Nordimpianti System Srl, 66100 Chieti, Italy

Proven hollow-core production line at the plant of Betard in Poland

In February 2018, at the company Betard, located in the fourth largest city in Poland, – Wroclaw, the Italian company Nordimpianti was held a seminar for specialists in the concrete industry. Among its numerous participants from Ukraine, Belarus and Russia were representatives of enterprises and companies, where Nordimpianti equipment is already in use, and those who are just planning to purchase it. For the firsts this visit to the Wrocław plant was an opportunity to once again talk with representatives of the Nordimpianti company, receiving first-hand answers to all questions of interest, and to exchange experiences with colleagues already using similar equipment. The latter could see first-hand the unique possibilities of the Nordimpianti technique. For both of those seen in Wroclaw will help to develop a highly effective strategy of reconstruction, modernization and technical development of their enterprises. Including the installation of the equipment made by Nordimpianti - a recognized leader in the design and manufacturing of machines for production of prestressed reinforced concrete products, which are increasingly used in housing, civil, industrial and infrastructure construction.

The production site in Wroclaw became the venue of this meeting not by chance. The Nordimpianti line for the manufacture of hollow-core slabs by the method of continuous casting has been successfully operating in the city for about a year.

Betard is a good known name in Poland. It is known by sports fans thanks to the sponsorship provided by the company to representatives of different types of sport. But, first of all, it is heard due to its production achievements - a wide range of high-quality concrete products, including prefabricated reinforced concrete elements, for all types of construction.

The opinions of the specialists of one of the flagships of the Polish construction industry in the country and abroad are regarded with great attention, and their experience in the selection of production equipment is get acquainted with the interest.

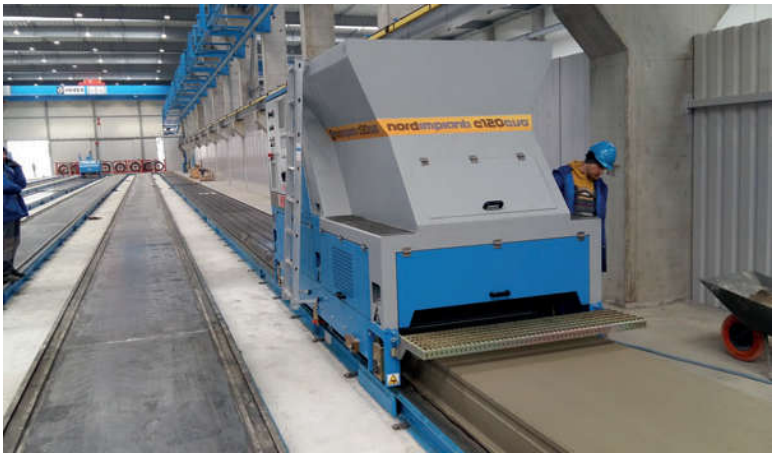
The construction industry in Poland – course for modernization

The Polish construction industry after some slowdown in 2011-2015 is again, on the rise. It's success is eloquently evidenced by the fact that in modern Poland the problem of housing shortage is basically solved. The Polish real estate market has become the center of investment attraction for citizens of not only Poland, but also other countries seeking to preserve and increase their personal savings.

Such interest in real estate cannot but stimulate the development of construction and production of construction materials. The unconditional advantage of the Polish economy is the

Before starting a new production cycle, the beds must be thoroughly cleaned.

A multifunctional machine is responsible for the quality of the lubrication; in Wroclaw it runs on gas.



The casting machine of the company Nordimpianti, an extruder of the EVO series, moves along the production bed. At the same time in the hopper of the casting machine should be provided a constant and continuous concrete supply (up to the end of the concrete casting process).

outstripping growth of industrial production, the growth rates of which are higher than the economy as a whole. And it is impossible without new industrial construction.

Not to forget that for the development of the economy of any country, and such a large enough as Poland in particular, the most important task of the construction industry, along with the construction of housing, is the implementation of large-scale infrastructure projects.

To successfully cope with the diversity of diverse tasks (and the Polish construction industry is coping with them), it is necessary to create new and modernize existing production facilities for the production of building materials.

By the beginning of market reforms, Poland approached with a rather impressive production base of the construction industry. Only the enterprises of large panel system housing construction in the country numbered more than one and a half hundred. But time required a large-scale reformatting of the construction industry in the organization of production and technical equipment. A lot of enterprises turned out to be uncompetitive and were closed or stopped a step away from closing. Some of them managed to be brought back to life as a result of reconstruction and modernization. Part of the production was created from scratch.

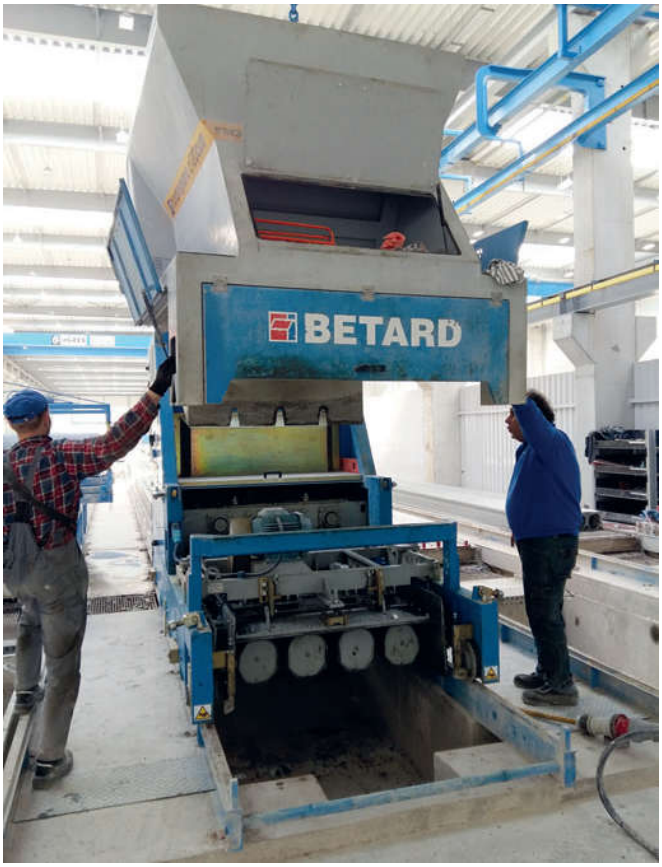
In both cases, it was necessary to install modern equipment, which makes it possible to implement resource-saving and environmentally flawless technologies. Technical re-equipment, which provides an increase in production volumes, a dramatic improvement in the quality of finished products and an increase in labor productivity have been the trend of the Polish construction industry for many years.
Companies that produce hollow-core slabs with conveyor-type production method switch to the method of continuous casting on long beds, using for this purpose installations from the best world manufacturers. Among them, Nordimpianti, whose equipment operates in more than 40 countries.

Nordimpianti – company and equipment

Experts all over the world could see the high quality of Nordimpianti - both the plants themselves and the produced with their help a wide range of products made of concrete. Along with the advantages of the equipment itself and the high quality of its products for customers, the principles and organization of the company's work with its customers are of great importance. Primarily, the fact that Nordimpianti is not just machines, but ready-made integrated engineering solutions, including the fully supplied production and technological process.

Specialists of Nordimpianti are actively involved in the work even at the stage of developing a project for the construction of a new or reconstruction of the existing company. They provide the necessary support at installation of the equipment, starting-up and adjustment works, in personnel training. After the launch of the production line, its users are provided with a modern high-quality service, including timely delivery of spare parts, provision of necessary consultations, etc.

All this predetermines the choice in favor of Nordimpianti. And this was the choice that made Polish company Betard, based in Wroclaw. On deliberation and responsibility, with whom this decision was approached, shows the fact that the project was financed exclusively from the company's internal sources without borrowing. Although one of the tangible ben-



The unit has a modular design: the power unit with the hopper can be easily transferred to another forming insert to produce a slab of a different height/width.

The use of curing treatment allows to reduce the time to reach the required strength up to 6–8 hours, after which the stress of the reinforcement could be relieved, and the array can be cut. During the curing treatment, it is recommended to cover the products with a vapor-proof material.

efits of Poland's staying in the EU is the arrival of money from the European Union, including investments in the construction industry.

Nordimpianti line in Wroclaw

The production-technological line at the Betard plant in Wroclaw, manufacturing hollow-core floor slabs using the continuous casting method, includes six stands, each in length 150 m. (Nordimpianti equipment with similar performance is installed in Russia, in Cheboksary, in the GBK-1 plant).

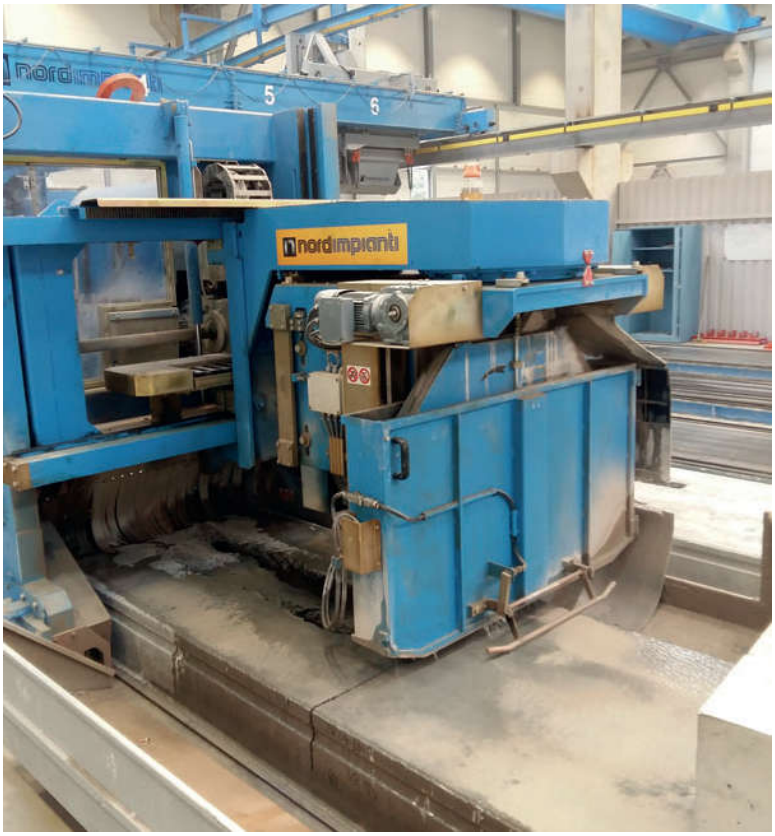
After the mixer the concrete is fed by a fly-bucket to the concrete distributor next to the extruder, and from there it goes to the concrete casting machine. In general, the delivery of concrete from a concrete mixing plant to a casting machine can be carried out in various ways, depending on the layout of the plant and the required production rate. The option used at the Betard plant allows the greater volumes and higher performance.

On the line in Wroclav operates the EVO series extruder machine for the manufacture of a wide range of prestressed hollow-core slabs and wall panels. The concrete is squeezed by screws onto the bed through the forming tubes making rotational and reciprocating movements. The extrusion casting process ensures the required level of compaction at each point of the product and eliminates vibration and high noise levels.

The height of the products varies depending on the from their destination and the necessary technical characteristics. Modular design of the extruder allows to change the forming inserts for a quick transition from one size to another.

Standard slab (panel) height -from 150 to 520 mm; width - 600, 1200, 1250, 1500, 2400 mm. It is possible to manufacture products of non-standard width - 800, 900, 1100 and more mm. Slabs of small height are used in low-rise construction and to cover short spans. In Wroclaw, the share of slabs with a height of 400 and 500 mm is 50-60% of the total production, in contrast to plants in Russia and the CIS, where it usually does not exceed 10-15%.

The external shape of the products is determined by lateral forming devices (side formers), and the shape of holes - forming tubes.



No hooks on the slabs are installed at the factory.

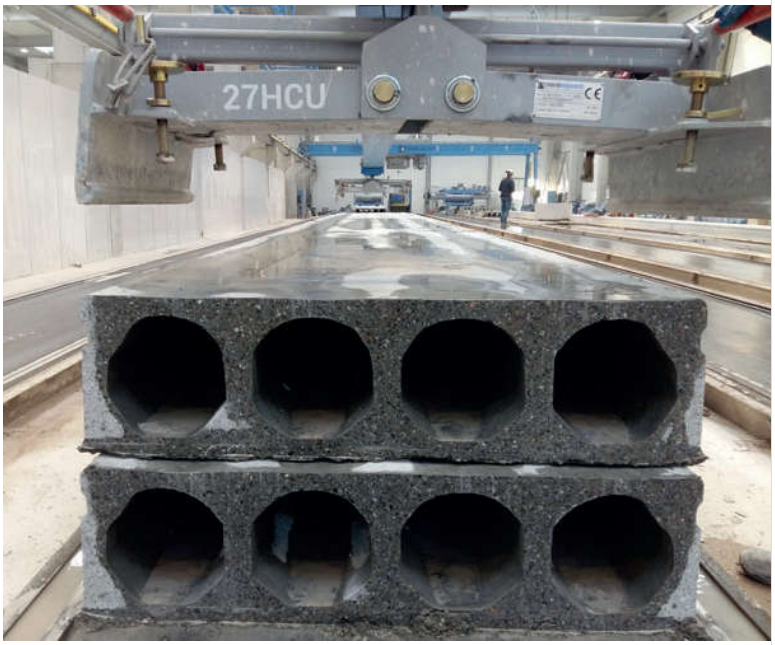
Betard plant distinguishes individual design of holes, sometimes having a very intricate shape. When it was created, the designers mainly pursue the goal of increasing the fire resistance of the slab. Slabs with a height of 160 to 200 mm have six holes, 265 mm high – five and a height of 300 to 500 mm - four.

Different from the factories in the CIS is the approach to reinforcement. In Wroclaw, and Poland in general, taking into account the high cost of metal fittings, they rely on the use of concrete of higher strength (class), and they try to minimize the amount of used reinforcement. A hollow-core made on long beds does not have a transverse reinforcement. But the longitudinal reinforcement is quite thick: for the slabs with the height of 200 mm – 12, and for the slabs from 320 mm sometimes it reaches 15.2 mm. The upper reinforcement is used only in slabs longer than 13 meters. In factories located in the post-Soviet space, the upper armature serves to compensate the bends that cause the appearance of cracks. Here, this problem is solved using high-class concrete. Regardless of the dimensions (length and height) of the slab and its load-carrying capacity, the concrete class B-50 (or C60/50 according to European standards) is used. The entire load, especially in the support zone, where the slab is pinched, is perceived only by concrete.

If the amount of reinforcement is less, then its tension is higher. As a reinforcement wire is used only for small products, for large ones are used strands. Due to the high quality of lubricant and the correct technology of its application (consumption per 1 m^2 does not exceed 25 grams), reinforcing strands do not slip.

The effect of disarming oil on product quality should not be underestimated. It should be borne in mind that some lubricants can react chemically with metal and water, applied to the bed surface before casting machine, that is fraught with corrosion of concrete. Certain types of lubricant, interacting with concrete, do not provide separation between concrete and the metal, resulting in is the sticking phenomenon.

The saw moves along the bed and is installed at the desired cutting point; cuts can be transverse, longitudinal or angular.



At a factory in Wroclaw, slabs with a height of 160 to 200 mm have six holes, a height of 265 mm – five, and a height from 300 to 500 mm – four, as shown here.

In the production factories in the CIS countries the strands are often placed "on dry", and then, lifting them, they put the lubricant on the bed. As a result, the over lubricated strand begins to slip.

It is more correct to first apply a thin layer of lubricant on the bed, and then lay out the strands. The consumption of the lubricant should be carefully monitored. If the lubricant layer is very thick, it envelops the strands, causing them to slip.

There is a simple test of the quality of lubrication. If the finger held along the bed becomes fat and there is not a trace left of it, then the lubricant is correctly applied.

In the Nordimpianti's line, a multifunctional machine is responsible for the quality of lubrication. Two rubber scrapers are part of its technological equipment. In the cleaning process one removes debris fragments, the second distributes lubricant in the most uniformly thin layer. Therefore, the strand, layed on the pre-lubricated bed, will not slip.

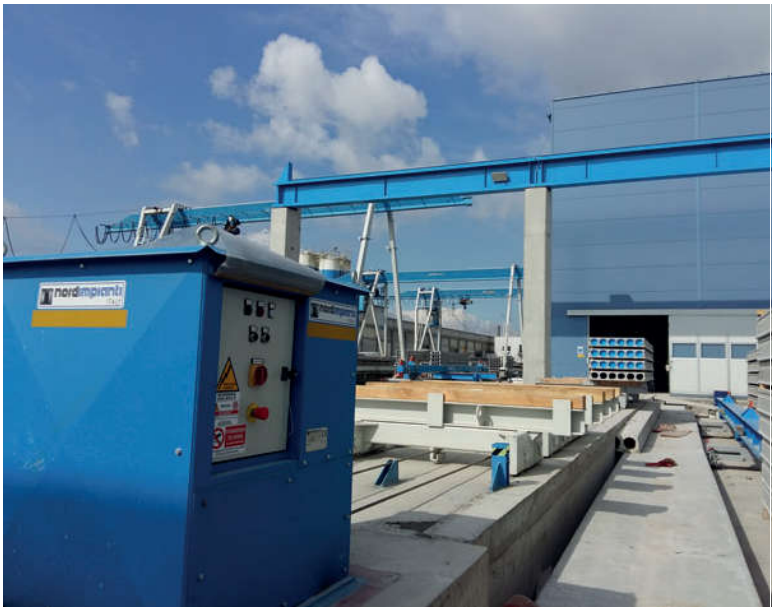
It is interesting that in Wroclaw this machine works with LPG motor unlike most plants in the CIS, where an electric drive is mainly used. Although in Russia there are companies where "gas" multifunctional machines are operated, there are factories GBI-1 and GBI-5 in Tyumen, "Armaton" in Novosibirsk. The advantages of gas are the higher speed of the multifunction machine; cable drum and cable do not interfere with operation. But gas requires strict adherence to safety regulations, and therefore, the appropriate organization of production. Which is better - gas or electricity - the client chooses.

When the product reaches the required strength, and the stress is removed from the reaction beams and transferred to the concrete, the array is cut into fragments with the help of a circular saw. The cuts are transverse, longitudinal, angular - can be performed anywhere in the product. Cutting time - from 90 to 180 seconds - depends on the type and height of the product, as well as the density of reinforcement.

When the reinforcement of the slab is significant the saw is bent. To prevent the saw blade pinch the saw is loaded with additional load.
The features of the plant in Wroclaw include a machine for punching holes in the slabs. In Russia, wooden bars are often used for this.

The hooks on the slabs are not set here: installation work is carried out with the help of clamps and lifting beams. For the small customers the lifting beams for the installation period are rented. The big ones, as a rule, have their own. Hooks are an extra consume of metal, and their installation - additional labor costs (this is a non-automated process, as a rule, it is carried out by two people). And the metal and the labor cost of the worker in Poland are high.

Another distinguishing feature of the plant in Wroclaw there is a double transport system - loading of the slabs in not into one, but in two rows across the width of the transport wagon, which allows you to simultaneously remove more products.



Pulling device for elements transport wagons is used for to roll them out of the production hall.

When in one place at the same time favorable conditions coincide, they say – "the stars came together." The Betard plant in Wroclaw is the best fit for this metaphor. But this expression can be understood literally, - the stars of the Polish construction industry and the European industry of machinery engineering for building came together in the implementation of a common project. Since 1974, Nordimpianti has supplied more than two hundred factories and plants around the world that can produce a wide range of prestressed concrete products. To the question of what is number of project is it for Wroclaw, the answer is not so simple. But the fact that it has become an important step forward for Betard, having significantly increased its capitalization and competitive advantages, is beyond doubt.

FURTHER INFORMATION

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

BETARD SP.ZO.O.
ul. Polna 30, 55-095 Długołęka, Poland
T +48 71 315 2009, F +48 71 315 2097
bok@betard.pl, www.betard.pl