

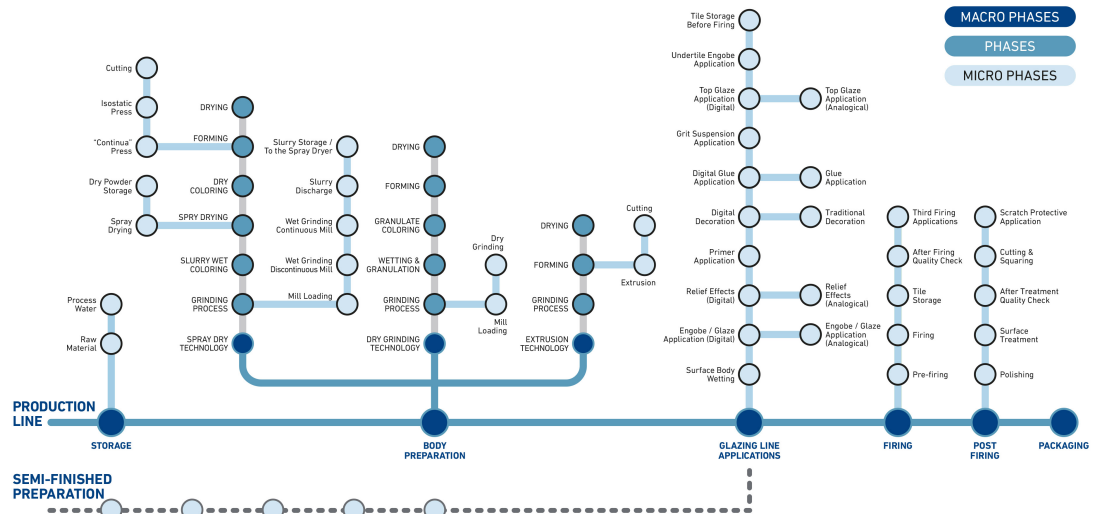


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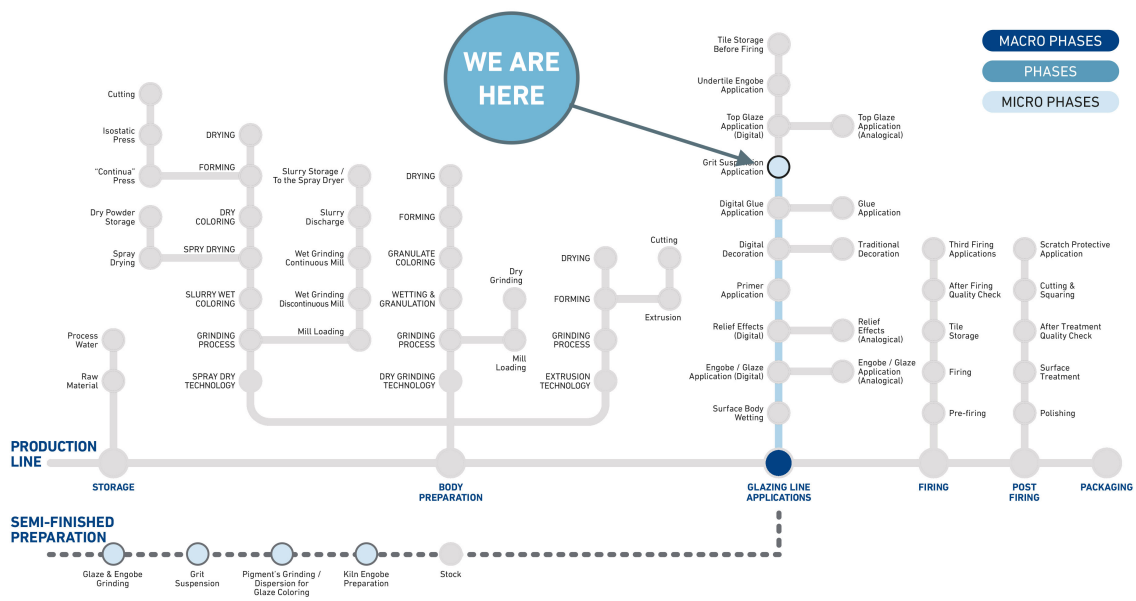
APPARENTLY INVISIBLE YET CONSTANTLY PRESENT

At every stage of the ceramic production process

A journey through problems & solutions



#11 DRY ANALOGICAL APPLICATION OF GRIT (GRANICER 6000)





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1. INTRODUCTION

The **dry application system of grit** is a mode of the ceramic production process that companies are looking at with increasing attention and that somehow has already found its circulation thanks to the wide use of digital systems that focus not only on the application of inks but also on the application of digital glues that necessarily foresee a subsequent dry application of grits.

Digital technology aside, this application can also be realized by means of traditional analogical systems, developing, in general, through three steps:

1. **Glue application** by means of spray system
2. **Grit application** by means of shot blasting machine
3. **Low weight grit application** by means of spray system (cover & final fixing)



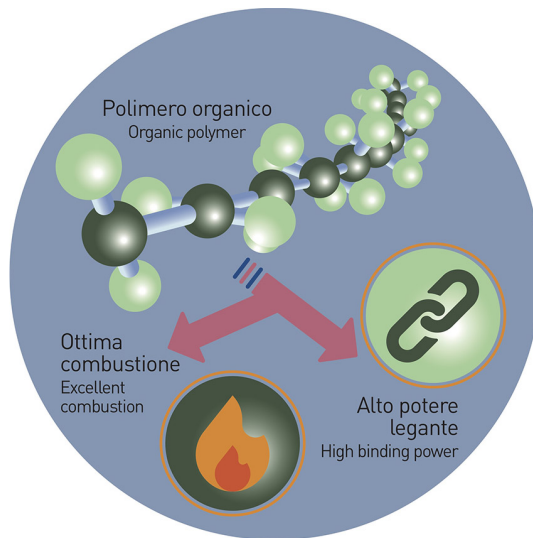
2. GLUE'S MAIN FEATURES

Compared to binders usually used for slurries and so for wet application systems, what are the main features of the glue used within this different process?



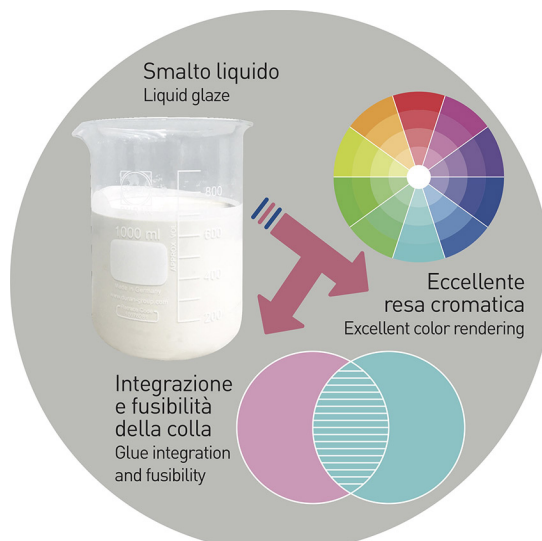
ORGANIC POLYMERS

These glues are usually based on **organic polymers** capable of effectively **fixing** the grit to the ceramic support. The polymers essentially create a cross-linking by chemically bonding themselves to the substrate, to the grit and binding together, at the same time, the grains of the grit. They are also designed to reach an excellent combustion during the firing process; this means that the formulation has been properly developed to delay the beginning of the combustion process inside the kiln so to produce a lower amount of semi-combusted products.



THE LIQUID GLAZE

Since in ceramic production the experience in field is very important, the application has been optimized over time by adding to the glue an amount of **liquid glaze** specifically designed to get an excellent performance in terms of **digital color rendering** and at the same time to promote a perfect **integration and fusibility** of the glue on the ceramic support that in turn produces a perfect leveling and a proper laying of the glass ceramic during firing.





FINAL COVERING GLUE: THE ROLE OF THE LIQUID GLAZE

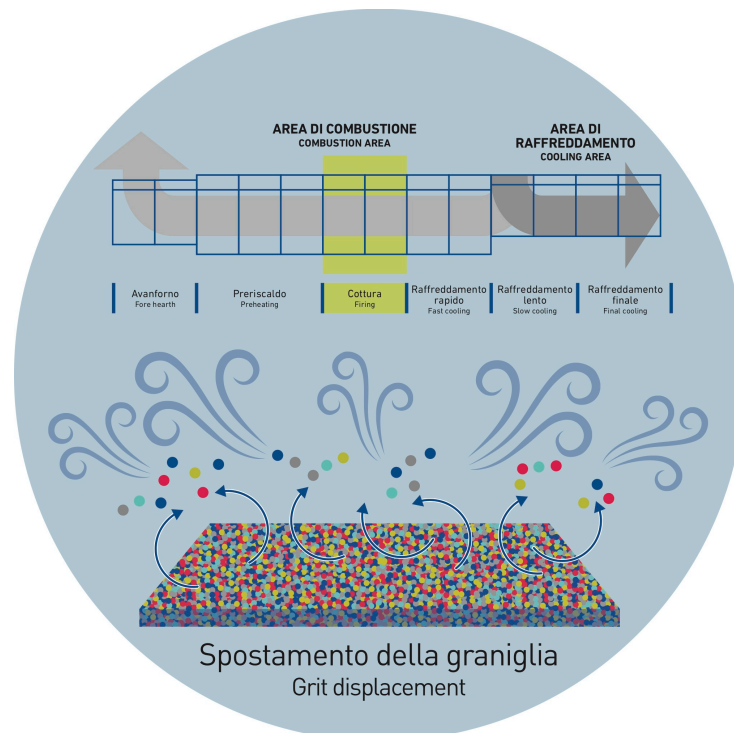
Liquid glaze also plays an important role within the glue applied (low weight) on top of the grit before the ceramic enters the kiln.

This expedient is important to avoid the grit's displacement during the pre-firing stage.

Glue, in fact, since it is largely composed of organic polymers, tends to decompose during the pre-firing phase until it is completely burnt. This decomposition process, however, takes place when the glue has not begun to melt yet.

The early decomposition of the glue, together with the uncomplete melting process of the grit during the pre-firing phase, could lead to a grit's displacement due to the air movements inside the kiln. A phenomenon that compromises the good result of the production, both technically and aesthetically.

The liquid glaze inside, instead, since it does not undergo to any degradation phenomena – at this stage - resisting to high temperatures, promotes an important cohesive effect avoiding the problem.



3. GLUE & RHEOLOGY

Let's see now what are the main rheological values that the glue must have to promote a good and proper application.

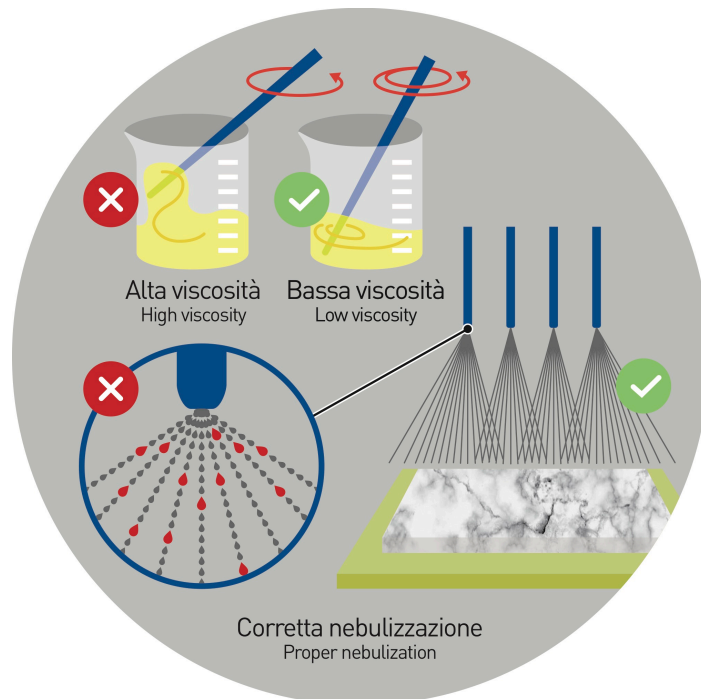
LOW VISCOSITY

First, it is very important to reach a **low viscosity** to let the nozzles provide an outstanding **nebulization**. A very viscous glue, for example, may produce overly large drops compromising, of course, the process and at the same time the tile.



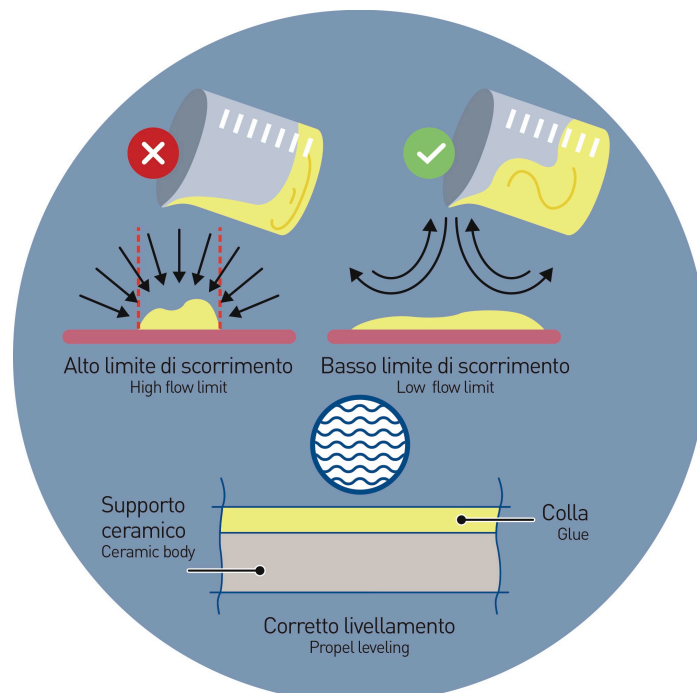
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LOW FLOW LIMIT

The low viscosity should be also combined to a **low flow limit** to ensure a good leveling on the tile. The more the glue is properly leveled, the more uniform will be its absorption by the following grit application.





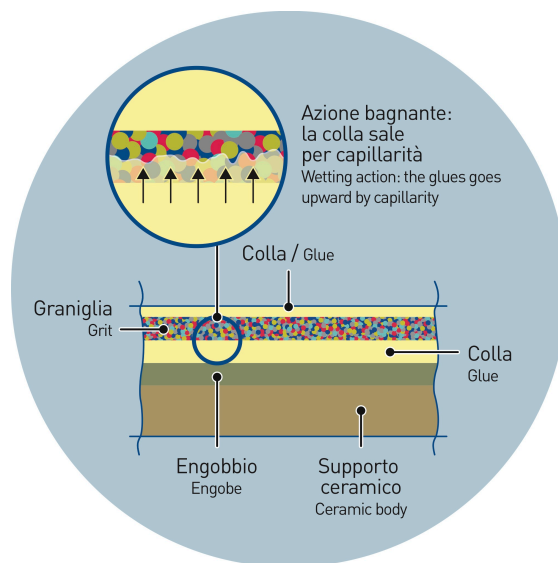
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WETTABILITY

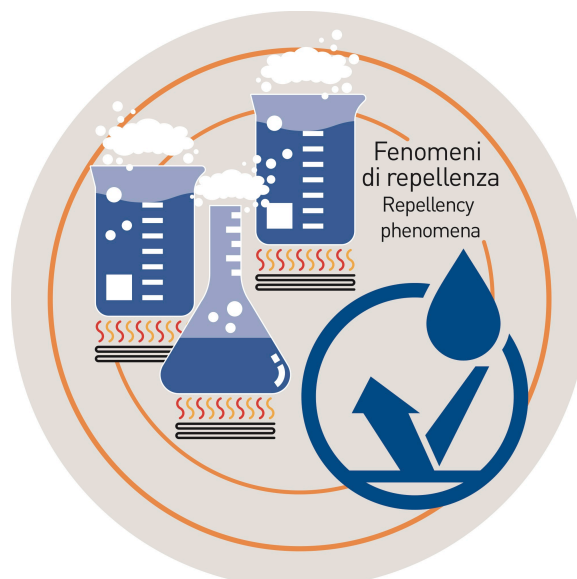
The glue must be able to **wet the grit, by rising by capillary action** to the higher layers of the tile, or even better, of the grit.

However, this feature, even when it develops a high performance, can sometimes be not enough to wet all the grit that has been applied. Especially in case of high weight applications (such as 800-1000gr/sqm). This is the second reason why the entire process should be developed in three steps, including a final application of glue, to wet and fix even the upper layers of the grit.



LEVELING AGENTS & COMPATIBILISERS

Finally, the formula is always properly designed to avoid repellency phenomena between the water-based glue and the inks that are usually solvent-based. To let this happen, leveling agents and compatibilizers must be added to the formula.





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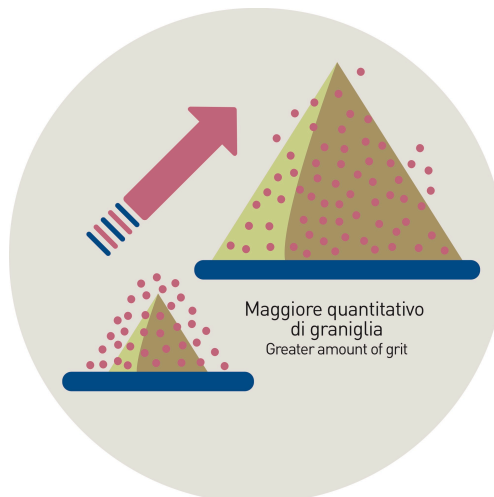
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4. DRY APPLICATION: DIFFERENT PERSPECTIVES

Although the traditional wet application of grits is still very effective and efficient, dry technology can open new areas of reflection and different opportunities in terms of production. Let's see the most relevant.

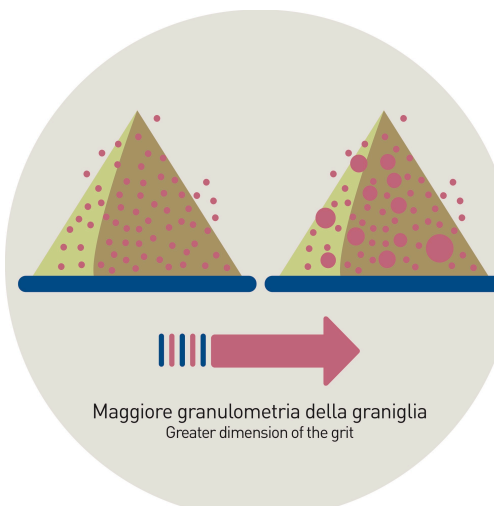
A) HIGH AMOUNT OF GRIT

In the case of high weight of grit normally used for full fields applications, for example, it is possible to apply large quantities of grit with a limited amount of water. This means that the features of the surface layer, even when it's partially removed by the lapping machine, allows you to get a total mirror effect, that means a mirror surface without light movements.



B) LARGER GRIT SIZE

Since the grit is not discharged by any the nozzles, it can have **higher grit sizes**. This aspect - that can seems apparently insignificant - is very important because it allows you to expand the possibilities in terms of selection of the grit that has to be applied.



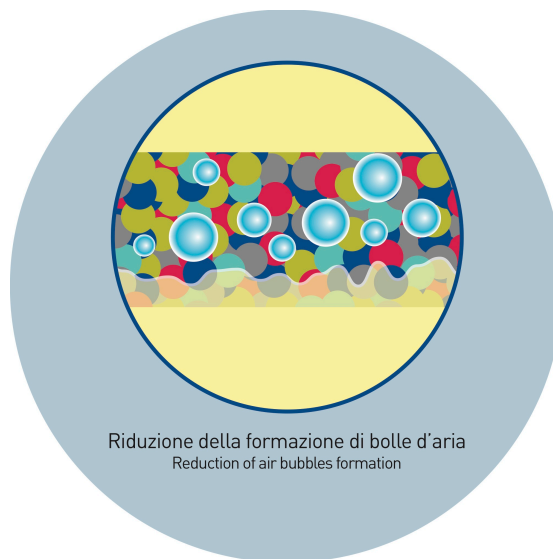


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C) CAPILLARITY PROCESS

The capillary process promoted by the glue - i.e. its ascent from the lower to the higher layers of the grit - largely avoid the possible presence of air in the deepest layers, reducing in turn all those defects that precisely derive from the air trapped in the ceramic body.



D) REDUCTION IN THE AMOUNT OF WATER

The reduced amount of water (unlike airless spray applications) can also reduce all problems that could arise in the kiln during the pre-firing stage, such as – for example - the difficult and so uncomplete water expulsion from the deepest layers of the tile that can increase the tension and the pressure inside the ceramic body producing a negative impact on the process.

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