Large-size ceramic panels and slabs: the evolution continues

大规格陶瓷板材：变革仍在继续

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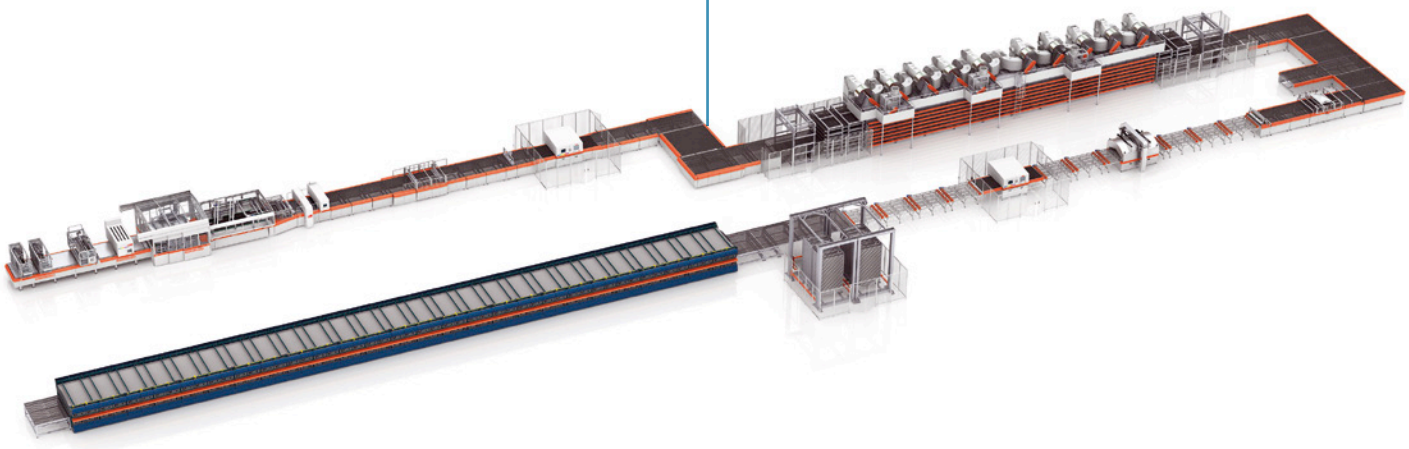
The production of large porcelain panels and slabs is now reality, testifying to the power of Italian innovation and the enormous development potential of traditional ceramic tiles.
The growing success of this new product type in its various versions owes much to recent advances in plant engineering and the development of innovative, high-performance solutions. The ***Continua+*** *line from Sacmi aims to offer manufacturers a hi-tech, full digital technology that is at the same time versatile and simple to use, capable of producing glazed and full-bodied porcelain in all sizes and thicknesses required by the market.*
The system has the flexibility needed to easily vary the powder loading width up to a final fired and rectified size of 1600 mm and thicknesses from 3 mm to 20 mm, allowing for the production of panels and slabs in all commercial sizes (1600x3200 mm, 1500x3000 mm, 1200x2400 mm, etc.) and the corresponding modular submultiples (80 cm, 75 cm, 60 cm, 50 cm, etc.) while avoiding the production of waste and maximising productivity. The availability of various devices for loading the powders on the steel conveyor belt makes it possible to apply any type of semi-finished products (spray-dried, dry coloured or micronized powders, granules, flakes, dry glazes, etc.) by means of automated digital dosing systems.
The upper continuous forming belt can be chosen in a smooth steel version, producing a ceramic surface that is ideal for subsequent digital decorations, or it can be clad with a regenerable structure with a graphic design extending over a length of 7.5 metres. ***Continua+*** *is effectively a* ***Full Digital*** *line: it combines dry digital decorations, a digital graphic texture, inkjet glazing and decoration and digital decoration with granules, providing manufacturers with cutting-edge tools for the pro-*

大规格陶瓷板材的生产如今已成为现实，证明了意大利创新的力量和传统瓷砖的巨大发展潜力。
这种新的产品类型在各领域中的成功发展，很大程度上要归功于设备工程最近取得的进步以及创新型高效解决方案的发展。萨克米（Sacmi）的**Continua+**生产线旨在为制造商提供高科技、全数字化技术，该技术具有功能多且易于使用的特点，能够生产市场所需的各种规格和厚度的釉面通体瓷质砖。该系统灵活性强，可轻松改变布料宽度，最终烧成宽度可达1600mm，厚度从3mm到20mm不等，因此能生产各种商业规格（1600x3200（mm）、1500x3000（mm）、1200x2400（mm）等）以及相应模块化系数（80cm、75cm、60cm、50cm等）的大板和厚板，同时在生产中避免浪费并最大限度地提高生产力。
由于可用多种设备在钢铁输送带上进行布料，因而可以通过自动化数字配料系统来处理各种类型的半成品（喷雾干燥、干粉混色、微粉、干粒、颗粒、干釉等）。顶部的连续性成型带可以选用光滑钢板，生产为后续数字装饰相匹配的陶瓷表面，或包裹能够将图形设计长度延伸7.5米的可再生结构。**Continua+**实际上是一条**全数码**生产线：它将干法数码装饰、数字图形纹理处理、喷釉、装饰以及干粒数码装饰相结合，为制造商提供先进的生产工具，为陶瓷原料生产提供尖端科技和美学附加值。
然而，为适配大板生产，整个工厂的生产环节都必须经过特殊设计、排序和施工，从运输和装卸系统到热能设备（干燥机和窑炉）以及生产线末端的辅助操作。
干燥的理想解决方案毫无疑问是采用**多层卧式干燥机**，该干燥机通常具有5或7层，既能保持对热循环的良好控制又能



duction of ceramic materials with extremely high technical and aesthetic added value. However, to produce large panels and slabs the entire plant must be specially designed, sized and implemented in all stages of the process, from the transport and handling systems to the thermal machines (dryer and kiln) and the auxiliary end-of-line operations.
The ideal solution for drying is without question the ***multi-tier horizontal dryer***, typically with 5 or 7 tiers, which is able to reduce space while maintaining perfect control over the thermal cycle, including temperature uniformity across the entire width of the dryer, final stabilisation and rapid extraction of the panels to be sent on to glazing/decoration. The ***kiln for panels and slabs*** must be designed in such a way as to avoid the stresses that typically arise in large-size tiles, especially in the cooling phase, which means it must have a suitable length. It is also necessary to minimise potential deformation of the panels or slabs in the firing zone caused either by incorrect roller pitch or by bending of the rollers under high loads, especially in the event of medium or large thicknesses, in which case kilns with a narrow entrance width (2170 mm) are preferable.
A complete plant for large-size panels and slabs must also include ***finishing lines that are suitably redesigned*** to cope with the large dimensions. These include:

- squaring and rectification lines
- honing/polishing lines
- fibreglass backing application lines for low-thickness panels
- submultiple cutting lines
- sorting and palletisation lines
- picking and packaging lines.

These finishing operations must be combined in order to handle the many semi-finished products that need to undergo further processing to create the packaged finished product. This, together with the ever smaller batch sizes and the greater product diversity resulting from the ease of varying the sizes and decorations of the panels, makes it necessary to adopt ***new production models designed for more efficient warehouse management*** of both semi-finished and finished products. The reorganisation of production and scheduling of operations in the various production islands requires the adoption of new control and logistics functions integrated with the company ERP, as in the case of the HERE supervision system proposed by Sacmi. Thanks to Continua+ technology, which already boasts ***more than 40 installations in the factories of top industrial groups, mainly in Italy,*** the production of porcelain panels and slabs can now be considered an outstanding example of the application of Industry 4.0 criteria. ×

减少空间，包括温度在整个干燥机上分布均匀、最终稳定性，并能够将大板快速提取输送至施釉/装饰阶段。
用于大板的窑炉必须经过特殊设计，以避免通常在大规格瓷砖生产过程中产生的压力，特别是在冷却阶段，这说明窑炉必须有一个适合长度。此外，在烧制阶段也有必要将大板发生变形的几率降到最低，大板变形主要是由于辊棒间距不合理或者辊棒负载过高产生弯曲而造成的，特别是大板厚度达到中高级的情况下，因此入口宽度较窄（2170mm）的窑炉更为合适。生产大板的成套设备还必须包括与之**相配的并经过重新设计的后期加工生产线**，以适应大板的后期加工。
这些生产线包括：

- 磨边和调整加工线
- 哑抛/抛光加工线
- 薄板底部添加玻璃纤维网应用加工线
- 约数切割加工线
- 分拣和码垛加工线
- 拣选和包装加工线。

这些加工工序必须结合起来，以便处理许多需要经过深加工才能制成最终整体产品的半成品。由于大板规格和装饰的多样化，从而使产品批量变得更小，产品差异化变得更大，因而有必要采用**新的生产模式**，以便**更有效地**开展半成品和成品的**仓储管理**。正如Sacmi提出的HERE监控系统一样，各生产工厂的生产和作业调度重组需要采用与公司ERP相融合的新的控制和物流系统。
如今有**超过40台Continua+技术设备安装在顶级工业集团的工厂，尤其在意大利**，因而可将瓷质大板的生产视为工业4.0标准应用的杰出范例。 ×