

Nordimpianti System Srl, 66100 Chieti (CH), Italy

# New production of pre-stressed hollow core slabs starts at one of the leading companies operating in the Belgian market

In recent years Nordimpianti system has successfully implemented and commissioned many plants all over the world. A new project in the North of Europe began in the spring of 2008 with the Belgium Company Fingo N. V. To the customer's satisfaction the plant was commissioned in October 2009 and this gives Fingo the opportunity to expand its position in the commercial, industrial and residential housing sector.



*Fingo's new production facility in the Belgium city of Malle*

Fingo is located in the Belgium city of Malle, to the north east of the capital Brussels. Here, excellent road links allow Fingo easy access to supply and deliver concrete elements, not only to the local market but to the rest of the Benelux countries as well as Germany and France. Fingo's activity started in 1946 meeting the needs of the local housing construction market with small reinforced slabs for floors. At that time, production used concrete moulds with fixed steel as the reinforcement. The steel was covered by concrete which then had to be vibrated. This method of production enabled only concrete elements of up to 8m to be manufactured with the slabs themselves having modest technical characteristics suitable mainly for house construction. This type of manufacture continues today and annual production now stands at 900 000 m<sup>2</sup> with a permanent stock of 100.000 m<sup>2</sup> to meet the demands of both standard and customer specified panels.

The success of Fingo is due to several factors that have helped maintain this family run company in an important position in the house building sector. Fingo's highly motivated team grew the company by listening

to customers' needs and paying close attention to the quality of the product. This ethos of "total quality production" is easy to declare but putting it into practise can prove difficult. Only by taking advantage of advanced technology and the continual investment in personnel training specifically

geared to production quality can a business hope to reach its goals. Fingo puts this ethos into practise.

Another characteristic of Fingo is the diverse range of products that satisfy a varied customer base made up of engineers, architects



*Traditional floor panel manufacturing*

and building companies. This non-stressed range of floor elements consists of panels with various surface finishes and of widths from 330 mm to 600 mm, and heights from 130 mm to 210 mm. The range also includes the same floor panels with the same widths and heights incorporating insulation on the lower part of the element.

### New projects – Creating growth

In recent years the company decided to diversify its offer and had the objective to branch out into pre-stressed concrete element production to run parallel with its existing traditional mould manufacture. Pre-stressed concrete production would enable it to exploit the new generation technology making inroads into a sector which was, up until this time, new to the company.

Pre-stressed concrete elements have long been available in Belgium and annual demand is now 7 500 000 m<sup>2</sup> of which 1 500 000 m<sup>2</sup> is from pre-stressed manufacture. The idea to create a new plant dedicated to the production of these pre-stressed elements represented a real challenge.

The reality of expanding into Belgium's already mature pre-stressed market changed the initial idea into an ambitious project driven by the entrepreneurial flair and the farseeing vision of Fingo's owner Mr. Marc Van Cauwenbergh and his son Gert. It was essential for Fingo to expand into pre-stressed concrete hollow core slab pro-



Mr. Marc Van Cauwenbergh and his son Gert show their approval aboard the Nordimpianti Extruder on the day of commissioning.

duction because it meant that the company would be able to increase its product offer to the house building sector and more importantly give it the opportunity to grow business by entering the commercial and industrial building sector.

From the beginning Fingo knew that to be successful in this already developed sector they had to be competitive. They knew that they had to manufacture a superior product at a lower cost. The main



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**Nordimpianti's casting machines have several advantages:** high compaction, proven reliability, minimum maintenance and long machine life, rapid changeover for the production of different profiles and **high cost-benefit advantages.**



### Extruder System



#### EXTRUDER MONO & DUO SYSTEM PRODUCTION

- Hollow core slabs up to **500 mm (20 in)** high
- **1x2400 mm (16 in)** wide
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- **1x1500 mm (10 in)** wide
- **1x1200 mm (8 in)** wide
- **2x600 mm (4 in)** wide



### Slipformer System



#### SLIPFORMER MULTI SYSTEM PRODUCTION

- Vineyard Post
- Lintels
- "T"-Beams - "I"-Beams
- Slab with lattice work
- "Predal" panel
- Double and Triple ribbed panel
- "U" Panel
- Double "T" panel up to **1000 mm (40 in)** high
- Hollow core slab up to **1000 mm (40 in)** high
- Grandstand plates



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question facing the company was whether this was to be achieved by using either the Slipformer or Extruder technology systems. The Slipformer system is well known to the Belgium market due in part to the close proximity of a large Slipformer technology supplier. Even so, Fingo wanted to evaluate in detail all possible modes of production used not just locally but throughout the world.

Past experience had taught Fingo that just taking into account the capital start up costs did not tell the whole story and would not by itself guarantee the best chance of a successful investment.

This view was confirmed by an independent analysis undertaken by Mr Bynens chosen by Fingo to be its technical consultant. Mr. Bynens is an Ex-director of one of the most well known Slipformer manufacturing companies and was chosen by Fingo due in large part to his deep and comprehensive knowledge gained over 20 years.

His investment cost-benefit analysis was wide ranging. Within the technical parameters set by Fingo, it compared many companies from all over the world, evaluating all financial aspects of the manufacturing process in order to arrive at the actual cost of the final finished element.

In his presentation to Fingo's directors, Mr. Bynens proven experience gave great weight to the analysis and the numbers he presented spoke for themselves as to which supplier would be best for Fingo's project.

The main points taken into consideration were:

- Product quality with special emphasis on the geometrical profile and surface finish;
- Low element weight with high element technical performance;
- Quantity of concrete per cubic meter needed to work with each type of casting machine (Extruder and Slipformer);
- Running Costs;
- Downtime when changing inserts to produce different elements.
- Functionality of the machine;
- Machine build quality;
- Machine reliability.

After many months of analysis, comparisons and numerous European trips to personally research the technologies, Fingo's attention focussed on the Italian company Nordimpianti. Nordimpianti has, for more than 35 years been supplying machines and complete production plants for the production of pre-stressed concrete products such as flooring and wall hollow core slabs, T beams, posts, lintels, U-Panels, and double T panels as well as many other elements.



*Various production machines supplied by the Italian company Nordimpianti*



*Excellent concrete element quality achieved with Nordimpianti's Extruder machine and the use of quality aggregates.*

The first meeting with Nordimpianti was in Italy in September 2008. There they had the opportunity to visit Nordimpianti's factory where the machines are designed and built and also several production plants using the Slipformer and Extruder machines. It did not take much to convince Fingo's technicians that Nordimpianti's Extruder responded perfectly to their needs. Fingo was leaning more and more towards the Extruder technology but there still remained an outstanding issue which could have changed the final decision. The market in which Fingo operates sometimes demands the insertion of holes, openings and product indentations, and when this is required it must be achieved on fresh concrete. Unwanted concrete has to be removed imme-

diately after casting using a Concrete Aspirator. Although these machines have been on the market for many years they have so far up to now not been used on the semi-dry concrete worked by the Extruder

The Extruder machine works with a lower water/cement ratio in comparison with the Slipformer system and gives a far greater level of compaction. It was at this point in the project that Nordimpianti displayed its expertise that has always been a hallmark of the Italian company. It made a proposal to Fingo to demonstrate the viability of a new Concrete Aspirator even before Fingo had made a commitment to purchase. Within 3 months Nordimpianti had designed and constructed a completely new



*The new Concrete Aspirator designed to remove the semi-dry concrete worked by the Extruder after compaction.*

prototype that exceeded the specifications of other machines on the market.

A test run of the prototype was planned at a factory of one of Nordimpianti's local customers on a 400 mm hollow core slab produced by Extruder technology. It was immediately obvious that the machine had no difficulty in removing the concrete even under the area of the pre-stressed wires.

Fingo was very pleased with the final result and also placed an order for this new Nordimpianti machine.

The contract was signed in December 2008 and Nordimpianti met all the delivery and commissioning terms. The project was also helped by Nordimpianti's Agent in Belgium, Edeg International, who gave a support from the outset and acted as an important liaison between the Italian company and Fingo.

### Fingo Plant Layout

In March 2008 Fingo decided to invest in a new facility dedicated to pre-stressed hollow core panels. Planning permission for the site was made in September 2008 and was granted at the end of December 2008. 2009 promised to be a very busy year and in March building work started at the construction site and was completed in October. The very first production run took place on the 26th of October 2009. Of that day's production run only 2 m<sup>2</sup> failed to meet Fingo's strict quality standards.

The new production plant covers an area of 40.000 m<sup>2</sup>, and is only a few kilometres from the other production plant.

The plant itself is 160 m long and has a span of 34 m wide. It is surrounded by a large stocking area which has a bridge crane rated at 40 tons.

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*The plant has 2 production lines, each consisting of 5 production beds, 120 m long.*



*The concrete is transported from the batching plant to the casting machines using an automatic transport system consisting of a fly bucket and two concrete distributors.*



*The Nordimpianti Saw 500AM that can cut concrete panels up to 520 mm high*



*The Nordimpianti Extruder EV2000 showing its ability to cast a single 1200mm wide element or two 600mm wide panels.*

The plant has 2 production lines, each consisting of 5 production beds, 120 m long. Pre-stressed production capacity is 400 000 m<sup>2</sup> per year using only 8-9 operators per shift.

Concrete production relies on a horizontal batching plant that sits at the head of the production bed. Aggregate storage is 960 m<sup>3</sup> distributed in 7 covered silos. Aggregate is mixed using sand types with 0-1 mm

and 0-4 mm granularity and with gravel particle sizes of 2-7 mm and 7-14 mm. The cement stock is stored in three 100 ton silos. Concrete mixing is achieved using a planetary concrete mixer with an effective capacity of 2 m<sup>3</sup>. Due to the availability of selected aggregates with diverse granularity it is possible to obtain an excellent mix that is reflected in the quality of the final element. The concrete humidity is kept constant

during production using ultrasonic detectors mounted in the sand silos and in the bottom of the mixer. The management control system implemented by the batching plant software allows precise water adjustment in the concrete preparation cycle depending on sand humidity.

The concrete is transported from the batching plant to the casting machines using an automatic transport system consisting of

a fly bucket and two concrete distributors, one for each production line. In this way it's possible to work with 2 casting machines simultaneously, reducing production time and maximising the potential production capacity of the plant.

All the production phases of the plant were studied in detail to optimise output without compromising operator safety. Particular attention was given to the construction of the production beds and to the cable stressing system.

Production beds were constructed with an incline of 3 ‰ to facilitate water runoff to the recycling area. The production beds are made up of a steel plate bed on which are mounted side edges to form the lower part of the elements and the rails on which the production machines run. Fingo also took on board Nordimpianti's suggestion of having a channel on each side of the production bed between the manufactured element and the rails to collect disc cooling water used in the cutting operation of the elements. This keeps water within the production bed and stops water spill in the corridors between the beds adding to worker safety and the cleanliness of the plant. The stressing system has two 300 ton reactions beams on which the stressing cables of  $\varnothing 5-7$  mm, 3/8" and 1/2" are fixed. The cables are stressed individually by a hydraulic unit powered by an electronic control system. The reaction beam at the other end of the bed from the tensioning area has hydraulic cylinders to release the cable tension before the cutting phase begins.

The production phase starts with the preparation of the production bed using a bed cleaner, a multifunction machine supplied by Nordimpianti.

The machine cleans the production bed, applies detaching oil and pulls the stressing cables into position along the length of the bed. Once in position the wires are fixed to the reaction beams with cylinder clamps and then stressed.

For concrete hollow core slab production Nordimpianti supplied two Extruder machines for producing various element heights using 5 different forming inserts:

- 1 forming insert to produce 2 hollow core slabs 600mm Wide - H 150-180-200mm
- 1 forming insert to produce 1 hollow core slab 1200mm Wide - H 150mm
- 1 forming insert to produce 1 hollow core slab 1200mm Wide - H 180mm
- 1 forming insert to produce 1 hollow core slab 1200mm Wide - H 200mm
- 1 forming insert to produce 1 hollow core slab 1200mm Wide - H 265mm



*Single 1200mm or two 600mm elements being transported by telescopic lifting beams from Nordimpianti*

After casting, concrete elements remain on the bed and are cured for 8 hours. This curing time is realised because of the installation of a hot water under-bed heating system. The system is fed from a heating plant that distributes the heating water via a centre tunnel running underneath and across the beds allowing easy access for maintenance of the plant.

Only when the concrete panels have attained the correct resistance to hold the cable tension are the hydraulic cylinders activated to release the cables. At this point the concrete element is cut to the required size and if necessary with a required cutting angle using a cutting saw supplied by Nordimpianti. The saw can be easily operated and can make transversal, longitudinal or angular cuts from 0 to  $\pm 90^\circ$  at any point along the element. The machine's cutting blade has a diameter of 1100 mm but, if needed, can be fitted with a 1350 mm disk able to cut elements with heights up to 520 mm.

The last phase of the production chain is the removal of the elements from the production area and transfer of the elements to the stocking area situated outside. For this, Nordimpianti supplied two telescopic lifting beams rated at 10 tons, one of them for use in the external area.

Using the telescopic lifting beam the elements are loaded on to trolleys situated along the central avenue of the plant before being transported to the stocking area.



The 40 ton bridge crane moving elements in the outside stocking area

The efficient removal of the elements from the production area means that the plant is now ready to begin a new production cycle.

### Future Plans

Within a few months after plant commissioning the success of the close collaboration with Nordimpianti was evident and will allow Fingo in 2010 to ramp up to maximum production and increase its range, offering elements up to 500mm high.

Fingo now looks to build on this success and are undertaking feasibility studies for the construction of a second plant for the production of hollow core slabs solely dedicated to the house building sector, a sector in which they already have vast experience. ■

### FURTHER INFORMATION



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