

The Irish multinational CRH invests in a new hollow core slabs production plant in Denmark

The Danish market demands wider hollow core slabs for floors, which has been the inspiration for the expansion of the production capacity at CRH Concrete. Hollow core floor slabs are precast elements well known throughout the world and especially in Northern Europe where they enjoy the widest popularity. They have gradually evolved both in terms of size and their fields of application. Since the 80s there has been a continuous drive to increase the thickness of these floor elements with the aim to achieve greater spans with higher loading capabilities. In 1987 the first Slipformer machines able to produce hollow core slabs of 700 mm height were launched, a height that increased to 1000 mm after only a few years.

The width of these floor slabs also evolved. Initially the elements were mainly 600 mm wide in order to limit their intrinsic weight and reduce the need to use large construction cranes. Over time and with the availability of better performing lifting equipment a width of 1200 mm became more widespread and has now become an international standard although some exceptions exist in countries like Brazil where the standard is fixed at 1250 mm and in Russia and former So-

viet Union countries, where they prefer to produce slabs 1500 mm wide.

On the other hand, quite a few producers have chosen to produce slabs in a special width of 2400 mm. This particular large size is aimed to meet certain requirements mainly relating to construction issues such as reducing the number of visible joints between one element and another and to shorten erection times thus benefiting from inherent cost reductions. This has been especially prevalent in the civil and residential sector.

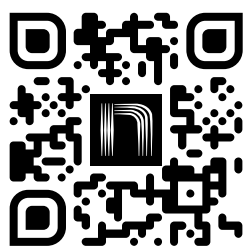
These advantages, combined with a rapidly growing demand for hollow core slabs with 2400 mm widths have been a catalyst for CRH, an Irish Multinational Corporation, to embark on a major expansion of its precast production plant situated in Viby, Denmark, a country in which the company holds a leading position in this sector. CRH has a presence in 32 countries with more than 85,000 employees in 3600 locations. In Denmark, the corporation operates under the name of CRH Concrete A/S and has 11 precast plants employing a total of 1400 employees.



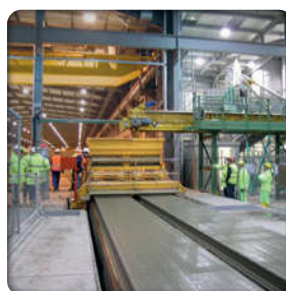
Nordimpianti's slipformer machine while casting in the year 1987 the first 700mm high hollow core slab.



The new production hall of CRH Concrete in Viby, Denmark.



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The Viby site underwent numerous developments between 1987 and 2006 and now produces a wide range of precast elements including the hollow core floor slabs with 1200 mm standard width. The plant employs about 120 people in the production in Viby as well as 50 employees within the sales office, technical office and erection department.

Thanks to the plant's strategic location close to the capital Copenhagen and the surrounding area, CRH Concrete A/S is able to consolidate its position as a market leader.

The construction of the new production hall is under the direction of Mr. Henrik Blaabjerg, the production manager is responsible for 5 out of the 11 of CRH's concrete production sites in Denmark.

For the new production hall CRH manufactured the pre-cast elements itself turning to the Italian company, Nordimpianti, a world leading supplier of machinery and equipment for the production of prestressed concrete elements. The construction of the new plant was completed on-time and production started in June 2018. The opening ceremony of the new plant took place in October of the same year.

The new production unit consists of five double production beds, 150 m long with widths of 2400 mm. The new Viby plant includes some innovative technical solutions that make it stand out from other standard plants, not so much for the product's width of 2400 mm but for certain technical challenges set by CRH Concrete and that were solved and implemented by Nordimpianti.

The most important amongst these were:

1. The requirement for the extruder machine to insert 10 mm diameter reinforcement rebar across and within the upper part of the slab during casting;
2. To simplify and reduce the time taken to perform numerous fresh concrete working procedures;
3. Automate the operation of the machines to reduce production costs;

To improve the working environment of the plant, to reduce maintenance costs, since the beginning Nordimpianti has provided its customers with customized solutions in addition to the supply of standard production machines. CRH presented Nordimpianti with an important opportunity, one in which Nordimpianti had to use all its wealth of experience and expertise to rise to the challenge and offer CRH innovative technical solutions that would meet their needs.

It was the first point that without a doubt gave the technicians at the Italian company the most to think about. In fact, although CRH was already aware of the high quality of Nordimpianti's extrusion machine, the biggest challenge was how to be able to automatically insert the rebar during the extrusion phase.

The need to have normal reinforcement placed transversally to the axis of the slab, in addition to the prestressed strands

is a special requirement of the Danish market. In Denmark the majority of hollow core slabs must have this additional normal reinforcement in order to give the element a higher transversal redistribution of concentrated loads and greater slab strength for the handling phases. Notwithstanding the fact that this has never been done before and that some previous attempts to solve this problem have proved unreliable, CRH Concrete decided to trust in the solutions offered by the engineers at Nordimpianti.

The bars to be inserted into the element are held in a container that automatically releases the bars one at a time at programmable points along the element according to the specific needs of the element being produced. Once the bar is placed in position a blade pushes the bar within the element to a set depth. To meet the challenge three problems had to be solved. The bar to be inserted had to be perfectly perpendicular to the product, the operation had to be automatic and most importantly of all the process had to be reliable. The storage magazine is incorporated into the extruder and is able to contain up to 120 bars allowing the machine to work for a long time before reloading is necessary.

For the planning of this new system, Nordimpianti carried out various studies and tests at its plants, often in the presence of CRH Concrete's own experts. It was the synergy between the technical staff of both companies that resulted in the project's success culminating in a new version of the Evo2 Extruder being successfully launched at the CRH Concrete plant. Small technical refinements during the testing phase were enough to obtain a highly reliable machine to the great satisfaction of both companies.

Nordimpianti's new machine produces 2400 mm wide hollow core slabs and with a single forming insert and it is able to produce elements 220 mm and 270 mm high by just changing the forming tubes and the upper smoothing device.

The casting machine chosen by CRH Concrete is the latest generation extruder model Evo2. This machine among other things allows the outer screws to be adjusted independently of the inner screws. This offers the great advantage of allowing the machine to adapt better to the customer's concrete mix and therefore to be able to produce elements of better quality. Being able to independently adjust the speed of the screws also allows to optimize screw wear, especially the outer ones which wear out quicker meaning a reduction of general maintenance costs.

All adjustments and machine controls are done through a large touch screen panel. The Evo2 extruder machine is equipped with a new software program that has been developed in collaboration with SEW-Eurodrive, supplier of electric drives and transmissions for all Nordimpianti's products.

Another issue, the technical staff from CRH Concrete were concerned whether a concrete aspirator machine was able, not only to remove semi-dry concrete compacted by an extrusion machine but also to keep up with the casting machine, considering the numerous work procedures required to be



Extruder Evo2 during the casting of a H 220 mm and 2400 mm wide hollow core slab.



Hollow core slab where it is possible to see the transversal reinforcement bars positioned by the extruder machine during the casting.

carried out on a 2400 mm wide panel. Their fears were unfounded and all their expectations were fully met due mainly to the impressive suction power of Nordimpianti's machine. Nordimpianti's concrete aspirator has also been equipped with two fixed suction nozzles fixed at the sides with the function to clean any residual concrete from the bed tracks.

Regarding the automation of the machines, CRH Concrete had clear ideas from the beginning. With much experience in this sector, CRH were well aware that in a competitive market such as the Danish, the numbers would only really add up if

the machines were automatic. The batching plant and the concrete distribution are fully automatic.

Once the flying bucket conveyor reaches the semi-portal bridge it discharges the concrete inside its hopper; the semi-portal bridge feeds the concrete and the power supply to the extruder. In this way it wasn't necessary to use a long electrical cable for all the length of the beds with economical and practical advantages. The semi-portal bridge is equipped with a telescopic hopper. This solution compensates the slope of the beds, namely to have a constant discharge distance between the hopper and the production machine.



Section of an element where you can see the transversal reinforcement bar positioned perfectly in the center of the upper slab.



Multiangle cutting saw mod. C500AM.



Cutting of a slab, showing the carter which collects the water inside the production beds.



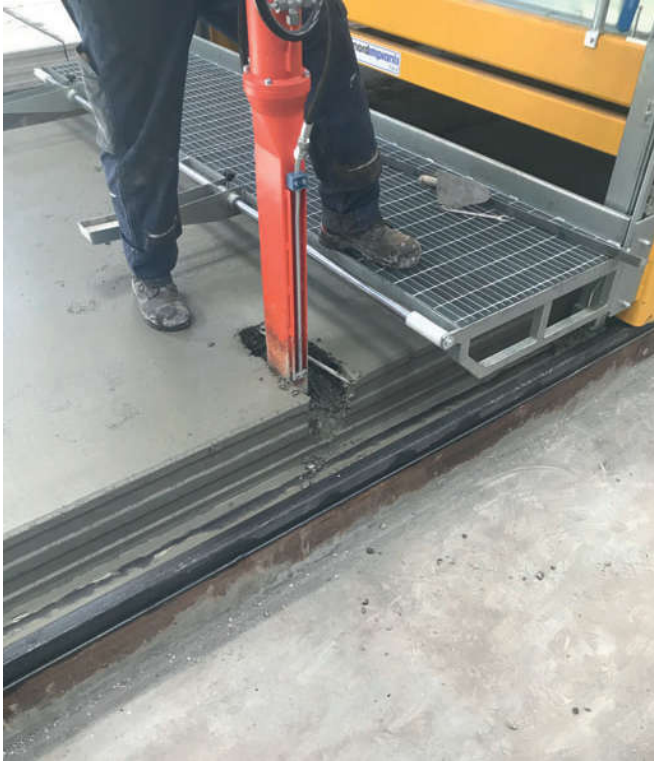
Concrete Aspirator machine while it is operating just behind the casting machine.

Another machine worthy of consideration is the multi-angle C500AM cutting saw able to cut elements up to 500 mm high. Nordimpianti's cutting machine can perform various types of cuts automatically. The cuts can be customized and memorised.

The C500AM saw has also been equipped with some particular accessories, such as the double motorized blade covers and the side water protectors. The motorized blade cover means that the blade is always covered during operation which, other than giving an increased level of safety also has the advantage of substantially reducing the amount of dust

and water in the immediate environment. The side water protectors stop the cutting water from flowing onto the corridors between the production beds as usually happens in many standard systems. This is due to the presence of a large amount of water used along the bed to cool the diamond cutting blade.

If the disposal of this waste water is not managed in a proper way, there could be the possibility of areas inside the plant and especially corridors between the beds flooded or at least wet with the inherent risk that workers will get injured.



Operator removing the concrete with the Concrete Aspirator from the element whilst it is still fresh.



Hollow core slab of 2400 mm width, which shows different shaped openings realized with the Concrete Aspirator.



2400 mm wide hollow core slabs ready for delivery.

Even with these issues Nordimpianti has developed a series of technical solutions which has alleviated many of the safety issues concerning water and dust. These solutions involved both the design of the production beds and the system for the collection and transfer of debris and cutting water.

The production beds chosen by CRH Concrete are equipped with a double rail with a space between the two, used as a channel to drain the cutting water. The first internal rail serves as a side edge to form the lower profile of the hollow core

slab while the external ones serve as a rail for the production machines.

During the cutting phase the water is conveyed into the channel between the two steel profiles thanks to the water protectors mounted on the saw. The production bed is sloped and the water in the channel runs down the incline. Once at the bottom of the incline the water runs into a chain conveyor system. The CRH Concrete plant has two conveyor chains, one of which is mounted at 90° (transversally) to the bed to transport the debris to a slurry tank inside the hall. From this tank the debris is removed by means of a suitable pump and the water is recycled with a special recycling plant. Thanks to these solutions, the aisles between the beds can be almost dry with obvious advantages both for the safety of the workers as well as a reduction in overall maintenance costs of the plant.

To complete the supply package, Nordimpianti also provided some auxiliary tools, such as a battery driven motorized plastic cover sheet coiler, a set of mechanical lifting clamps, stackable strand decoilers and a service platform used for the maintenance and cleaning of the machines.

The commissioning of the machines was carried out by Nordimpianti's technical staff, who also conducted the training of CRH Concrete's team for the use and maintenance of all the equipment. On completion of the final test of the plant,



Guests at the opening ceremony of the new Viby production plant for 2400 mm hollow core slabs.

the Project Manager Mr. Henrik Blaabjerg declared himself to be completely satisfied with the project.

Mr. Henrik also reported: "A great deal has been achieved between us and the team at Nordimpianti. Besides the quality of their machines they have demonstrated an ability to listen to what we required as well as being open to take on board the practical advice that we have gained from our long experience on the production line".

This wasn't the first time that Nordimpianti has worked with one of the divisions of the CRH Multinational in fact the two companies already knew each other from projects in other countries where the company operates, such as Belgium, France and England.

Nevertheless, this latest experience in Denmark represents a remarkable step forward for the Italian company, strongly interested in starting new collaborations with Scandinavian producers of hollow core slabs.

With this important collaboration concluded, the owner of Nordimpianti Mr. Gian Piero Gagliardi expressed himself by saying: "We have demonstrated our abilities and the absolute compatibility of our products and services to Scandinavian standards. We are very proud of the result achieved and we thank CRH Concrete and all its staff for the trust they have given us with the hope of being able to continue to face new challenges together and with the same level of success ". ■

FURTHER INFORMATION



CRH Concrete A/S
Vestergade 25
4130 Viby Sjælland, Denmark
T +45 7010 3510
info@crhconcrete.dk
www.crhconcrete.dk

nordimpianti

NORDIMPIANTI SYSTEM SRL
Via Erasmo Piaggio, 19/A
Zona Industriale Chieti Scalo, 66100 Chieti (CH), Italy
T +39 0871 540222, F +39 0871 562408
info@nordimpianti.com, www.nordimpianti.com

