Innovation, efficiency and productivity
in a modern ceramic factory

Innovazione oggi è sinonimo di efficienza energetica e massima produttività, due fattori decisivi per la competitività di ogni azienda ceramica moderna. In quest’ottica Siti B&T Group ha sviluppato una serie di tecnologie all’avanguardia, prime fra tutte Supera® che rappresenta un nuovo concetto per la produzione di grandi lastre ceramiche.

Supera® è una tecnologia progettata con le più avanzate tecniche del settore, dal design innovativo, dotata di sistemi intelligenti e tecnologie brevettate. Disponibile in quattro modelli, da 25.000 t fino a 44.000 t, può produrre formati fino al 1600x4800 mm, è flessibile e versatile negli spessori (da 6 a 25 mm) e raggiunge una produttività fino a 13.000 mq/giorno. Caratterizzata da assenza di stampo e fondazione, Supera® elimina totalmente gli sfridi e garantisce la migliore planarità del prodotto ceramico (“ISOplanarità”).

Se dal punto di vista estetico consente di realizzare finiture superficiali “senza confini”, di rilievo è il livello di efficienza energetica raggiguibile. Su questo fronte, infatti, vanno sottolineate la riduzione degli scarti di produzione e il basso consumo energetico (<0,20 Kwh/m2) necessario per la produzione delle grandi lastre, soprattutto grazie al sistema brevettato di energy on demand Start&Stop, una centrale idraulica che azzera i fermermacchine e riduce i consumi, garantendo la massima efficienza di processo. Mutuando un concetto già in voga nel settore automotive - “spegnere il motore” durante le fasi del ciclo in cui non è richiesta energia - questa soluzione consiste in un generatore idraulico con motori controllati da inverter. Il gruppo è costituito da un motore asincrono ad alto scorrimento direttamente accoppiato ad una pompa idraulica a pistoni a portata fissa. Ciascun generatore idraulico è in grado di erogare una pressione massima fino a 420 bar. Grazie a Start&Stop, la potenza totale necessaria per la pressatura può essere fracionata, disponendo in parallelo di diversi generatori idraulici.

Supera® è stata progettata e realizzata secondo l’innovativo ISO Concept, che si declina in diverse caratteristiche: ISO Technology “Tensionless” (nessuna difettologia sul prodotto); ISO Thickness (uniformità di spessori su tutta la superficie dellastra); ISO Press (forza di pressaturadistribuita in maniera uniforme); ISO Plane (planarità unifor mme), grazie al sistema di pressatura con cilindri sincronizzati. Planarità, densità e spessori...
The Supera® patented mobile front and side plate system guarantees the absence of waste and allows for a standard deviation in apparent density of less than 0.02, apparent density of between 2.1 and 2.15 kg/cm³; a green breaking strength of more than 8 kg/cm² and a variance in maximum thickness across the panel of 0.2 mm (figures for BIA porcelain). Flatness control of the panels during firing is also facilitated by a specially designed direct cooling section. It features automated management of two longitudinally separated areas and manual management of two separate sub-zones (high and low), which can be automated with percentage control. Each zone is controlled by modulating the air both above and below the rollers by means of blowing pipes with differentiated holes on the centre/sides. Gaps are managed by means of burners located at the end of the direct cooling zone using active temperature control. Cooling cracks are avoided thanks to controlled indirect cooling in fase di cottura è agevolato anche da una sezione di raffreddamento diretto appositamente studiata. È prevista infatti una gestione automatizzata di due zone separate longitudinalmente e la gestione manuale di due ‘sotto-zone’ separate (alta e bassa), automatizzabile con controllo in percentuale. Ogni zona viene gestita modulando l’aria, sia sopra che sotto i piani rulli, da tubi soffiatori a foratura differenziata centro/lati. Grazie a bruciatori disposti a fine raffreddamento diretto, e quindi ad una gestione attiva.

### TAB. 1 - SUPERA® TECHNICAL DATA

<table>
<thead>
<tr>
<th></th>
<th>25,000 t model (1200x3600mm)</th>
<th>33,000 t model (1600x3200mm)</th>
<th>36,000 t model (1600x3600mm)</th>
<th>44,000 t model (1600x4800mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. pressing force / Max. forza di pressatura</td>
<td>25,000 t</td>
<td>33,000 t</td>
<td>36,000 t</td>
<td>44,000 t</td>
</tr>
<tr>
<td>Max. service circuit pressure / Max. pressione circuito servizi</td>
<td>200 bar</td>
<td>200 bar</td>
<td>200 bar</td>
<td>200 bar</td>
</tr>
<tr>
<td>Max. circuit pressure / Max. pressione circuito</td>
<td>380 bar</td>
<td>380 bar</td>
<td>380 bar</td>
<td>380 bar</td>
</tr>
<tr>
<td>Distance between columns / Distanza tra le colonne</td>
<td>2250 mm</td>
<td>2400 mm</td>
<td>2400 mm</td>
<td>2400 mm</td>
</tr>
<tr>
<td>Max. table/crossbeam distance / Max. distanza bancale/traversa</td>
<td>65 mm</td>
<td>65 mm</td>
<td>65 mm</td>
<td>65 mm</td>
</tr>
<tr>
<td>Max. loadable spray dried powder thickness / Massimo spessore atomizzato caricabile</td>
<td>65 mm</td>
<td>65 mm</td>
<td>65 mm</td>
<td>65 mm</td>
</tr>
<tr>
<td>Number of pressings per cycle / Numero pressate per ciclo</td>
<td>1-2-3-4</td>
<td>1-2-3-4</td>
<td>1-2-3-4</td>
<td>1-2-3-4</td>
</tr>
<tr>
<td>Max. number of cycles/min. / Numero di cicli/min. fino a</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Installed power / Potenza installata</td>
<td>55-220 kW</td>
<td>55-220 kW</td>
<td>55-220 kW</td>
<td>55-275 kW</td>
</tr>
<tr>
<td>Net weight / Peso netto</td>
<td>281 t</td>
<td>320 t</td>
<td>330 t</td>
<td>350 t</td>
</tr>
<tr>
<td>Max. loading length / Max. lunghezza di caricamento</td>
<td>1330 mm</td>
<td>1760 mm</td>
<td>1760 mm</td>
<td>1760 mm</td>
</tr>
</tbody>
</table>
ing, which prevents internal non-uniformities in the panel from causing breakages. This precaution is particularly useful when producing large-format panels and slabs and extruded products.

**Efficient thermal machines for large-format panels**

To achieve high outputs of large-format panels, it is also necessary to adopt cutting-edge thermal machines with a high degree of energy efficiency and the highest levels of daily productivity.

For the **horizontal dryers**, SITI B&T offers the innovative 7-layer “jumbo” dryer with entrance width of up to 4000 mm and low specific energy consumption of 1250 kcal/l of evaporated water (<70 kcal/kg of product). For the same length, this particular construction solution allows for a significant increase in production compared to the solutions currently available on the market.

The horizontal dryer can also be equipped with a specific system for recovering heat from the kiln, which brings a further energy saving of up to 18%. This is extremely important in the most advanced markets where fuel costs are significant.

Available in single- or multi-channel versions with high technological performance, horizontal dryers can be used to dry all kinds of ceramic products. The modular structure with independent adjustment combines simple construction with extremely rapid assembly and start-up. The multiple independent channels allow for the production of various sizes while ensuring considerable flexibility and increased production.

The main advantages include:

- high drying efficiency based on hyper-convective exchange, which allows for very low levels of consumption and a maximum temperature difference over the product of 5°C;

- efficient thermal machines for large-format panels

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Turbomach gas turbine packages (from 1 to 22 Megawatts) offer unmatched advantages:
Easy installation and integration, maximum reliability, and maintenance convenience. Each package is functionally complete with all main and auxiliary systems fully assembled.

The whole package is tested in our factory to guarantee outstanding quality, saving you time and money. All components of the package are proven and standardised to guarantee the highest possible availability.

Excellent performance, minimum maintenance and high energy efficiency are characteristics shared by the VDN vertical dryer, with increased rack dimensions of 1750x2230 mm and a machine height of 11 metres. It is the first and only dryer capable of handling a rack load of four 800x800 mm tiles. It has a capacity of up to 4 sq.m of loaded product per layer and a high degree of flexibility in terms of production, sizes and thicknesses. The upper drying curve has 5 set points (two intermediate set points have been added in the rising and descending sections). Finally, other options include ventilation and/or heating of loaded pieces as well as pre-ventilation for stabilisation.

Specific energy consumptions are equal to 1500 kcal/l of evaporated water (<90 kcal/kg product). Here too, they can be reduced by a further 15% by installing a dedicated heat recovery system, resulting in significant energy savings. In vertical dryers, the roller racks are hinged to the supporting arms which in turn are connected to the chain and are driven by drive units consisting of a self-braking motor and planetary gear unit. The special geometry of the supporting arms eliminates lateral stresses on the guide chains and makes component wear non-existent. The ample scope for adjusting the drying cycle allows custom settings to be made according to the type of products needing to be dried.

As for firing, the latest generation of kilns equipped with SITI B&T’s innovative Titanium® burners deliver the highest levels of energy efficiency (with up to 30% reductions in fuel consumption) and productivity (+25% compared to the traditional technologies present on the market). Titanium® kilns have an entrance width of between 3,500 mm (five 600x600 mm tiles per row) and 3,850 mm (four 800x800 mm tiles per row). This means they are capable of producing one piece more than conventional kilns that handle these sizes. SITI B&T thermal machines also have very low emissions of CO, CO₂ and NOx.

Additionally, SITI B&T can supply a wide range of burners (Greenburners and Titanium®) for any kind of kiln, characterised by excellent temperature distribution in the kiln chamber, high performance, high energy efficiency and minimal emissions. Mixed operation (with heat recovery system) allows for massiva limitazione sul prodotto pari a 5°C; • spazi d’installazione ridotti; • il sistema di movimentazione dei rulli metallici è regolato da una serie di motoriduttori che consente di ottenere un avanzamento uniforme del prodotto.

Prestazioni ottimali, minima manutenzione ed alta efficienza energetica caratterizzano anche l’essiccatore verticale VDN, con dimensioni del bilancella incrementate a 1750x2230 utile e un’altezza della macchina di 11 metri. Si tratta del primo e unico essiccatore in grado di gestire una carica bilanciata di 4 pezzi da 800x800 mm. Ha una capacità fino a 4 mq di carico a piano e un’elevata flessibilità in termini di produzione, formati e spessori. La curva di essiccazione superiore ha 5 set point (sono stati aggiunti due punti di regolazione intermedia nel ramo di salita e nel ramo di discesa). Esiste infine la possibilità di ventilazione e/o riscaldata dei pezzi al carico, oltre alla pre-ventilazione di stabilizzazione. I consumi specifici sono pari a 1500 Kcal/l acqua evaporata (<90 Kcal/Kg prodotto) che anche in questo caso, con l’installazione di un aspetto sistema di recupero calore, possono essere ridotti di un ulteriore 15% assicurando un significativo risparmio energetico. Negli essiccatori verticali le bilancelle a rulli, incernierate a bracci di sostegno collegati al catenario, sono mosse dal gruppo motorizzazione composto da motore auto-frenante e riduttore epicycloide. Grazie alla particolare geometria dei bracci di sostegno, vengono annullati gli sforzi laterali delle catene sulle guide e reesa inesistente l’usura delle parti. Le molteplici possibilità di regolazione del ciclo d’essiccazione permettono l’impostazione personalizzata in funzione del tipo di materiale.

Per quanto riguarda la cottura delle lastre, l’ultima generazione di fornì equipaggiati con gli innovativi bruciatori Titanium® di SITI B&T rappresenta oggi il top sia sul fronte dell’efficienza energetica, con consumi di combustibile ridotti fino al 30%, che della produttività (+25% rispetto alle tecnologie tradizionali presenti sul mercato). I fornì Titanium® sono caratterizzati da una larghezza della bocca variabile da 3.500 (5 piastrelle 600x600 mm per fila) a 3.850 mm (4 piastrelle 800x800 mm per fila). Consentono quindi di produrre un pezzo in più rispetto ai fornì tradizionali che gestiscono questi formati. Le macchine termiche di SITI B&T garantiscono inoltre emissioni minime di CO, CO₂ e NOx.

In aggiunta SITI B&T può fornire un’ampa gamma di bruciatori (Greenburners e Titanium®) per qualsiasi tipo di fornì, caratterizzati da ottima distribuzione della temperatura nella come-
We have a burning passion: to produce kilns that consume less and deliver greater savings and care for the environment.

Thanks to our Titanio® burners we already lead the field. But the flame of our passion continues to burn. And we have no intention of putting it out.
fuel savings of up to 30%. Emissions are reduced thanks to the special operating principle of the Titanium R burner, which unlike traditional burners acts as a post-combustor. Because flue gases that still have an oxygen content are partially used as combustion air, CO, CO₂ and NOx emissions tend to be significantly lower. Last but not least, various heat recovery systems (LHR, MHR, HHR) are used to ensure lower consumption and operating costs, higher efficiency and more consistent colour tones and calibres, as well as a rapid return on investment (2 years considering fuel costs in advanced markets).

A complete line for XXL large-format panels

Last but not least, SITI B&T Group is able to supply a complete modular line for XXL panels, from filling through to handling. It consists of machines designed and built entirely by the Group’s divisions with the utmost attention to innovation, efficiency and productivity.

After double or triple powder filling, Supera® forms the panel. The green material is then cut (although fired material can be used) by means of XXL Green Cut from Ancora, which delivers energy savings, low costs and maximum efficiency. The G5 and EVO8 machines from Projecta Engineering are used for digital decoration.

After single-chamber drying, the panels are dried in the Titanium® 3850 kiln. In the end-of-line stage, the panels are stored by Gripstrong and lastly handled with Bigmover, an LGV vehicle specially designed for large formats.

Table: Performance of Heat Recovery Systems

<table>
<thead>
<tr>
<th></th>
<th>Combustion air temperature</th>
<th>Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>LHR</td>
<td>120°C</td>
<td>5.5%</td>
</tr>
<tr>
<td>MHR</td>
<td>230°C</td>
<td>10%</td>
</tr>
<tr>
<td>HHR</td>
<td>300°C</td>
<td>14%</td>
</tr>
</tbody>
</table>

Siti B&T Group, in conclusione, è in grado di fornire una linea completa e modulare per le lastre XXL, dal caricamento alla movimentazione, con macchine progettate e prodotte interamente dalle divisioni del Gruppo, sempre con la massima attenzione a innovazione, efficienza e produttività. Dopo il doppio o triplo caricamento delle polveri, Supera® provvede alla formatura della lastra, mentre il taglio in crudo (ma può avvenire anche in cottò) viene realizzato con la XXL Green Cut di Ancora, che offre risparmio energetico, costi ridotti e massima efficienza.

Per la decorazione digitale, entrambi le macchine G5 ed EVO8 di Projecta Engineering.

Dopo l’essiccazione a camera singola, la cottura avviene nel forno Titanium® 3850. Nel fine linea, Gripstrong provvede allo stoccaggio delle lastre, movimentate infine con Bigmover, LGV progettato appositamente per i grandi formati.
The only and real high speed

- **FASTER**  High-speed spindles: up to 30 linear metres/min. for porcelain stoneware
- **BETTER**  Full dry squaring high energy efficient: -30% consumptions
- **STRONGER**  Greater productivity and reliability

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