

Porcelain: Porosity & Pores

This months Aqua Chat focuses on the difference between the issue of porosity and surface pores.

We are all familiar with the problems of porcelain being difficult to clean. However in many instances the blame is directed towards the porcelain being of inferior quality due to excessive porosity. This however is not always true.

In many cases it is not porosity that is the issue but surface pores.

It is an important fact to establish.

As manufacturing of unglazed porcelain moves out of the traditional strongholds of Italy and Spain and into the greater world economy, porcelain from other regions (such as Asia and South America) is being branded inferior.

The main yardstick used to measure this inferiority is porosity. Problems such as staining and difficulty in maintenance are attributed to these inferior products because they are more porous. BUT ARE THEY?

It is this general view that poor quality in porcelain is due to high porosity that needs to be scrutinized and clarified because it is in many cases simply confusion between porosity and pores.

Porosity

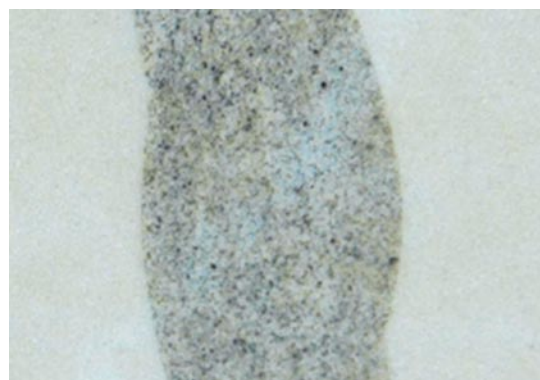
So what is the difference between porosity and pores?

Porosity is by definition the ratio of voids to solids in a tile. It is measured by the amount of water a tile can hold expressed as a percentage of its own weight.

The test in simplified form is carried out by firstly weighing a dry piece of tile, soaking it for 24 hours in water – drying the surface water – and then weighing the wet piece. The tiles porosity is the difference in weight between the dry and wet piece. It is expressed as a percentage gain over the dry weight and indicates how much water or moisture a tile can absorb.

Pores

A pore is something different. A pore by definition is a hole or opening on the outer surface of an animate or inanimate object. Surface pores are not measured in a quantifiable manner and hence are not part of the ceramic or porcelain standard. However they do have a large influence on how porcelain will perform. Moreover it is a tile's pores rather than just porosity in isolation that creates many of the cleaning problems and hence should be scrutinized when deciding if a product is high or low quality.



Whiteboard marker ink in pores of polished porcelain tile

Cleaning & Staining of Porcelain

The problems most associated with "lower quality" porcelain are most always related to cleaning and maintenance.

Common problems are:

- The porcelain will stain.
- It will mark (especially from car tyres) and soil easily.
- It will stain during the grouting installation especially when grouts with high contents of coloured oxide are used.

The reason for this sub-standard performance? Porosity.

Continued from page 1...

The porcelain has high porosity and hence absorbs these contaminants. It is therefore “low quality”. Unfortunately this conclusion is only part of the truth.

Porosity is certainly one of the main factors in creating these problems and in determining quality. However it is the surface pores that play an almost equal part. If a porcelain has large surface pores (these are still very small mostly visible through a microscope) then it will suffer from exactly the same cleaning and maintenance problems.

The pores do two things:

1. They increase the surface co-efficient of friction thus doing a better job of collecting dirt (cleaning the bottom of your shoe).
2. Secondly they provide below surface reservoirs to hold the dirt.

The end result is that the pores create exactly the same problems as porosity and is the reason why so many people confuse the two characteristics.

Quality equals Porosity and Pores?

The quality of a porcelain product is determined principally by the blend of clay that is used and fired. The higher the content and purity of white Porcelain Clay (China Clay or Kaolin Clay) the better the porcelain.

Our two characteristics, porosity and pores, are directly related to the China Clay. With high quality clay the tile has less volatiles and hydrocarbons to burn off during firing. This results in a tile that is denser and hence low porosity. However it also results in a tile that is harder with better vitrification. This means that there are less surface pores.

This becomes even more important for the polished porcelain.

The polishing process has a habit of creating pores as the grinding/polishing process removes softer particles leaving behind surface holes or pores.

The harder the tile and the more even the body composition, the less pores are created. So it is both the porosity and the amount and size of surface pores that effects performance and helps to characterize quality.

Problem Solving

Most problem solving for these “inferior” porcelains is done by way of sealing & effective maintenance. A penetrating type sealer is applied with the expectation that this will lower the offending porosity, however, it will have no positive effect on the surface pores. In other words the traditional diagnosis of porosity as the only cause will lead to the wrong solution in many cases.

To protect and ease maintenance of porcelain with excessive porosity a premium quality penetrating type sealer (Aqua Mix **Ultra Solv**) is the correct solution.

However to effectively protect and maintain a porcelain with excessive pores, a combination of a premium quality penetrating type sealer (Aqua Mix **Ultra Solv**) & an effective maintenance routine using quality cleaners such as Aqua Mix **Concentrated Tile Cleaner** for routine cleaning & Aqua Mix **Heavy Duty Tile & Grout Cleaner** for periodic cleaning, is required.

Correct products & procedures in the maintenance schedule will play a big part in the performance of the porcelain. This includes:

- Sweeping or vaccuming floor;
- Following directions for correct dilution (too much & a residue will appear, not enough & the porcelain will not be cleaned)
- Adequate well time;
- Agitation;
- Extraction & thorough rinsing.

Cleaning Products

Routine:

- Aqua Mix Concentrated Tile Cleaner

Periodic:

- Aqua Mix Heavy Duty Tile & Grout Cleaner

Commercial Routine & Periodic:

- Aqua Mix 1 & 2 Deep Clean

Porcelain with large pores will cause most problems during the grouting process. The grout gets caught in the micro pores, hydrates and bonds making it virtually impossible to clean without using harsh acids.

To solve this problem, the following procedures should be followed

LAY THE TILES	
No Surface Wax	
STEP 1	Pre-seal with Aqua Mix Ultra-Solv or Pro-Solv 10
STEP 2	Grout as usual
STEP 3	Clean up grout residue with Aqua Mix Grout Haze Clean Up
STEP 4	Seal tiles & grout with Aqua Mix Ultra-Solv or Pro-Solv 10

OR

LAY THE TILES	
Surface Wax Present	
STEP 1	Grout as usual
STEP 2	Clean up grout residue with Aqua Mix Grout Haze Clean Up
STEP 3	Strip wax and clean floor with Aqua Mix Heavy Duty Tile & Grout Cleaner
STEP 4	Seal tiles & grout with Aqua Mix Ultra-Solv or Pro-Solv 10

Note: For Highly Textured, Structured or Anti-slip tiles apply Aqua Mix Floor Shine & Hardener as a pre grout coating, then follow “Surface Wax Present” instructions above.

Identifying if porcelain suffers from high porosity or excessive pores is sometimes difficult. However the easiest way is to carry out a simple stain test. Expose a sample for 24 hours to a typical household contaminant such as red wine or cooking oil. Apply a cement grout (preferably a contrasting colour) to a second piece and try to clean.

Continued from page 2...

If a tile suffers from high porosity it will be stained by the household contaminant. If the surface pores are the problem then it will be the grout that creates the problem. There will be of course those porcelains that stain from both sources.

Conclusion

It is understandable that porosity is so often blamed for the cleaning and maintenance issues surrounding some porcelain. Likewise it is equally understandable that it is associated with inferior quality, because high porosity and surface pores both create the same problems. However in many cases, the pores create these problems.

An understanding of the difference is imperative so that the correct solution can be implemented. It is also important to acknowledge that inferior porcelain is not one that simply has high porosity. The number and size of surface pores is equally important. Moreover there are many porcelains (mainly polished) that have low porosity but suffer the cleaning problems due to their pore characteristics. Of course there are other factors such as size, selection and kiln contamination etc that help determine quality. However it is the porosity and pores that can most easily be modified after manufacturing to ease problems that make them perhaps the most important to understand.

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Stone Sealers Choice

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- Ideal for food preparation and serving areas;
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