THE FUTURE OF THE GLAZING PROCESS

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Mr Stefani started work at the age of 16 in Ceramica Marazzi as an electrician.
With a purely technical background and a great passion for automated systems, he established his own company towards the end of the sixties and started building the first automatic screen-printing machines.
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Ceramic tile production technology has undergone impressive development that has almost wholly transformed the appearance of the various production sections: huge continuous mills instead of batteries of batch mills, silent hydraulic presses with unimaginable power instead of batteries of noisy friction presses, roller kilns with firing schedules only lasting tens of minutes instead of tunnel kilns that need days, stores moved by silent automatic vehicles that have replaced rails, pushers and transfer. However, there is one section that has nevertheless remained largely unchanged, and which in spite of the introduction of sophisticated technologies has kept its classical physiognomy: **the glazing section.**

How often, during a visit to a manufacturing facility, have the visitors, impressed by the level of automation of kilns and presses, shown their incredulity and surprise on coming face to face with the apparent precariousness of the glazing lines. It is also quite evident for even the most inexpert observer that an overall vision has been to date been lacking with regard to the glazing line.

Fortunately, at least in the industrial field, substance is of greater importance than form. However, in spite of this, the chaotic, disordered, dusty and muddy appearance of a

glazing machine is a certain indication of an infinite series of issues and problems yet to be resolved.

THE IDEA

A great imaginative effort is required to visualise what an ideal glazing facility might or should be like. This is probably the most recondite, repressed dream of every ceramist: a clean, ordered, predictable system. Without any dust, glaze splashes, flying tubes, electric panels, gloves, levers, pulleys and differentials to be manipulated.

It is precisely in the great imaginative effort that the idea of a new procedure is born, wholly redesigned in terms of the end product, quite different from the methods traditionally used in the ceramic branch. Other industrial sectors exhibiting similar problems implemented innovative technological solutions time ago, suffice it to consider the successes booked in technological advances in paper printing.

The problem of tile glazing and decorating has often been tackled by a great many operators in the sector, who have decisively contributed to the aesthetic and qualitative improvement of the finished product. However, all the techniques proposed to date for glaze application stem from craft methods, which are not very suitable for automatic control.

The various application methods involve letting the glaze fall in solid or liquid form onto the tile surface: what was formerly done with a cup is now performed by the bell, the effect obtained manually with a pencil is now achieved in-line by the disk, etc. However, glaze not only falls on the surface of the tile, but also dirties the edges as well as the conveying system, and requires using containing booths for application systems. The consequences of this requirement are significant: the glaze that falls beyond the tile surface can be recycled, though a part is inexorably lost; tile edges must be scraped, thus raising the risk of damaging the unfired piece; application systems need frequent washing, thus wasting time and water: but above all, the process is itself unreliable and needs constant adjusting.

Attempts to regulate this intrinsically unstable process automatically have yielded excessively complicated systems. Although it is possible in general terms to tackle the problem of developing glaze weighing systems in the glaze application line or automatic washing systems for the applicators, the already high complexity of the glazing line runs the risk of becoming overcomplicated.

THE ANALYSIS

A possible solution to the problem requires thoroughly overhauling the process: it is necessary to remove sources of instability rather than seek automatic regulation. An intrinsically stable process is surely easier to control. The new glazing line is born of such a vain conceit: elimination of instability, elimination of causes of scattering, elimination of

the most common causes of the defects that lead to tiles being scrapped, at their very source.

The ANALYSIS clearly shows that all the factors involved are closely intertwined: an unstable, dispersive process is by definition also hardly controllable, and is thus subject to unforeseen events that produce defects. It is not possible to tackle just one problem at a time: only an overall approach can yield substantial improvements.

This ANALYSIS also highlights the enormous economic value associated with enhancing process stability, reducing scattering and eliminating many types of defects, and precisely this justifies the great research and development work needed to tackle the overall problem.

The crucial question then becomes: how to transfer the glaze onto the tile surface in a perfectly controlled way, without dirtying tile edges or conveying systems. The answer also automatically solves a great many other problems: the scatter disappears, with a drastic cut in supervision requirements. However, this machine only represents the first step in redesigning the glazing section.

The first industrial result of this innovative approach was the ROTOCOLOR decorating machine. In this machine we can already find all the analysis and redesign elements of a printing process yielding a totally novel product that has become a world-wide success: absolute process control, eliminating printing defects and scattering, with a drastic drop in supervision requirements. However the machine only constitutes a first step in the work involved in redesigning the glazing section.

The hardest function is to design a machine capable of glazing a tile, while assuring the same advantages obtained in decorating with ROTOCOLOR.

ROTOGLAZE TECHNOLOGY

We can now proudly say that the result was based on a fully innovative glazing system, which brings together all the above characteristics. The new glazing system, called ROTOGLAZE, is quite unlike any traditional method, and may be defined as a lamination or glaze printing method on the tile surface. Glaze is only transferred onto the tile surface, in a mechanically pre-set fashion. The machine memorises optimum parameters and finds them automatically, minimising human error.

The glaze does not dirty tile edges or the means of conveyance, eliminating most of the scatter and suppressing the need for frequent washing. Transport can take place in an unbroken carpet instead of peaking belts. Tiles no longer need scraping or being kept in line by side guides, thus drastically lowering dust production along the line and the risk of unfired pieces knocking together or breaking.

The highly ambitious objectives set at the outset of the project were achieved one after the other. Moreover, new, and more interesting possibilities arose during the research and experimentation: possibilities that go far beyond the most fervent imagination, but which have opened up new horizons for tile production.

NEW PRODUCTS

One of the first results, for instance, which was immediately put into industrial practice was the possibility of producing mosaic tile with fully asymmetrical patterns, having spacings void of glaze between the patterns, to allow effective grouting.

Tile of this kind cannot be produced by traditional technologies, not even by transferring the glaze onto the patterns by screen printing. Indeed, the irregularity of the unfired tile edge makes it impossible to centre the tile under the screen, and the structural variety of the patterns would require a different screen for each die.

We can proudly say that some of the most admired mosaic designs exhibited in recent international trade fairs were produced thanks to ROTOGLAZE.

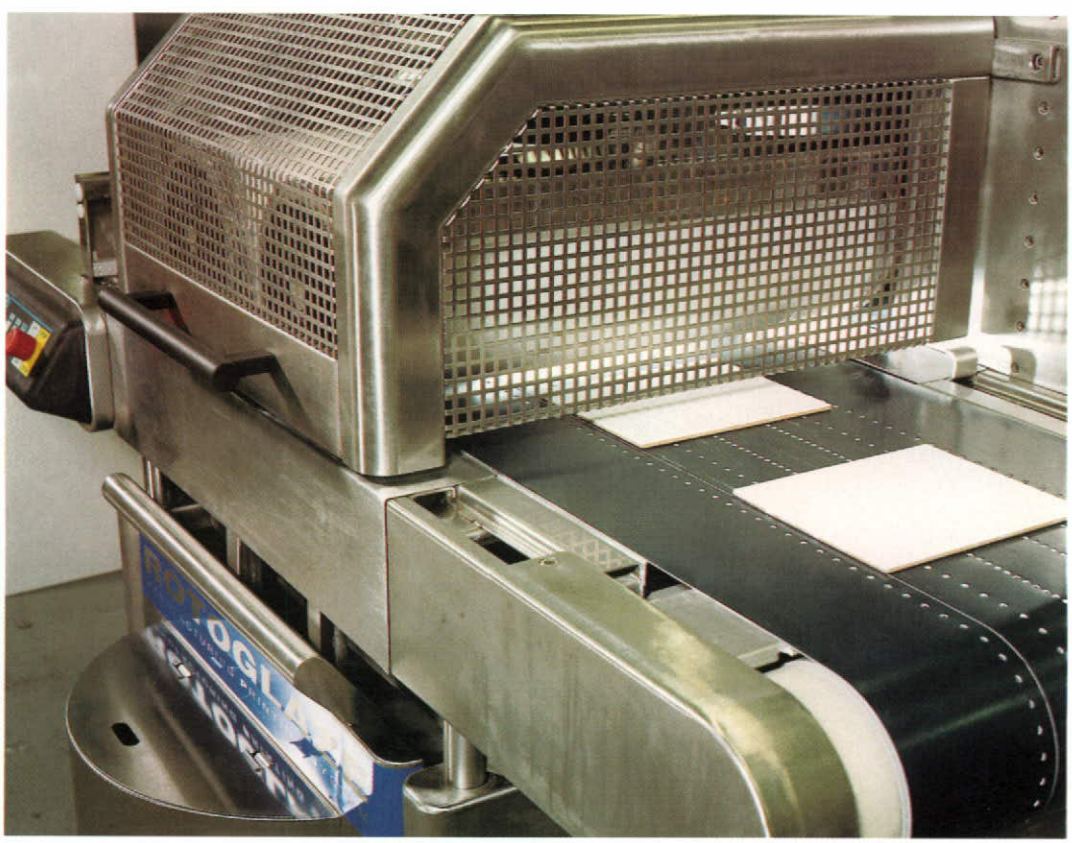
VERY SHORT LINES

However, the surprises do not end here. During the development of suitable glazes for application by ROTOGLAZE technology, another enormous advantage was found, relating to glaze lamination on the tile surface. Suitable glazes for this type of application should be mixed with a minimum amount of water: glaze spread over the tile is assured by the roller's mechanical laminating action.

No other type of applicator is capable of using glazes with such a low water content. The direct consequences of this fact are much shorter drying times for the glaze layers in the production line. Distances of tens of metres between glaze and decoration applications are no longer necessary: a few metres are enough. No drying lamps or vertical line extensions are needed: the glaze dries so quickly that no glazing line covers are required.

The introduction of ROTOCOLOR has led to a substantial reduction in the space required for decoration, going from 6-7 metres spacings between traditional screen-printing machines to little more than one metre between ROTOCOLOR heads.


ROTOGLAZE



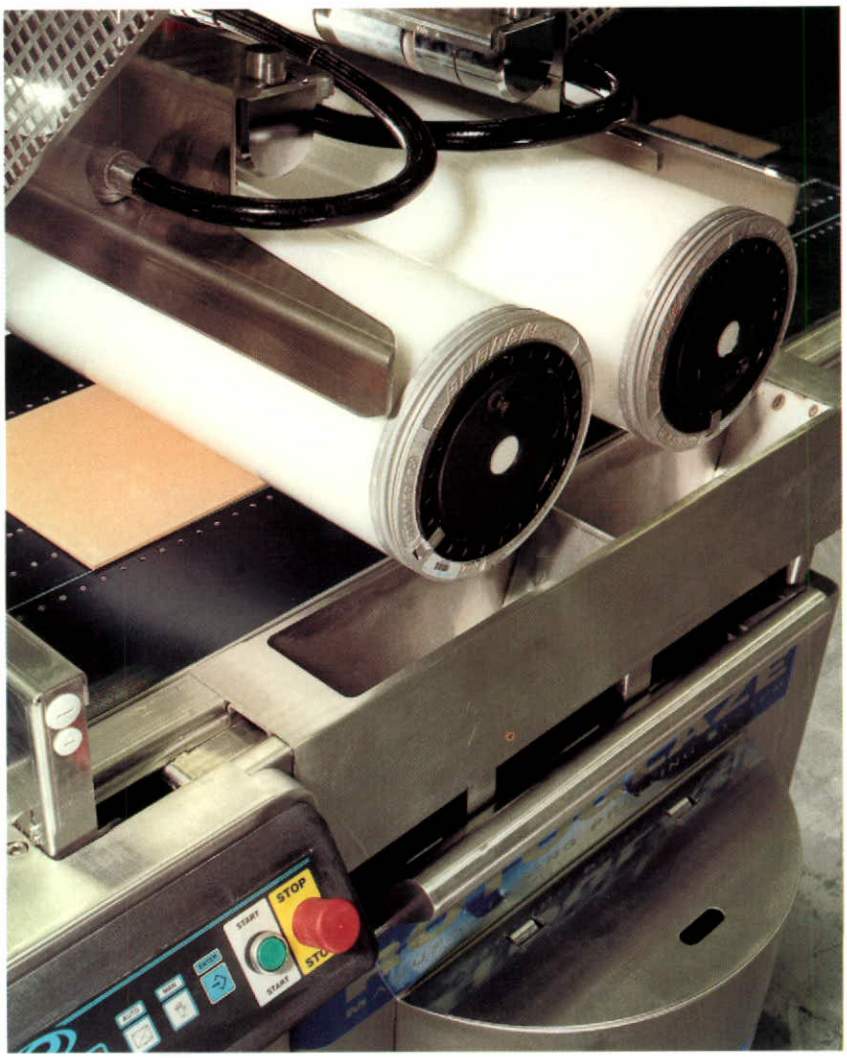
Implementing the ROTOGLAZE system will also drastically allow reducing the distance between decorating glaze applications.

It is currently already possible to manufacture products with a level of quality equal to large-size porous single-fired tile with a glazing and decorating system taking up less than 20 metres.

This until recently quite unimaginable result is today an industrial reality that will change the appearance of ceramic tile manufacturing facilities. The impact on the production system is enormous because it completely revamps traditional layouts.

PARALLEL GLAZING

From an installation point of view, there may be further repercussions, associated with the intrinsic characteristics of this new glazing system. Suffice it to mention parallel glazing of different flanking pieces. The glazing operation is conducted over the whole roller surface and since tile edges are clean, no scraping is required. Thus the existing obstacles to parallel glazing of small sizes have been suppressed.



The concept of parallel glazing and decoration is loaded with meanings and possibilities, in as much as it allows eliminating a constraint on decoration: parallel-glazed tiles with ROTOGLAZE can be parallel-decorated by ROTOCOLOR on receiving different portions of a decoration that can lie across the whole decorating roller surface.

Besides the aesthetic interest in a solution of this nature, a great installation advantage becomes conceivable: a line capable of glazing two rows of module thirty products, or three rows of module twenty products, can achieve twice or three times the productivity of a traditional line with the same rate of advance.

A line designed with ROTOGLAZE and ROTOCOLOR technology can also function perfectly at a high advance rate, namely twice or three times that of traditional lines, as the tiles are carried on a band, untouched by metal guides. Furthermore still to be considered is the fact that current storing systems for unfired products or firing kiln feeders may exhibit important limitations, which are not to be underestimated, with regard to the number of pieces that can be handled per minute.

The great increase in productivity in a glazing line of this type can be turned to great advantage in logistic and organisational terms, as production lots can be run in very short times compared to the traditional line.

MULTI-SIZE GLAZING

On freeing the spring of creativity our imagination can soar to flights in which differently sized tiles for puzzle-type flooring designs, or pieces with totally irregular edges for mosaic designs can be glazed and decorated at the same time. The only constraint in this sense is thickness, which must be the same for every size, however the system ensures that all pieces are glazed with the same glaze and are perfectly consistent in colour.

Without being over-imaginative, an enormous technological and installation advantage can immediately be had by implementing a glazing and decorating line without size constraints, capable of glazing different sizes without moving a single guide. A line of this type, provided with a standby press, can change sizes without a minute's production downtime.

NEW HORIZONS

This new extraordinary technology opens up new horizons for ceramic tile production as it allows viewing the glazing stage from a completely different perspective.

The fact of being able to think of a glazing section as a clean, ordered section, in which a perfectly predictable and controlled process is run, makes efficient control of the work environment perfectly feasible. Only by working in dust-free surroundings can the battle be undertaken against the smallest defects, thus always ensuring perfect glaze production.

ROTOGLAZE technology is ideally suited to designing highly compact lines, where room temperature and relative humidity can be efficiently controlled.

Imagining an air-conditioned environment in which glaze rheological parameters are no longer subject to atmospheric variations might have appeared quite unthinkable up to yesterday. But remember that enamelling car bodywork, undoubtedly exhibiting many more problems than tiles, has been already done for years in dust-free, air-conditioned environments.

The ceramic technician can now effectively benefit form the possibility of keeping steady all the parameters associated with glazing, and can finally concentrate on the most gratifying aspect of the work: the product's aesthetic creation.