

Case Study Title: Adopting a Continuous Improvement culture across their Design for Manufacturing & Assembly operations

Company Overview | HORIZON OFFSITE | horizonoffsite.ie

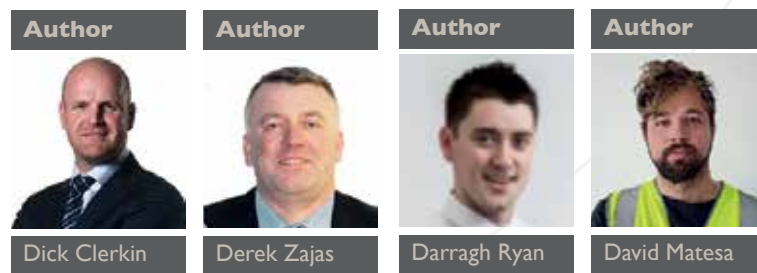
Horizon Offsite, part of the Etex group New Ways Division, is a leader in Offsite Construction and Modern Methods of Construction (MMC), providing fully accredited, structural Light Gauge Steel (LGS) systems.

Established in 2017, the company currently employs over 60 people at a 35,000 sq. ft. manufacturing facility in Cahir, County Tipperary supplying projects across the residential, industrial, commercial, healthcare and educational sectors.

Light gauge steel products and systems are at the cutting edge of modern methods of manufacturing and construction due to the increasing demand for more offsite construction globally. The

versatility of light gauge steel gives architects and structural engineers the opportunity to create their most creative and enterprising designs, providing the most cost, energy and time-efficient solutions. All Horizon projects are designed in-house by highly skilled design engineers and manufactured onsite in Cahir, ahead of despatch to site. The Horizon structural system is delivered on site, ready to be installed. Therefore, the system can usually be erected in a matter of days as opposed to months.

At a time when there is an ever-increasing need for fast and efficient building methods, light gauge steel is on the fast track to becoming one of the most sought-after building methods, due to its low cost, high-speed, and high-quality characteristics.



Overview & Background to the Lean Initiative

As Ireland moves forward with its Housing for All Initiative, there's no better time for construction to shift towards leaner, innovative and sustainable methods of producing buildings. With the Irish government looking to produce 33,000 homes a year (or between 50,000 -60,000, according to some market commentators) as well as the ever-growing demand for construction to deliver infrastructure in less time and reduced costs, Design for Manufacture and Assembly (DfMA) will form a strong part of the solution.

With its growing presence in the Irish construction marketplace, the demand for Horizon's light gauge steel solutions has grown year on year since its founding in 2017. The focus of this lean initiative was to significantly increase the output capacity of the Cahir manufacturing facility, whilst introducing lean processes and systems of work to ensure safe and sustainable operations that could ensure quality products were delivered to the site, on time.

In parallel with the proposed changes to the factory layout, systems and processes, a cultural shift in the business was also needed to ensure that any changes implemented were sustained. This required buy-in across the Horizon team, from senior management to the shop floor; and a willingness to adopt a continuous improvement mindset that would allow for the introduction of Lean construction principles into the organisation.

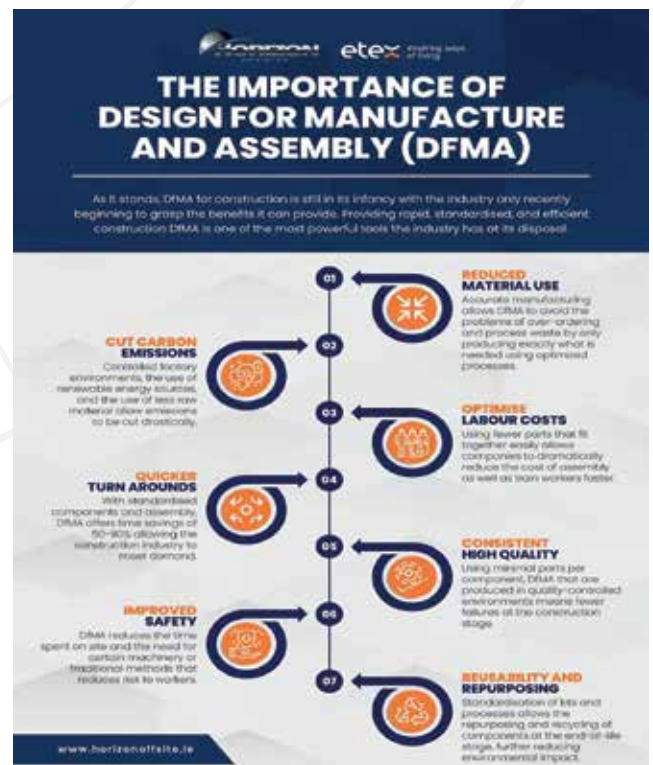


Figure 1: Design for Manufacture and Assembly

Lean Initiative Undertaken – Lean Thinking, Tools, Techniques

The concept of 'Lean' is still very much in its infancy across the construction industry and is often seen as a way of working that is only relevant to traditional line manufacturing operations. With that in mind, from the outset of the business transformation process in Horizon, it was important to use language and terminology that was relatable to the people within the organisation, and any tools or techniques deployed linked directly to the solving of accepted challenges and areas for improvement within the business.

From the outset, it was made clear by the senior leadership in the organisation, that significant change in the organisation was imperative, to continue to meet the growing customer demands for the Horizon LGS system. With expansion into larger premises not feasible in the short term, the need to optimise the existing Cahir premises to extract maximum output capacity was a core objective. The Horizon Steering committee was established in the business to develop a project framework and structure through which any improvement initiatives and projects could be discussed and approved ahead of any rollout. Following an initial business diagnostic and gap analysis carried out by Clerkin Consulting using operational excellence benchmarks, a continuous improvement program for Horizon was agreed upon, that focused on the following four key pillars that are grounded in Lean thinking and principles:

1. Workplace and Factory optimisation

The following are the key objectives:

- Reduce the Health and Safety risk profile of the Manufacturing operations.
- Increase available manufacturing space in the Cahir Manufacturing site.
- Realign the raw material storage, Work in Progress (WIP) flow and finished goods work areas, to eliminate excessive material handling, movement of staff and transport of tools and equipment.

2. Performance tracking and data visualisation

The following are the key objectives:

- Accurately measure and track daily, weekly, and monthly Key Performance Indicators (KPIs) across design, manufacturing and site operations.
- Report and review departmental performance against its target, to understand variances in output and key drivers impacting same.
- Increase awareness across all levels of the organisation of the nominal output capacities of each department, thus understanding bottlenecks that could impact overall outputs.

Systems and processes to accurately measure and track key performance metrics across the manufacturing and design departments were introduced, to provide management with detailed insights on performance capacities. In manufacturing, simple check sheets that monitored area output were introduced to the shop floor that then fed into a master spreadsheet database that would combine information to calculate productivity and trend outputs, on a daily basis. Shop floor Visual Management boards titled CPM (Continuous Performance Management) were introduced that provide both a location and focus for daily factory huddles, to review day-to-day issues, and promote problem-solving at the factory level. In addition, the design department implemented a measurement

system that tracked the output rates of individual technicians to measure and track both individual and team outputs.



Figure 2: Visual Management Board

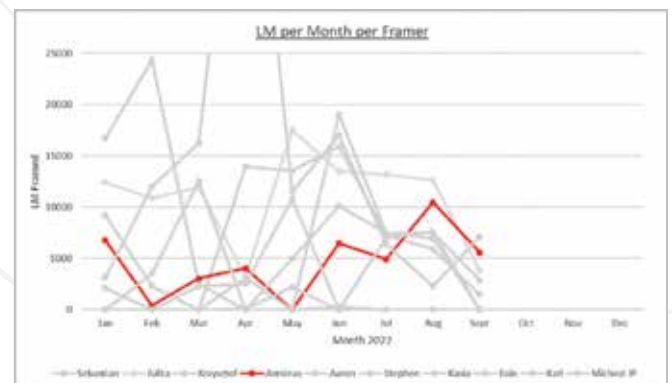


Figure 3: Individual Framers outputs (linear metre) by month

3. Non-Conformance tracking, Problem-solving and Root cause analysis

The following are the key objectives:

- Identify and log major non-conformance instances relating to either Health and Safety, Quality, Production or Cost.
- Report and review performance against target, to understand variances in output and key drivers impacting same.
- Fully investigate non-conformance issues to identify the root cause, implement corrective and preventative actions and avoid repeat occurrences.

Prior to introducing new systems and tools to both track and follow up on non-conformance issues, a review of existing workplace practices (as per Figure 4) was carried out to identify opportunities for improvement and provide a platform from which the Horizon team could begin implementing new ways of working.

Training workshops were held with the Horizon team members to outline best practices around problem-solving techniques and root cause analysis. Following this, a new non-conformance tracker and Root Cause Analysis (RCA) log was set up through which major and recurring design, manufacturing and site issues were both logged and followed up on, with effective RCA and corrective and preventative actions.

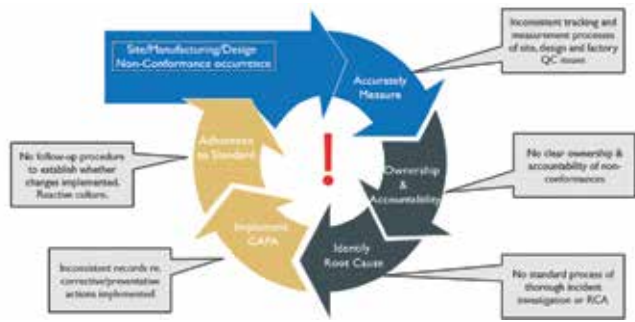


Figure 4: Review of Non-Conformance Process

4. Capacity planning: Ensuring ‘Flow’ through Horizon’s operations

The following are the key objectives:

- Ensure ‘Production’ always have sufficient work to Pull from ‘Design’ to maintain high levels of factory efficiency.
- Ensure all departments are sufficiently resourced and managed to deliver consistent output levels in line with business targets and volumes.
- Production schedule is aligned with site schedules, to minimise onsite storage costs, and avoid missing site dates.

Capacity alignment is critical across all key stages of the DfMA

process to maintain factory efficiency and to avoid incurring on-site costs due to either missed delivery dates, reworks or additional transport needs.

The concept of ‘Flow’ is very well established in traditional manufacturing operations, but one which is still in its infancy in the construction industry, which typically operates in a ‘silo’ culture. To achieve this State of ‘flow,’ each department must be sufficiently resourced and aligned to avoid creating bottlenecks, and to be able to deliver target output on a consistent basis. Manufacturing can only make what the Design department issue out to them. The site crew can only fit what is delivered to them from the factory. And so on.

Due to the size and volume of Work in Progress (WIP) and finished goods related to Horizons LGS panels, storage is a major limiting factor in Horizon’s operations. A critical aspect to the continuous improvement process was to ensure awareness across the organisation of the importance of creating alignment across all departments, to keep product moving through the factory and to site.



Figure 5: Flow through Operations

Lean Initiative Improvements & Impact

As illustrated by the ‘before and after’ photos in Figure 6, 7 and 8, the improvements in factory layout and workplace organisation contributed significantly to the increase in output capacity, and production efficiencies across Horizon’s manufacturing operations. As per Figure 9, Horizon’s nominal output capacity has increased by over 27% (total panel assembly) owing largely to the improved flow of raw materials and WIP through the production process because of the changes to factory layout.

Similarly, the focus on key performance metrics across both design and production, has contributed to improved capacity planning to ensure the factory is fully utilised, thus realising maximum operating efficiencies.

The improved tracking and follow-up of reported non-conformances have resulted in a marked reduction in both the frequency and cost contribution of design and production errors, which result in delays and customer complaints on site. See Figures 10 and 11.



Figure 7: After: A new consumables and raw materials stores created.



Figure 6: Before: External space inefficiently used for miscellaneous storage of spares and raw materials.



Figure 8: Clean, safe and well organised work areas throughout the factory.

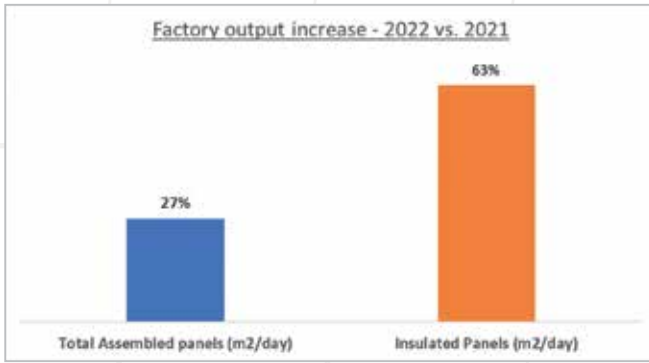


Figure 9: Increase in Horizon manufacturing output – 2022 vs 2021



Figure 11: Non-Conformance related costs

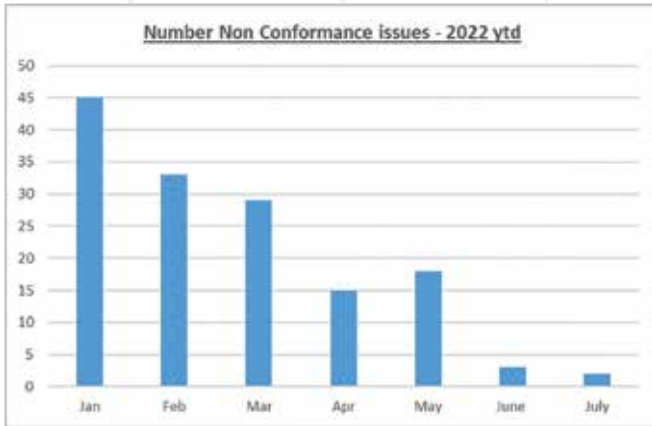


Figure 10: Reduction in site non-conformance issues reported

Summary and Lessons Learned

The cultural change across Horizon offsite, following the adoption of Lean Construction principles, will see it continue to flourish as the offsite construction industry continues to mature, and new technologies and digital platforms further enhance capabilities and efficiencies. With forecasts predicting a year-on-year increase in demand for cost-efficient offsite building solutions, Horizon has embedded a strong continuous improvement culture across all

aspects of operations that will see it continue to adopt further improvements in best practice offsite construction methods. Critical to its continued growth and success, and recognised across the Horizon team, is a continued commitment to focusing on the key principles of efficient and lean offsite construction practices that have been outlined in this case study.

