COMPANY OVERVIEW

COMPANY WEBSITE

www.johnsiskandson.com

John Sisk & Son Ltd. ("SISK") is an innovative international engineering and construction company employing more than 1,300 people across its operations in Ireland, the UK, and Europe. SISK has the track record, scale, and capacity to successfully undertake large, complex, multi-disciplinary programmes, and is recognised by our global customers as a world leader in safe delivery. Operating since 1859, SISK is a progressive business with long-term vision and it is Ireland's No.1 ranked provider of construction services.

SISK's strategy is to create value for customers, partners, and people through technical knowledge, ability, and experience:

- We collaborate with our customers and supply chain to provide technical and delivery solutions in an open and can-do way to meet aligned objectives.
- We offer a full range of solutions where safety, innovation, quality, efficiency, and value are integral to everything we do.
- We deliver projects and programmes in key sectors such as Data and Technology, Pharmaceutical and Life Sciences, Infrastructure, Transportation, Healthcare, Commercial, Residential, Retail, Industrial, Leisure, Education, Water, and Energy.

AUTHOR

Joe O'Sullivan

OVERVIEW OF THE LEAN INITIATIVE

This project was a Life Sciences Project in Ireland. The project was a new-build extension on an existing life-sciences campus. It involved a steel frame four-storey building with concrete floors and flat roof. External pipe-racks, tank-farms, and a small amount of general external works were also in the project scope. Limited storage space and restricted access influenced construction speed and sequencing. The installation of 32 pieces of large equipment, some 6,000 metres of piping, along with associated electrical and controls, were key coordination and critical path challenges.

BACKGROUND TO THE LEAN INITIATIVE

The project involved a fast-track schedule on an extremely tight footprint and on a live-operating life-sciences campus. The construction schedule ran from December 2016 to December 2017; design commenced in June 2016 and completed in July 2017; and commissioning overlapped from October 2017 to June 2018.

Key partners included:

- Client local construction/engineering team.
- Client corporate team.
- Client existing operations.
- Client-appointed design team.
- SISK as Construction Manager.
- 8 substantial critical construction packages.
- 26 smaller construction packages.

The following parameters were critical to the project:

- Zero interruption or impact on the Client's core business.
- Exemplary safety record.
- Highest quality standards with zero or minimum rework.
- On or ahead of schedule.
- On or under budget.
- Visibly demonstrating respect for all involved in the project.
- Delivering job satisfaction.
- Ensuring a common understanding of project status through accurate, visually clear, and fully shared reporting.

LEAN INITIATIVE UNDERTAKEN – LEAN THINKING, TOOLS, TECHNIQUES

SISK took a strategic decision to implement Lean on this project. We applied Lean principles and we used select Lean tools where appropriate. Additionally, we committed with the Client and design team to collaboratively deliver the project.

Owing to the overlap of design with construction, the agreed project approach was that the design team would take the 3D model to LOD (level of development) 200, with the construction team completing the balance of design and with mechanical, electrical, and sprinkler contractors progressively inputting into a federated model controlled by SISK.

It was clear that the overlap of design and construction schedules, along with overlapping responsibilities in terms of design coordination, would require a specific collaborative workshop-type approach to the design process. Similarly, the confined working environment would require a unified and streamlined approach to logistics and cooperation between contractors.

A planned Lean programme was an obvious enhancement to business as usual. The following initiatives subsequently formed the basis of the Lean programme for the project. Some were strategically planned from the outset, and others were established or developed opportunistically.

Constructability Enhancement in Cooperation with the Design Team

With the benefit of early involvement with the design team and Client, SISK set about undertaking schedule, constructability, and sequencing "what-if" exercises. The purpose was to ensure that every opportunity to add value was exercised while still avoiding design rework. Arising from these early exercises, the lift-shaft design was revised from in-situ concrete to braced structural steel, and this directly saved three weeks on the critical path and project completion date. Several utility pipes mounted on the side of the building were relocated internally to the building, with direct cost savings exceeding €20k.

The 3-D modelling of the building was a significant contributor to the team's ability to visualise potential installation sequence mismatches early in the process. For

example, cable-tray on pipe-racks was relocated fractionally to avoid having to delay piping installation, and some suspended ceilings were converted to walk-on ceilings, thus eliminating over €60k of steel access platforms. Utility piping was rationalised, also providing significant cost savings.

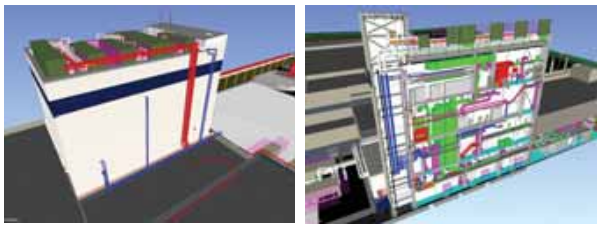

Figure 1. Project 3D Modelling

Logistics Designed to Eliminate Overlaps
To ensure the most efficient logistics on the project and to facilitate maximum cooperation, SISK decided to supply all office accommodation for all contractors. A single shared accommodation block was set-up with, for example, a safety department shared by safety officers from all contractors, a shared BIM area, and a shared staff canteen. To manage the tight footprint, all movement of materials onsite and the provision of skips were undertaken by SISK. This was done with zero cost impact as subcontractors deducted their normal allowances from their bids at tender stage. More importantly, the sharing of facilities and resources helped to dilute the normal barriers which traditionally tend to exist between contractors and the Construction Management Team.

Commitment from the Supply Chain at Tender and Award Stage and on Follow-Through
The tendering process included a commitment from bidders to the Lean programme for the project. The project's Lean philosophy and charter were explained, and director-led commitment to the Lean programme was secured from the outset from the full supply chain. The key message of course is that the openness, transparency, and trust which is required in the Lean process is a significant mindset change for many contractors and is most likely to be secured incrementally with each party sharing a little more as the weeks go by.

Trust is earned and it is vital that everyone follows through on their commitments. For example, every contractor will from time-to-time be let down by a supplier and/or materials or components will be delivered late. Traditionally there is a tendency not to share this problem – perhaps there is even a tendency to invent reasons why a task cannot be done to hide the issue of the missing component lest another party claim that they were delayed, for example. However, in the collaborative scenario each party must share their problems, be honest if they cannot complete a task, and all others must develop an appropriate work-around.

Figure 2. Collaborative Engagement

Relate to Supply Chain as if They Are Your Own Staff – Cut Down Emails, Meetings, Reports
A team comprising of one company will typically communicate and interact in a manner that reflects the fact that they instinctively and intuitively believe that they are on the same team, all working to the same goals on a project. Mistakes will be made and differences of opinion will occur, but the manner of resolving and working around problems will reflect the common goal.

Traditionally when we establish a team comprising several contractors we introduce an element of commercial and contractual defensiveness – an element of mistrust, however small. Take a group of contractors on a traditional project and count the hours that are spent writing minutes, preparing progress reports, and writing emails. These activities largely reflect a contractual defensiveness and add little or no value to the project delivery process. The time wasted on such activities detracts from the effort in getting the job done.

To break down these traditional barriers and ensure that as far as possible all effort was directed towards the project goals, the directors of the contractor teams agreed not to send any emails during the project if a phone call or face-to-face was adequate – emails were restricted to information sharing or technical matters.

During the project, we recognised that too much time was being spent in meetings, perhaps too many people were in attendance, and the minutes were perhaps too detailed. We therefore introduced a "'policy" of allowing no more than an hour per meeting, and no more than a single page of minutes limited to a list of action points. If possible we avoided minutes and simply recorded actions on a whiteboard.

We tracked time spent at meetings and delivered an approximate 30% reduction in time spent by SISK staff at meetings, with an equivalent saving in the time spent by our supply chain partners.

Developing the 3D Model with Maximum Efficiency
The 3D Model was developed by the design team to LOD 200. The model was then issued to the construction team who developed the model to LOD 350. A "BIM hub" was established on site – this being an open plan office set-up to get people engaging with the model and collaborating. Key subcontractors came into the open plan area as required and worked together with SISK to overcome issues. The 3D model was used in 90% of meetings to review all design, constructability, and schedule, and it added value to all meetings.

The coordination process via the 3D model by the mechanical, electrical, and plumbing (MEP) contractors resulted in streamlining and a physical reduction in the quantity of services – particularly on piping, with overall metreage reduced and resulting in savings of over €145k for the client. This is just the physical non-value-add (NVA) or "waste" that has been stripped out of the project, and does not include the more intangible savings associated with clash prevention, sequencing, or early resolution of details.

Information Management and Communications – Common Data Environment
SISK manages information on projects using a collaborative cloud-based and off-line mobile field document control and BIM solution. This enables effective collaboration across the entire project team, design, client, and subcontractors. The entire team has confidence in the information process as it minimises the risk of incorrect or out-of-date drawings being used in the field, for example.

Figure 3. Weekly Senior Supervisor Planning Forum

Respect for People
One of the goals of the Lean charter was to "visibly demonstrate respect for all those involved in the project". SISK's focus against this objective was to provide first-class welfare facilities for all operatives on the project, to maintain them in pristine fashion, and to engage in a health and wellbeing programme with the workforce in addition to the standard safety programme.

An ongoing "culture of care" campaign was devised collaboratively, and during the project a planned series of events was scheduled to demonstrate this caring and respect, including mental health and stress management talks to 85 of the site team, a safe driving campaign, and a focus on nutrition and exercise. Additionally, external suppliers were invited to site to demonstrate innovations and best practice in safety matters like working at height, for example.

Figure 4. Culture of Respect

Collaboration in Safety Management
SISK employs a standard approach to safety management across all projects – the task on this project being to identify whether the application of Lean principles could deliver an added benefit. The key technique employed was to leverage the "respect for people" concept and ask for something in return.

The SISK "Safety Observation Report" system – whereby operatives submit "positive" or "corrective" observations on safety matters – was identified as the vehicle for securing engagement from the trades in the field. This required the commitment of all subcontractors and the results were dramatic. A total of 3,875 observations were submitted, averaging more than one observation per person per week. It was critical that any corrective observations – where trades felt an improvement was possible or that some element of the site was capable of improvement – were addressed and appropriate feedback provided. A reward and recognition programme was also initiated to recognise best practice safety or greatest contribution to site welfare in each month.

Systems of Communication – The Importance of the Visual
We focused on visual communication at all levels in the belief that everyone on the project should be capable of understanding what the immediate priorities are to a level appropriate to their role. Safety risks were visually communicated in the field using a simple tool which indicated which of the critical "S5" safety risks – that is the five most significant risks in construction per the SISK analysis of national safety data and SISK's own experiences – were increasing and which were reducing.

Daily whiteboard meetings were trimmed-back to 15 minutes and all supervisors on the project were obliged to attend to confirm work crews, areas of work, key deliveries, and access issues. The meetings were followed by a site walk involving only the personnel responsible for each area, and any additional and specific items were noted on the area or zone whiteboard.

A weekly planning forum with all senior supervisors was held in stand-up mode, and there were no minutes but the visuals were updated to reflect the agreed plan for the week. At commissioning stage these meetings ramped-up to become daily working meetings comprising a 20-minute overview followed by a series of mini-breakout sessions immediately afterwards.

Figure 5. Common Purpose Daily Meeting

Best Practice Quality – Preventing Rework and Damage
The Lean approach applied to quality involved trade-by-trade brainstorming sessions on best practice and ideas which the SISK staff or the subcontractor staff had seen employed on other projects. Typical examples included having steel columns coated with intumescent paint and then wrapped with cling film locally in advance of pouring concrete floors, which helped avoid unsightly spatters and subsequent damage to the paint. A sample room was developed to ensure that all details were fully developed early in the project, and this helped avoid rework and allowed micro-sequencing of trades.

In addition to this attention to detail, the team developed a zero-defect approach, and gradually there was an ongoing acknowledgement that "fixing it now" was cheaper than "fixing it later". All trades were given quality inductions which simply consisted of showing them the agreed "first in place" assemblies or workmanship samples relevant to their trade.

LEAN INITIATIVE IMPROVEMENTS & IMPACT

This project was a success for the Client, for ourselves in SISK, and for the supply chain, as evidenced both by the metrics provided and in the outline of the various aspects of the project, safety, quality, and respect. Schedule improvement was delivered firstly by constructability improvements, secondly by early engagement with key specialist trades, and thirdly by intensive challenge through the BIM process. Intensive engagement at field level allowed us to hold these gains.

To what extent do we attribute the project success to our

Lean Programme? There is a story told of a young man who inherited a farm, but whose fortunes were progressively declining. He visited the local wise man, who gave him a large container of "magic dust" to sprinkle in the corners of every field and shed every morning at sunrise for three months. Perplexed, the young man did as directed. During his first week he found his workmen were still in bed at sunrise and he decided to remedy this. As the weeks went by, he found more and more that could be done, should be done, needed to be done – repair work, draining, stock management. Every day he ensured that good work got done. After three months, his fortunes had improved dramatically, but his container of magic dust was empty. He returned to the wise man, who asked him to recount his journey for the three months – the young man explained his journey enthusiastically. On leaving he asked for more dust – "I do not think you need it anymore" the wise man said, "and anyway, it was nothing but common sand. You were the magic ingredient.

The point of this story? There are perhaps several points: the first is that it's all about people, relationships, and trust. The second point reflects the "collateral benefits" delivered when we attempt to do something well – when we pursue excellence in one avenue we see other areas crying out for improvement and we act. The third point is that nothing can replace the daily walk, the continuous targeted walk, the "go and see".

The success of this project therefore is not simply a Lean story. In fact, very few technical Lean tools were employed in a textbook fashion. SISK would argue that strong experienced supervisors and planners can plan the detail of a project quite well, both in the medium-term and the short-term. SISK would likewise argue that the process of interfacing design information and construction can be managed quite successfully using traditional "information required" tracker type systems. SISK would also argue that the "recommended" Lean process of "making ready" is surely so fundamental and instinctive to good supervisors that it does not need another process or discussion. However, the "ownership" and commitment that is secured from all players when it becomes "their project" is significant – this is a softer issue and difficult to measure, but real enough that it can be attested to by the participants.

The intentional application of our Lean Programme was a highly significant contributor to the success of this project; however, many of the benefits accrued in a manner which we had not foreseen fully. We set out to strip-back waste, to stop taking unnecessary steps, to spend less time in meetings, to eliminate NVA correspondence. We also set out to do a highly efficient project by providing a shared infrastructure, logistics, a 3D model, and a common data environment for all project information. All of these achieved solid improvements.

The greatest benefit to the project accrued, however, in a manner that we did not clearly foresee. It manifested itself in the collaborative mindset that developed, in the lack of conflict, in the minimalist approach to correspondence of any kind, in the absolute ownership of the project, and in the cooperation and camaraderie received from the trades who have collectively delivered first-class safety and first-class quality.

Some key initiative outcomes include:

- Safety – 225,000 man-hours worked, zero lost time incidents (LTI), zero reportable occurrences.
- Safety – employee engagement in the safety observation reports (SOR) process is 40% higher than the national average performance.
- Schedule – schedule on track for an 11-week (15%) improvement.
- Cost – outturn cost will be 7.5% under budget, largely achieved through design optimisation, sequencing optimisation, removing unnecessary piping and eliminating rework.
- Cost – zero claims from contractors and supply chain.
- Cost & Quality – less than 1% rework.
- Quality – punch-lists nearing completion are minor compared with experience on other projects.
- Efficiency – 30% reduction in time spent at meetings (compared with earlier in the project).
- Satisfaction and Engagement – the following quotes from the two most senior supply chain supervisors on the project summarise the impact:
    - The Electrical Project Manager said, "The One Team approach has influenced behaviours of site personnel. With all documents being available to all, there is an increased sense of project ownership. This, in my opinion, filters throughout the workforce who have developed added pride in their involvement in this Project".
    - The Mechanical Project Manager said, "Our experience to date of the One Team Approach has been a positive one especially when it comes to one to one contact across the single office set up, (talking sorts problems) there has also been a very open approach to the safety organisation onsite with both contractor and CMT safety sharing one office which has in turn led to shared discussion on safety matters and a quick decision-making process which helps with productivity onsite. All in all, the One Team Approach is good for both Client, CMT and contractor".