison, they usually use dark colors more as veining or "accent" colors and they normally buy these dark colors in much smaller quantities.

When we match a new color we determine how much the raw materials will cost us, then we add our overhead expenses along with a reasonable profit margin. The amount we end up with is our base price. We start from this base price and discount it according to the **quantity** you order.

So far, so good. Now let's go back to the beginning of our "pricing" process and examine the raw material cost a little closer. Light colors are normally formulated by combining Titanium Dioxide with a small amount of "tint" pigments. Titanium Dioxide is relatively inexpensive and even after you've added in the cost of the "tint" pigments, a light color like Bone has a lower raw material cost than a bright color like Antique Red. When you start off with a low raw material cost, your selling price should also be lower, and ours are. That's also why each one of our colors has it's own individual selling price.

Our competitors may "average" the cost of all their colors and then sell them all for the same price. This method benefits them a lot more than it benefits you, because you normally buy more light colors than you do dark colors and the light colors should be costing you less.

Whatever their reasons are, when you buy a pound of Bone color from them it's going to cost you the same as a pound of Antique Red. Now, if you're paying the same price for both colors are you paying ***too much*** for the Bone, or ***too little*** for the Red?

We also offer our customers a rather large discount that no other color supplier offers. Our discount works like this. If you pay our invoice within 2 days of it's receipt in your plant we offer you an additional **5% Discount** off that invoice. (We will check the postmarked date of your return envelope. Please note also that the shipping charges cannot be included in the discount. This discount applies to the cost of the **color only**. If you incorrectly take a discount on the shipping charges you will be rebilled the difference.) To make it as simple as possible the amount of the discount we offer is marked on each invoice. Please use that figure when taking the discount.

We're not less expensive on **every** color, and we're not claiming to be, but we are probably less expensive on the colors you use most often because our prices are based on our raw material costs. We suggest you compare our prices yourself and confirm how much you could save.

BroCom is not only unique because of what we do but also for how we do it. As we've mentioned, most of our competitors distribute a complete range of products to the marble manufacturer, and if one line isn't selling well they can simply push something else to make up for lost sales. We don't have that option at BroCom because we only have one product line - color. If we don't do a good job with our color we literally have nothing else to fall back on. We think this makes us take our color business much more serious than our competitors take theirs.

The prevailing attitude before we came along seemed to be "take it or leave it" and for the most part marble shops had to buy color "as is" with no guarantee of consistency. **We changed all that.**

We researched the problems involved in formulating for marble applications, and then selected only the best pigments. Light stability, acid and heat resistance, chemical compatibility, toxicity and resistance to oxidizing agents were prime considerations for us - not to mention the obvious things like tinting strength, cost, and ease of dispersion. Within two years we found ourselves supplying color to 30% of the marble shops in this country. Designer Marble Colors were accepted as the new industry standard without BroCom ever having to run a single ad and during the first two years we never even made a sales call outside of Colorado. We succeeded simply because we had a better product than what had previously been available. BroCom pigments worked better than other dry colors because it had been specifically engineered for marble. Our customers told their friends about us, their friends told their friends, and the rest became history.

SEEING COLOR

The pigments used to color our marble have been formulated using sophisticated electronic equipment and they are as exact as can be achieved using today's technology. Our customers are very important to us.

Several factors may influence how they appear to you however. No two people see color exactly the same due to the physical make up of our eyes. Some of us have more color sensing cones in our eyes than other people and this gives a few of us the ability to distinguish a wider range of colors. On the other hand, those of us with fewer cones can't perceive colors as well and a small percentage of us can't see some specific colors at all.

For most people, this fact can be demonstrated by looking at the room you're in now using only your right eye, and then quickly viewing the same scene using only your left eye. Blinking first one eye closed and then the other eye several times in succession will allow you to compare the color sensing abilities of each eye, which are usually different. One eye may often give the impression that everything seen through it has a slight yellow tint. This is normal. Of course, your eyes are not the only variable condition that can affect the colors we see.

The type of light a color is viewed under has a great influence on that color. Regular incandescent light bulbs that most people have in their bathrooms tend to give colors a warm reddish tone, while normal fluorescent light bulbs will place a blue or greenish cast on everything. If achieving an exact and specific color is very important, the type of lighting your customer has in their home will have to be taken into consideration when selecting that color.

Reflected light is also very important. An enclosed shower area will usually appear to be somewhat darker after all three walls are covered in marble, even though the wall panels are a light color like Almond. This is because the shower walls receive "reflected" light from the adjoining panels and that reflected light will absorb and carry with it a slight Almond tint. This makes the other panels appear to be a more intense or darker Almond color than you may have anticipated. (Photographers have taken advantage of this phenomenon for years by bouncing light off different colored panels to achieve special effects.) There are many complicated variables involved in selecting and matching colors, and it is important to realize that while color may have become more of a science, the physical limitations of the human eye sometimes makes *perfect* color implementation difficult.

We set the highest color standards and we always strive for total customer satisfaction in spite of the known difficulties. When everyone involved understands and accepts the relationship between lighting and color we all stand a better chance of achieving 100% customer satisfaction.

PROBLEMS WITH “DO IT YOURSELF” COLOR MATCHING

From the beginning there were two basic approaches to coloring marble. The first method is the one that was used (out of necessity) by almost every shop many years ago. Shops bought various raw pigments and white and then mixed them together to get the depth of color they were looking for. Using this approach the marble manufacturer could exert a lot of control over the end color - but had to also take a lot of the responsibility. With this method there were also a lot of variables that were simply beyond most shops control.

First the “batch man” had to have the ability to see the color the same every time and he also had to keep track of all of his formulas. If your “batch man” left the company, so did your ability to reproduce some colors. When he was out sick and you had someone else filling in for him they usually didn’t “see” colors the same, and try as they might, they weren’t always able to turn out the exact color matches you needed.

Second, you had no way to know if the raw pigments you were using were even the right color to start with. If you bought these raw pigments from the local hardware store (where they were sometimes sold as cement colors), the quality control these pigments received prior to packaging was only “commercial” at best. Nobody expected to get an exact color when pouring slabs of outdoor concrete (which is exactly what these packaged pigments were intended for). Also, pigments designed to disperse in a watery gravel filled mix didn’t always do such a hot job in marble matrix. (We talk a lot about moisture later on.) They frequently speckled, streaked, and came out dull and lifeless. Cement colors are not brilliant by any stretch of the imagination!

If you were one of the “cutting edge” shops that had discovered paste colors, you were able to achieve the clean colors you were looking for since paste colors did at least contain plastic grade pigments, but weighing out the pastes was messy, time consuming and unpredictable. A lot of people gave up trying to weigh the paste (they didn’t even own a scale) and simply added paste to the mix until they got the visual color they were looking for. When they “overshot” the color they had to add more white to shade it back. Pastes were much more expensive than simple dry pigments and when you “overshot” and added too much paste you had to add more white to tone everything down. This back and forth procedure made your coloring costs even more expensive.

As years went by, things improved in the marble industry and eventually “preblended” raw pigments became available. Now when you needed to make a Wild Rose part you could buy the raw pigment “tints” already blended together in the proper proportions. Instead of tinkering with five different pigments, you only had to proportion the pigment blend and the white. This was a big improvement, until some shops began to take short cuts with the white - especially when white was in short supply. While some shops automatically added white every time they made up a batch of matrix (in order to clean up the mix), other shops began trying to “tint” the natural matrix mix with the preblended dry color by itself. They figured that since natural matrix mix already had a chalky white

color, why not just tint that? This turned out to be a little short sighted since their other raw materials changed color with almost every shipment. When the color of your other raw materials changed, so did the base color of your marble.

When your dry pigments contained undispersed lumps of raw pigment you could smear the pigment on a white piece of paper and see individual color streaks! We knew that if you could see individual color streaks on the paper you would also be able to see them in your finished parts, so we developed a particle size reduction process so advanced that our customers began calling it a “Cosmetic” grind. As a result of this process our finished colors took on the consistency of an ultrafine “Cosmetic Grade” face powder. This first technical improvement, along with our unsurpassed quality control program, virtually eliminated color “flairs” in your finished marble parts and guaranteed our acceptance as a quality color supplier.

We didn't just make one little improvement and then stop there, and over the next few years our competitors were forced to improve the quality of their colors to meet the new standards we were setting. These other suppliers undoubtedly wished we would just go away, but we had found a home and we were here to stay. We felt confident enough about our colors to make the following guarantee, which we print on every carton of color that leaves our plant: ***“IF YOU ARE NOT COMPLETELY SATISFIED WITH THIS PIGMENT, SIMPLY RETURN THE UNUSED PORTION, ALONG WITH A COPY OF THE ORIGINAL INVOICE SHOWING THE AMOUNT YOU PAID, DIRECTLY TO BROCOM CORPORATION FOR A FULL REFUND.”***

We can afford to make this guarantee because we know from experience how our Designer Marble Colors will perform. Our competition has yet to print a money back guarantee on their color containers. Maybe they know something about their color that you don't.

WHAT DO WE MEAN WHEN WE SAY “RAW” PIGMENT ?

Most dry pigments have an average particle size of from .4 to 5.0 microns. When we say that a pigment has a .4 micron mean size particle this is a technical description of how large the particles would be if they were all separated from each other, (which doesn't happen very often). If you examined raw pigments under a powerful microscope you would be amazed at the different shapes and surface textures that pigments have. Some pigments are made up of extremely small elongated spheres while others are cubical. Still others are platelets with jagged edges. Depending upon their shape (among other factors), when these particles come into contact with each other some stick together more easily than others do. When enough of these extremely tiny particles have locked together they form “specks” which are big enough to be seen with the naked eye.

One reason that pigment particles are difficult to keep separated is because most “raw” pigments have been processed in a water slurry. It is much easier for the raw pigment manufacturer to process wet pastes than dry powders so they add water to the dry pigments, grind the wet slurry and then remove the water when they're done. They extract the water by squeezing it out through extremely fine filters. This leaves a block of solid pigment called a “press cake”. This solid block is then passed through a hammer mill that mechanically tears the agglomerates apart, *supposedly* leaving you with individual micron sized particles again.

Unfortunately, since they spend part of their early life in a water slurry most pigments have become preconditioned to absorb water. Under a microscope you would see that the surface of most pigments are porous and rough, much like a small sponge. Because they are dry and porous, they easily absorb liquid. In fact, unless they are packed in airtight containers immediately after they are dried they can absorb over 4% water by weight - just from the humidity in the air. That means that a hundred pound barrel of pigment left open to the atmosphere can absorb 4 pounds of water out of the air!

Almost everything will absorb *some* water, but remember the old adage that water and oil don't mix? Well it's still true. Polyester is an “oil” product and when there's moisture on the surface of the pigment it keeps the liquid resin from getting absorbed into the pigment's surface. The water not only forms a barrier shield between the pigment and resin but the water also acts like a magnet to other pigment particles. Whenever two or more of these particles come into contact with each other, the “static” property of their water coating tends to lock them together and they can form specks large enough to be seen with the naked eye. If you've ever noticed water drops on your windshield, you know what happens when they touch each other. They stick to each other and become larger drops! Wet pigment reacts the same way in your mix.

That's one reason why BroCom goes to all the trouble to dry all our colors, but there's more to it than that. After we get them dry we seal the surface of each pigment particle with a water repellent chemical that hates water but combines with polyester resin like magic! When we're finished with all that we pack our colors in special airtight

containers and heat-seal them shut. Since everyone stocks some color in their shop they should be aware of the importance of how color is packaged and how it should be stored. Small individually sealed cartons will last longer in your plant and in the long run will out perform pigment that's being stored in open 50 pound pails

When we formulate our colors we use electronic equipment so sensitive that it can weigh 1/1000th of a gram. Because we're color professionals we recognize the need of being able to consistently get the identical results all the time, but as we talk with our customers we are surprised to discover how many of you still use "teaspoons" to measure out your color. Being able to weigh the precise amount of pigment every time would allow you to make higher quality parts with less work, and anything that makes your job easier makes our job easier. **For this reason we strongly suggest that you weigh all your colors.** The last thing you need is customer complaints and rejected parts, and that's exactly what the old "teaspoon" approach will get you. It's just plain unreliable.

If you are already using someone else's dry color, and you would like to "check us out", call us and request a free sample. Color is the most "visible" ingredient in your part and mere words can never adequately describe its' effect on the finished product. That's why we have gone to the trouble of putting together a visual color catalog with removable standards.

The only thing we ask when you test our colors is that you give our colors a fair trial and make sure you are comparing apples to apples. After BroCom colors are dried and ground into a fine powder they tend to become somewhat "fluffy". By comparison, the dry color you may be using now is probably pretty dense. If you were to take a "teaspoon" of ours and compare it to a "teaspoon" of theirs, our teaspoon would actually contain less pigment by weight. Since you buy pigment by weight and not volume, using a volume measurement to compare one to the other wouldn't yield honest results.

Few people realize how complicated selecting proper pigments can be. Sometimes even what seems to be the most obvious choices aren't so obvious. White is a simple color, right? Well, did you know that Titanium Dioxide is made by both a "Rutile" and an "Anatase" process in the USA? Pick the wrong type and it can yellow over time, giving you real problems. (the Anatase grade yellows). Also, low grade Titanium Dioxide made overseas can sometimes contain trace contaminants that will affect your cure times. Even within the individual grades of Titanium Dioxide, there are further variations regarding the actual amount of Titanium Dioxide each formula contains, and what extenders or fillers have been added. These all affect your final product.

Most pigments being used in marble today are probably adequate for indoor applications which, fortunately, is where the majority of Cultured Marble is used. However, if your cast part is going to be used outdoors it is in your own best interests to alert your color supplier of that fact. Lots of organic pigments lack the light stability required for outdoor projects, and a nice bright red could end up becoming a light faded "pink" after only a few months outside.

At BroCom we quality control each lot of our color to strict tolerances under demanding conditions, and we feel our quality control is the best in the business. First, the raw pigments we use are tested for color durability at 400 degrees Fahrenheit to ensure that there will be no significant color shift during catalyzation.

Second, color plaques are molded and kept on file from every lot of pigment and the plaques are compared to our original standard before that lot can be authorized for release.

Third, we keep a sample of pigment from every order we produce on file for seven years. If you should have a complaint we can test our sample of the actual lot of pigment you are using.

Of course, the three tests mentioned here are just the beginning. We perform a whole series of exhaustive Quality Control tests that includes testing for such things as agglomerates, dispersability, and strength.

BroCom investigated hundreds of raw pigments before we selected the ones we use to formulate our marble colors with. Finding the right pigment with the right properties requires a certain amount of applied technology and experience, which not everyone has. Selecting raw pigments for plastics is a technical application and should not be undertaken by a marble manufacturer, since knowing how to manufacture good quality marble does not automatically qualify someone to formulate and manufacture high quality color.

HOW STRONG SHOULD DRY PIGMENTS BE?

How can you tell when you've reached maximum dispersion, and how strong do you really want your dry pigments to be? We all think that we want pigments to be as strong as possible, but "strong" pigments aren't always a cost savings. That's because stronger pigments are usually much harder to use effectively. For instance, overall labor costs can really soar when the color is so strong that you're forced to weigh it out in very small and exact amounts. With a really strong intense pigment the smallest deviation or mis-weigh could result in an off color that would have to be corrected. Stronger pigments can also leave color residue in your equipment that could take twice as long to clean out between color changes.

Technically, a pigments strength is usually related to that pigments oil absorption. If you take a small amount of dry color and begin mixing mineral oil into it, it can only absorb so much oil before the pigment and oil begin to separate. Weighing the mixture at that point will indicate just how much oil the pigment was able to absorb.

Pigments with a smaller particle size will normally be able to absorb more oil because they have more surface area, and these are the same pigments that tend to spread throughout the mix and color more effectively.

Titanium Dioxide is a rather crude pigment with a large particle size and has an oil absorption value of about 14. Carbon black, which is extremely strong and has a very tiny particle size has an oil absorption value of about 300.

High oil absorption values are one reason why paste colors can only hold a limited amount of pigment. "White" pastes can achieve as high as an 80% pigment loading since the main ingredient, Titanium Dioxide doesn't absorb much of the carrier resin. By the time they reach an 80% pigment loading however, the paste has become so thick that it will no longer flow easily.

At the other extreme, "Black" paste made with carbon black pigment can't hold anywhere near 80% pigment. In fact, a paste manufacturer would probably be lucky if they were able to get 30% carbon black into their paste before it got too thick to handle effectively. With an oil absorbency of around 300, Carbon Black absorbs so much of the carrier resin that the paste becomes too thick to use effectively.

ARE DRY COLORS ALWAYS 100% PIGMENT?

In spite of low relative cost of dry color, rumors occasionally surface regarding the amount of filler that different color suppliers add to their colors. For the record, BroCom does not add fillers to any of our colors, but we do add buffering agents to improve the physical properties of our colors when and if such changes are needed. Changing the physical properties of things is a fairly common practice in the chemical industry.

As an example, R-900 is a very popular paint grade Titanium Dioxide from DuPont[®]. A lot of shops use R-900 yet few realize that it's only 94% Titanium Dioxide! If you didn't know any better you might conclude from this that DuPont[®] was trying to save money by "filling" their R-900. The truth is however, that the missing 6% has been intentionally replaced with special moisture absorbing chemicals that bond onto the outside of each Titanium Dioxide particle. This allows DuPont's[®] R-900 to absorb moisture easier and makes it disperse better in wet systems! This "buffered" version is actually much more effective than the 100% pure version could ever be.

Unfortunately, there is a big difference between simple "fillers" and chemical "buffers". Fillers are simply some type of inert material that's being added for no other reason except to extend the volume of existing colors, hopefully making additional profits for the seller.

A common "buffer" for marble colors is calcium carbonate, but there are many other types of "buffering agents" out there. There's talc, barium sulfate and aluminum lakes to name just a few, and each one brings its own unique chemical properties to the finished color blend. Under certain circumstances they could also be used as simple fillers, but to real pigment engineers they are key ingredients in a complicated and highly technical chemical engineering process designed to improve the final product.

A good example of a pigment that needs "buffering" would be Carbon Black, which at present is the main ingredient in BroCom's A-306 Black. Carbon black is not only extremely strong, but it is also very light and fluffy. It would be less work for us, (and a whole lot cleaner), if we could just resell the carbon black full strength like we buy it, and not have to mess with weighing, batching, grinding, drying, and testing it. Unfortunately, in its natural state it's so light and fluffy that most marble shops wouldn't want to even have it in their plant, much less use it. We go to the trouble to "buffer" it with a special grade of calcium carbonate in order to make the black more dense and therefore easier for our customers to handle.

Calcium carbonate is a good choice as a "buffering agent" in this case because it's inexpensive and since Cultured Marble already contains over 70% calcium carbonate adding a few more grams isn't going to affect anything. Of course, if someone ran a test to see if calcium carbonate was present in our A-306 Black it would certainly show up, but their test could not show why the calcium carbonate was added.

So, is the special grade of calcium carbonate we add to our black a "filler" or a "buffer"? The truth can be discovered by looking at our selling prices. Because a portion of our A-

306 Black has been replaced with inexpensive calcium carbonate it also ends up being the cheapest color we sell! Remember, the selling price of every BroCom color is based upon its raw material cost.

If we charged the same price for every color like our competitors do, we could easily increase our net profits by simply adding a little more filler from time to time. For instance, calcium carbonate that cost 6 cents per pound to buy could be mixed in with the pigment and would then be worth \$6.00 per pound when it was sold. By adding just 5% filler the seller could end up increasing their net profit margin significantly, and no one might ever know. Would your shop notice a 5% reduction in pigment strength, or would you just figure that one of your other raw materials had changed again?

Fortunately, that's not the way we do business. If we add "buffering agents" for any reason, it usually lowers the overall raw material cost of that formula which in turn lowers it's selling price. Because our prices are set based upon our raw material costs, there is no financial advantage for us to "cut" our colors with fillers, and a brief glance at our pricing sheet will bear this fact out.

Is there any way to tell if the color you are using now has been "cut" with calcium carbonate? Maybe. This simple test might not stand up in court but it makes good sense when you think about it. Calcium Carbonate is just ground up rock, and if it were being added to the color for "engineering" purposes, it would be weighed out and added along with each of the individual pigments. When it's added at this point it receives the same processing as the pigments and gets ground down into a ultra fine powder. On the other hand, if someone wanted to "cut" the finished colors with calcium carbonate simply to increase profits, it would be blended in after the pigment formula had been processed and this calcium carbonate wouldn't receive any real processing.

Adding ground rock that hadn't been processed would tend to make the entire pigment batch noticeably "gritty". All you would have to do is rub some of the color between your fingers and you could feel the "grit". Pigments themselves aren't gritty, not even raw pigments.

We first published this information a few years ago and soon after we told everybody what to check for, the grit in most of these dry colors suddenly disappeared! Had these guys suddenly stopped adding calcium carbonate? An investigation tended to suggest that they had simply changed to a grade of calcium carbonate with a very small particle size, to small to rub between your fingers and notice. If suppliers like this put as much effort into making good dry color as they have put into trying to figure out ways to increase their profits they would make fierce competitors indeed.

Have you been paying \$6.00 a pound for calcium carbonate? If you want to find out, go back through your inventory and find a container of dry color that was bought years ago and test it like we suggested. Who sold it to you?

As you can see, it's no coincidence that you can only buy BroCom's Designer Marble Colors through authorized distributors, pre-packaged in factory sealed cartons. Every one of our colors are sealed in air tight containers before they leave our plant and our distributors couldn't add anything even if they wanted to. (And we wouldn't do business with a distributor that would! Our distributors have as much integrity as we do.)

COMPARING PORCELAIN AND CULTURED MARBLE COLORS

Cultured marble manufacturers have always had to offer the same colors that companies like Kohler[®] and American Standard[®] offer, and achieving this isn't easy. Marble manufacturers have problems duplicating these colors because of the coloring process companies like Kohler[®] and American Standard[®] use. Frankly it's pretty unstable. You see, porcelain plumbing fixture companies color their parts by coating their "rough" fixtures with precolored powdered glass and then bake the fixtures at temperatures in excess of 1000 degrees Fahrenheit. The porcelain parts are loaded onto a conveyor belt which is slowly moving down the middle of a long high temperature furnace.

Temperatures vary considerably from spot to spot within the furnace, but the temperatures are hot enough to melt the powdered glass and it liquefies and fuses onto the surface of the part. This is what gives the finished part its smooth and durable "glass hard" finish. However, because glass will "flow like water" when it is melted under extremely high temperatures, the thickness of the melted glass coating can vary in relationship to the furnace's temperature. This variation in the thickness of the colored glass coating can cause color problems.

Also, temperatures that are hot enough to melt glass can also affect the pigments they use, and temperature variations within the furnace allow some parts to take on a different color than others. The bottom line is that color variations frequently occur from lot to lot and there's not much anybody can do about it.

We weren't aware of all the processing problems these companies had to deal with at first, and when we ordered ceramic color standards from them we figured that we would at least be starting off with the right color. It didn't take us long to discover the truth however. We found out that they bake their ceramic color standards under the same high heat conditions as the fixtures themselves, and color variations show up almost every time a new batch of standards are produced!

We've done the best we can to offer a reliable set of standard colors, but it's still hard to hit a moving target. After trying to explain this problem to marble manufacturers for several years, we finally assembled a "comparison set" of three different Kohler[®] Raspberry Puree cast iron standards. We mounted them side by side on a white background and everyone can see that each standard is a different color. We show this display at every trade show we attend and it always draws an amazed crowd. We're not picking on Kohler[®] - we could have used almost anybody's standards and seen the same results. We just happened to have Kohler's[®] Standards handy.

What does this mean to your shop? It means that just because you have an "official" ceramic standard in your shop, you shouldn't automatically assume that **your** color standard matches the color standard **we** used when we matched that color. Variations can

even exist between our ceramic standards and the porcelain fixtures that your customer has in his home. Both you and your customer need to be aware of this problem.

While it's true that BroCom can't do anything about this problem, we can assure you that *our* colors won't drift, and that's actually a pretty amazing statement. We **guarantee** that you will receive the same Raspberry Puree color from us in March that you bought from us in December, and apparently we're still the only ones willing to do that. Porcelain fixture manufacturers certainly can't hold their colors as close as we can, and they cover themselves by putting a disclaimer on their "standards" telling you to expect color variations. Read their fine print!

When you get an order for a standard color that absolutely positively *has* to match your customers existing fixtures exactly, compare our standard color to the color of your customers existing fixtures *before* you make the parts. What can you do if you discover a problem? First, be honest with the customer and try to determine exactly how critical the color match has to be. If your customer just can't accept any color difference at all, send us a screw cap from the toilet in question and ask us to do a custom color match. (We explain this option in detail in another chapter.)

Ok, what else can go wrong? Well, just like natural marble, Cultured Marble varies from batch to batch and unless a lot of things change dramatically in our industry it probably always will. In fact, sometimes it seems that almost every ingredient used to make marble changes from order to order. Cultured Marble is made from marble dust, and marble dust is simply ground quartz rock. The companies that supply it dig it out of a quarry, crush it, wash it, and classify it for color. The dirtiest rock is sold for use in adhesives, putty, and other commercial applications that can tolerate poor color control, and the cleaner material is selected for special applications like Cultured Marble. When the quarry owners eventually get to a spot where they begin digging up "gray" rock, they can stop digging and move to a different spot, but that's about the only option they have.

"Clean" marble dust is identified by comparing it to a preset standard. If it is at least as white as the control lot, it passes. Now, common sense should indicate that in reality it might be quite a bit whiter, or it might just be barely acceptable. This means that each new lot of marble dust you get is probably going to contain different amounts of "contaminates" which affect it's color.

Everybody in the marble business has, at one time or another, received a shipment of marble dust that turned out to be noticeably different in color than what they were presently using. Quartz rock is not a man made material, and no one has any control over its' quality. To complicate matters further, even the polyester resin you use can change color with age. (Some of our customers report that it can even change color with the weather.) In fact, identical grades ordered from two different manufacturers may frequently show obvious color differences. Even small day to day things, like a slightly thicker gel coat can cause the end color of your finished part to appear darker.

Experienced marble manufacturers know the variables involved in making a good product and they try to compensate for these variables. Unfortunately, even when using BroCom's' Designer Marble Colors (which have been designed to cover up most of these problems), variables can still be a big problem to the unsuspecting. Every variable needs to be recognized and addressed, otherwise we tend to forget about them or dismiss them

as being relatively unimportant. Forgetting about them can be an expensive mistake.

When your matrix is very “gray” or “tan”, the easiest thing to do to help correct the situation is to simply add more BroCom color to your mix. Our colors contain everything that’s needed, including white. If you use someone else’s color, you might have to “doctor” each batch with a pinch of white or a pinch of something else, and you could end up spending hours making color adjustments and still never end up with exactly the right shade. Why bother?

GENERAL USAGE INFORMATION FOR FIRST TIME USERS

Our colors are “Color Complete” and should require no further formulating or adjustments. If you are already using someone else’s dry pigments, you can switch to our colors and use the same techniques you used before. Using BroCom pigments allows almost anyone to get professional results quickly, but more importantly, they can do it consistently time after time.

We suggest you start by adding one ounce of pigment (by weight) for each ten pounds of MATRIX MIX. If you are using a dirty lot of marble dust or a dark lot of resin, you can help compensate by SATURATING over those dark material changes with more pigment. You will have reached COLOR SATURATION when the natural color of your other raw materials has been “covered up”.

If your matrix mix has a very strong white color, you may have to use more than one ounce of pigment when pouring some of the darker intense colors. **Our colors are not “tints” that rely on the natural color of your matrix mix to be a consistent color.** We have added everything you will need (including white) to get the correct end color shown in our catalog, assuming you add enough pigment to your mix. If you add too much pigment it will normally not change the color of your marble, but once you have managed to cover up the natural color of your matrix adding more pigment is just wasteful.

Problems can occur however, if you do not add enough pigment. This can allow the “dirty” natural color of your raw materials to influence the overall end color, making it dull, gray, and lifeless. Other things besides how much pigment you add can also make a difference. Little things like “how” you add the color are important too. For best results, we recommend that you add our pigment to your MATRIX MIX and not to the resin alone. We feel that by doing this it tends to give more uniform distribution of the pigment throughout the mix. If you already have procedures that require you to add the color to the resin however, you don’t have to change your procedures. Continue to do whatever works for you. BroCom colors are designed to be versatile.

To make it easy..... THINK 1 - 2 - 3

Add 1 ounce (29 gms.) per ten lbs. of matrix mix for LIGHT COLORS (the majority of our stock colors).

Add 2 ounces (58 gms.) per ten lbs. of matrix mix for MEDIUM COLORS (or when your marble dust or resin is darker than normal.)

Add 3 ounces (87 gms.) per ten lbs. of matrix mix for a few select DARK COLORS (Antique Red, Black, Navy and some greens).

You should only add pigment to your mix until you have reached “color saturation”. Color saturation is that magic point where you’ve finally added enough color to your matrix to mask all of the minor variations present in your other raw materials.

BroCom colors disperse so well that they may actually cause problems if you’re not

careful! After using Designer Marble Colors for a while many customers start taking them for granted and begin thinking that they can reduce their mixing cycle even more and save more time. **DON'T MAKE THIS MISTAKE.** Some folks just don't know when to stop and they keep reducing the mixing times until not even BroCom colors have time to disperse. Even though we have synergistically ground, dried and processed our pigments better than anyone else's, dry color particles still require adequate mixing.

Under some really adverse conditions (extreme temperature and/or humidity changes to name just two), you may be required to actually **increase** your mixing time! Also, when adding dry pigments to your mix you should always remember that dry pigments can stick to the sides of your mixer. In fact, anything that has stuck to the sides of the mixer during the mixing cycle stands a good chance of not having been mixed properly. Scrape the sides of your mixer occasionally to get this "stagnant" material into the mixing area, otherwise when you empty the container this unmixed material can "contaminate" the whole batch. It won't make any difference how long you mix the batch if you don't scrape the sides, because the material stuck to the sides will be stagnant and remain undispersed.

Using BroCom dry colors can help make your manufacturing much easier, but dry pigments have their limitations, and BroCom dry colors are not magic. They will not solve all of your manufacturing problems, and in the end, the quality of the finished part can only be controlled by you the marble manufacturer. Your processing methods will dictate the quality of the product you end up with.

BroCom colors are manufactured from the safest and highest quality pigments available and are formulated specifically for use in cast polymer. Aside from being dried and surface treated, our color formulations are ground to a cosmetic grade particle size to assure our customers superior dispersion and wet-out. Using BroCom dry colors can make your marble manufacturing much easier and you can take advantage of the benefits of **REDUCED COLORING COSTS, EXTENDED SHELF LIFE, EASY CLEAN UP,** and the availability of an **UNLIMITED RANGE OF COLORS.** To use any dry pigment effectively however, you must always wet the pigment out **THOROUGHLY AND COMPLETELY** to eliminate any possibility of specks or streaks.

If you are not completely satisfied with the results you get from our colors, simply return the unused portion along with a copy of your invoice showing how much you paid, and BroCom Corporation will cheerfully refund your purchase price.

In the old days, most marble shops started out by adding Titanium Dioxide (white) to their marble mix in order to clean it up. Then, using high strength "raw" tint pigments, they mixed in enough "tint" to achieve the shade and depth of color they were looking for. Using this method, several factors influenced the end color, including how much white was added, whose white you used, whether the color matcher "weighed" everything or used "teaspoons", and what the natural color the matrix was to start with. Considering all these variables it was no wonder that colors had to be "fine tuned" in your shop for every order! Even today many "marble experts" still claim that you can't get consistent results because all the raw materials vary - like different lots of marble dust or different lots of resin. Some of this is true, but a lot of it has been overstated to cover up poor quality control.

You cannot operate without Titanium Dioxide, but we do think that you should examine your usage and discover where you can cut back without affecting your product quality. (One of our customers reported a 90% reduction in his Titanium Dioxide requirements after switching to BroCom colors!) Never automatically add white to your mix but if you do add it, it should always be weighed. Our colors already contain Titanium Dioxide in the proper proportions where it is needed, so adding more white only serves to weaken our colors and then requires you to use more color to try to cover up the extra white.

Finally, we need to make a simple common sense disclaimer. There are literally hundreds of different processing methods in use today, and we simply have no control over our customers mixing procedures. Because of this we cannot accept responsibility for improperly wet out pigment, nor any parts that are rejected because of it. We suggest that you test for undispersed pigment by opening your mixer and smearing a small amount of the mix onto a white piece of paper. If you can see streaks of color the dry pigment has not been wet out enough.

WHEN YOU NEED A CUSTOM COLOR MATCH

Everyone needs a custom color matched every once in a while, and when you do here are a few things you can do to help us achieve the best match possible. We do not charge for color matching, even though we color match hundreds upon hundreds of custom colors every year.

First you must send us a visual example of the color you want. This can be an ink swatch, a piece of cloth, a small piece of marble, or if you have it, a sample of the pigment you are using. When we have a choice we prefer matching to the pigment you are already using although we understand that this isn't always possible. If you can send us pigment, give us at least a heaping tablespoon full. We can sometimes match to as little as one gram of pigment, but why take the chance, because if we can't you have wasted a lot of time, and we must then wait for you to send us a better sample.

Sometimes if you are in a hurry, a "quick" match can be arrived at by choosing the color you need from the Wilsonart[®] laminate series. Wilsonart[®] chips are available all across the country and we keep a complete set in our lab. If you can find a Wilsonart[®] laminate chip that matches the color you need, all you have to do is call us with their color number and we can get right to work on it! We have most of their colors already matched and on file. We also have most of Formica's[®], Corian's[®], and Nevamar's[®] colors matched. We try to anticipate our customers needs.

BroCom has the latest computerized color matching equipment and can formulate a new color in under five seconds. To achieve this speed however, we need a spot on your part 3/8" in diameter to get a color reading from. If you have to send us a piece of marble, make sure you send a part with a 3/8" "spot" of pure color on it somewhere and circle the spot you want us to match.

Matching cloth, paper swatches, or pigment is pretty straight forward and doesn't require any detailed explanations. Just put the swatch in an envelope and mail it to us with a short note telling us how much color you need.

Whenever possible, we like to be allowed to keep the color standards you send us. If a problem arises we then have a visual standard to refer to.

After we have a computer formula, we weigh up a small batch, grind it, and test it again. (We can lose almost one half pound during grinding). Then if the formula yields the color we expect, we package up the remaining pigment and send it to you, at an average cost of \$7.50/lb. (Some deep pure colors like Emerald Green can run twice that much, but are still much cheaper than the cost of doing it yourself.) We guarantee the color will match or you can return the pigment to us for a refund.

Chances are that your present supplier isn't interested in color matching a one pound order for you, because he would undoubtedly lose money on the deal. We can say that with a certain amount of confidence because we do a lot of one pound orders and we lose

money on every one. The reason we continue to offer this service is because we know Designer Marble Colors are the best colors you can buy. We convert skeptics into new customers by getting them to test us with a custom color match. After they try our colors and see how well they work they start placing regular orders, and that's what it's all about. We're not afraid to let our color speak for itself.

JUDGING COLORS UNDER DIFFERENT LIGHT SOURCES

Colors sometimes look different when viewed under different lights because of the pigments that are used in their manufacture. This strange phenomenon is called “metamerism”.

When making Cultured Marble, you usually have to match the color of your customers existing porcelain fixtures, and as you read, porcelain fixtures are colored using high heat pigments capable of standing up to over 1000 degrees Fahrenheit. We don't use those type of pigments because they are weak, expensive, and sometimes even toxic!

Since we can't use the same type of raw pigments that are in the porcelain parts it's sometimes hard to get a marble color to duplicate a porcelain color under every lighting condition. Fluorescent lights tend to bring out the blue in a color, while regular incandescent light bulbs emphasize any red undertones. Most things in life are a compromise, and the easiest solution to overcoming metamerism is to color match the marble part under the same lighting conditions that the finished part will be viewed under!

Remember that the lights in your shop where you make the marble are probably fluorescent, while your customer will probably be looking at the part under incandescent lighting. This variable is important to keep in mind when making color decisions.

SHOULD YOU USE PASTE COLORS OR DRY PIGMENTS ?

To understand the problems you can expect to run into when coloring marble with either type, we should examine the conditions under which each type of color is used. First, however, you must understand that the majority of marble shops are specialists who routinely “handcraft” individual pieces for their customers. Most shops are not high volume manufacturers and much of the appeal of cultured marble stems from the fact that customers can get special custom parts that they can’t get elsewhere.

As a rule, paste colors offer the best pigment wet-out possible. That’s the single biggest difference between paste colors and normal dry colors. It costs a lot of money to wet-out and disperse pigments into a paste carrier but how much pigment dispersion do you really need to color marble? For most shops, paste colors are simply over-kill.

To begin with, paste colors are just dry pigments that have been mixed with a liquid resin carrier and made into a thick paste. Pastes can cost up to eight times as much as dry color because they’re expensive to produce. It’s almost always less expensive for the average marble shop to just use dry pigment to start with.

Because you end having to pay unusually high prices for smaller quantities (if you can even buy small quantities), when you use paste colors you’ll frequently end up doing a lot of your own color matching. If you want your paste supplier to formulate a custom color match for you, they can do it, but they want you to order minimum quantities to make it worth their while. It’s expensive to make pastes. Most marble shops can’t justify the lead time required or the added cost of using custom matched paste colors, so they end up buying five or six basic colors and they use them to mix their own custom colors in house. Unfortunately, buying even minimum quantities of five or six primary colors is still a big investment.

If you plan on using paste colors you should make sure that you only order as much as you can use right away, since paste colors can gel and harden as they get old. By comparison, dry pigment have an almost unlimited shelf life. Some of our customers are still using dry pigments that they ordered ten years ago!

Also, trying to use “old” paste colors to color match with can turn color matching into a real nightmare. That’s because the pigment that was mixed into the liquid carrier will gradually settle to the bottom of the can. Obviously any paste taken from the top of the can will contain less and less pigment over time, and your perfectly tuned formulas eventually won’t be worth the paper they’re written on! All you can do at this point is experiment with the proportions until you discover the proper amount to add to your mix - at a labor cost as high as twenty-five cents or more per minute!

Yes, case studies have shown that labor costs can easily run as high as twenty-five cents PER MINUTE to do your own color matching, with an average color match taking at least thirty minutes to complete. Several of our customers who have switched from paste colors to dry colors claim they are now saving more on labor than they spend for the dry color. They tell us that’s like getting the color for free!

A few of our customers have also told us that some paste and liquid colors they have tried can't even be catalyzed, (due to the liquid carrier the supplier used), and any heavy solid veining done with them results in a soft spot under the gel coat. They say that you can actually push the spot in with your thumb nail! If you're using paste colors in your shop now, try catalyzing a small amount of the paste by itself to see if you could ever have this problem.

If you are a large marble shop and you can get away with only offering two or three basic colors, using paste colors could have some advantages. Most of our customers however, aren't in a position to produce only two or three colors, and they have to deal with a lot of different color requests. Paste colors are great for coloring gel coats but just aren't economical as the primary coloring method for most marble shops, and no amount of advertising by paste manufacturers is going to change that.

Five important (and often ignored) costs of using pastes compared to those of using dry colors.

1. Pastes are more expensive per pound than dry colors even though pastes may only contain 50% pigment or less.
2. When using pastes you will frequently end up having to do your own color matching, which increases your labor costs significantly.
3. Establishing an inventory of paste colors to color match with usually requires a pretty big up-front investment.
4. Pastes have a limited shelf life and can gel over time. If they sit on your shelf long enough the pigments will also settle to the bottom of the can, leaving the weaker paste on top (where you dip from). This can make your carefully documented color formulas unpredictable and they will become more difficult to duplicate as time goes along.
5. Heavy solid veining with pastes can sometimes cause under catalyzed soft spots in your parts that you can actually push in with your finger nail. Most pastes can't be catalyzed because of the carrier resin that's used. Pastes are designed to be completely dispersed in gel coats, not used in heavy solid veining for marble.

THE IMPORTANCE OF HAVING YOUR OWN QUALITY CONTROL PROGRAM

Quality control is the most important single function in manufacturing. Aside from the fact that your reputation rests on the quality of your product, there are serious financial factors that must be considered. I would like to use a simple example to illustrate the importance of good quality control.

Let's assume that your company makes and sells 100 vanity tops to a local builder for \$50 each. (OK, don't laugh, these figures are just for comparison – they don't have to be current!) When you produce this \$5,000 order the raw materials cost you \$2,500 while your labor and other overhead cost you another \$1,000. Total expenses to produce the order comes to \$3,500 which leaves your company with a 33% "profit" of \$1,500 which doesn't sound too bad.

Unfortunately your color match turns out to be "a little off" and the builder rejects the order. He returns the tops to you - freight collect - and wants his \$5,000 back. You've already spent \$3,500 of the money producing the parts, the return freight costs you another \$200, and you now only have \$1,300 left. Where do you get the rest of the money?

Simple. All you have to do is sell another \$11,000 of marble at a 33% profit margin to break even. Added together with the initial order, you will have had to produce \$16,000 worth of marble just to break even on the \$5,000 order you failed to adequately quality control. Sadly, you will also have lost a very good customer who is now going to tell everyone he knows about the poor quality of your work. Suddenly the importance of good quality control becomes abundantly clear. ***Refunds always come out of your net profits and it's always less expensive to spend money on quality control than to refund money to the customer.***

As a rule, overall quality has improved a lot in our industry over the last five years. Raw materials have gotten better and our products have gotten better along with them. It's a fact of the free market system however that any time demand becomes greater than (or even as great as) the supply, "wide spec" material suddenly disappears from the market place. Do raw material manufacturers have the ability to simply stop making "marginally acceptable" product or is the demand for their product so great that they can sell their wide spec material at regular prices and get away with it? We think you know the answer to that one.

Folgers[®] ran a coffee commercial twenty years ago that we can still remember today. It opened with a well dressed man standing on the shipping dock of a large warehouse. He had a clipboard in his hand and as he turned to address the camera he said something like this: "Folgers[®] has always made the very best coffee in the world, and everyone at Folgers[®] takes this responsibility very seriously. Our quality control department tests thousands of tons of coffee beans every year, looking for those exceptional coffee beans that will yield the best flavor, aroma and freshness. Not all beans meet our rigid requirements, and last year we rejected over 500 tons of inferior coffee beans!" At this point he peers into the camera over his reading glasses and says: "**And our suppliers**

sold those beans to someone else.”

It's a sad fact of life that marginally acceptable raw materials aren't removed from the market place - they're just "sold to someone else".

At BroCom Corporation we stand behind our color and we print **a money back guarantee** on every container of color we sell. Does *your* color supplier do that, or are you just "someone else" to them?

BASIC COLOR TOOLS EVERY SHOP NEEDS

1. A board of color standards to hang in the mixing area.
2. Proper lighting to duplicate your customers home.
3. A scale to weigh pigments.
4. Information brochures explaining color.
5. Marble samples your customers can take home and examine.
6. A BroCom color catalog in your showroom (and maybe even a BroCom catalog for each builder you do business with). One of our customers in the Northeast has already handed out over two hundred of our catalogs to the builders in his area. He sees them as inexpensive sales aids that work for him twenty-four hours a day.

COLORING DENSIFIED MATERIALS WITH BROCOM 'S "ATH" COLORS

A new day is dawning on the Cultured Marble Industry, and BroCom Corporation is proud to be a part of it. When "Densified" solid surface processing became commercially feasible, marble shops discovered that normal dry colors weren't the best choice for coloring these materials. Predispersed paste color seemed to be the only immediate solution in spite of it's high cost. As a dry color manufacturer we were soon asking ourselves "why can't we engineer dry pigments to work in these applications?"

We knew that pigments tended to agglomerate when they contained high percentages of moisture and we knew that drying the pigment reduced lumping and specking significantly. Our lab had been repeatedly improving the dispersion of our dry pigments since 1985. Regular Cultured Marble contains approximately 70% calcium carbonate filler, (commonly called "marble dust"), but Densified products don't use calcium carbonate as a filler. That's because calcium carbonate can "stain" when it comes into contact with the wrong substances, and without a gel coat surface to seal it completely, this staining could become a serious problem when used to manufacture products like kitchen counter tops. Normal marble dry colors shouldn't be used in Densified Materials since most dry colors designed for cultured marble do contain small amounts of calcium carbonate. While these small amounts probably aren't significant enough to stain and show up as a surface defect in your finished parts, can you really afford to take that chance? Our special "ATH" series of colors contain no calcium carbonate.

Unlike Cultured Marble, Densified Material is blended in a vacuum mixing pot which is designed to draw off all the microscopic air bubbles in the mix. Removing all the air pockets makes the resulting material much more "dense", and that's where the name "Densified Material" comes from. Densified Material can contain 45% resin, and requires the use of a clean white filler with a fine particle size. ATH meets these requirements. The letters "ATH" stand for alumina trihydrate, a powdered material that's a by-product produced during the manufacture of aluminum. Due to the Densified mix's unusually thin viscosity and high percentage of catalyst, normal dry colors can't be broken down and dispersed in the Densified mixture. There just isn't enough time before the mix starts to set up. Our new "ATH" surface coating solves this problem.

How well does our new "ATH" surface coating technology work? You can see for yourself by trying to stir a teaspoon of regular dry pigment into a glass of water and then trying to do the same with our new "ATH" dry pigments. Normal raw pigment "wets out" immediately and sinks to the bottom of the glass, coloring the water. By comparison, no matter how hard you stir our new "ATH" pigments, they will continue to float on top, repelling the water and remaining completely dry. Obviously our surface treated pigments will stay dry for a long, long time.

If your company produces "Densified" Materials, or plans to do so in the future, then you need to try BroCom's new "ATH" dry color line. And, if your shop makes both Densified products and regular Cultured Marble you'll be glad to know that BroCom's ATH colors can be used in both product lines! This makes our ATH color series very versatile.

What colors are available for Densified? Almost any color you can imagine! However, while the selection of color is a highly personal decision, customers should be given as much guidance as possible about selecting “appropriate” colors for a Densified product. They should be warned about the additional maintenance required to keep dark colors looking their best since surface scratches are going to show up more readily on dark backgrounds than on light colored backgrounds. Haven’t you ever wondered why DuPont[®] only offered their Corian[®] in a limited range of light pastel colors? Could it be that they discovered that light colors wouldn’t show scratches as easily as dark colors? They reduced complaints by not offering their customers dark colors.

Just because you can get a Deep Jade Green “ATH” color from BroCom doesn’t mean that it’s always a smart business decision to offer that color in your Densified line. Even though your customer might think Deep Jade Green is a great color, wait until he gets the first scratch in it!

Instead of our usual “A” prefix on our formulas, the Densified color formulas use an “ATH” prefix so they can be easily identified. For example, our match for Eljer’s Dusty Rose in Cultured Marble is A-519 Dusty Rose. If you wanted that same color in Densified, you would order our ATH-2595 Dusty Rose. Any of our colors can now be ordered in “ATH” for Densified Materials.

Actually, our industries ability to duplicate standard densified colors may be too good! DuPont[®] recently charged that in several cases their Corian[®] product line had been illegally replaced with substitute materials by some of their dealers. (Of course, the fact that anyone got away with it at all establishes the role that color plays as being the main deciding factor for most products. If it hadn’t looked exactly like Corian[®] the dealers would never have been able to substitute it.) In fact, the substitution was only discovered when a customer complained about some other technical problem. DuPont[®] investigators were the only ones able to actually uncover what had taken place. We don’t advocate doing business that way, but it does make a point about the importance of color.....

PIGMENTS AND SAFETY

Pigments are just pretty chemicals, but don't just take our word for this - read the material safety data sheet on the colors you are now using. Do you recognize what type of chemicals are used in them? Are these chemicals potentially harmful to you or your employees? The law says that you must know the answer to these questions, and it is these type of potential problems that should be addressed when selecting a color supplier. Either you or your color supplier must be aware of these problems and take responsibility for them. Unfortunately, most color suppliers avoid this type of responsibility like the plague.

Some chemicals are worse than others, but when selecting colors, the consensus is that Lead pigments should always be avoided. According to the government, they are toxic! The Federal Lead Standard (1910.1025), (yes they wrote a standard specifically for Lead), clearly explains what an employer must do if he exposes his workers to Lead in the work place.

You must collect at least a seven hour air sample for each different job classification on each shift, to ensure that employees are not exposed to more than thirty micrograms of Lead per cubic meter of air, averaged over an eight hour period. For a work area 25 feet long by 25 feet wide, and 12 feet high, the permissible amount of Lead allowed in this space within any eight hour period would be an amount about the size of the period at the end of this sentence. (Not a literal technical description.)

The law says that you must post illuminated signs in the work place that state: **WARNING, LEAD WORK AREA, POISON, NO SMOKING OR EATING.**

If your work place exceeds the legal levels, you must supply your employees with adequate respirators, a "clean" room to change clothes in, uniforms and other protective clothing, and you must also supply laundering (or disposal) of these protective items. (Note: In most areas it is even illegal to run "Lead contaminated" wash water down the drain).

You must also ensure that exposed employees take a mandatory shower at the end of their work shift, and you must provide them with a lunchroom that is not only temperature controlled, but it must also have a filtered "positive pressure" air supply, and employees cannot be allowed to wear "Lead contaminated" work clothes into that lunchroom. (Considering these requirements, one can only assume that these workers would have to change clothes before they could even eat lunch.)

You must also run blood Lead level tests every six months. If an excessive amount of Lead is found to be present in their blood, you must continue to test them every two months thereafter, and notify them in writing of the results. Exposure monitoring and medical test records must be kept on file for 40 years.

If you want to know if any of the colors you have used in the past (or are now using) contain Lead pigments, look at the Material Safety Data Sheet they sent you. Your

supplier may have also noted it on the label of their container.

Unfortunately, if you are using old Lead pigments, you could be exposing your company to possible fines and penalties. Under penalty changes approved by Congress in 1990, the cap for serious and non-serious OSHA violations zoomed from \$1,000 to \$7,000 per violation. For repeat or “willful” violations, OSHA can now hand out maximum fines of up to \$70,000 per violation!

Is there an easy answer to this serious problem? You bet there is - use BroCom Designer Marble Colors. They have unconditionally, absolutely, positively ***never*** contained Lead pigments - and never will. It has always been our goal to manufacture the safest colors in the industry and we wouldn't purposely use anything that might constitute a health hazard to the people using it. We don't expose our employees to these hazards and we won't expose your employees to them either. We're professionals.

Unfortunately, for years and years the leading color supplier for marble routinely used Lead pigments in their formulas, and thousands of old containers of their pigment are undoubtedly still sitting on the shelves of marble shops all over the country. If OSHA becomes aware that you have these Lead pigments in your shop, they may want to investigate your employees Lead exposure in depth. The situation is sort of a “catch 22”. While it is not yet illegal to use Lead pigments, it is practically impossible to meet OSHA's exposure requirements.

Do you have any old Lead pigments in your shop? If you want to find out, start looking where the OSHA inspector would look - by reading labels. You could have problems if your old color containers are labeled “FOR INDUSTRIAL USE ONLY - MAY CONTAIN LEAD”.

If you are inspected by OSHA you must be able to prove to the inspector that the container doesn't contain Lead. How? Well, the Material Safety Data Sheet for that product must list the toxic ingredients. If you no longer have the Material Safety Data Sheet, request another one from the supplier who sold you the color in the first place. (If you call them they have to send you one by law.) Unfortunately there's more bad news. You should also know that if the container actually does contain Lead pigments, you can't just throw it away. Lead must be disposed of in a regulated land fill. If you want to get rid of it, the safest thing to do is to try to get your supplier to take it back. This would be a good time to see if he will stand behind his product.

You can find out more about the negative aspects of Lead by contacting your local OSHA office and asking them for a copy of the Federal Lead Standard 1910.1025.

COMMON COLORING TECHNIQUES

Veining:

With normal cultured marble it is possible to add the catalyst to the matrix mix, then mix in the background color, and then add the veining colors, all before the mix sets up.

To achieve uniform catalyzation of both the matrix and the veining, you can remove some matrix from your mixer right after you've added catalyst and before you've added any background color. You can then use this as yet uncolored matrix for producing color veining. Simply take it and mix in whatever dry color you want your veining to be. Using this method will help eliminate "orange peel" or secondary shrinkage where heavy veining is needed.

Generally speaking, the mix for most veining or accent colors should be as thick or thicker than the background matrix so "bleeding out" doesn't occur. If you want a SHARP and defined edge to the veining color, your veining material can be thickened up with a little cab-o-sil. If your veining material is thicker than the rest of your mix it won't bleed into your background color as easily.

Generally, a sharp detailed accent is preferred because colors that "bleed out" into the background color usually have no character. Even white on white or any other light color background with light color veining is prettier when it shows a sharp edge.

On the other hand, if you want a SOFT color edge, thin your veining mix. A thinner mix will bleed into the rest of the matrix and produce a "whisper" color edge.

Paper transfer method:

This technique can be used to duplicate exotic patterns and to get precise swirls or layered colors where normal color mixing techniques might not work consistently.

This procedure involves using wax paper and manually placing colored matrix on it's surface in order to visually design the pattern you want. The matrix on the paper should be built up to approximately 1/4" thick.

When you have "decorated" the surface of the wax paper with the pattern you want, simply turn the paper over and transfer the matrix to the gel coated surface of the mold. Press down on the back of the waxed paper to make sure that the pattern and colors have completely transferred to the gel coated surface.

Because you need around 1/4" of matrix on the paper, it would be wise to reinforce the wax paper with masking tape. Apply masking tape length wise and width wise, criss crossing the back to give the waxed paper added strength.

Flat slabs, panels, and even integral bowls can be done this way. Sometimes two employees are required to turn over the larger sheets of paper and sometimes using a support under the middle of the sheet is also necessary. In any event, the papers should be turned over quickly so that the patterns and colors don't run and sag.

Using undispersed dry pigment.

Some shops create interesting and strikingly visual color veins by sprinkling dry pigments onto the gel coated surface and pouring background colored matrix in behind it. This can be done in conjunction with conventional veining.

Regardless of the methods used, don't forget what the objective is. The color patterns in cultured marble should be a "reflection" of the color patterns in real marble - with all it's subtle differences.

THE TOP THREE MOST OFTEN ASKED COLOR QUESTIONS

Color is the first thing your customer sees when they look at your product and when used correctly it can save you a lot of time, money and headaches. We talk to hundreds of marble manufacturers and we find that the problems they complain about are common among marble manufacturers from coast to coast.

In this industry coloring methods are as diverse and individual as formulas for matrix mix. You have numerous choices of resin, marble dust, catalyzers and color. We're not here to tell you how to make marble, especially since many of you are seasoned veterans and you've survived the days when almost every material you bought changed almost weekly. *Color* is our business, and we're here to give you the answers to common color problems that we're asked about all the time.

As you know, every raw material you use already has it's own natural color. The color of some raw materials simply disappear when you start mixing, while some are destined to become a part of your end product. Make sure that your production department remembers that when they start producing an order - because that's the first step to good quality control.

Here are the questions we're most frequently asked:

WHY DOES THE COLOR SOMETIMES SEEM LIGHT OR WEAK..... Titanium Dioxide may have been added to try and clean up a dirty lot of marble dust. Throwing in Titanium Dioxide will weaken any color pigments you add later, making the end color appear too light or weak. Try adding more color instead of Titanium Dioxide. Designer Marble Colors will do a better job of covering up dark marble dust and can save you money in the long run.

When the color of your matrix is a bright clean white and you are pouring one of those intense darker colors, you may also have to add more color - not less. If you don't, the clean white color of your matrix can make a darker color appear "washed out". Most people believe that just because a pigment is dark it's also strong. Actually one has little to do with the other. The pigments needed to formulate most dark colors are usually organic and are light and fluffy. If you filled a measuring cup with one of these dark pigments, it would actually take less pigment by weight to fill the cup, so in truth you really have less pigment in your cup compared to normal colors. A cup of Titanium Dioxide will actually weigh a lot more than an equal size cup of almost any dark color. If you use "cup" measurements you can frequently end up with a lighter version of the desired color than you expected.

WHY DOES THE END COLOR APPEAR TO BE DULL, GRAY, GREEN, BROWNISH, OR TOO DARK..... This generally happens when the natural color of the matrix hasn't been completely covered up. The gray or brown undertone could be the natural color of the matrix influencing the end color. Coloring matrix is a lot like painting a wall. If the wall is already a dark color you'll need several coats of paint to cover it over completely. By comparison, when your matrix already has a stronger than

normal color of it's own, you have to add more pigment to cover it up. We call this "saturation coloring". It's the best approach to use when coloring cast polymer products, otherwise you'll waste more money in time and labor than you spend on the color. Saturation coloring isn't a miracle worker, but it has saved a lot of jobs for our customers when conditions unexpectedly change.

WHY DO YOU SEE FLAIRS OR STREAKS, AND THE COLORS AREN'T UNIFORM..... This can happen when the sides of the mixer are not scraped and pigments on the sides aren't allowed to "wet out". Remember that dry pigments have many advantages - the top two being price and versatility - but you must remember to "WET OUT" dry pigment. We've lowered the required mixing time for our colors by using a special grinding process and by adding a special surface treatment to the pigment. Because our pigments disperse so easily customers may periodically get over confident and reduce their mixing time too much. Also, remember that increased mixing time may be required for extreme temperature changes or sudden increases in humidity.

Every so often odd problems rear their ugly head, like the case of the inexpensive Titanium Dioxide that was being imported from Europe. It ended up increasing catalyzation time because it was full of impurities. There was also a problem with marble dust that was making the end color of the marble come out with a yellowish cast, even when yellow didn't exist in the formula. With proper research and good customer communication, the answers to problems like these can usually be found and bad parts can be avoided. Good communication between suppliers and their customers can only help our industry grow.

Problems can also occur when you insist on using old "out of date methods" such as using unprocessed raw pigments, using **water based paint colors** which don't disperse easily and can destroy the physical properties of your finished product, and using Titanium Dioxide that's full of moisture.

At one time you were routinely expected to add a little here, take some out there and hope for consistency. What you actually wound up doing was chasing your tail and spending more on labor than you ever realized. To top it off, after all this extra work the best you could hope for was that your customer would accept the variations. If anyone is still using any of these out of date methods ask yourself whether or not this is really the best you can do. These methods are still costing you time and money, not to mention the headaches and stress.

The single most important thing we can recommend is to **WEIGH ALL YOUR PIGMENTS**. If you can't convince your production crew to use gram scales and you have to keep your spoons and cups, at least realize when you need to add more pigment. Volume measurements are very deceptive and can hurt the consistency of your end product. Add color until it matches the color "standard" in your color catalog and then record exactly how many cups or spoons it took.

WHY DRY PIGMENTS MAY SOMETIMES LOOK DIFFERENT AFTER THEY'VE BEEN DRIED.

From time to time we get a call from someone who has just opened up a carton of our pigment and noticed that it doesn't look exactly like the pigment in the carton they just finished using. Here's the main reason why these dry powders sometimes look different.

When we dry our colors, the raw pigments we start with all contain differing amounts of moisture. Every lot is different, and when we find that a raw pigment contains a lot of moisture, that pigment has to be dried longer than usual. This intense drying process can sometimes affect the way light is refracted off the surface of the pigment, which can make it look different than an identical formula that didn't have to be dried as long.

Tests have shown, however, that as soon as that pigment is wet out in the matrix it will perform as expected and give you the correct color values. We do not discourage our customers from calling us when they notice something different - we applaud them! This is what Quality Control is all about!

LOOKING AHEAD.....

Are we doomed to be simple “accessory” manufacturers forever? One company that we know of has said **NO!** and has done something rather unique about the problem. They’ve figured out how to take a white “top of the line” Eljer[®] toilet and encase the outside in a thin layer of marble. Since this doesn’t affect the interior working parts of the toilet it’s still covered by Eljer’s[®] standard guarantee, and the bowls white porcelain interior can be cleaned with regular abrasive cleaners without having to worry about damaging it. Of course, the main point here is that since it’s actually an Eljer[®] toilet the marble shop isn’t responsible for it’s “operation”, just it’s appearance. The “engineering” problems are all Eljers[®] !

Since this marble shops customers can now get **all** their fixtures in custom marble, they’re no longer limited to buying marble that’s the same color as their existing porcelain toilet, and the marble shop is no longer limited to supplying the same old conventional bathroom colors!

A new bathroom (which can be a multi-thousand dollar job) can now be offered in any color scheme the customer wants, which is as it should be! Just think about the implications of this. Using this “hybrid” approach you could begin manufacturing and selling **complete bathrooms** in any color or pattern your customers wanted, and after all, isn’t this what entrepreneurs like us do best?

You could eventually forget about having to match Kohler[®] or American Standard[®] colors and you could start promoting your own custom colors and designs. When you stop to think about it, it’s just this type of innovative thinking that has always set us apart from our competitors.....