

PERFORMANCE AND RISK



Industrial Internet of Things (IIOT) is driving new ways of managing performance and risk.



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Dr. Neil Arthur
Technical Director,
Digital at LR

Recent advances in IIoT, machine connectivity, big data and cloud technology have created some promising new ways to assure asset integrity and provide a holistic, real-time understanding of operating assets to optimise production and operating costs, while minimising risk.

Safe and reliable operations are both moral and business imperatives. Balancing performance and cost with risk is challenging in a dynamic environment; businesses need to be confident that threats to safety, productivity and the environment have been mitigated, while maximising output. Yet recent events, such as the Philadelphia refinery explosion and the Baytown plant fire in the US, are evidence that more needs to be done to avoid catastrophic incidents.

The greatest fear for operators is not knowing the areas of exposure to risk, and therefore not being able to address them. As LR Technical Director Digital, Dr. Neil Arthur, says: "Organisations have huge repositories of structured and unstructured data, but many struggle to access the richness of insight that can be gleaned from their historical maintenance records and process readings. Operators are calling for expert engineering solutions that provide comprehensive, accurate and up-to-the-minute information on asset and plant performance, along with assurance that risks have been identified and can be addressed through preventative maintenance actions."

In heavy process industries such as oil and gas, power, chemical and petrochemicals, as well as in the maritime sector, planned maintenance has traditionally been undertaken at fixed intervals. But periodic inspections may be too early or too late to identify problems. Time and money may be spent on non-critical assets, while other components are not tested frequently enough. It can also be difficult to take account of the operating environment or circumstances affecting operators, such as fatigue.

Industry 4.0: a dynamic approach to asset performance and risk management

Recent advances IIoT, machine connectivity, big data and cloud technology have created new opportunities and some promising new ways to assure asset integrity and provide a holistic, real-time understanding of operating assets to optimise production and operating costs, while minimising risk. These include predictive analytics, quantitative maintenance optimisation and digital twins.

Predictive analytics and risk modelling have the potential to take asset performance and maintenance to new levels through the extraction and analysis of valuable information from previously unmanageable pools of historical and real time data. Artificial intelligence (AI) and machine learning (ML) can further enhance this capability to deliver unprecedented insights into the true state of assets.

Quantitative maintenance optimisation allows modulation of maintenance activity in response to the changing reliability, economic and safety performance of assets. A 'live' model of the facility is developed, and planned maintenance activity scaled in response to changes in the prevailing technical and commercial environment. LR Technical Director Energy, DJ Schuld points to substantial gains from adopting this approach. "Many of our customers have seen a net reduction of 30% or more in planned maintenance through adopting these techniques."

Automating this approach through AI and ML will allow large-scale maintenance optimisation and performance benchmarking at pace. DJ sees particular value in benchmarking when the causes of risks are unclear. "Typically 35% of risks in a facility are unknown, with root cause analysis of limited value on account of the operational complexity. In situations such as this, benchmarking across organisations and sectors can be of significant value, and with our long history and the breadth and depth of our expertise, LR is uniquely placed to develop the data libraries required."

Digital twin models have the potential to transform the performance of assets by using new risk and reliability methodologies, failure data libraries, modelling tools and advanced analytics to process huge amounts of inspection, maintenance and other data. Digital twins enable users to test alternative prescriptive strategies by doing what-if tests in the digital model and then deploying the strategy once proven to the asset's physical twin. LR has extensive experience in digital twins and recently launched its Digital Compliance capability, providing an assurance and approval framework for Digital Health Management system providers and operators applying digital twin technology.



The real value lies in bringing together technology and human intellect to interrogate and extract value from vast data sets, to generate actionable insights that pinpoint risk and enhance asset performance – improving our understanding of the past and present to predict and inform the future.

Dr Maurizio Pilu
VP Digital Innovation
at LR

A key enabler to increased adoption of these approaches are the rapid advances made in sensor technology, with costs falling at a staggering pace and ever simpler installation. As sensors become more pervasive, remote monitoring and the automated analysis of data will become the norm. VP of Digital Innovation at LR, Dr. Maurizio Pilu is clear that technology and data are only part of the solution. “The real value lies in bringing together technology and human intellect to interrogate and extract value from vast data sets, to generate actionable insights that pinpoint risk and enhance asset performance – improving our understanding of the past and present to predict and inform the future.”

Adapting business models from other sectors

Aside from the advances made in sensors and data analytics, adoption of business models from other sectors can be a game changer in helping organisations to reduce risk. Maurizio says: “For example, deploying drones is an increasingly common way to avoid exposing humans to potential harm, and we are seeing development of Uber-like platforms for drone inspections that match client requirements with suitable providers.”

Semi-autonomous drones that will be capable of relaying camera inspection data and the associated 3D models to businesses such as LR, which are expert in analysing the information, are under development.

Working in partnership

In an environment of ever increasing scrutiny of performance and risk, as new technologies and approaches are developed, the importance of collaboration and open innovation is also increasingly apparent. As Maurizio puts it, “One of LR’s core strengths is the ability to turn data into knowledge into value, and we have exceptional insights into sectors and customers around the world. We are uniquely positioned to be able to work with customers in an impartial way to select best-in-class technologies, and to develop solutions to extract insights.”

An example of collaboration with external cutting-edge technology partners is the LR Safety Accelerator, a partnership between the Foundation and LR. The Safety Accelerator was set up to help large companies with some of the toughest safety and risk problems identify potential solutions from among some of the world’s brightest entrepreneurs and technology start-ups.

Adopting the right approach for customers

Industries – and individual organisations within them – are moving at different speeds. Some are leapfrogging solutions to adopt the latest technologies, while others prefer to extract value from investments they made ten to fifteen years ago, and are reluctant to invest in new approaches.

As Neil Arthur concludes, “Whatever a customer’s asset management strategy, our unique ability to bring together deep expertise developed over our long history across sectors and regions with solutions at the forefront of the field makes us a trusted partner to support customers, whatever their needs.”

CASE STUDY

LR delivers world’s first Safety Accelerator.

The challenge

Maritime and offshore, energy and supply chain industries are some of the most dangerous in the world, posing risks to workers, property and the environment. While safety improvements have been made, a gap exists for new approaches, to drive down accidents in these sectors.

The solution

Recognising this need for change, the LR Safety Accelerator was launched in 2018, by LR and the Foundation, run in partnership with Plug and Play, the largest global innovation platform and most active venture capital fund in Silicon Valley. The programme connects start-ups and customers to work together developing highly innovative digital solutions to improve safety and reduce risk.

Working in collaboration with LR customers to identify tough safety and risk challenges, the Safety Accelerator then expertly sources innovative start-ups capable of solving these challenges. After a rigorous selection process, successful startups pilot their solution with the customer in a three-month live environment.

The result

The programme has facilitated 10 ‘safetytech’ pilot projects to address safety and risk challenges in collaboration with LR customers including Kotug, Pacific International Lines, Omexom, Scorpio, Shell, Benugo, Wallenius Wilhelmsen, Bernhard Schulte Shipmanagement and HSE’s Discovering Safety Programme, and is currently running its fifth round of challenges with DCP Midstream, Phillips 66 and PepsiCo. 400 start-ups from all over the world have applied to solve the challenges, with 40 finalists pitching in front of customers and LR experts.



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DJ Schuld
Technical Director Energy
at LR

CASE STUDY

Aker BP: Using data intelligently to cut planned maintenance in half.

The challenge

Aker BP is a well-established exploration and production company, with activities on the Norwegian Continental Shelf (NCS). Measured in production, our client is one of Europe's largest independent oil companies, employing a workforce of around 1,300 people.

As an energy leader, the company was keen to see how it could make the most of its real-time equipment data to safely reduce maintenance workloads and spending. Aker BP asked us to run a pilot project using the Skarv floating production, storage and offloading (FPSO) unit it operated as the test asset. The pilot focussed on two core maintenance areas – the FPSO's centrifugal pumps and its fire and gas detectors – covering a total maintenance history of 60 months. The objective was to quickly demonstrate the business benefits of our recommended approach, combining our data and engineering expertise with our LR AllAssets™ Maintenance Optimisation software solution.

The solution

The close, collaborative approach made full use of our client's existing data sets for the Skarv FPSO and LR AllAssets™ Maintenance Optimisation solution.

The project was broken into three main stages:

- Gathering asset information from our client, including maintenance history, maintenance procedures and criticality ranking of every item of equipment under investigation
- Analysing and reviewing the information using different strategies and methods for each equipment or device type
- Optimising test intervals using LR AllAssets™ Maintenance Optimisation software and expertise, with supporting maintenance findings, insights and recommendations

Using our sophisticated, risk-based algorithms, and extensive engineering knowledge across reliability and maintenance optimisation, we then analysed the data to determine the most effective maintenance strategies.

The result

The project delivered almost immediate results and return on investment for Aker BP, with several major benefits:

- Full maintenance cost transparency
- Optimised centrifugal pump maintenance, with an estimated annual saving of 400,000 Norwegian Krone
- Reduced the annual maintenance hours/cost for fire and gas detectors by more than 50% by optimising test intervals and reducing inspection activities
- Maintenance activities refocussed in key areas for improved production availability