

## The marble and granite resin process: How and why

Natural stone comes in many different colors, shapes and textures. A lot of these materials unfortunately have natural defects, mostly fractures and superficial holes and pits. In the quarry, the ever-evolving extraction technology has reduced the number of damaged or completely destroyed blocks, leaving the major repair burden to the polishing phase.

Besides the logical tendency to save as many slabs as possible, there are also other different reasons why the technology evolved for stone enhancement and repair. The main reasons include the following:

- Several materials are naturally fractured and could not otherwise be sold or marketed even if they are superior in terms of color, durability and other qualities.
- There is a growing tendency in producing thinner slabs to reduce transportation costs and open up new markets and different stone uses.
- The waste from manufacturing slabs of particular materials (especially some marbles) could represent 35 to 40% of production, thus considerably increasing the cost of the remaining slabs.
- Many different kinds of granites have natural micro-fissures that compromise the final polished effect, thus reducing the beauty of the material.
- There are materials just too fragile to be polished, leaving no solution but to close down quarries.
- Some granites have fissures that pass through the slab and considerably decrease the strength of the slabs and pose an hazard when used as outside paneling.
- Limited reserves of a particular color of stone leave only the worst and more damaged veins to be quarried.

### Different solutions for different materials

In marble polishing, the use of polyester resin to fill and reinforce the slabs has been an accepted solution for over 50 years. All the travertine and a great number of marbles are nowadays filled with either polyester resin or cement. Those fillers are mainly used for aesthetic effects and to avoid open holes in the surface of the material.

The more fragile marbles have also a reinforced backing support, usually in a form of a fiberglass mesh. This solution gives a strong and durable surface for transportation purposes and to avoid breakage. In this process, the main material used with the net is a polyester resin. Although not a very strong glue, polyester resin in marble is still the method of choice, mainly to reduce costs (and it still has sufficient bonding strength due to the relatively soft and porous substance of the marble).

The polyester resin has also the added value of fast drying time, making it a perfect solution for automatic line manufacturing.

Nowadays there are many different kinds of polyester resins, with different viscosity, color and hardening times. Some resins have even the capability of UV hardening, allowing a very fast curing time.

Generally, the systems commonly used in marble processing are not satisfactory for granite processing lines. The main reasons for this lie in the different chemical structures of the two materials. Granite is much harder, with microscopic fissures and a different absorption rate. The very thin cracks represent an additional problem, since no polyester resin would have the capability to deeply penetrate in the stone, harden up and give a sufficient strength to the material.

About 20 years ago, after some unsuccessful trials with polyester and acrylic products, a new family of products was tested. Using materials with optimum adhesion (epoxy systems) on granite, the typical problems were resolved and a new technology was developed.

The epoxy resin has shown the capability to run into each of the cracks and fill all of the pits and micro-fissures present in the granite. Additionally, its long hardening time allows the glue to penetrate deeply into the stone before the complete curing will occur.

This very durable and extremely elastic family of glues can also follow the different thermal expansion of the granite, leaving the treated product capable of sustaining a wide array of temperatures, making it suitable for inside and outside usage. They also provide a solution when there is a need to glue the granite slab to another material (aluminum honeycomb, glass or steel).

The extremely high strength of the glue helps to fix any structural defects, giving the slab a very strong and durable finish.

### **How is it applied and how does it work?**

Before being treated, the surface of a granite slab has to be honed; to allow the surface of the material to evenly absorb the resin. The material also needs to be completely clean and dry, so the resin can deeply penetrate in the smallest cracks of the surface.

This process requires special convection ovens or two to three days in favorable dry working conditions. After being mixed in the right ratio (either using a scale or an automatic mixing dispenser), the resin is then spread on the whole surface.

Nowadays, there are hundreds of different epoxy systems for granite, with different physical characteristics. The right system is always chosen in relation to the color of the granite, the machinery available and the desired results to be obtained.

After the system is completely cured (usually it takes up to 24 hours, depending on the system and the equipment used) the slab is ready to be polished.

During the polishing process, the first steps are focused on removing all excess resin poured on top of the slab, leaving only the resin that has filled into the cracks or the pits. In this way, the epoxy resin will not form a film on top of the granite, and it will be present only in the interspaces and in the micro-fissures.

One of the first noticeable affects of the resin is a darkening effect on the whole surface of the slab. This is due to the effect of the resin on the quartz itself. This byproduct enhances the color of the slab and allows for a better polishing effect as a final result. On lighter materials, and when this effect is not desired, the application of special epoxy systems allows the material to maintain its color.

## **Common problems and issues**

One of the first questions that comes with a resin-cured granite slab is how to match the color between the "darkened" surface of the slab and the subsequent polished edge of a finished product (like a kitchen countertop).

There are special products on the market for enhancing the color of granite and marble. Applying these products will allow you to permanently match the two colors with one application. Beware, though, of easy solutions such as mineral oil or a cheap color enhancer. These products will solve the problem only momentarily, eventually leaving the customers dissatisfied in the long run.

Another issue is the durability of the process. The epoxy resin was invented in the early 1940s to develop a strong and durable product in the aeronautical engineering. The historical data available today refers only to that particular branch of the industry, while in the stone industry there are only laboratory tests to support the long-term effect and durability. So far, none of these tests have proven that the system cannot last for a long time.

Another question is whether the epoxy resin is safe for kitchen countertop surfaces, and whether they will be damaged if a homeowner were to place a hot item on the surface. The answer is that the resin materials used must comply with the latest FDA rules for food contact. As far as high temperature goes, the epoxy system has the tendency to soften up in presence of high temperatures. However, unless there is a particularly large hole that was repaired with the epoxy system, the small fractures are not affected by the local application of heat. Even if there is a large patch of epoxy glue visible, it will go back to its original status as soon as the temperature goes back down to a normal level.

## **Conclusions**

Although the epoxy resining of the granite slabs has been scrutinized by the "purists" in this business, it has grown now to a point where it is not only accepted by the majority of the operators,

but often required in a lot of materials. The resin has the double effect of assuring the strength of the slabs and providing a clean feeling of touch to the homeowners and other end final users.

Technology has recently improved the quality of these systems, ensuring a better natural product at a marginal cost in the final outcome. And as a result, some of the world's most beautiful granites are available on a larger scale and at a reduced cost, allowing the stone industry to deal with quality products virtually free of defect.