

AT A GLANCE

Oran Pre-Cast produces hollowcore flooring by casting a continuous narrow slab of concrete, which is then cut to the required length. Prior to the implementation of this project, cutting positions were marked out manually and errors led to a large volume of waste. The installation of a bed plotter, directly linked to the design office CAD system, significantly reduced such errors. Since the installation, there have been no measuring defects. Furthermore, plant capacity has improved by 20% as a direct consequence of eliminating this waste.

ORAN PRE-CAST LTD

Oran Pre-Cast is an indigenous SME. The company, which is located in Oranmore, Co Galway, manufactures a number of pre-cast items, which are normally used in the construction of concrete frames. The range of products includes concrete floor slabs, commonly known as hollowcore flooring – see Fig 1.

This product is used in domestic, commercial and industrial buildings. Typical application contracts include apartments and multi-storey car parks.

BETTER PLANNING REDUCES WASTE SIGNIFICANTLY

AIMS OF THIS PROJECT

The aims of the project were straightforward: to reduce the number of incorrectly cut concrete slabs and, more particularly, to reduce the high level of waste that results from the incorrect marking of slabs.



Fig 1. Slabs awaiting dispatch

PROJECT DESCRIPTION

Hollowcore flooring is made of hollowcore slabs measuring typically 1.2 metres (width) by 150 mm to 400 mm (depth), while the length is cut to customer requirements. The depth of the hollowcore slab is dependant on the relevant load and length of the slab. A series of parallel holes running from end to end minimise the weight of the slab

without compromising its strength. Near the bottom of the slab a series of pre-tensioned wire strands run parallel to and beneath the solid part of the hollowcore slab: these strands reinforce the concrete. Both the thickness and the arrangement of pre-tensioned wires depend on the load-bearing requirements of the slab.

In order to manufacture the product, a frame consisting of a continuous steel plate is raised off the ground. Prior to casting, the bed is cleaned: any remaining concrete or aggregate from previous use is removed. A series of steel wires varying in diameter from 9.3 to 12.5 mm is then threaded between headstocks at either end of the bed. Both the size and the number of wires depend on the specifications of the slab being cast. The wires are then tensioned using a hydraulic power pack. Once the bed has been prepared, batches of dry mix are assembled in the computerised mixing plant. These are transported to the casting machine, which lays a continuous slab of concrete along the length of the bed, shown in Fig 2.

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Fig 2. Casting machine

Prior to the implementation of this project, the concrete slab was marked out by hand into individual lengths. This was done manually by drawing a line on the concrete using a scribe. The person marking the slab used a works order produced by Oran Pre-Cast's drawing office to determine the lengths to be marked out.

Once the concrete has cured sufficiently, a hollowcore saw is used to cut the slabs to the correct length.



Fig 3. Saw used to cut slabs.

In some cases angles need to be marked for cutting at a later stage. These cut outs enable the flooring slabs to fit around pipes and other projections on site: they also allow

them to be laid quickly. It is therefore imperative that in addition to the slabs being the correct length, all cut-outs must be placed correctly. The angles can be difficult to mark out, as it is difficult to use the edge of the cast slab as a reference point.



Fig 4. Slabs marked for cut out.

Any mistakes in cutting the slabs would generally be noticed only at the point where they were being installed at the client premises. Normally, rectification of the error on site would not be possible, and the faulty slab would have to be returned to Oran Pre-Cast and a replacement duly manufactured.

The project was conceived in order to eliminate all marking-out errors and to ensure that the slabs leaving the factory would be 100% correct. The solution was to use a bed plotter, which followed the casting machine and automatically marked the slab with an ink spray. The data for the bed plotter was directly downloaded from the drawing office PreCAD system. This solution has resulted in zero marking defects although there may still be some concrete failures and damaged slabs. The innovative element of the project was to have a direct link from the CAD system to the bed plotter, thus eliminating human error.



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ACHIEVEMENTS

Plant productivity has improved by 20% due to the elimination of error. This ratio is calculated by subtracting the disruption to production schedules caused by having to remake product that has been returned to the plant because of an original manufacturing error. Since Oran Pre-Cast has five pre-cast floor beds, this capacity improvement represents the equivalent of gaining one additional bed.

The implementation of the new system means that the number of truck movements has now been reduced as a result of not having to collect faulty product and return it to Oran Pre-Cast. This has been estimated as a saving of two truck movements a week.

OBSERVATIONS

Initially, there were some teething problems. First, the data sent from the CAD system to the plotter caused a rotation by 180 degrees to some cut outs. Second, the ink did not have sufficiently high visibility to cope with the light levels encountered in concrete casting units. However, through co-operation with the suppliers these problems were overcome.

The technique that was developed during the course of this project would be suitable for any activity that currently includes manual marking out of flat objects.

LESSONS

Good research into the causes of waste, and investment in the requisite technology to prevent waste, represent time and money well spent.

MORE INFORMATION

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CLEANER GREENER PRODUCTION IS...

the application of integrated preventive environmental strategies to processes, products, and services to increase overall efficiency and reduce risks to humans and the environment.

- Production processes: conserving raw materials and energy, eliminating toxic raw materials, and reducing the quantity and toxicity of all emissions and wastes
- Products: reducing negative impacts along the life cycle of a product, from raw materials extraction to its ultimate disposal.
- Services: incorporating environmental concerns into designing and delivering services.

CLEANER GREENER PRODUCTION REQUIRES...

new attitudes, better environmental management, and evaluating available technology options. We need to take good environmental practice to the stage where it is an inherent part of any business operation.

HOW IS CLEANER GREENER PRODUCTION DIFFERENT?

Much of the current thinking on environmental protection focuses on what to do with wastes and emissions after they have been created. The goal of cleaner, greener production is to avoid generating pollution in the first place.

This means:

- Better efficiency
- Better business
- Better environmental protection
- Lower costs
- Less waste
- Less emissions
- Less resource consumption

WHY IS THE CLEANER GREENER PRODUCTION PROGRAMME BEING RUN?

The Irish Government, through the National Development Plan 2000 - 2006, has allocated funds to a programme for Environmental Research, Technological Development and Innovation (ERTDI).

The Department of the Environment and Local Government asked the Environmental Protection Agency (EPA) to run the CGPP as part of the ERTDI programme. With the programme continuing to 2006 about 60 businesses will be supported to implement cleaner greener production and to demonstrate their achievements to the rest of Ireland.

The long-term goal is to ensure that cleaner, greener production becomes the established norm in Ireland. The programme seeks to promote environmentally friendly business through increased resource productivity, waste reduction, recovery of materials, improved efficiency in a product value chain, energy management, and a change of culture within organisations.

The programme aims are focussed on avoiding and preventing adverse environmental impact rather than treating or cleaning up afterwards. This approach brings better economic and environmental efficiency.

PROGRAMME MANAGERS:

The Clean Technology Centre (CTC) at Cork Institute of Technology was appointed to manage the programme in association with O'Sullivan Public Relations Ltd, and Energy Transport Actions Ltd, (ENTRAC).

The CTC was established in 1991 and is now nationally and internationally regarded as a centre of excellence in cleaner production, environmental management and eco-innovation across a range of industrial sectors.

WHERE CAN I GET FURTHER INFORMATION?

This case study report is one of 29 reports available from the organisations that participated in the first phase of the Cleaner Greener Production Programme. A summary of all the projects and CD containing all the reports are also available. More information on the Programme is available from the Environmental Protection Agency

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