THE FUTURE OF THE CERAMIC PROCESS IN A GLOBAL MARKET REQUIRES A NEW BUSINESS STRATEGY

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GIULIO CICOGNANI earned his Degree in ELECTRONIC ENGINEERING in BOLOGNA; his thesis was entitled "Two-directional couplers for microwaves in rexolite".

In 1973, he was engaged by TELETTRA of Vimercate (today Alcatel) on research in long-distance transmissions on digital platforms in coaxial cables and optical fibres. He joined SACMI in 1975 as Head of product and plant automation. In 1979, SACMI appointed him Director of its Spanish office "FATMI ESPAÑOLA" at Madrid, where he remained for approximately 2 years. He was appointed Sales Director of the SACMI IMOLA Ceramic Division in 1983. In 1987, he was appointed General Manager of the SACMI IMOLA Ceramic Division. He became General Manager of the SACMI IMOLA Group in 1990.

During this period, he established most of the companies of the Group and held numerous positions on their Boards of Directors, both in Italy and abroad. In 1997, he became a Member of the CNR Scientific Council of Faenza on advanced ceramics, including bioceramics for medical prostheses. In 2001, Giulio Cicognani was appointed "GENERAL MANAGER OF THE SACMI GROUP", charged with growth by outside lines to the parent company, growth of the associate companies, and acquisitions. Currently in this post.

Finally, in 2002, he was appointed President of the company NEGRI BOSSI SPA, which is listed on the Milan stock exchange, operating in the field of Plastics. Currently in this post.

1. INTRODUCTION

The affirmation and success of the ceramic sector are today incontrovertible facts.

The goals attained have been remarkable, both from a quantitative standpoint, world production is now over 5000 million m^2 tile per year, and qualitative standpoint, mainly as a result of the dedicated ongoing technological and commercial drive, particularly of the Italian and Spanish ceramic industry.

At present, the ceramic sector can without a doubt be considered a mature industry in the economies of the developed countries, where it is managed and developed as such, while in developing countries, it has only just started, taking into account that the new context of a global market will continue to offer new and interesting prospects.

The future can therefore be faced with confidence by both the mature and fledgling industries, setting out from the multiple strong points already acquired and interpreting the emerging demands, still unexpressed, which the new marketplace will be soliciting and rewarding.

2. THE EVOLUTION OF THE CERAMIC PROCESS

2.1. THE ORIGINS

The ceramic industry was basically born at the beginning of the 70s.

Till then ceramic tile manufacture had been based on almost craft processes, characterised by low productivity and processing systems involving high labour and energy input.

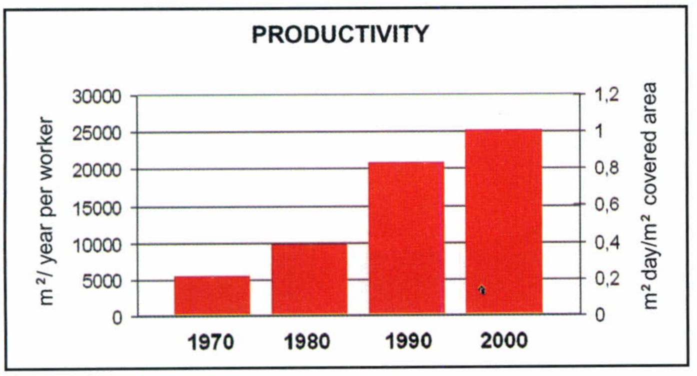
The demands of that time, dictated by the need to build popular housing and driven by an economic boom, were readily satisfied with simple products: these involved small sizes (15x15, 20x20) of low aesthetic content, without any decoration or at most with geometric patterns (chequers, borders, rhombuses, etc.) or floral designs.

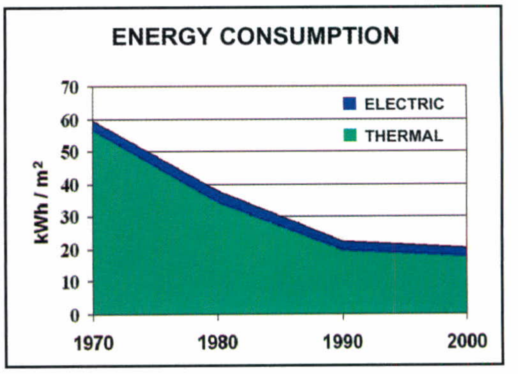
On the other hand, the corresponding offer in plant and equipment engineering involved technologically antiquated machines (manual friction presses, tunnel dryers and kilns, etc.), so that the stage was set for an important technological leap forward.

2.2. THE NEW TECHNOLOGIES

The awaited revolution arrived punctually in the 80s, particularly as a result of the introduction of the single-deck roller kiln, which transformed the firing process from a batch to a continuous process, enabling high productivity with contained energy consumption. The figures below evidence, on the one hand, the production growth per worker and unit surface area covered, and on the other, the minimisation of the energy demand, which for the ceramic industry is predominantly thermal.

Concurrently, the development of hydraulic pressing and body preparation by the wet method, followed by the spray-drying process, transformed the entire manufacturing process into a reproducible process, characterised by the industrial logic of certain events.





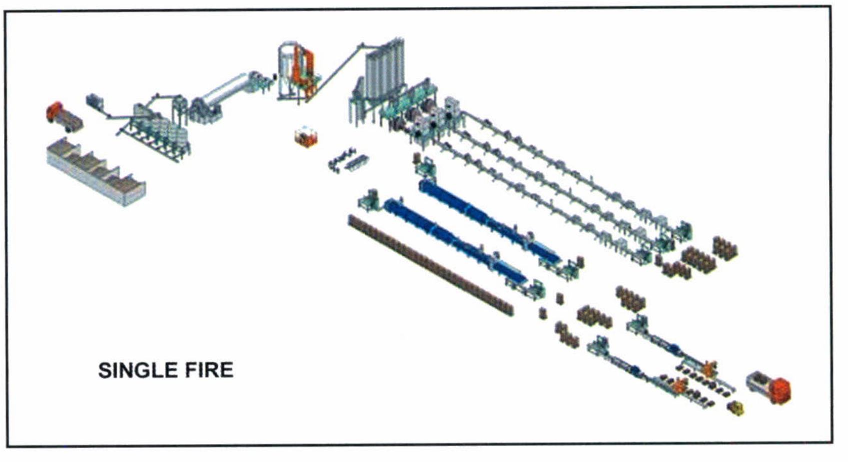
2.3. OPTIMISATION OF THE PRODUCTION PROCESS

The 90s were characterised by an intense search for optimisation of the manufacturing process, particularly with a view to achieving maximum production line flexibility and progressively greater degrees of automation.

The demand for automation has to a certain extent been satisfied in every section, from grinding with continuous mills to completely automated selection lines.

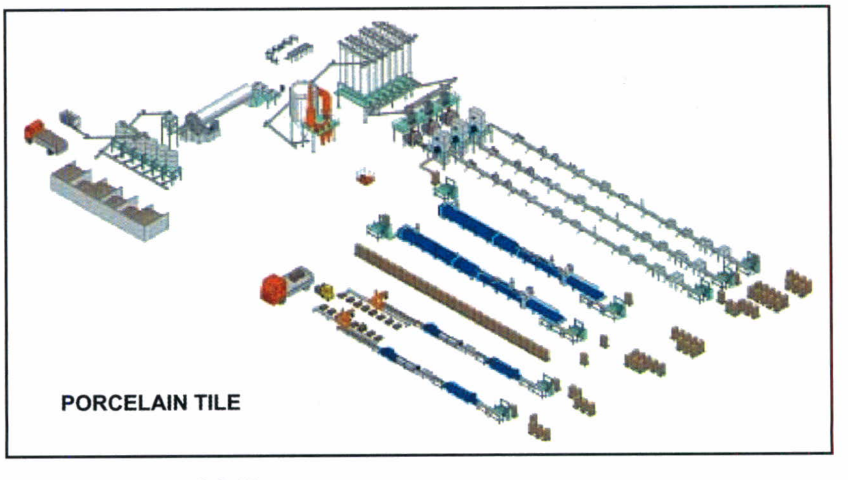
Factory layout has witnessed the multiplication of parallel lines to assure fast product changeovers as a response also to the demand for the fabrication of small lots.

To this end, the new decoration systems (in line by the wet method and by dry application at the press) have enabled readily varying product aesthetics, seamlessly incorporating these systems into an automated process and allowing high line speeds.

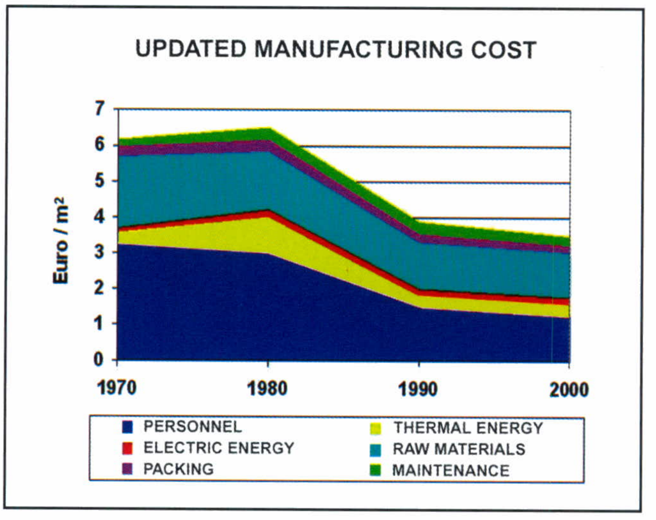


SINGLE FIRE

It can therefore be stated that the ceramic production process has asymptotically reached its minimum in the manufacturing cost/product quality ratio, and although the world of research continues its ceaseless evolution, new technologies capable of replacing current ones with wide scale implementation are not foreseeable in the short term.



PORCELAIN TILE



In view of the foregoing premises, coming years can be expected to witness the est evolution of the ceramic industry not so much inside the factories, as outside them.

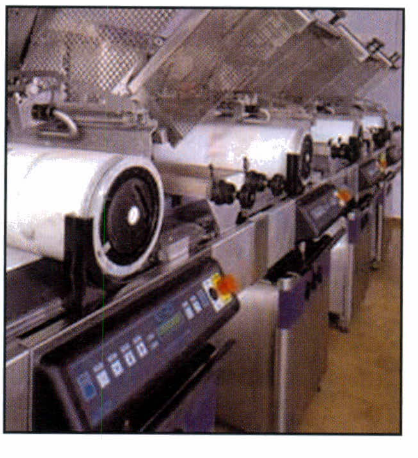
The first requirement will be the optimisation of distribution logistics in the context of a global market, with stores that are demand oriented and not production oriented.

3. EVOLUTION OF THE PRODUCT

3.1. THE DIFFERENT TYPOLOGIES

The development of new products and particularly the differentiation within each ceramic typology have without a shadow of a doubt far surpassed those of any other industrial sector, being comparable only to the fashion branch.

In fact, perhaps the only example to which one can resort, and with which on the other hand quite a number of affinities exist, is that of the textile industry, also characterised by continuous development of designs and colours on a multiplicity of substrates.



In the ceramic industry, since the 80s, a great technological drive has taken place in fine-tuning appropriate bodies and glazes for the various classes of end products (wall tiles, floor tiles and stoneware), in addition to which there has been the research into porcelain tile, perhaps only today reaching completion.

For all these marketing classes, enormous resources have been devoted to ceaseless industrial activity in product differentiation, by virtue of which each company has progressively characterised and built itself, updating its product catalogue every day.

In addition to the far-reaching diversification in sizes based on type of product (from mosaics to ceramic sheets), trims such as listels, skirtings, coves, corners, etc., deserve special note, whose dissemination has been quite extensive and will foreseeably be even wider, also taking into account the availability of highly efficient dedicated lines.

In sum, the principal factors that have enabled realising and managing incessantly changing products in terms of size and decoration have been:

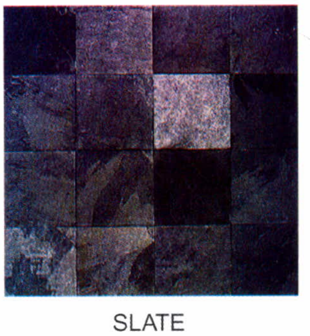
- flexibility of the presses, handling lines and roller kiln.
- continuous developments in screen printing systems up to modern printing processes by pad-printing and rotogravure.

This frenetic work of development and industrialisation, headed by ceramics manufacturers, plant and facilities builders and colour producers, has led to the growth of a new sector, the service companies, demonstrating that it is not sufficient to simply make ceramic tiles, but that tiles must also be designed and clad.

3.2. DEVELOPMENT OF AESTHETICS

The statement that, just as fashion, ceramic tile follows culture and the evolution of society has already become a cliché.

For us as Europeans, the plain colours, geometric patterns and repetitive polychromy undoubtedly reflect the tastes and moods of past decades, whereas recent trends have shifted particularly towards the development of natural products, which are atonal (never too saturated), and metachromatic (without any dominant schemes).


SLATE

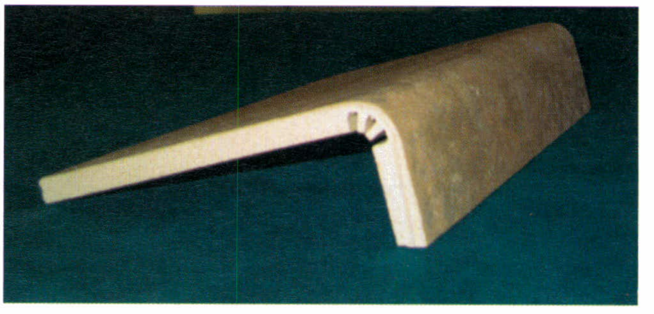

SLATE

This has originated the powerful drive to reproduce natural stones, seeking new techniques for the creation of non-repetitive products, with shades, featuring "native" colours.

On the other hand, this tendency has also been one of the main factors in the success of porcelain tile, a natural ceramic material par excellence, of high technological content and performance.

A first consideration of importance is that, until a few years ago, there was only one single part of the manufacturing plant dedicated to the development of aesthetics:

the glazing facility, located between the drying and firing stage. At present, the number of manufacturing areas that contribute to determining product end appearance are far more numerous: these start with the preparation of coloured bodies, their mixture and processing, special charging systems (dedicated dispensers and fillers), followed by presses and multiple-size dies with appropriate profiles, and converge in a renewed glazing line in which modern roller decoration systems enable obtaining high-resolution designs, without the traditional disadvantages of screen printing with a mesh.

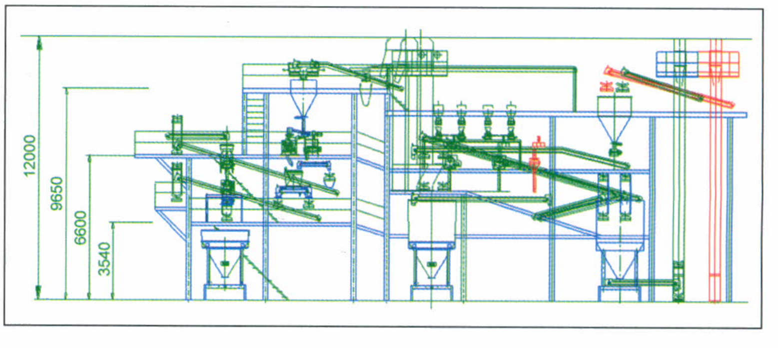


In addition to the above, further to be noted are all those mechanical dressing and finishing systems for machining ceramic tiles and tile surfaces, applied after firing and/or selection, such as: finishing, grinding, cutting, squaring, lapping, polishing operations, etc., which are auxiliary processing operations that contribute in an ever more determining way to the realisation of new product typologies. Other ceramic products can further be made by re-firing processes, to also make special pieces or trims (step treads, corners, etc.) directly from production tiles, thus maintaining absolute faithfulness to colours and decorations.

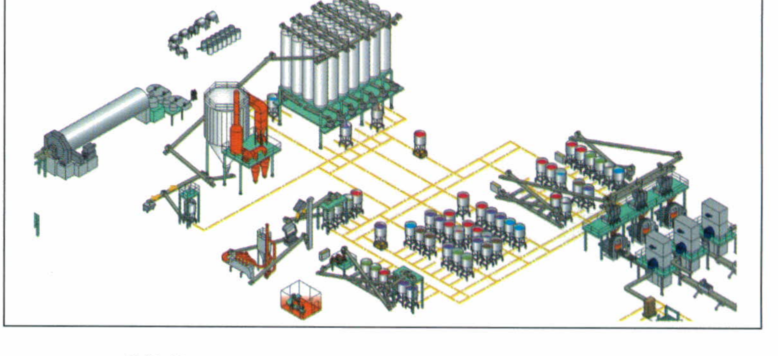
This new concept of developing product aesthetics by an integral approach will doubtlessly be the leitmotiv for coming years.

On the other hand, there are already a great many already available or emerging innovative technologies developed for decoration by dry application at the press, as well as for decoration in line by the wet method:

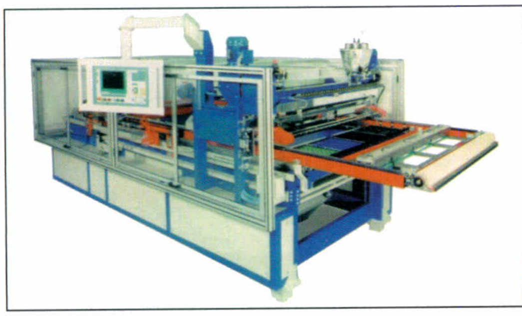
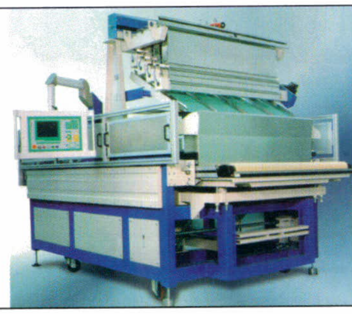
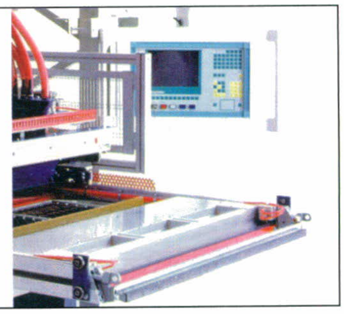
a) sophisticated engineering of facilities before the press, designed to produce a wide range of semi-processed products (dry coloured powders, grits, flakes, micronised colours, etc.), with a vertical development (Technological Tower).

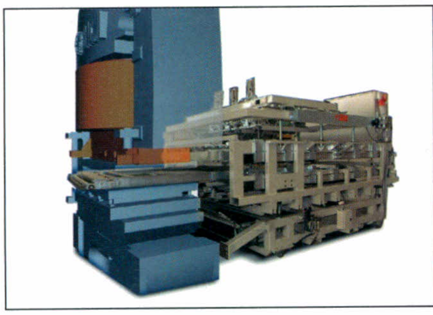
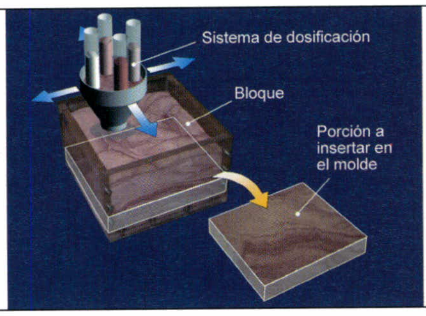


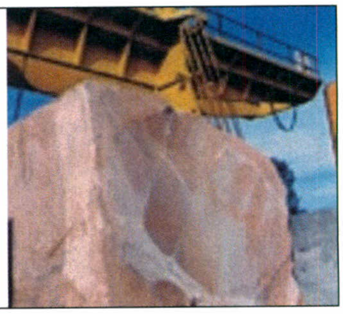
b) system with mobile silos, suitable in particular for management on the ground, in a flexible and controlled way, of the preparation of numerous semi-processed products used in manufacturing porcelain tile products.



c) press feeding fillers equipped with highly varying charging systems, to achieve variegated through-body colouring, inspired by the typical grained structure of marble blocks, an effect that finds its highest expression in polished products, but which can also be suitably used as a background for glazed rustic products.

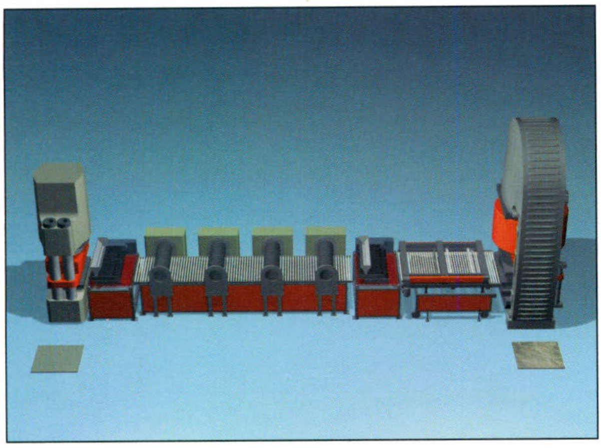
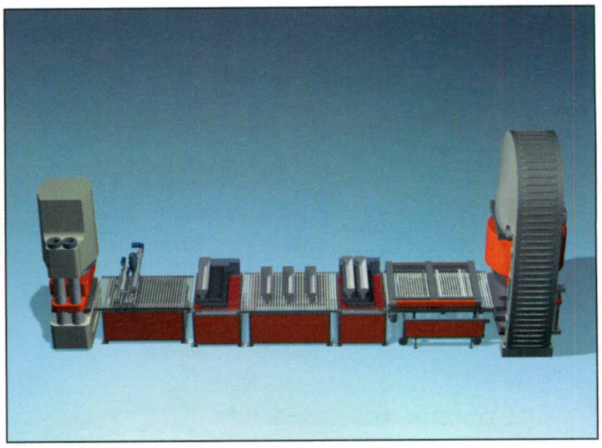






d) on the other hand, robotised systems have also recently been introduced, with a view to further enhancing the designs obtained by using coloured powders, with some constraints as regards the attainment of high production rates.

e) probably the most interesting innovation for the development of product aesthetics has been the recent double-pressing technology, which features an intermediate step in surface decoration, predominantly by dry application, by means of all the useable techniques for this purpose (rotary screen printing, rotogravure, rollable belts, etc.), while keeping line rates unaltered, regardless of product complexity.

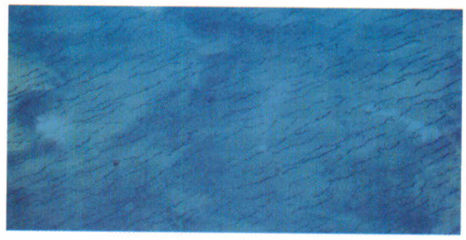



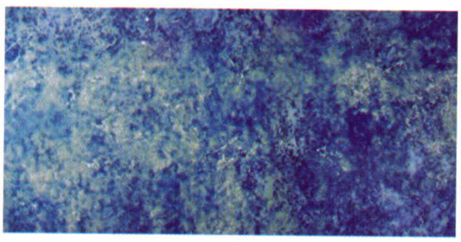
DOUBLE-PRESSED PRODUCTS


Natural


Natural


Natural/Lapped


Polished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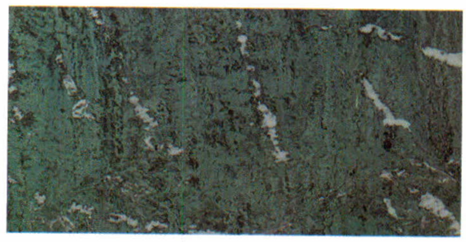
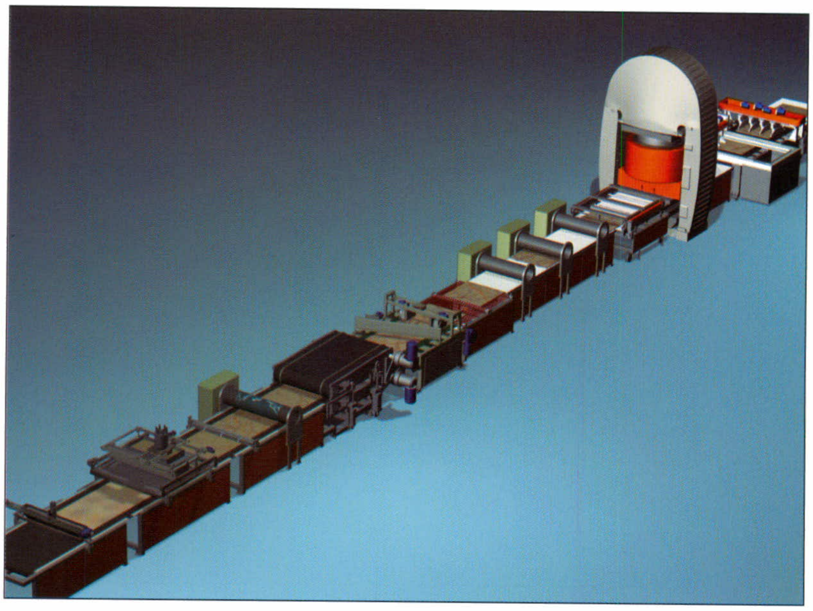
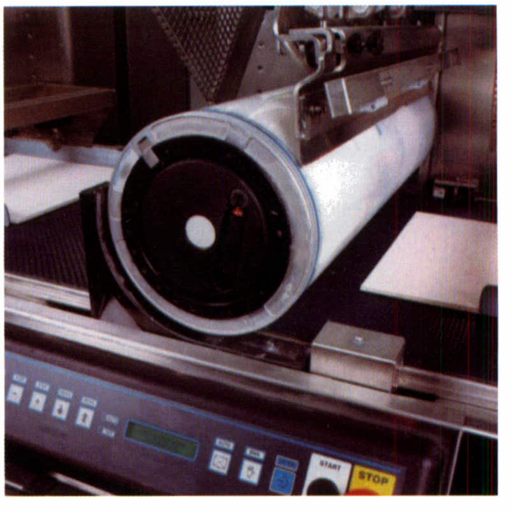

Natural/Lapped/Polished

f) a further evolution of this work approach (precompaction, decoration, pressing) is represented by pressing and dry decoration on a belt, which allows readily obtaining through-body as well as surface effects.

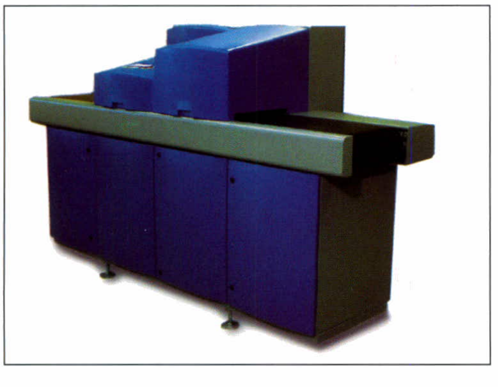


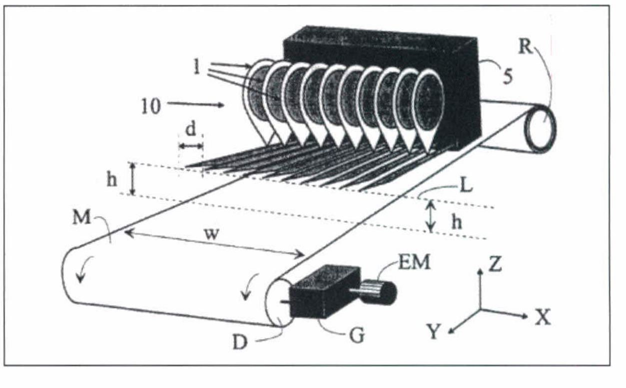
g) the gates have thus been thrown open to other forming technologies than the consolidated uniaxial pressing with hydraulic pistons, e.g., by roller compaction, which will enable developing new products (large thin sheets), for applications in sectors today out of bounds to ceramic materials.

h) on the other hand, with regard to wet decoration in the glazing line, the most innovative techniques are those involving all the continuous decoration systems capable of producing random designs, with the possibility of rapid product changeovers; the instigator of this innovation has been and continues to be the rotogravure system with silicone-sleeved rollers.



i) however, the new frontiers of in-line decoration are represented by contactless technologies with digital handling of the images reproduced on the tiles, involving technologies transferred from other sectors (paper, textile, plastics, etc.), which have recently been the focus of numerous research and development initiatives. Two principal roads have already been travelled, transferred from other industrial sectors: laser printing with ceramic powder toners and jet printing of ceramic inks with piezoelectric dispensers. In the former case, the greatest difficulties actually lie in formulating appropriate ceramic toners for the high firing temperatures and in the objective difficulty of printing directly onto the ceramic substrate. In the latter case, the main problem lies in the inadequacy of traditional piezoelectric heads to work with suspended ceramic pigments, which owing to their size and hardness clog and wear these heads. One line of research therefore centres on the development of new and more appropriate piezoelectric systems for use in the ceramic industry (please see the scheme).





3.3. CREATION OF ENVIRONMENTS

Another key factor in the development of ceramic products, particularly valorised in recent years, has been the concept of creating environments.

This means applying to the ceramic tile a "market-oriented" vision, definitively abandoning the "product-oriented" vision.

It is evident that the ceramic tile joins in the creation of an environment with many other interior design elements, with which it needs to integrate and combine.

In ceramic flooring, the first step has been the offer of highly differing sizes based on building domains and styles, until creating mixtures of coordinated sizes.

In wall tiles, the search for combinations with special pieces of high aesthetic value has always been greater, also fabricating these pieces with increasingly advanced techniques.

In the traditional environments dominated by ceramic tile, i.e., the kitchen and the bathroom, total integration has taken place with the other elements, both of a ceramic and non-ceramic nature: workbenches, profiled tops, sanitary ware, bathroom accessories, shower boxes, etc.

This has in turn led tile manufacturers' interest to other complementary industrial segments, for example like the production of ceramic sanitary ware, bathtubs and showers in plastic materials, tile installation products, household articles, etc.

The ultimate result has been that the most competitive companies have equipped themselves with multi-purpose sales rooms, which besides offering the full range of all the home decoration items, also provide a customised environment design service.

3.4. ADAPTATION OF THE PRODUCT RANGE TO DIFFERENT MARKETS

In the economy of ceramic industries, exports are fundamental for achieving both turnover and profit.

This gives rise to other problems, whether these be the creation of an efficient distribution network or appropriate product design, both from a technical and aesthetic point of view.

The main consequence is a broader range of products in the catalogue and the need to fabricate highly differentiated lots of products.

It is therefore important to assess the demands of the markets involved and correspondingly perform optimised selections of facilities-production to manufacture the desired product mix.

It is evident that in this sense, commercial agreements between complementary companies can be extremely advantageous, yielding reciprocal benefits, whereas the logic adopted by the large groups involves acquisitions or new investments, also abroad.

4. THE FRONTIERS OF ADVANCED RESEARCH

Even if the attention of the ceramic industry has mainly focused on the development of the binomial product/technology in the context of present market demands, as this translates into prospects of immediate benefit, with regard to future planning we should spare a moment to briefly glance at the most advanced areas of ceramic materials research.

In view of the extent of the subject, it is useful to distinguish between the innovative proposals directly relating to building materials and the construction technologies sector, and the studies conducted in high-tech ceramics, which could however have interesting consequences for traditional materials.

In both cases, the ceramic product is "conceived" in a different way from the customary approach, in order to achieve enhanced performance features or even cross borders till now considered inherent to this class of materials.

A few examples of transverse problems are: the classic problem of the brittleness of ceramic materials, the dualism gloss/hardness, the passive function of ceramic materials, the difficulty of bonding/installing ceramic products, their high specific weight, etc.

4.1 BRITTLENESS

The brittleness of ceramic materials has always been considered an inherent characteristic and although this is sometimes exploited positively (e.g. in cutting tiles), in general it is a negative feature.

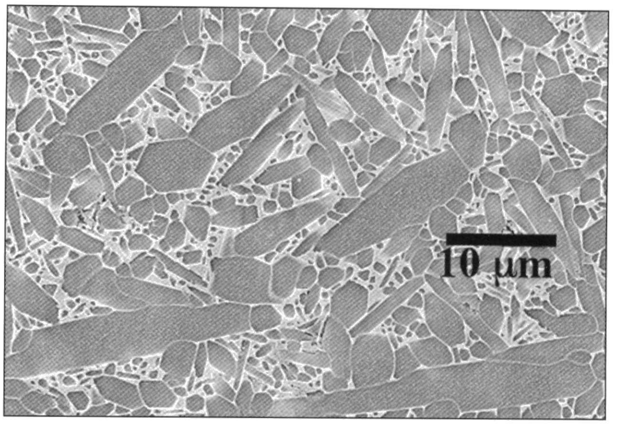
In actual fact, in the field of advanced ceramics, the problem of brittleness has already found numerous solutions. Indeed, since the 70s, most academic and industrial research in this field has centred on the need to make ceramic materials tougher, i.e., in purely technical terms, more resistant to propagation of a pre-existing crack (simply for the sake of reference, it may be observed that the fracture toughness of glass is around 0.5-0.7 MPa $m^{1/2}$, whereas that of a standard polycrystalline alumina is about 3 MPa $m^{1/2}$).

Three methods are currently available for improving the fracture toughness of ceramic materials:

- dispersion of fibres, which are always ceramic, in ceramic matrices (ceramic composites);
- crack deflection;
- toughening by phase transformation.

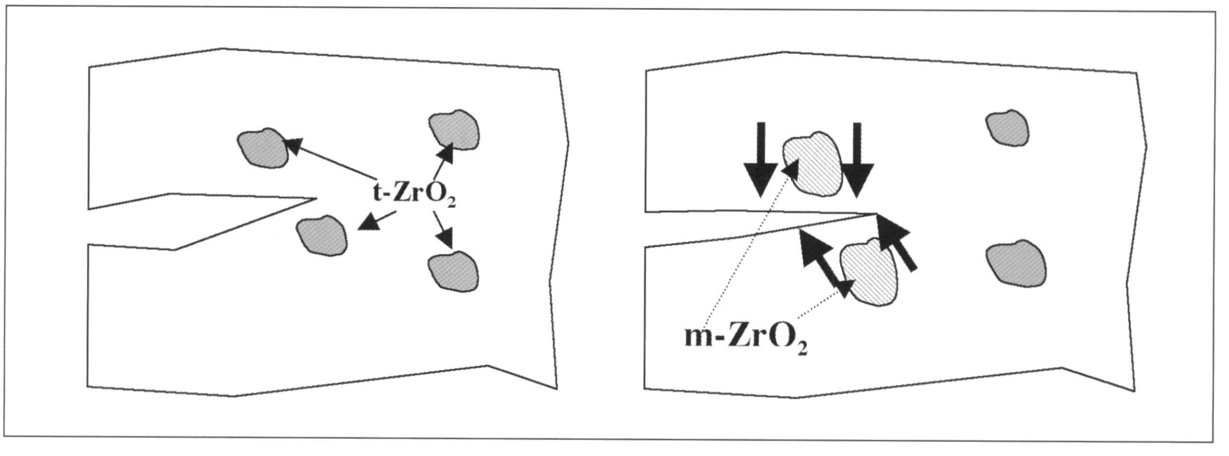
In the first case, toughness increases by the dissipation of crack energy in unravelling and then, eventually possibly breaking the highly resistant fibres dispersed in the matrix. A typical case is the composite made up of an alumina matrix with fibrous inserts of silicon carbide: the resulting fracture toughness, expressed as KIc can attain values around 30-40 MPa $m^{1/2}$, resembling those of steel. It is interesting to observe how in this case, the coupling of two materials like alumina and silicon carbide, which are individually quite brittle, yield a very tough composite.

The case of toughening by crack deflection is clearly illustrated by silicon nitride: in this case, the beta form of silicon nitride tends to grow in the form of lengthened grains, which make the advancing crack adopt a very winding course, yielding KIc values around 15 MPa $m^{1/2}$. The figure depicts a typical example of the microstructure of high-toughness silicon nitride.



The system of toughening by phase transformation is the classic mechanism at the origin of the high KIc values of zirconia: a crack moves in a material that contains a dispersion of tetragonal zirconia ($t\text{-}ZrO_2$) particles.

The field of stresses generated by the advancing crack causes the transformation of tetragonal to monoclinic zirconia ($m\text{-}ZrO_2$). This phase has a volume approximately 5% larger than that of the tetragonal phase, and the expansion makes the crack close owing to the high arising compressive stresses.



The phase toughening mechanism can raise fracture toughness to 15 MPa $m^{1/2}$. Another interesting consequence of this phase transformation is the fact that the stress-strain curves of tetragonal zirconia-based materials display a very similar travel to that of yield in metals, consequently anticipating the approach of catastrophic failure. This effect stems from the fact that whenever a little zirconia is transformed into the monoclinic phase, the external load decreases.

4.2. GLOSS/HARDNESS

Numerous studies have been conducted in the past, some of which have been put into practice, on glass-ceramic materials, made up of (hard) crystalline phases dispersed in a (glossy) glassy matrix.

However, these materials have only been partly successful, since the recrystallisation process generally leads to surface matting, adversely affecting the aesthetics of the end products.

Besides this technical solution, which is nonetheless interesting, the possible use of nanoceramic powders for surface coatings is also being studied.

The use of this technology is already widespread in optical lenses (scratchproof treatments) and the technique's limitation for large-scale use stems from its high cost and sophisticated application methods.

By way of example, 1 kg of nanometric alumina costs about 200 euros, whereas the tabular alumina used in refractories costs about 350 euro/ton; moreover, there are no suppliers able to ensure a continuous supply of nanometric alumina, not even of one ton a month. The main reason for the high costs is because these ceramic powders are prepared from expensive metallo-organic reagents, while traditional milling methods provide too low a yield to be useful for industry. This subject still undoubtedly deserves more profound study.

4.3. LIGHTWEIGHT CERAMIC MATERIALS

Although the high specific weight of ceramic materials for building construction, particularly with regard to ceramic tile, constitutes a prerogative of robustness, this negatively impacts tile transport and installation operations.

Consequently, various initiatives have since quite some time been undertaken with a view to "dematerialising" ceramic materials: the most obvious solution is reducing tile thickness or fabricating thin products by adopting different forming techniques, ranging from traditional pressing, to on-belt compaction, and even to casting.

Furthermore, effective use of a thin ceramic product often requires combining it with other materials, such as plastics or wood, to make materials with a composite sandwich structure.

Another possible way of making ceramics lighter, restricted however solely to given applications, is the production of highly porous ceramic materials, which are therefore lighter, by formulating special bodies or even using foams.

This thus enables making, for example, insulating and sound-absorbing panels.

This then leads to the concept of a broadening of ceramic materials properties, converting tiles from simple passive coverings (extremely resistant and aesthetically pleasant surfaces) into "intelligent" systems.

4.4. FUNCTIONAL CERAMIC MATERIALS

For some time, ceramic materials have been available that conduct electricity (for antistatic environments), surfaces ceramics that contain bactericide or photochromic compounds, heating panels of ceramic materials inside which the appropriate heating elements are lodged, etc.

Research in these sectors is currently focused on integrating ceramic tiling with actual electronic circuits, e.g. for producing electrochromic surfaces, or activating temperature or movement sensors, with a view to creating the smart house of the future.

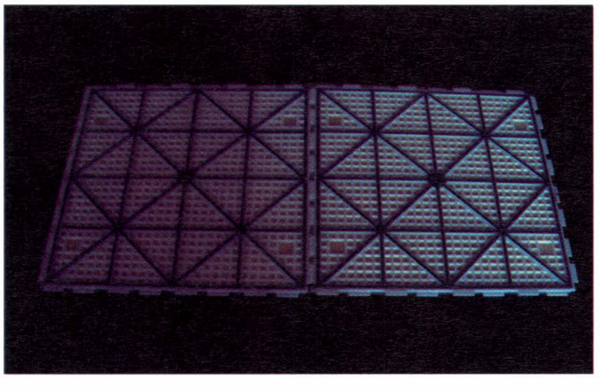
On the other hand, in the advanced ceramics sector it is a well-known fact that in the electronic industry, ceramic materials are capable of performing a wide variety of functions, ranging from condensers (all based on perovskitic ceramic materials of the barium titanate, $BaTiO_3$, type) to non-ohmic resistors used in circuit protection (based on silicon carbide and, particularly, zinc oxide) and integrated transistor gates, which are currently witnessing study of zirconia's twin brother, i.e. hafnia, HfO_2. Various ceramic materials are used in the field of sensors: the well-known, widely used zirconia-based lambda probe, hematite-based (iron oxide III, Fe_2O_3) sensors and tin oxide-based (SnO_2) sensors, whereas the perovskites mentioned previously are also extensively used for piezoelectric sensors (e.g. automatic door openers) and pyroelectric sensors (e.g. heat-sensitive video cameras).

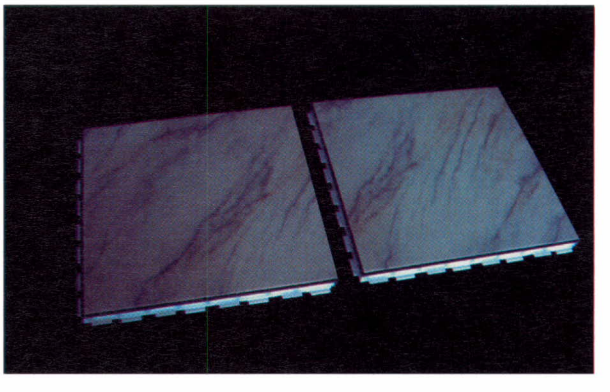
4.5. DRY-SET TILE BONDING AND INSTALLATION

A final sometimes limiting factor in the dissemination of ceramic materials is the problem of tile bonding and in the case of the tile, the relative complexity of tile installation.

If, from a purely scientific point of view, using nanometric ceramic particles nowadays enables providing ceramic materials with an almost ductile behaviour that also allows forming, which is usually impossible with ceramic powders, and even enables joining two ceramic elements, in the industrial field of ceramic tile installation, semiautomatic or automatic methods are currently being advanced.

In the first case, self-positioning tiles are involved, a function provided by the appropriate structures, e.g. in a plastic material, which enable easy joining of the pieces and also include the joints in a rubber/siliconic material.





In the second case, authentic robots are being proposed, which are able to automatically lay tiles of different sizes by traditional fixing.

4.6. TECHNICAL CERAMICS

Technical ceramics are steadily gaining ground on metals in the marketplace, particularly in the lathe tools sector. Bulk alumina-based tools (although there are also silicon nitride pieces and alumina/ titanium nitride composites) have shown themselves to be quite superior as regards useful life, and furthermore, given the traditional refractoriness of the ceramic materials, they require no cooling systems. At present, batch processing of cast iron is widely entrusted to ceramic tools. World market turnover currently lies around 1000 million euro per annum.

On the other hand, the fine-tuning of new superhard materials, for instance of the cubic boron nitride type, will allow fabricating improved abrasives, which will enable shortening lapping and polishing times. In this context, porous abrasives are already available that wear faster, but which have a greater abrasive efficiency because of brittle fracture which continuously exposes new point-studded surfaces.

Zirconia still remains at the centre of notable research and development investments, as a heat barrier for turbine systems, both for aeronautical engines and for electric power stations.

Based on the above, the market for advanced ceramics, in terms of the American market which accounts for approximately 65-70% of the total market, presents the following prospective development (ACERS Bulletin, July 2003):

Sector	2002 (M$)	2007 (M$)	Expected increase %
Monolithics	6443	10155	9.5
Coatings	662	875	5.7
Composites (ceramic matrix)	360	540	8.4
TOTAL	**7465**	**11570**	**9.2**

5. NEW BUSINESS STRATEGIES

The subject of Qualicer is exquisitely technical; the entire overview represents the synopsis of the long road travelled, in which the ceramic sector has given of its best to improve the product in all its technical, technological and aesthetic aspects by increasingly efficient manufacturing processes.

Much still remains to be developed, but if we wish to draw up a balance, it may be said that the Ceramic Sector has known how to invest with foresight in human resources, the manufacturing cycle and the product, something that has not been so evident in other sectors.

The force of the ceramic district (with Spain and Italy at the head), understood as a:

"Production area capable of developing everything needed for a project", and not just a "product", has been the element that has contributed to the success, and to keeping the manufacturing process agile, streamlined and efficient.

Today, however, globalisation and internationalisation force us to extend our horizons if we wish to maintain our leadership in the future. The following question therefore arises spontaneously:

"Shall we be able to keep our leadership only with technique and the aesthetic development of the product?" The reply is probably NO!

"What has been done until now will be, for the future, only a necessary, but no longer a sufficient condition", as today's consumer has three main reference points: "the trademark, distribution and communication".

The company anchored in its territory must learn how to "fly" in order to be "recognised and recognisable".

- Each action shall be increasingly focused on the future and not on the immediate present.
- We will be forced to programme and plan our future more than in the past.
- The mechanics of distribution will increasingly be a barrier to the trademark and recognition of product value by the consumer.

If this barrier is kept in place, the system can become impoverished and may no longer have the necessary means for technical, technological, aesthetic and production development it had in the past.

The development of a new "Business Vision" in this sense will require:

- "Time"
- "New professional figures"
- Far greater "financial means" than the traditional in-plant investments.

Current estimates, already today, indicate that for each euro invested in the production process (system hardware), it will be necessary to invest at least 4 euro in communication and distribution (system software), and this ratio is destined to grow in the future.

An interesting exercise would be to analyse how products from other market sectors have reached the marketplace, and what development this material has had in the last decade.

The change is, in all truth, somewhat surprising.

The great distribution, born to acquire by effecting large "scale economies", has step by step shown itself to be the true interlocutor of the consumer and the strategic element in the entire "Product - Market" system.

Today one buys what one encounters and knows.

The pillars on which the future will be based are: "Quality, Distribution and Communication".

Quality and know-how will be prerequisites.

The example of the great distribution in the food business has been reproduced in all the market sectors, seeking always after further specialisation, distributing "Products and Services".

Noteworthy examples are to be found in the food sector, in DIY, in gardening, in building construction materials, and in interior design, not to mention fashion. Other prestigious groups are entering with enormous capital.

Thus, if the future road to retaining market leadership is that of distribution, this will require:

- "Investing in distribution creating a system of companies"
- "Delocalising product manufacturing centres according to cost and/or distribution expediency".

As a business approach, it is logical to consider that the ceramic districts of today, even when they continue to be important production centres, will increasingly become sources of aesthetic and technological creativity and plant and equipment engineering and therefore of: "System Intelligence", which will involve devoting available financial resources to production facilities deployed in strategically convenient geographic areas and to distribution centres (established singly or jointly with others) according to expediency and financial availability.

The reply to the question: "Shall we be able to keep our leadership only with technique and product development?" is NO, because it will be necessary "To conquer the relation with the market in order not to be conquered".

I believe it is necessary accomplish this step to complete the enterprise "Product - Market".

This "new business strategy" will bear with it the elements for achieving a "System of Companies", capable of self-generation with new production and distribution positionings in a global market with variable geometry, which will be profitable if it can: "Be Recognised".