

GENERATING INNOVATION

A world leader in small hydropower systems and engine cooling pumps, Gilkes built a long history of success based on proven products. In 2013, executives recognized that, to maintain leadership, product innovation was needed. By building in-house expertise in engineering simulation, the company is re-inventing its product line, both quickly and cost-effectively. This successful 162-year-old business has a few lessons for other companies targeting major innovation.

By ANSYS Advantage Staff

Increasing environmental regulations, coupled with government incentives for green products and systems, have created dramatic changes for engineering teams in many industries. For example, in the power generation industry, more plants are being constructed using wind, water and solar power, which has created a fast-growing market and a new set of customer needs. Product development teams focusing on engines or engine components face stricter emissions standards as well as weight restrictions that support greater fuel efficiency.

Gilbert Gilkes & Gordon Ltd. — commonly referred to as Gilkes — is a leading manufacturer serving both the power generation and engine industries. Gilkes Hydro is a global leader in hydropower systems that generate electricity from water, with more than 6,700 turbines installed in more than 80 countries. Gilkes Pumping Systems manufactures a range of sophisticated pumps for the cooling of high-horse power diesel engines, supplying many of the world's top diesel engine manufacturers.

Founded in the United Kingdom's Lake District in 1853, Gilkes is steeped in tradition. Its main factory has been in the same location since 1856, and it has been under the same basic ownership since 1881. With a loyal customer base and a stable of proven product designs, Gilkes was able to lead the global market in small hydropower systems and engine cooling pumps for many years.

"The traditional approach at Gilkes was to create a high-performing design through testing, optimize it for production in our factory, then rely on variations of that design for years," said Lindsey Entwistle, mechanical design engineer for cooling pumps at Gilkes. "Customers were very happy with the product's

Gilkes had to be able to guarantee higher turbine performance if it were to retain its market share.



▲ Alan Robinson, Jo Scott and Lindsey Entwistle

performance, and it was an approach that worked for many years."

However, in the last decade, the landscape began to change in both industries that Gilkes serves. Due in part to government subsidies for renewable energy, the market for hydro turbines began to grow quickly in many regions of the world, new competitors appeared and Gilkes had to guarantee higher turbine performance to retain its market share.

In addition, increasing environmental awareness meant new regulatory standards for diesel engines. Gilkes' existing pump designs required higher levels of performance to contribute to decreased emissions and other environmental goals, as well as reduced production costs. For the first time in years, Gilkes' product requirements were dramatically changing.

SIMULATION: A COMPETITIVE ADVANTAGE

Across both market segments, Gilkes' historic competitors moved quickly to develop innovative designs that capitalized on these opportunities — relying heavily on computational fluid dynamics (CFD) simulation tools to drive



fast design and market launch of new products that answered these needs.

Engineering simulation was not a new concept to Gilkes. Historically, when design analysis was needed, the company had outsourced CFD simulation to experienced consultants. Gilkes had also sponsored the work of a Ph.D. student, at nearby Lancaster University, who had built his thesis around answering one of Gilkes' pressing engineering challenges.

"We had dabbled in engineering simulation in the past, but not really committed to it as a central strategy to support product innovation," explained Alan Robinson, research and development manager for Gilkes hydroturbines. "We have a history of under-promising and over-delivering. But with efficiency guarantees so heavily weighted in bid evaluations, we knew we had to improve our product performance — we had to innovate so we could offer higher guarantees and keep our valued ethos. And the engineering team responded with a proposal to create an in-house simulation capability — because we recognized that simulation had become a key competitive edge we were lacking."

"We showed the board of directors the capabilities of simulation software and how it could help us quickly redesign our products," Robinson continued. "The board agreed to make a significant investment in not only technology but new engineering staff with simulation skills."

A NEW CAPABILITY TAKES SHAPE

In 2013, Jo Scott was hired as an experienced CFD engineer for Gilkes' hydro turbines business. Because Scott had used simulation software for 20 years in his previous positions, he became the champion of simulation within both Gilkes business units.

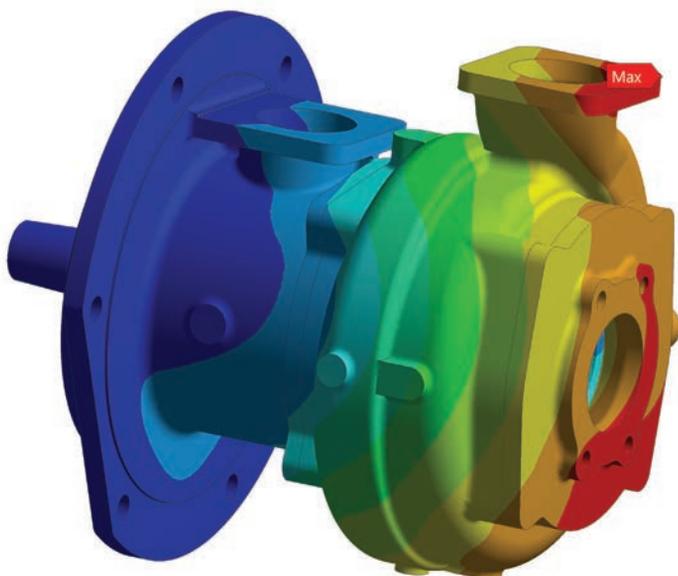
"Our first lesson was to choose the software carefully," noted Scott. "Even after we decided to purchase a best-of-breed software, we had to select the actual solutions. We realized that CFD simulation was a requirement for both businesses, but that the pumps engineering team also needed to do finite element analysis (FEA) to ensure structural robustness. But there were many levels of FEA analysis tools, so



▲ Gilkes has a long history of engineering excellence.



▲ Gilkes cooling pumps



▲ ANSYS structural simulation of Gilkes dual circuit marine pump showing total deformation under installed load conditions



▲ Pelton runners on Gilkes shop floor

we had to match the solution to our day-to-day challenges.”

While Scott initially tried to train some of his colleagues in simulation software, he quickly realized that the best strategy was to leverage the expert training provided by ANSYS. “Even though I knew the CFD software very well, it simply wasn’t time- and cost-efficient to have me manage the internal training – and I had little working knowledge of FEA solutions,” said Scott. “So we had a team of people attend formal software training, which helped us get a core group of users up and running.”

Today, Scott is joined by three part-time ANSYS users in the hydro turbines business. In the cooling pumps business, Gilkes has four engineers using

CFD software and another three team members using FEA software to analyze structural issues.

Throughout, Gilkes has made full use of phone-based support and an online customer portal to get answers to technical questions. “Software providers offer web- and phone-based support for a reason – and you shouldn’t be shy about using those resources,” stated Scott. “There’s so much product knowledge there.”

While Gilkes began with a single seat of software – relying on a leasing approach for additional seats – in 2015 the company realized that it needed to make a longer-term commitment. “Once we were able to assess the real usage of simulation software at Gilkes, we saw that it made more sense to

buy licenses instead of leasing them,” said Scott. “It was a financial decision based on how frequently simulation was being used by our team by 2015.”

A WELCOME CHANGE

At Gilkes, the adoption of engineering simulation was embraced by many existing employees who were eager to learn leading-edge skills. “Our engineers had been doing a lot of complex calculations and design work using more-traditional methods, so they were extremely enthusiastic about having new software do the work for them,” said Robinson. “They wanted to get up to speed on the latest practices.”

The new focus on simulation is also attractive to recent graduates who are ready to apply the skills they have learned in college. “Traditionally, there was a gap between how Gilkes engineers were working and the way new engineers were being trained at university,” noted Entwistle, who joined Gilkes in 2014. “But that gap was disappearing by the time I arrived. And today, Gilkes really is at the forefront of engineering practices. It’s exciting to work here.”

While the change was welcome, Robinson noted that it was challenging from a cultural standpoint. “Previously, we had engineers spreading their skills

We showed the board of directors the capabilities of simulation software and how it could help us quickly redesign our products. The board agreed to make a significant investment.

We have won some sizable customer contracts because we can produce innovative designs more quickly and cost-effectively.

thinly to oversee entire projects,” he explained. “Now we’ve installed a modular process in which people have different roles and different areas of expertise. We have specialists at every stage, including our CFD and FEA experts. We’ve had to change our process and re-align employees’ roles, but that was necessary to fully adopt simulation as a core competency.”

“It was helpful that everyone recognized the need to change,” added Robinson. “We realized our efficiencies had to improve, and a lost order helped everyone recognize that we had to do things differently. I would advise other businesses to share the top-level vision with their engineers, because that certainly helped us overcome any cultural resistance at Gilkes.”

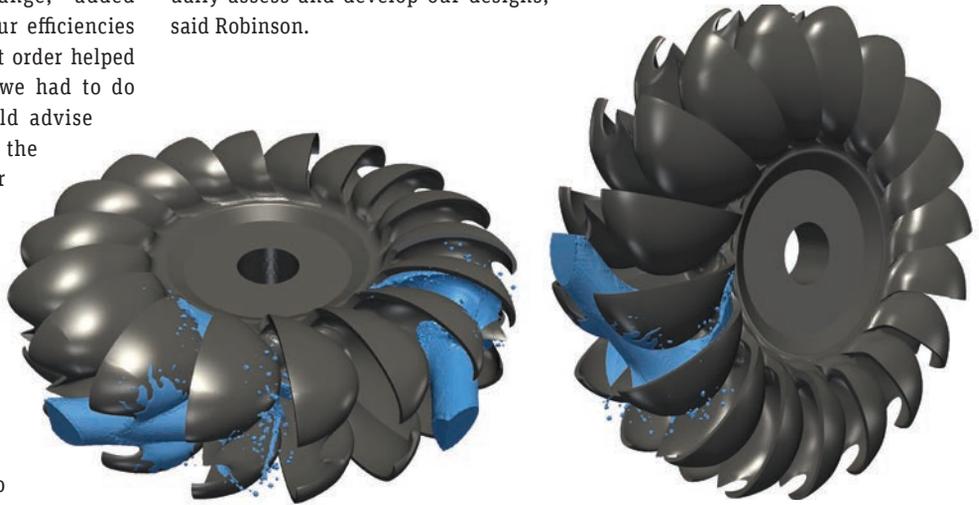
LAUNCHING A NEW ERA

In just three short years, Gilkes has transformed from having no internal simulation capability to having 10 engineers regularly using simulation software. The company has invested approximately

£150,000 in building this capability – including software licensing, hardware and training. The company is now looking into the creation of a high-performance computing (HPC) cluster to manage large simulations and make its analysis capabilities even more powerful.

“Engineering simulation now forms the basis of a strategy of analysis that is being used to promote intelligent, blue-sky design thinking, where we continually assess and develop our designs,” said Robinson.

“It’s hard to measure the financial impact of our investment in simulation,” he continued. “But I can tell you that we are now seeing a return on that investment due to winning more contracts because we can produce innovative designs more quickly and cost-effectively. We believe that simulation has made a real difference already – and that it’s positioning Gilkes for a new era of success.” ▲



▲ ANSYS CFD simulation of Pelton turbine runner

New to Simulation? Four Lessons from Gilkes

- **Choose the software carefully.** Make sure that the provider is best in class, but also choose individual solutions that meet your daily engineering challenges.
- **Structure licensing around your actual use of the software.** Gilkes first leased software, then bought the right number of licenses after usage was fully understood.
- **Capitalize on the provider’s knowledge base.** Expert training, phone-based support and web support are there to help customers. Take advantage of these resources.
- **Communicate the need for the change.** Even positive changes can be hard to accept unless employees understand the reasons why they need to work differently.

GILKES