

COMPANY OVERVIEW

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OVERVIEW OF THE LEAN INITIATIVE

This project was the Beddington Energy Recovery Facility in Beddington Lane, Sutton, London. At a cost of GBP£205M, the Energy Recovery Facility (ERF) was designed to process around 275,000 tonnes of non-hazardous residual waste per annum. Environmental benefits of this facility

will include the landfill diversion of up to 95% of waste delivered to the facility, and the generation of up to 26MW of electricity which will power the facility itself and supply over 22MW to the United Kingdom National Grid.

BACKGROUND TO THE LEAN INITIATIVE

DPS Engineering was requested by King & Moffatt to initiate a continuous improvement program on site at the Beddington energy renewable facility located in the London borough of Sutton. The project commenced with measurement and analysis of key processes to understand the various wastes impacting process efficiency. It also included the implementation of standardised processes, including but not limited to materials management and with a strong emphasis on just-in-time (JIT) materials supply to work crews to eliminate waiting times. Additionally, it involved daily crew impact assessments and observations of key processes to understand baseline waste levels and to develop opportunities to eliminate and reduce waste in order to increase available time for value added (VA) work.



Figure 1. Project Site.

LEAN INITIATIVE UNDERTAKEN – LEAN THINKING, TOOLS, TECHNIQUES*Current State Analysis*

- Multiple trips per day by multiple work crews to and from the material storage location, with 50-80+ hours per week of waste in the form of transportation, motion, discussion, and waiting.
- Material shortages holding up crews from installing to plan amounted to 20+hours per week.
- Access impacts to crews daily.
- Re-ordering of materials already on site, increasing costs and adding processing time of 10+ hours per week.
- 5+ hours per week spent locating hire equipment in a multi-room and multi-level building site.
- Planning for install starts on the day of install generating excessive waste before first VA work takes place – this waste being in the form of retrieving materials, discussions about how to proceed, and waiting for information.
- Work crews were unaware of how current work practices were impacting on their ability to do VA work.
- Lack of centralised area for information sharing, like a whiteboard communication area for example.

It became apparent after the first day on site that initial impacts to trade productivity within our control were material part shortages and materials management. The focus initially was to create a standardised process to eliminate part

shortages, excessive motion, and transportation of materials by work crews from the materials storage areas to points of use.

On any site the material stores area can be the centre of human activity – a hive dominated by multiple comings-and-goings of trades workers. Changing the centre of the point of install was the end goal, and making the materials storage area an auto JIT supply chain unit triggered into action a refined standardised process.

5S

The first step was to undertake a 5S exercise on the materials storage cabin. Starting with understanding what materials we had and required, and removing what was not required in the space, culminated in the standardisation of its layout and operation.

In the initial stages the storage cabin was a typical store-all area with little segregation of parts, tools, and miscellaneous items. This contributed to multiple searches for materials in multiple locations by multiple members of the install team, making it virtually impossible to establish exact inventory levels and leading to parts shortages. This was also generating excessive motion, waiting, and discussion waste on an hourly and daily basis.

The concept of 5S seems simple, but if done properly it can have a substantial impact on the initial development of a Lean culture at grassroots level, as well as early acceptance of the benefits of making small incremental changes to make things easier for all.

Kanban

With the 5S in full flow, parts were segregated and tagged for identification, and items not identified as being in use were removed from the area. Parts previously stored in cardboard boxes were moved on a Kanban basis to newly purchased Linbins, the bulk of these remaining in cardboard boxes behind the Kanban to ensure ease of inventory control. Parts most frequently used were set in order on the shelf and labelled for visual management and ease of order picking for the store manager.



Figure 2. 5S & Kanban.

Standardise

With visual management in place, it was time to standardise by setting new rules defining the use of the storage area. Critical to the standardisation was the alignment of support structures, and the setting of Kanban levels was determined by mapping the material usage for the remainder of the project and setting out the material requirements in key installation areas on a weekly basis. The creation of an online Excel-based auto Kanban system was instrumental in providing flexibility to the ordering sequence, and it eliminated hours of motion, discussion, and waiting waste. Microsoft SharePoint was the software used for material requisitions on site.

Visual Management

A visual management traffic light colour coding system was introduced to the requisition sheet to indicate the materials delivery status. This reduced review time by members of the external supply chain as information was now available about what materials had arrived on site and what materials needed to be chased up with suppliers to ensure parts were available for work crews on site. This eliminated large amounts of waiting time brought on by parts shortages.

Keeping track of machinery and mobile scaffolding on a large site was proving time consuming, so a daily machinery and mobile scaffold tracking sheet was introduced and all items were signed out at the start with a location provided. This substantially reduced the amount of motion time spent looking for equipment on site.

Mobile scaffolds were also proving a time consuming issue. These come with multiple parts and seemed to be always missing a section when they were eventually located. Thus a visual management system was put in place with each mobile scaffold being given a different colour tape and number so

they could be easily identified, but, more significantly, crews were now given ownership for any mobile scaffold they took out and had to communicate where it would be at the end of each shift. This information was placed on the central information board in the central meeting area on site, both at the start and end of each working day.



Figure 3. Visual Management.

Direct Observation

Along with implementing a standardised system of materials management onsite, direct observation was also used to observe specific processes on site so as to understand what was impacting working crews on site as they endeavoured to carry out planned work at the point of install. Direct observation is defined as observing a subject in the natural environment without altering that environment; but more importantly it is about observing a process and not a person, and any observations made must focus on how the process can be improved to support the person using the process. The only way to improve a process is to understand where there is waste occurring in that process and putting measures in place to reduce or eliminate that waste. Unless you observe the process independently and honestly with an understanding of what waste is, then nothing will change.

The process observations were carried out over a number of weeks, and the main impacts to productivity were as follows:

- Space restrictions due to previous installations – Increased motion to measure and discussion about how to proceed safely. This was addressed through collaboration with previous trades and the introduction of crew readiness cards that forced the crews to establish a pre-task plan of action on the day before commencing their planned activities.
- The nature of ad hoc installations and lack of pre-task planning – Increased discussion, motion, and transport. This was addressed through the introduction of crew readiness cards, which forced the crews to establish a pre-task plan of action on the day before commencing their planned activities.
- Cluttered work areas left by previous trades – Increasing transport, motion, and discussion. The introduction of crew impact cards allowed the crews to communicate the impact of issues previously absorbed into a normal day's work.
- Crews living with problems not reporting back issues and impacts leading to repeat impacts – Increased motion, discussion, and transport. Crew impact cards issued to each crew for reporting helped with this.
- Task and location changeover impacting on restart times at new location – Increased motion, discussion, and transport of safety structures up multiple levels. Crew impact cards issued to each crew for reporting helped with this.
- Retrieval of materials from stores multiple times per day – Increased motion, discussion, and transport.

LEAN INITIATIVE IMPROVEMENTS & IMPACT

There were many benefits ensuing from the application of Lean thinking and practices on this project, including:

- JIT material delivery to crews at point of use.
- Material shortages eliminated.

- Crews used a standardised method of planning for the next day's work, which reduced waiting motion and discussion times. Crews knew how to progress and didn't have to wait for instruction from their foreman to begin work as discussion on how to progress has already happened prior to install and negative impacts were removed.
- Potential impacts were communicated and removed prior to the next day's work.
- All KPI planning information was located to one central location visible to everyone, thus reducing excessive motion and discussion to understand current status of multiple variables within the project for the foreman and stores personnel.
- Online site inventory and material delivery status indicators were implemented.
- Each working crew developed a clear understanding of what is termed "waste".
- Crew readiness checklists enabled crews get to know how to plan their next day's work without waiting for instruction, and meant they were thinking about what the day ahead will involve beforehand and not when they arrived at the point of install, thus reducing the time to first VA activity for each crew.
- The foreman gained more time to plan activities and was not spending time understanding what materials are on site, and potential parts shortages were flagged online before they become an issue and action could be taken there and then. All materials available on site were displayed online to view, making population of materials requisition sheets and the ordering of required materials a much more efficient process and saving multiple hours per week. This reduction in administrative tasks allowed the foreman to be engaged in more practical planning and issue resolutions for the team.

Overall, 100+ hours per week were saved through waste reduction and implementation of standardised processes. Inventory accuracy was consistently above 95%. Teams received hands-on Lean training and developed pre-planning skills through the use of crew readiness cards. All Lean skills and knowledge are now transferable to all projects going forward.

Some unforeseen impacts pertained to:

- Site conditions – the site's low water table impacted on materials deliveries.
 - Other trades not sticking to plan and impeding work on planned install.
 - Drawings and design conflict with other trades.
 - Multiple levels on building with access restricted depending on certain activities taking place on certain levels of the building.
 - Walking route to site changed halfway during the project with increased walking times to get to site.
As a key learning, don't underestimate the impact of small incremental changes. Poke Yoke where you can through standardisation to avoid reverting to the way it's always been done; and standardise everything you can.
- Some key initiative outcomes include:
- 100% reduction in part shortages.
 - 80% reduction in retrieving materials waste.
 - 60% reduction in waiting times due to crew readiness and JIT material delivery.
 - 100% improvement in inventory accuracy on site.
 - Time to first VA was reduced significantly with crews engaged in pre-task planning the day before.
 - Cost savings of over GBP£100k.
 - Supply chain efficiency increased.
 - Learnings proliferated across multiple King & Moffatt sites, and this company-wide improvement is expected to continue to provide gains into the future.
 - Employees now understand the simple things that can impact their day. They understand what waste is; they are prepared for the next day's work; and through the crew readiness cards are constantly challenged to think about their requirements and what may impact their day so that they can work to remove that impact before they commence work.
 - The wider supply chain has benefitted from this continuous improvement initiative as companies now have greater visibility of materials supply and demand, and potential impacts are highlighted much quicker, so they can respond quicker and the people on the site are updated with key materials information in real time.