

SIEMENS COCIGY

SIEMENS ENERGY: DECADES OF MANUFACTURING EVOLUTION

Siemens Energy is a global leader in the energy business, employing over 92,000 people across the globe. Its innovative products are helping its customers to reach decarbonisation and the reduction of greenhouse gasses through the application of technology resulting in highly efficient low or zero emission power generation including renewables, gas turbines and the consumption of "greener fuels".

Siemens Energy is among leading global manufacturing organisations that embrace agile in their operations to deliver the best possible products and solutions to its customers across the globe. With that in mind, we spoke at length with **Phil Harpham**, Head of Manufacturing Engineering at Siemens Energy's Ruston Works site in Lincoln, UK, to understand how he has spearheaded an evolution in the site's approach to agile manufacturing over the last few years.



SIEMENS ENERGY SGT-400 INDUSTRIAL GAS TURBINE:

- + State-of-the-art
- + Low emissions
- + Fast start-up
- + Economic operation
- + Ensuring a clear path to decarbonisation

Harpham and his team develop state-of-the-art industrial gas turbines designed for low emissions, fast start-up and economical operation while ensuring a clear path to decarbonisation.

Working for Siemens Energy since 2006, **Harpham** has seen many methods being tested to reach lasting performance improvement, many of which he has utilised to make its processes and procedures "leaner".

These included **Kaizen** (a short-term improvement project designed to accomplish significant results in process quality issues), **First In, First Out** (an inventory valuation used for cost flow assumption purposes commonly referred to as FIFO), and **One-Piece Flow** (also named Continuous-Flow Processing or Single-Flow Processing where only one item is proceeded through the various stages of production at a time).

External consultants were also brought in to offer their words of wisdom. But frustratingly, progress was slow, with little evidence of improvements or efficiency gains. *"It was a complete overload, and we weren't actually getting much out of it,"* says Harpham.





AGILE: THE BUZZWORD THAT'S CHANGING THE WAY WE WORK?

"Not too long ago, all you heard about was Lean. Further back, you had to do it 'The Toyota Way,' and now everything is about flexibility and being more Agile, which shows that the sector constantly evolves. But what is really important is to define what people mean when they use a term, because there will be subtle differences when it comes to implementing new approaches and processes," he says.

A visit to East Asia would prove to be the catalyst for change. **Harpham** remembers visiting a Japanese supplier and seeing this as a perfect opportunity to get some insight into how to improve what we were doing at Siemens Energy and learn more about the perspective of their CEO about implementing agility to create more efficient, productive and collaborative teams. *"It was an eye-opener when he asked me whether we were practicing Western Lean or Japanese Lean"*.

He explained: "Western Lean is like collecting badges because we've got all these initiatives and tick them off as we go, but we don't think about how to utilise them. In comparison, Japanese Lean is having all of that expertise in a toolbox and pulling one out every now and again when you need that tool. He was right; we were trying to do everything all at once rather than using the right tool when needed."



THE ROOT CAUSE ANALYSIS

On **Harpham**'s return to the UK, all Lean manufacturing activities were halted. A holistic view of the company's production was taken with an emphasis on reoccurring problems and common pain points. The facility manufactures a range of industrial gas turbines that generate power up to 15 megawatts, as well as producing a vast variety of spare parts for legacy platforms and installations. With such a large range of complex components to produce it often led to issues with on-time delivery. Poor communication between team members and manufacturing cells was also identified as a contributing issue.

Roles were broken down into sections, so individuals took charge of particular parts of the manufacturing process; for example, one person looked after discs, another oversaw blades, and so on. It represents a sea change from the previous setup, where multiple team members looked after various components of the manufacturing process. Workers now have their role and know it well. The second step, which **Harpham** describes as *"vital"*, was developing an ongoing dialogue with the people on the shop floor.

"WE NEEDED TO FIND OUT WHAT WAS CAUSING ISSUES, AND WHAT WE KEPT HEARING WAS THERE WAS NO VISIBILITY INTO WHAT WAS GOING ON ..."

"We needed to find out what was causing issues, and what we kept hearing was there was no visibility into what was going on. When there was a perception that work was running out, output slowed because it wasn't clear when more work would be coming into a cell. Establishing that visibility was incredibly important."





LEVERAGING YOUR PEOPLE AND MAKING PROCESSES VISIBLE

Visual management was introduced to ensure the workforce could instantly see what jobs were coming down the line. Perhaps surprisingly, jobs on the visual management board took the form of poker chips. "We introduced different colour poker chips to represent the different turbine engine types and the part numbers," says Harpham. "Every time a job progressed, that was reflected on the boards by moving the chips to the next slot. We could also show when maintenance was scheduled in with the chips, and everyone could see that a machine was going to be down for a certain period of time."

"THE KEY WAS GIVING OWNERSHIP OF THE PROCESS TO THE PEOPLE ON THE SHOP FLOOR ..." "The key was giving ownership of the process to the people on the shop floor. Nobody told them what to do, there was no master scheduler – they completely organised themselves. Giving more visibility has increased collaboration and allowed us to be much more efficient. Let's say we needed to produce 30 different types of Compressor Discs a week. The teams would get together and produce all the type A Discs on a Monday, type B on a Tuesday and so on."

"A key factor in this was to drastically reduce the set-up time for each operation and strive towards SMED (Single-Minute Exchange of Die) so that the change over from Disc types was kept to an absolute minimum so the mix of component types became less of a constraint. And they'd tailor the approach so that no cells were being starved of work further down the line. The approach also showed the teams we trusted them to take ownership of the shop floor and determine how best it should operate."

It is a salient example of how empowering people to own processes and workflow can deliver real impact. "The team were proud of it and protected it because it was theirs. That pride delivered some of the best efficiency gains we've ever achieved."



EXAMPLE OF SIMPLE "POKER CHIP" FLOW BOARD





BREAKING BOTTLENECKS

Part of the production review also targeted bottlenecks. But rather than one or two permanent issues, it found that bottlenecks were emerging across the shop floor - on one machine one week and another the following week. Those moving bottlenecks caused workstations to come to a standstill, meaning operatives – who specialised on particular pieces of the manufacturing line – could see work stop for days at a time. To solve that issue, staff were trained to operate multiple pieces of equipment. But when the time came to cover another station, operatives were rusty.

"We asked people to work on machines they had been trained on, but which they might not have operated for a year or longer. So, while on paper, we looked flexible, we had to teach them again, or in a worst-case scenario, our

scrap and NCR rates would rise. We decided to become regimented in our rotation, making us more dynamic and exposing our people to different disciplines. It's a bit like three-dimensional Tetris in that you need to move people into the right places at the right time."

"It can be challenging, especially if you're moving people between production cells, but the payoff is worth it. We still carry out bottleneck analysis, and while we still have them, the number is negligible compared with the previous system when operatives stuck to one piece of machinery. We're much better placed to deal with bottlenecks now."



Back to the toolbox; one of the issues revealed by the audit was the duplication of data, which led to inaccuracies and conflicting information. As part of its continual improvement approach, **Harpham** and his team at Siemens Energy have been working on several initiatives to centralise all data in a single depository, which can be accessed by all groups across the organisation.

"If you're working on a particular blade, all the data and information you need is stored in that repository. Everyone across the company can feed data into that central location, whether from design, engineering, QA, manufacturing, or laboratory – it's open to everybody. There are no competing data sources, which has made our processes much more efficient."







A NEVER-ENDING JOURNEY

It hasn't been an overnight success. **Harpham** says the shift in mindset took around 12 months, and he admits there have been numerous challenges along the way. *"We ran an initial pilot for six months, and there was some heartache. But as we saw results, our people bought into what was happening. It was a snowball effect that happened quite organically. The concept of the poker chips started in one cell, and others followed suit because they saw how well it worked."*

"Again, it's about empowerment and ownership: we've given them the tools, but they've been the ones to customise and run with the concept."

In **Harpham**'s own words, the quest for manufacturing perfection is on ongoing pursuit with no definitive end. But the evolution he has overseen in his division of Siemens Energy has, he believes, shown the value of combining agile manufacturing methods in pragmatic fashion (see: Japanese Lean), and empowering people on the shop floor to co-create a thriving manufacturing environment.

"We all like simple things," he says. "When you start bringing in consultants who talk a different language, you can see the people on the shop floor shutting down. Break things down, use simple terminology, and show people how you can help them with their jobs. You can use all of the buzzwords in the world, but if you can't demonstrate the value of changing something to the actual people on the ground, you'll never get buy-in."

"Be clear, be honest, and give people the ownership they want. Give people pride in what they do so they turn around and say: 'I did that, I made that happen'. It's incredibly powerful and contagious."

"The Siemens Energy case study is a prescient example of the power of agile manufacturing principles. A bottomup approach has resulted in widespread buy-in from the shop floor, and a willingness to embrace change. Flexibility has also been critical to break bottlenecks and reduce both machine and equipment downtime, resulting in much-improved performance, and demonstrably better productivity," says Harpham. *"GIVE PEOPLE PRIDE IN WHAT THEY DO SO THEY CAN SAY: 'I DID THAT, I MADE THAT HAPPEN'. IT'S INCREDIBLY POWERFUL AND CONTAGIOUS."*

That flexibility has also made the Siemens Energy team far better equipped to iterate more rapidly and to respond to customer demands. It is stands as a success story for agile manufacturing methods that consider tools and machinery, as well as the people on the ground.







KIMBERLY-CLARK PROFESSIONAL AND SIEMENS

As part of Siemens Energy's continual work to improve health, safety, processes, costs, and sustainability, it recently launched an initiative to reduce its paper product usage. The nature of the company's work meant it needed to find a strong disposable cleaning solution that could cope with industrial environments.

After careful consideration, Siemens Energy chose a newly launched product from Kimberly-Clark Professional[™], the WypAll[®] Forcemax[™]. The industrial cloths are specifically designed to cope with tough wiping tasks, absorbing 40% more oil, five times faster than rags or laundered cloths.



WYPALL® FORCEMAX:

- + Absorbs 40% more oil and 5x faster than rags¹
- + Reduce disposal waste by up to 78%²
- + Occupies 68% less shelf space than rags2
- 1 Results of LaboratoryTests July 2017 2 Comparison based on average WypAll* cloths usage vs. average rag usage

"The introduction of the enhanced WypAll® Forcemax[™] product has proved very successful in supporting a reduction in paper product usage and personnel exposure to contaminants during cleaning operations in the engineering environment," said **Gael Hanson**, Principal HSE Engineer at Siemens Energy.

Kimberly-Clark Professional was also able to change the packaging it delivered its products in, reducing cardboard waste.



"Kimberly-Clark Professional's continued assistance, after the implementation, to support the culture change needed to make this new process a success, has been fantastic," **Hanson** said.

The work with Siemens Energy is just one of many examples of Kimberly-Clark Professional working with blue-chip clients to achieve their agile manufacturing goals. Our cleaning solutions are helping several manufacturers achieve effective production processes to support efficient and agile manufacturing.

We understand that manufacturers with multiple product changeovers require consistently top-quality cleaning at a higher frequency to avoid cross-contamination and poor product finishes.



PHIL HARPHAM IS HEAD OF MANUFACTURING ENGINEERING & PROJECTS AT SIEMENS ENERGY INDUSTRIAL TURBOMACHINERY LTD, A SIEMENS ENERGY COMPANY.

He studied at the University of Derby and started his engineering career at Rolls-Royce (Derby, UK) where he worked in the Manufacturing Design Office determining methods of manufacture for various components for the Civil Aero Engine Division.

In 1989, he joined Cosworth Racing, a company based in Northampton, UK, which designed, developed and manufactured high performance race engines for Formula 1, Indy CART, World Rally Championships as well as a range of high-performance engines for road cars. He became the Head of Manufacturing for Cosworth, helping the business branch out into new ventures such as small volume, high accuracy components for the aerospace industry, while continuing to develop its motorsport presence.

In 2006, he joined Siemens Energy in Lincoln, UK, where he currently heads up the Manufacturing Engineering & Projects Department, looking into new and innovative manufacturing methods as well as supporting the operational needs of the business.







GAEL HANSON IS PRINCIPAL EHS ENGINEER, QUALITY AND SECURITY AT SIEMENS ENERGY.

She started working at Siemens Energy back in 1999 as an Administration Trainee, working towards becoming a secretary.

In 2013, she moved into Health & Safety after completing her National General Certificate in Occupational Health & Safety (NEBOSH NGC) and continued to achieve her NEBOSH Diploma in Occupational Health & Safety, in 2018.

Her primary focus, as part of a small team of operational EHS Engineers, is to support the manufacturing team directly. She is actively engaged in many projects which cover a multitude of environmental, health & safety aspects and sustainability improvements. Workforce engagement will remain to be a critical aspect of any improvement programme, whether EHS or otherwise.

ABOUT SIEMENS ENERGY

Siemens Energy is a global team of more than 91,000 dedicated employees. Together, we're responsible for meeting the growing energy demand while ensuring our climate is protected. We keep the best of our 150-year legacy and push the boundaries of what is possible. We strive for sustainability in our decarbonization journey, innovation centred on future technologies, and transformation among future focused offerings, portfolio and mindset. Together as one team across 90 countries, we are committed to making sustainable, reliable and affordable energy possible. This is how we shape the energy of tomorrow.



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ABOUT KIMBERLY-CLARK PROFESSIONAL

Kimberly-Clark Professional partners with businesses to create Exceptional Workplaces, helping to make them healthier, safer and more productive. Key brands in this segment include Kleenex[®], Scott[®], WypAll[®], KleenGuard[®] and Kimtech[®]. To see how Kimberly-Clark Professional is helping people around the world to work better, please visit









