COMPANY OVERVIEW

KSSL
KIERNAN STRUCTURAL STEEL LTD.

COMPANY WEBSITE
www.kssl.ie

Kiernan Structural Steel Ltd. (KSSL) is a leading structural steel fabricator, based in Longford, supplying various types of structural steel solutions to clients across Ireland and the UK. The KSSL factory covers 13,000 sq.m. within a 5-acre site. Internally there are 26 overhead gantry cranes with three main production lines. KSSL run two manufacturing shifts in the factory. Our dedicated staff of over 180 are committed to providing clients with a high-quality service since 1989.

KSSL services:

- In-house structural steel frame design, including Value Engineering.
- 3D Steel Frame Detailing using Tekla BIM Software.
- Structural steel fabrication and erection.
- Safety netting, metal decking and shear stud welding.
- Offsite intumescent fire protection painting.
- Beam cambering and castellated beam manufacture.
- SIN Beam manufacture and distribution.
- Edge Protection Systems (EPS) – Irish Agent for Rapid EPS.
- Temporary 1 Level car parking solutions.

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OVERVIEW OF THE LEAN INITIATIVE

As a first-tier supplier to its construction sector client base, KSSL recognised the importance of extending Lean project fulfilment upstream into the supply chain manufacturing processes to ensure that maximum value is provided to the Client. Recent construction industry trends are seeing additional value-added (VA) provided in the extended supply chain such as our factory-applied fire-proof-coated structural steel. This would have been traditionally applied on the construction site with the aid of elevation equipment. To further enhance the concept of additional VA and quality-at-source; a strategic decision was made to launch our Lean journey to complement the concept of systematic value creation end-to-end throughout the extended project delivery supply chain.

BACKGROUND TO THE LEAN INITIATIVE

KSSL started Lean training and implementing Lean procedures in October 2015 in a bid to become more efficient, reduce waste, and look for improvements in its manufacturing processes to complement the Lean Construction concept of whole-chain end-to-end value optimisation. Our management team identified several opportunities to apply Lean Construction techniques to become a more efficient and safer company, as well as to gain a competitive edge. The KSSL production department was using a software called "StruMIS" for the day-to-day management of the saw and drill lines as well as for stock control. However, this was only using StruMIS to approx. 20% of its full potential to aid factory production management and tracking. KSSL management decided this software should be utilised fully and incorporated with our steel detailing "Tekla BIM" software. Whilst investigating value engineering cost saving solutions for clients, our engineering department came across a structural steel beam replacement solution which came in the form of a weight-saving innovative SIN Beam.

Figure 1. KSSL Site.

LEAN INITIATIVE UNDERTAKEN – LEAN THINKING, TOOLS, TECHNIQUES

StruMIS Management System – Production Tracking

KSSL had been using StruMIS software since the late 1990s. From then up until late 2015 the software was not being used to a fraction of its potential. It was only being used for steel stock and the day-to-day running of the saw and drill lines. Following a major Lean project review, two employees were sent over to StruMIS headquarters in England to get trained to become "super users".

From this training, improvement areas were identified that could make the application of StruMIS more efficient by further integrating all departments into an overall factory management system. This would provide accurate factory production tracking and process improvements.

It was subsequently rolled-out across all departments within the factory, including pricing, purchasing, stock control, machine use, internal factory station points, and dispatch. This tied-in perfectly with our quality assurance CE marking requirements for material traceability as all certs for materials purchased are stored within StruMIS to match their purchase orders. The sections for machine use and internal station points within the factory can track the status of particular elements within a project. This daily update is sent to the various construction site managers after our daily morning whiteboard meeting.

Value Engineering – SIN Beam
A project was identified by company management to identify a unique product that could separate us from our competitors and ultimately make us more competitive, and a product called "SIN Beam" was identified. From a structural engineering point of view, the SIN Beam is a lightweight steel beam product which can provide significant weight savings and financial savings versus similar standard rolled steel sections. It is used for long-span roof structures, car parks, and portal frame structures.

Portal frames are approximately 20% of all structural steel buildings built in the UK annually. KSSL see the export of the SIN Beam to other steel fabricators in the UK for portal frames as a potentially very large export market, and indeed interest has been gaining steadily in the UK amongst engineers and other structural steel firms. A major capital investment project was launched which resulted in the purchase of the SIN Beam machine from an Austrian manufacturer, and the machine was installed at our factory in Longford in June 2017. KSSL secured rights from the Austrian machine manufacturer for the manufacture and distribution of the SIN Beams for Ireland and the UK. During this project, KSSL machine operatives and engineers were trained in Austria and on site in Ireland.

Figure 2. SIN Beam Robotic Welding.

BIM Model & StruMIS Integration – Paint DFT
As an add-on project to the production tracking project mentioned earlier, it was identified via our idea board – which ultimately became an A3 project – that a major potential time saving could be realised by integrating the paint dry film thicknesses (DFTs) to be applied to the steel sections in the paint shop via our steel-detailing BIM model.

Inputting the paint details into the BIM model ensures that the details will be on the steel fabrication member drawing, and this thus removes the need for unnecessary additional paperwork lists. It also means that the various paint systems are included in the finished product labels.

Process Mapping: StruMIS Integration
The Lean team, led by our internal Lean champion, focused on the traditional 2D method of planning and process mapping to examine how StruMIS could manage a typical project from beginning to end, highlighting waste, duplication, and areas where errors were most likely to occur. The process map demonstrated the various points within the factory where StruMIS was not being utilised to its full potential, and furthermore additional opportunities were then identified for process improvement.

Value Engineering: SIN Beam
Our team of structural engineers reviewed the design of some standard designed structures used in previous projects where rolled steel sections were used. Very preliminary design was carried out using SIN Beam via the Austrian engineers, and potential steel weight savings were calculated. These weight savings were passed on to our quantity surveyors and a potential cost saving analysis was carried out wherein it was identified that significant savings could be achieved dependant on the type of structure and its use.

Idea Board & A3 Projects
Over 900 implemented ideas by factory floor and office staff have been actioned via the visual idea boards located next to the daily stand-up whiteboard. Monthly recognition vouchers are used to acknowledge staff ideas. Any idea that is viable but not deemed a quick win, or is too complicated to make a quick decision whether to implement or not, becomes an A3 project provided management feel the ideas will be worthwhile and provide production benefit. A3 projects involve putting a small, specialised team together to review a project in further detail and to carry out a cost-benefit analysis as to whether an idea is viable.

Daily Whiteboard Meetings, 5S Audits & Waste Walks
The introduction of daily whiteboard meetings started in November 2015. Each morning, safety, quality, maintenance, and production issues are discussed. It is an open forum that lasts 10-15 minutes in which participation by all employees is facilitated.

Additionally, 5S workplace organisation was introduced across different departments within the factory. This resulted in much-improved safety through a daily area cleaning system, reduction of workplace risk, better work environment, reduced lost time in production, and increased employee participation and morale.

Factory management, along with specific area charge-hands, carry out waste walks once a week. These generally take 15-20 minutes and identify waste and clutter in the work area, and also look at improvement in the methods of working to prevent time waste, which thus increases overall production. Potential safety hazards and opportunities for quick win ideas are also identified.

Figure 3. KSSL Daily Stand-Up Meeting.

LEAN INITIATIVE IMPROVEMENTS & IMPACT

KSSL understands that for the construction sector to adopt Lean, the entire construction supply chain needs to implement Lean thinking and practices to enable quality-at-source, to improve right-first-time (RFT), and to deliver VA to its construction client base. By adopting Lean, KSSL is able to improve its own operational efficiencies, increase production, enhance its competitive advantage, provide a safer and more enjoyable workplace for its employees, and better satisfy its construction clients.

KSSL is now utilising StruMIS to almost 85% of its potential across various departments. Training and upskilling is continuing and further opportunities for process improvements are planned. Improved communication between all departments has led to enhanced production

tracking and improved process flow. Our BIM models are integrated with StruMIS requirements, which includes the paint DFT requirements. KSSL made a significant capital investment in the purchasing of the SIN Beam machine in 2017. Improvements in factory safety culture and the awareness of potential risks, the daily whiteboard meetings, 5S audits, waste walks, and Idea Boards and A3 projects are now "how we do things around here".

Benefits from the Lean Initiative - Utilising StruMIS

- Gave all internal departments and the Client complete project visibility in terms of project tracking.
- Improved factory project management via the daily visual whiteboard stand-up meetings.
- Improved manufacturing schedule management – the factory schedule is now planned up to 12 to 16 weeks ahead. This aids the smooth running of the factory production and ensures utilisation to full capacity. It also aids our procurement department when tendering projects to see if potential available factory slots can meet client project programme requirements.
- Better planning of delivery logistics – dependent on the type of production, especially where fire paint drying times are critical to a site construction team, priority is given to these loads.
- Improved product document control for quality assurance purposes.
- Improved inventory control and purchase order management.
- Aids accounting department analysis of projects by providing live project cost data.
- Enhanced departmental reporting to management.

Benefits from the Lean Initiative – SIN Beam

- Provided KSSL with a niche product for the Irish & UK steel construction markets.
- Cost savings were achieved by value engineering traditionally designed buildings with the SIN Beam. This has opened a new market in the UK portal frame construction sector where previously KSSL were uncompetitive.
- Through marketing of the product, good relationships have been created with structural engineers, architects, and other steel fabricators across Ireland and the UK.
- Eliminated time loss for steel mill delivery dates of large sections.
- Reduced waste as the SIN Beams are manufactured to length.
- The robotic welders on the machine can also manufacture other products such as slim-flor beams and light plate girders.

Unforeseen Impacts

- Greater engagement with frontline factory staff has resulted in enhanced staff morale.
- Long-term staff, after initial resistance, have now fully embraced the improvements from the Lean process.
- Frontline factory staff have so many ideas, but previously felt they were too busy or had no platform to express these ideas.
- Changes in behaviours and methods of working, with an emphasis on health and safety.
- Simple ideas can result in major savings in time, money, and waste prevention.

Learnings from the Lean Initiative

- When a new software is purchased it is best to get one super user trained so that the full extent of the software can be utilised sooner.
- All staff ideas must be reviewed, and it is very important to provide feedback if ideas cannot be implemented – otherwise the flow of new ideas stops.
- Projects KSSL receive for tender should be thoroughly reviewed in terms of value engineering whether SIN Beam is applicable or not. This value engineering can provide a competitive edge while also giving the client better value for money.
- Persistence is required when introducing new systems or changes to processes.
- Future planning across all departments is paramount to foresee potential issues.
- Enhanced employee engagement and participation is instrumental in business development.

The full roll-out of StruMIS through Lean has become permanent in how KSSL now manage all projects. The benefits are significant and are clearly visible across all departments. The use of systems mapping was recently used prior to the capital investment of a new high-speed drill. This new drill line has increased weekly production by 10-20% dependent on the type of project and the tonnage of steel involved.

Quite simply, KSSL could not revert to previous methods of working and continue to produce the same weekly output. It has changed the company processes of how projects are tendered and managed from inception to completion. The main advantage for the Client is that they are getting better value for money whilst still maintaining high quality and safety levels.

There have been numerous improvements made across all departments within the company. Overall communication has improved dramatically, leading to significant improvements within each area of the business. Process improvements were made, employee engagement and participation has increased, safety and quality awareness has also been improved, and new opportunities for business growth have been identified.

Some initiative outcomes include:

- Lost Time Accidents reduced by 30%.
- Machine breakdown time reduced by 20% annually.
- Material cost reductions across top-5 expenditures reduced by 5%.
- Volatile Organic Compound (VOC) reduction programme successfully implemented – overall reduction of 7% in emissions.
- Process improvements facilitated increase in productivity by 12.5%.
- Over 900 quick-win ideas implemented to date.
- Steel waste reduced by 3% annually.
- Snag items reduced by 30%.
- Non-conformances reduced on projects by 40%.