

New solutions for the production of hollowcore slabs with exposed wires

Ronveaux SA is a leading producer of precast elements and in particular hollow core slabs in Belgium with two production plants, one at Ciney where prefabricated linear elements are produced and the second at Crisnée where hollowcore slabs are produced. The company was founded in 1923 and has always stood out for the quality of its products and the reliability of its services. The Crisnée hollow core slab production plant was started up in 1984 and has a production capacity of over 220.000 m² per year. Production is divided into two halls. The first hall has 6 beds 125 m long and is dedicated to the production of elements from 150 mm up to 270 mm high. The second hall has 5 beds 125 m long and is dedicated to the production of elements from 270 mm up to 500 mm high.

The Crisnée production plant covers an area of 48.000 m² of which 9.500 m² is covered. Concrete is produced by an on-site concrete mixing plant equipped with 2 mixers capable of supplying the base concrete to all the production halls. These production areas are equipped with an advanced concrete transport and distribution system made up of fly buckets and concrete distributors on cranes.

In contrast to other countries most Belgian manufacturers need to produce hollowcore slabs with the pre-stressed reinforcements exposed at the headers. This particular production characteristic stems from the French regulations (CPT "Planchers" - NF DTU 23.2) adopted by Belgium (NBN B 21-605) and which also apply in other countries such as Morocco and Tunisia.



Hollowcore slabs with exposed pre-stressing wires



External view of the production plant of Ronveaux, located in Crisnée



Internal view of the production plant

Outside the above-mentioned countries, the embedded wires of the hollow core slabs are cut by a saw when the concrete is dry and ready to resist the prestressing forces imparted by the steel wire reinforcements known as strands. Exposed wires are used to enlarge the concrete support of the hollowcore slabs when this support is reduced during the temporary step of installation (e.g. installation on a double wall panels). A further positive effect is to improve the reliability of the connection of the hollowcore slabs to the load-bearing structures (beams or walls).

Ronveaux, like many companies producing elements using extrusion or slipformer technologies do so because of the advantages of working with semi-dry concrete. However, things get a little more complicated when the wires have to be exposed using this type of dry concrete.

As the element is cast continuously it means that the wires have to be exposed at the cutting zone when the concrete is fresh, soon after casting. This operation usually involves several workers who manually or semi-manually remove the concrete following closely behind the casting machine. The length of the exposed cables varies from 50 mm to 120 mm.

In the early years, concrete removal was done completely manually, with approx. 4 people dedicated exclusively to this heavy manual labour. Spurred on by the growth in demand for hollowcore slabs Ronveaux has considered to invest in an "Unconventional Concrete Aspirator Machine" and incorporate it into its production cycle.

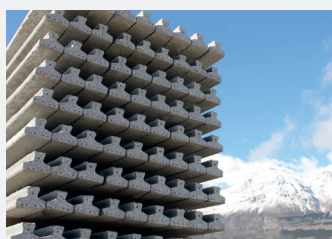
Nordimpianti already had in its range the Manual Concrete Aspirator. This type of machine, supplied to many hollowcore slab production companies around the world, is equipped with a suction system connected to a metal tube operated by an operator to remove concrete where necessary. In addition to exposing the wires, this machine can also be used to carry out other machining operations such as open cores and making recesses and holes of various sizes according to the technical specifications of the elements.

Without a shadow of a doubt, the concrete vacuum machine has brought a number of advantages, including:

- Improved working conditions for the operators.
- Time saving for this type of fresh concrete working
- Reduction of production costs because of the reduction in personnel required

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Typical work openings on fresh concrete

However, although the Concrete Aspirator machine has led to a major improvement in production efficiency, there remains an issue concerning the difficulty for the operator to obtain a clean precise cut perpendicular to the production bed.

The problem stems from the fact that the operator has to manoeuvre the suction tube manually across the bed, following the cutting lines previously marked on the surface of the element. The problem is accentuated when producing thick elements which make precision even more difficult.

To resolve this problem, Ronveaux consulted Nordimpianti, a leading manufacturer of hollowcore slab production machinery based in Italy.

Based on an idea and tests performed by Ronveaux, after careful analysis, Nordimpianti proposed a simple and ingenious solution not only to improve the quality of the fresh cut, but also to offer to automate some aspects of the concrete aspirator.

The new machine designed by Nordimpianti is equipped with an automatic fresh-cutting unit consisting of two mobile and independent guillotines with the function of descending into the fresh concrete and ensuring a perfectly vertical and transversal cut. Once the guillotines have automatically cut into the concrete the operator can easily vacuum up the concrete between the guillotines knowing that he will not disturb the edge of the cut. Once the removal of the concrete is complete, the guillotines are raised leaving the cut perfectly perpendicular to the plane of the production bed.

Positioning of the semi-automatic concrete aspirator is done automatically via a downloaded plot file generated by ERP management software. To ensure high positioning accuracy, the machine is equipped with a laser that monitors the position of the machine along the entire casting bed. The new concrete aspirator machine was commissioned in July 2023 and was deemed a success by both Ronveaux and Nordimpianti.



Semi-automatic Concrete Aspirator



Fresh concrete guillotine cutting assembly



Quality of the fresh cutting with the guillotine system

The implementation of this new concrete aspirator has allowed Ronveaux to definitively increase the quality of the fresh concrete cut whilst at the same time increasing production efficiency, two aspects very important to the company's ambitions and competitiveness within its target market.

The automatic concrete aspirator was only a part of Ronveaux's investment with Nordimpianti. Three other equally

important projects aimed at improving production were launched during the same year:

- Development of an automatic multi-function cleaning machine.
- Implementation of the de-tensioning system.
- Combination of the concrete aspirator with a fresh cutting saw to execute the longitudinal cuts in automatic.

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References **Referências** **Референции** **Referenze**
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With over 50 years of experience in the prestressed concrete industry NORDIMPIANTI's machinery is manufacturing concrete elements in over 50 countries.

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Automatic fresh cutting saw combined with the concrete aspirator

Automatic multi-purpose cleaning machine

When producing hollowcore slabs the preparation of the production beds is one of the most time-consuming operations. The preparation consists of the following operations:

- Bed cleaning.
- Application of detaching oil.
- Pulling the prestressing wires along the length of the production bed.

These three operations are usually carried out one at a time by a standard multi-function cleaning machine with one operator on board.

In order to improve the efficiency of this production phase, Ronveaux was inspired by an automatic multi-function cleaning machine offered by Nordimpianti, which, unlike standard

machines, is able to perform the above three operations in a single pass and without the presence of an operator on board.

To fully meet the working specifications set down by Ronveaux, this machine would have to work on a dry production bed, as in this context the elements are not cut with a normal cutting machine that uses water to cool the cutting blade. This particular constraint, if unresolved would have caused excessive dust creation which would have had a serious negative impact on the working environment of the production hall and had to be avoided.

In order to solve this, Nordimpianti proposed a modification to its standard machine, equipping it with an efficient dust extraction system mounted next to the rotating brush.

Thanks to this solution, the new automatic multi-function cleaner efficiently performs bed preparation in a single pass and minimising the creation of dust into the working environment.

In order to be able to lay all the cables along the bed in a single pass the pulling capability was increased. The machine is capable of pulling up to 23 1/2' strands along the length of the 125 m long bed.

Implementation of the detensioning system

When the hollowcore production plant was designed back in 1984, reinforcement detensioning before cutting was not a widespread practice. With the passing of the years and the advent of new regulations on the safety of both the working environment and the quality of finished products, the detensioning of stressing wires has become a very serious and pressing issue. The bed anchors, on both ends, were fixed and therefore the prestressing cables were cut manually by the operator under load. This potentially dangerous and outdated practice is still suggested by some machine manufacturers for purely economic purposes.



Automatic multi-function vacuum bed cleaner





Fixed detensioning pump unit installed at the detensioning side

Ronveaux asked Nordimpianti to look into the possibility of modifying one of the two fixed sides and installing Nordimpianti's detensioning system consisting of a movable anchor and relaxation cylinders

The study was carried out with close cooperation between Ronveaux and Nordimpianti as it involved modifying structures for which not all the technical information of the initial design was known. Several visits were carried out by Nordimpianti's technicians in order to arrive at the design of the new anchors equipped with the detensioning system. The final design settled on positioning of the detensioning unit in a fixed position rather than a mobile one.

The hydraulic detensioning power unit was placed on the wall near to the bed end and connected to the detensioning cylinders via flexible hydraulic hoses.

Each production bed has its own control so that each bed can be operated independently.

The new detensioning system has been installed in both hollow core production halls and allows Ronveaux to operate this delicate phase of work safely.

The collaboration between the two companies has been very successful. All three projects were completed satisfactorily and, above all, within the delivery schedule agreed with Nordimpianti.

Already new ideas and projects are in the pipeline for the future and will further consolidate the close partnership already forged by the two leading companies. ■



New reaction beams with detensioning

FURTHER INFORMATION

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