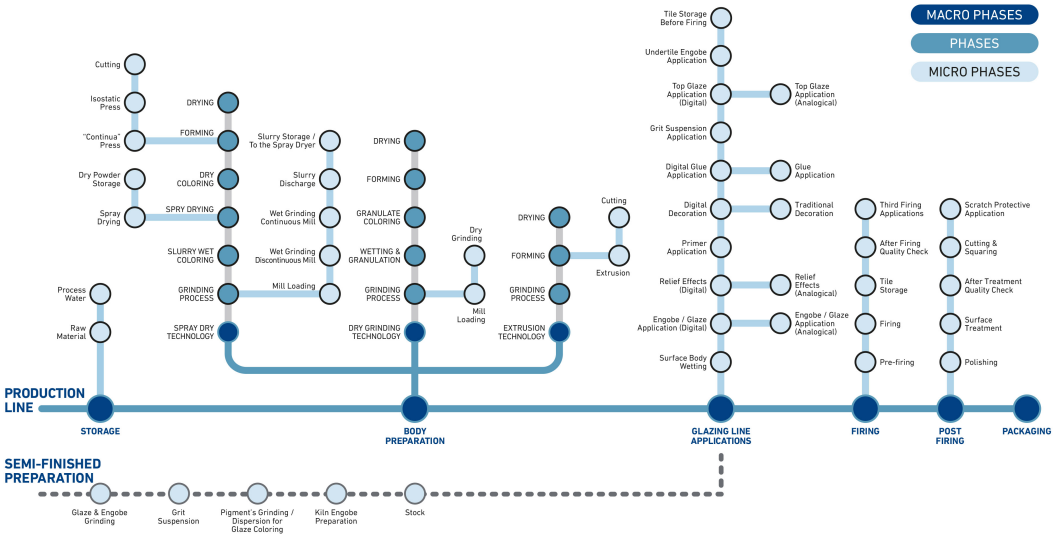
ZSCHIMMER & SCHWARZ
CERAMCO

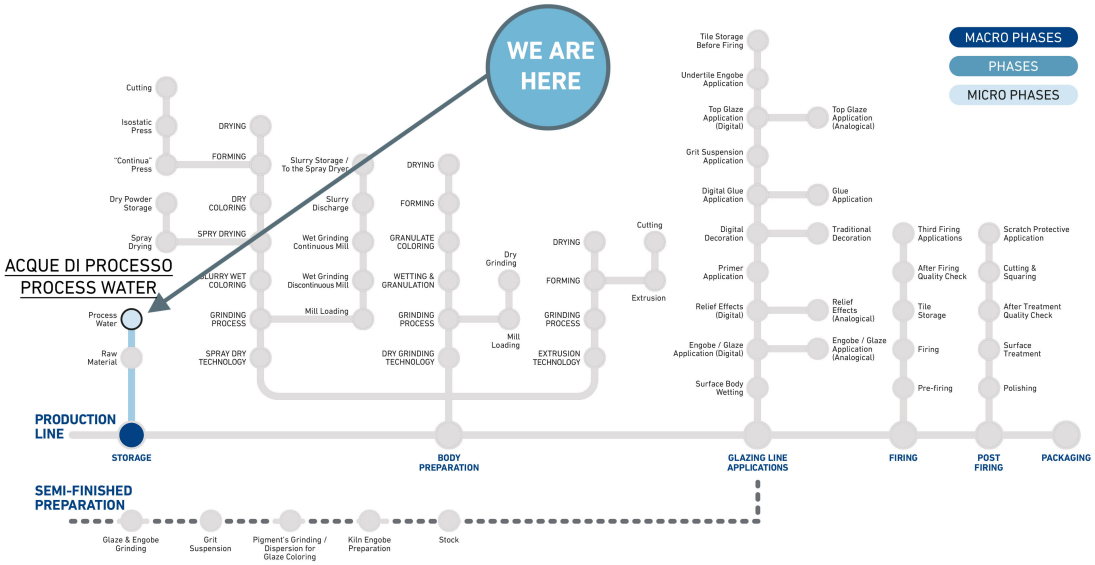
APPARENTLY INVISIBLE YET CONSTANTLY PRESENT

At every stage of the ceramic production process

A journey through problems & solutions



#04 PROCESS WATER & PRODUCTION PROBLEMS



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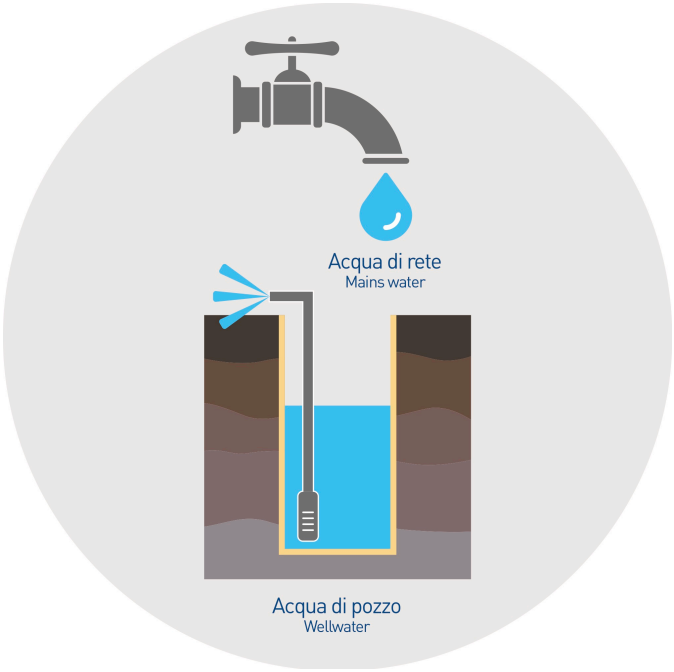
Process waters play a very important role in ceramic production since they are involved in many steps of the process. They are also essential for the proper development of any single stage but they can sometimes lead to serious problems when they do not have the proper features.

1. ORIGIN OF THE WATERS

As many know, we assume that ceramic production is a closed-cycled system where process water mostly come from in-house production activities.

We are essentially talking about **WASTEWATER** mainly deriving from the **grinding department** as well as from the **post-firing activities**, such as cutting and polishing.

This implicitly means that ceramic companies tend to recycle water both in order keep costs and to reduce environmental impact: a question, now more than ever, extremely relevant.
Together with this recycle activity, it is also important to take into consideration all waters that do not come from the company's internal closed-cycle but that come from outside.



We are basically talking about:

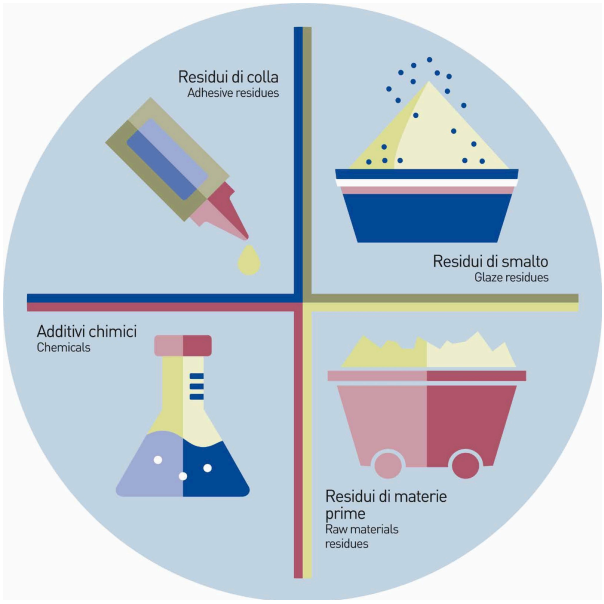
1. MAINS WATER (that is controlled and stable over time, mainly used in the glazes' grinding department)
2. WELLWATER (that instead needs more detailed inspections)

2. WATERS' FEATURES AND CRITICAL ISSUES

Process waters are made of a very heterogeneous mix.
And this mix can include some components that we could define as dangerous or even better that can be the origin of the critical issues that we are going to address.

What are this components?
Following here the most important ones:

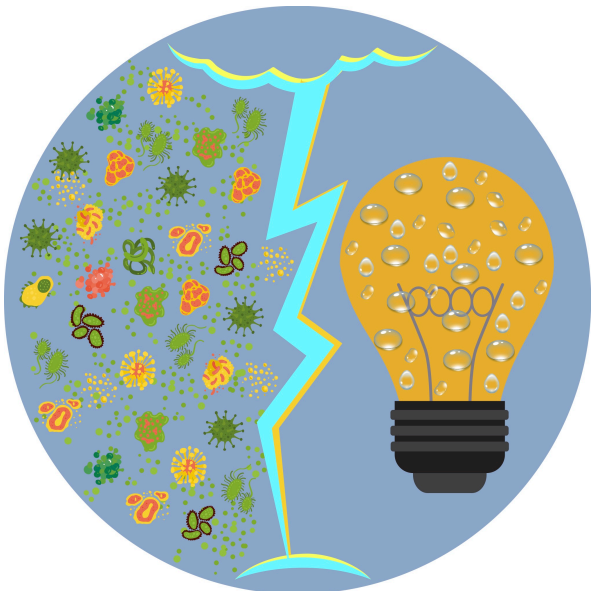
- Glue residues
- Glaze residues
- Chemicals
- Raw materials residues



How do these elements affect the application?
How can they interact with processes?

The presence of **ORGANIC MATTER** in the process water together with its **exposure to the air** may enrich over time the waters both of bacterial colonies and microorganisms leading to very rapid degradations.

Bacterial degradations may produce in turns a significant increase of **WATER ELECTRICAL CONDUCTIVITY** that, simplifying, we could define as the **ability of a liquid to carry an electrical current.**



The conductivity value is directly affected by the water's content of ions. We could generally say that the greater is the content of ions (or of the ionic charge), the higher is the water conductivity.

Why is it important to constantly check the water conductivity's values?

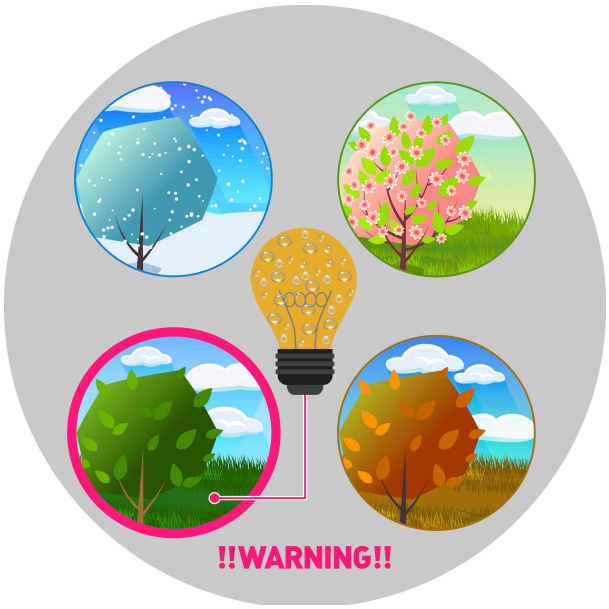
A high conductivity water can be a problem because it may negatively affect the application. For example, it may improperly act on the viscosity of the slurry or of the glaze.
In some cases, the conductivity reaches such high levels that to proceed with a proper application – it is necessary to add more water in the process and this, of course, affects in a negative way both the productivity as well as the environment.

In fact:

a. The increase of water content per kg obviously reduces the solid percentage within the suspension, leading to a **lower hourly production of spray-dried powder during atomization**.
b. The lower hourly production of atomized powder together with the higher amount of water produces in turns **a more important energy cost**, also promoting a **higher production of CO_2** (carbon dioxide). In other words, since we have more water that must evaporate, we produce more emissions.

3. CONDUCTIVITY & GROUNDWATER

Critical issues promoted by waters' conductivity (that chemically speaking is due to an excessive presence of multivalent cations such as calcium and magnesium) are also related to groundwater that, since it comes from deep under the ground, it is by its nature subject to changes according on the season.



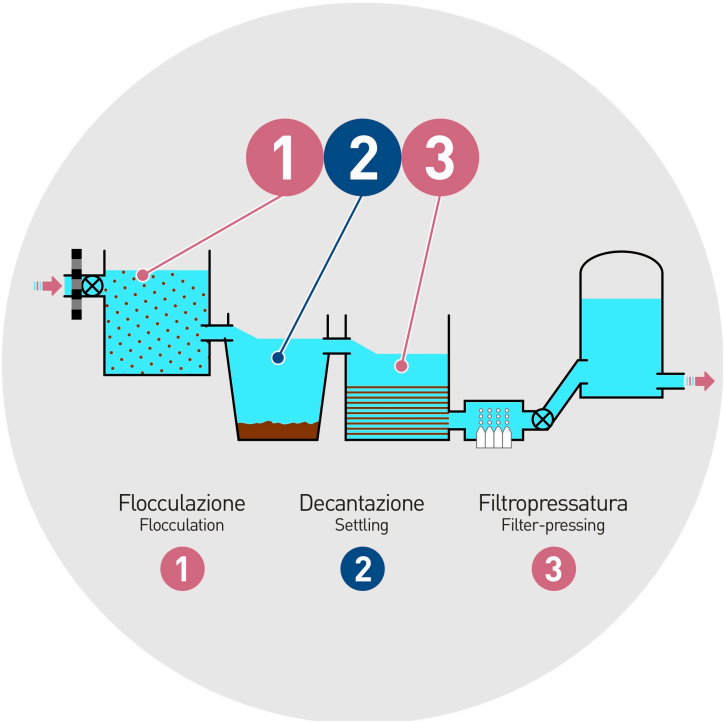
During summer, for example, the massive withdrawal of groundwater, together with the less frequent rains, leads to a dip in the waters level and therefore to an increase in the ionic concentration (and so in the conductivity).
It's not by chance that problems related to conductivity can much further emerge at the end of the summer months.

4. ACTIONS & SOLUTIONS

Process waters often require different kinds of treatment to perform at the best and avoid production problems.
These treatments can be different from company to company according to the specific production parameters in use.

A. WATER CLARIFICATION

WATER CLARIFICATION PROCESS is certainly one of those.
We can describe it, to make it simple, as a three-step process that develops through a flocculation and decantation phase, followed by a filter-pressing process of the suspended particles that are in the water.

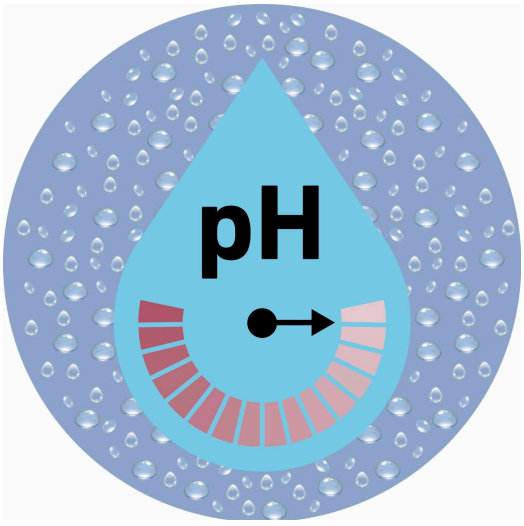


B. SANITIZATION

Beside the water clarification process, it would be important to proceed with a detailed study of the water cycle to properly act with a SANITIZING and/or PRESERVATION process. The main target is obviously to break down microorganisms and bacteria by means of proper preservative and sanitizing agents.
A grinding water containing bacteria may for example lead to a bacterial proliferation inside the slurry after the grinding process. The situation could get even worse thanks to the slurries organic content that is food for bacteria.

C. pH CONTROL

It is also very important to check the water basic parameters and especially its pH value. These controls are important make adjustments in case of very non-standard parameters (in our case the ideal water's pH value is about 8.5 / 9).



A too acid pH, for example, could worsen the slurry's viscosity value as well as the slurry's flow.

D. EVALUATION OF WATER DERIVING FROM PURIFIERS & TANK STORAGE

Two last measures could be useful to avoid problems.

- Carefully evaluate the water coming from purifier: even if it has an harmless-looking, it could hide some traps (such as containing not negligible amount of flocculants residues)
- Stock water process inside big tanks to manage at the best possible fluctuation