

AIMM

STORK MAGAZINE 2017

The Impact of Big Data on Asset Management

Maintaining power stations:
time vs. timing?

Addressing scopes in hard-to-reach places

Sustainable innovation on the work floor

Getting Statoil's Mariner project
off to a flying start

STORK

A Fluor Company

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ABOUT BIG DATA AND THE PREFERRED APPROACH FOR ASSET MANAGEMENT

Dear reader,

In March, we celebrated Stork's first year as part of the Fluor family. The combination of our global asset management expertise and Fluor's EPC (engineering, procurement and construction) capabilities has resonated well in the markets we serve. Mutual clients embraced our combined portfolio of integrated solutions. Their interest resulted in new synergy contracts from the Americas to the Middle East. These awards demonstrate the integrated solutions that we are uniquely positioned to provide; bringing our specialist technical solutions and maintenance experience to front end engineering design and construction which allows us to optimize the design, reduce cost and boost efficiencies.

Achieving efficiencies are of great importance to our clients as the markets they operate in continue to present challenges. Combined with the knowledge that technological advancement will continue, we have refined our strategy to best serve our customers. We are committed to growing our clients' business sustainably and successfully through innovative, digital and data-informed life-cycle asset solutions.

Sharing information and expertise helps maximize productivity and asset performance. This is key in the collaboration with our clients. Coupled with operational data, our asset monitoring and inspection services help clients to progress from a reactive to a proactive maintenance strategy. However, the preferred approach for asset management is predictive maintenance. And for that, Big Data will be essential. As Big Data will fuel our industry in the years to come, we have asked Bernard Marr, a leading business and data expert, to comment on the use of Big Data in conjunction with asset management in the oil & gas sector. His expert opinion, shared in an interview exclusively for *AIM* magazine, can be found on page 8.

Partnerships, sharing knowledge and information and process optimization will also contribute to improved safety performance. Within Stork, safety is at the heart of everything we do. It is a company value and part of our DNA. At the beginning of this year, we launched Stork's life-saving rules. This is a global initiative to help keep our people safe when executing high-risk activities, and is based on thorough data analysis. It is directly linked to our responsibility to ensure that our employees return to their families safely at the end of their shift. On page 16, you can read all about it.



“ Partnerships, sharing knowledge & information and process optimization will also contribute to improved safety performance. ”

At its core, Stork is a people business. Our employees deliver on our integrated solutions promise. Therefore, their performance is our company's performance. I'm very proud of their contribution to our clients' long-term success. In this issue of *AIM*, we have collected different stories from around the world that explain how our teams add value for our clients.

Enjoy reading,

Taco de Haan,
President Stork



BUILDING A TRACK RECORD

In this edition of *AIM*, we highlight some of the best examples from the past year, in which our combined portfolio of products and services added value to the markets we serve: oil & gas, chemicals & process, metals & mining, food & pharma, power & manufacturing.



CONTINUING LONG-LASTING RELATIONSHIPS IN THE USA

Over the next five years, Stork will continue to supply maintenance and small capital projects for four Huntsman International chemical plants in Texas. Huntsman has been a Fluor client on projects around the globe for nearly two decades. This contract symbolizes Stork's emerging growth in the oil & gas and chemical markets along the US Gulf Coast.



SOURCING EQUIPMENT IN THE NETHERLANDS

EQIN, Stork's equipment rental and sales organization, recently supported Fluor Infrastructure in a major highway project in the Netherlands. EQIN supplied road barriers and is exploring future collaboration opportunities related to these projects. Teaming up with Fluor helps EQIN to accelerate its steps towards new market segments.



COMBINING MANPOWER IN THE UK

Fluor's Industrial Services team relocated to Stork's Aberdeen office. With the addition of Stork's Energy Resourcing team, three decades of specific UK oil & gas experience is now blended with a rich tradition of supplying expatriate manpower to globally based clients.



EXPANDING OUR SERVICES TO CHINA

In China, a dedicated team started from the Fluor office in Beijing to support Stork's business in China. Focusing on the thermal power market, the team will supply equipment ranging from boilers to deaerators to Chinese clients. Support and training will be provided from the central Stork Power Services division.



ENGINEERING UNDER A SINGLE DUTCH ROOF

For a major oil & gas client in Rotterdam, the Netherlands, Fluor and Stork engineered, constructed and commissioned an additive-injection skid. Fluor and Stork teams did the engineering under one roof, resulting in a seamless transition from basic engineering to detailed engineering to construction.

JOINTLY BUILDING & MAINTAINING IN PERU



SacyrFluor, a joint venture between Fluor and Sacyr Industrial S.L.U., is the main contractor to build a gas compression plant in Peru. Through SacyrFluor, Stork was selected for the maintenance part of the EPCM contract. This was due to Stork's experience in operations and maintenance (O&M) projects and its relationship with Fluor. Stork will supply round-the-clock operations support and day-to-day maintenance activities until 2028. In addition, Stork will supply spare parts for compressors and generators during this term.

THE IMPACT OF

BIG

DATA ON ASSET MANAGEMENT

In recent years, asset management and maintenance have evolved from reactive to proactive. The next logical step is predictive maintenance, which addresses potential issues before they even arise. And the key to predictive maintenance is Big Data. But how can companies ensure that they collect the right data at the right time? And what should they know about how to navigate the next industrial revolution? We spoke to Bernard Marr, one of the Top Five Business Influencers and one of the world's leading experts on data, to find out.



INDUSTRY IN A CHANGING WORLD

According to Mr. Marr, data and analytics provide huge opportunities for asset management and maintenance. They will allow asset management providers, like Stork, to provide predictive maintenance that addresses issues before they disrupt operations.

"For example, new types of sensors can monitor most parts of asset performance," he says, "and Big Data algorithms can help foresee issues." Mr. Marr points to industry leaders like Shell, who use this technology to monitor its assets. In addition, many companies remotely monitor their assets. "Tesla and John Deere use the remote monitoring to dynamically adjust maintenance and service cycles," he says.

KEEPING UP WITH THE TIMES

But can Big Data and analytics truly impact traditional industry in the same way as these high-tech innovators? According to Mr. Marr, that's not only a possibility, it's an imperative. "I believe many companies in 'the old economy' have not completely understood the opportunities of the change we are seeing. And therefore, they are not necessarily tackling data and analytics on a strategic level," he says. "Big Data, analytics and Artificial Intelligence (AI) may sound like just ideas for tech companies, but they will be at the heart of any successful company in every industry, even the most traditional."

ADDRESSING THE CONCERNS

There are, however, significant questions about the impact of innovation and technology. The Internet of Things (IoT) revolution and AI are expected to dramatically alter manufacturing, energy, agriculture, transportation and other industrial sectors within the next 10 years. What will be the effect on people and competencies?

"There will probably be fundamental labor reorganizations, involving the automation of any repetitive, computation-heavy business tasks. This is likely to be felt across workshop floors and logistics," Mr. Marr says. "This leads to a fear that the so-called 'Robot Job Apocalypse' will lead to widespread human redundancy on a detrimental scale. But in reality, it's likely that – just as happened in previous industrial revolutions – humans will evolve their skillsets to fit with roles that robots will not be able to fill for some time, if ever. Humans can augment their abilities through technology. We need more people that can use data – and the insights it generates – to help with decision-making and job performance. This means awareness of the importance of data and the fact that data-skills are now part of every job. It also often means a cultural challenge of changing attitudes and creating an environment in which people are comfortable working alongside data-driven systems and AI-enabled robots and devices."

"Understand and embrace how data can become a core asset to the business and deliver real-world financial returns," says Bernard Marr, renowned expert on data in business.

"There are immediate opportunities available for predictive maintenance, improving capacity utilization, and generally driving up operating efficiencies."

BRINGING PRODUCTION BACK TO THE HOME FRONT

According to Mr. Marr, the tendency towards automation might spark initiatives to move production back to regions like northwestern Europe. "Fully automated factories mean that the advantages of manufacturing in low-wage regions are taken away. I have seen a number of manufacturers bring production closer to where the product is required," Mr. Marr explains. He points out that this could impact the way in which the industry needs to be organized. "More data will be available to monitor and fine-tune every aspect of the manufacturing process, and we will use increasingly intelligent algorithms to control everything. The longer-term vision is that these facilities will basically be increasingly run autonomously by computers."

CAPITALIZING ON THE BENEFITS

This new evolution offers real opportunities to advance industry, according to Mr. Marr. There will be a strong move towards the operationalization of (near) real-time data. This will drive efficiency by enabling predictive maintenance and machine-driven optimization of manufacturing and logistics processes. "Data-driven decision-making is most likely to have an impact 'in the moment,'" Mr. Marr explains. "When organizations can act at the moment data is available, they move away from the concept of the 'Tuesday meeting' – in which factors that influence bottom-line metrics are assessed the day after their impact is felt. I suspect that the immediacy of action will continue to cut waste and streamline procedures and decision-making, just as it is doing today."





STRATEGY AS THE KEY TO SUCCESS

In order for industries to take full advantage of the possibilities of Big Data, Mr. Marr emphasizes a strategic approach. To stay ahead, industrial companies must address Big Data from the Board level onward. The process should begin with a data and analytics strategy to identify clear ROI targets.

“Most important is to ensure you are exploring Big Data for the right reasons, and not simply because everyone else is,” Mr. Marr advises. “Start with your key strategic challenges and have a clear business aim regarding what you want to do with the data. Understand and embrace how data can become a core asset to the business and deliver real-world financial returns.”

Mr. Marr cautions that a ‘collect everything and see what we can do with it’ may be a tempting approach, but this has a

tendency to result in initiatives that fail to return on their investment. Data availability does not always go hand-in-hand with data quality. “Simply collecting all the data you can and hoping that it will help to provide the relevant insights is a big mistake. Instead, companies need to figure out what they need to know, and then put processes in place to ensure the right data is collected, in the right way, to generate reliable results.” He advises a productive initial approach. “Identify useful sources of data and efficient means of capturing, analyzing and operationalizing it.”

What’s more, Mr. Marr says that sharing data or data-driven insights is of utmost importance. “Significant thought must be put into the best way to get the right information to the right people at the right time,” he says.

GETTING BIG DATA REQUIREMENTS RIGHT

While navigating the world of Big Data, some important requirements come to the forefront. The first involves data ownership. “It is very important that clear agreements are in place concerning stewardship and ownership of any data being collected for analysis or monitoring,” Mr. Marr says. “As data is transferred between parties, firm agreements should state what purpose the data is being transferred for, and what rights, if any, the provider has to ownership of the data.”

“Predictive Big Data algorithms can help identify and foresee issues.”

ABOUT BERNARD MARR

Bernard Marr is an internationally best-selling business author, keynote speaker and strategic advisor to companies and governments. He is also one of the world’s most highly respected voices anywhere when it comes to data in business, and has been recognized by LinkedIn as one of the world’s Top Five Business Influencers. His latest books are ‘Data Strategy: How to profit from a world of big data, analytics and the internet of things’ and ‘Big Data in Practice’, which is an overview of success stories across most industries.

In addition, data security is a paramount concern. Particularly if a company is collecting, processing or dealing in commercially sensitive or personal data. “Misuse of data – especially personal data – through ineptitude is likely to have grievous consequences,” he warns. “Regulatory oversight here is high, and breaches can lead to all sorts of problems – not the least of which is a massive loss of trust from customers and the wider public.”

BENEFITS FOR OUR INDUSTRY

Mr. Marr identifies four key benefits of effective analysis of Big Data: decision-making, better understanding of customers and market trends, improved operations, and opportunities for monetization. In terms of predictive maintenance, operational improvement is the most clear benefit in our industry. “There are immediate opportunities available for predictive maintenance, improving capacity utilization, and generally driving up operating efficiencies,” he says.

“These areas are also really easy to monitor and quantify in terms of ROI. Companies can also package data analytics into new product and service offerings – offering clients integrated solutions including intelligence, insights and feedback.”

To truly harness the power of predictive maintenance and the benefits of Big Data, industries must develop a strategy that offers the biggest opportunities for return. But with the right strategic plan and an eye on data ownership and protection, Big Data can lead to the desired predictive end-state of maintenance to support and improve operational efficiencies for many years to come.

“When organizations can act at the moment data is available, they move away from the concept of the ‘Tuesday meeting.’”

PREDICTIVE MAINTENANCE BY STORK

The processes that affect the deterioration and failure of assets are complex by nature, which increases the level of uncertainty in the predictability of risks. Stork’s Asset Performance Management 4.0 (APM 4.0) is a solution that deals with the uncertainty and risks effectively by providing accurate insight in the probability factors that underpin current asset risks on the basis of the best available information.



FROM REACTIVE TO PREDICTIVE

Stork is currently working on a variety of programs to help clients progress from reactive to predictive maintenance as a means to optimize productivity and asset performance. Key in this process is collaboration and the sharing of information (read: data). Coupled with operational data, Stork’s asset monitoring and inspection services are already in place to measure the state of assets and to predict remaining asset life.

WIN-WIN SITUATION

Data availability will prevent unexpected failures and enables higher plant availability. This benefits both partners in the client-supplier chain. Clients can produce more reliably and more predictably. Stork has more means to effectively plan and execute activities and to achieve first-time-right execution, enhancing its added value services through failure prevention recommendations.

ASSET PERFORMANCE CENTER

As part of APM 4.0, Stork developed the Asset Performance Center (APC) to monitor client assets remotely. APC aspires to provide realtime insights to support clients in determining a fitting asset management strategy. Stork is currently performing the first Proof-of-Concepts (POC) at selected launching clients.

BIG DATA IN PRACTICE

Recently, Stork conducted a POC on rail shifts, in collaboration with a public transportation company. Malfunctioning shifts cause tram delays, and the resulting traveler claims negatively impact the company’s service level. The POC proved that with existing sensors and the forthcoming available data, failure prediction is indeed possible. This led to a very positive business case for further investments to lower costs and improve the client’s reputation.

DATA USAGE REQUIRES NEW SKILLS

As part of a POC, Stork also assesses the available skills to determine the impact that the proper use of available process data will have on the client’s personnel and organization. As companies need to develop data-related competencies, like analytics, they also need to develop new skills. Stork supplies training and coaching to put data at the forefront of decision-making.

BRIDGE TO ENGINEERING DATA

The value of Big Data is not limited to the field of effective operations & maintenance. Stork is working to connect with data from the engineering process, leveraged by the unique combination of Fluor and Stork.



ASSET DATA IMPROVES DECISION-MAKING

Asset-intensive companies face tighter maintenance budgets, stricter regulations and increased pressure to improve asset performance. Managing an asset with these challenges requires informed decision-making based on insight, knowledge and forecasting. Data is a powerful tool to help achieve this goal.

More relevant measurements lead to more reliable information for decision-making. The following 'Internet of Things' innovations have led to a rapid increase in the availability of field data for faster and immediate processing.

Digital devices: Handheld devices with an internet connection are now affordable and readily available. They can be used to capture and report measurements, observations and actions in real time.

Smart Sensor technology: A Smart Sensor with a microprocessor and network interface can make information about the condition of equipment readily available.

Global positioning: Systems that track particular locations are becoming less expensive, and can be used to help predict how degradation factors, such as weather, can affect an asset.

Remote self-diagnostics: Equipment can self-test and indicate what actions should be taken to avoid failure.

Real-time monitoring: Real-time monitoring is possible because of measurements obtained by control systems, like SCADA and DCS, together with observations in the field. Having the right information at the right time is critical for identifying the degradation and failure behavior of resources.

These examples are only the tip of the iceberg and are some of the ways how Stork applies data technology to help asset owners stay at the forefront of innovation and efficiency.

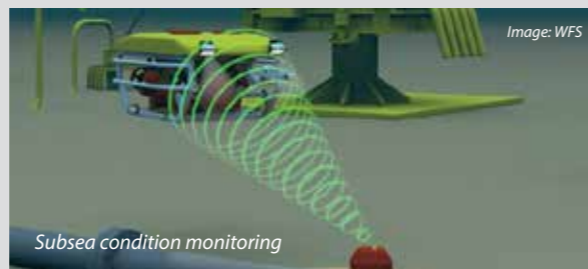
CHECKING THE ASSET PULSE

With hundreds of health-related apps in the average app store, chances are good that you have one or two installed on your smartphone. But if we are so comfortable monitoring our own personal condition, how comfortable are we with the systems in place to monitor the condition of industrial assets? Is it possible to check the pulse with a simple push of a button?

Stork's condition monitoring services are equipped to provide 24/7 access to information about when and where to intervene to assure the integrity of assets. The intervention tooling packages can be off-the-shelf or project-specific, and can be intrusive, non-intrusive, passive or online systems. Stork's extensive experience in field operations and additional complementary services provide a unique and robust monitoring solutions package.

The applications combine technical knowledge, expertise and experience. They provide optimal solutions that assure the protection of assets and infrastructure. Typical applications include:

- Wireless data loggers
- High-temperature, non-intrusive monitoring
- High-accuracy intrusive probes
- Traditional corrosion monitoring
- Bespoke designs for corrosion monitoring systems
- Retrofit corrosion monitoring systems
- Live intervention based on double isolation and hydraulic actuation
- Data assessment, management and verification
- Sand and other particle detection
- Erosion modeling



Subsea condition monitoring

SEATOOTH® CP

Cathodic Protection (CP) is essential to subsea asset integrity. However, getting accurate and reliable CP condition data can be a challenge, especially when critical locations are not accessible due to geometry, location (e.g. splash zone) and/or burial.

Instead of having to physically touch CP anodes, Stork's Seetooth® CP enabled anode can wirelessly transmit more than 100 monthly collected data points to an ROV that comes by periodically. This takes care of hard-to-reach anodes and provides far greater numbers of data points than the traditional method (one reading per ROV visit).

REAL-TIME MONITORING IN PERU

In a true example of the power of innovation and teamwork, Stork in Peru has developed Real-Time Stork® (RTS). RTS is an online technological platform that allows the storage, integration and processing of online operational variables from real data collection. The tool includes web access and its own app, which supplements Stork's asset management portfolio. It helps clients reduce risks, ensure security through prompt decision-making and improve performance of their assets with use of technology (see next pages).



Development of the RTS app began in 2014, and after tests and improvements, has been available for use since over one year. The first clients are already utilizing this innovative solution today. Through RTS, Stork controls operational parameters for the monitoring and analysis of oil and energy production in real time. It also records more than 400 essential process variables in these operations.

Duvan Castañeda, commercial manager at Stork Peru: "At many clients, project magnitude makes RTS an invaluable solution. For instance at China National Petroleum Corporation (CNPC), we have broader operational capabilities, and carry out control in real time for more than 2,400 wells that produce approximately 10,000 drums per day."

HIGHER EFFICIENCY AND EFFECTIVENESS

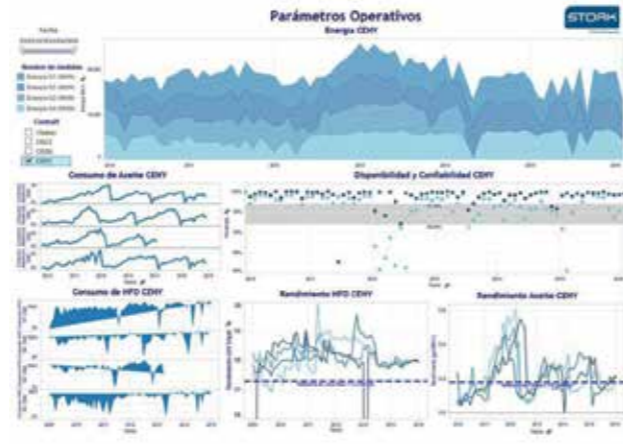
RTS has become an essential technological tool for decision-making and operational follow-up for clients in Peru. It replaces the time-consuming data collection in traditional spreadsheets. This increases operational efficiency, since it is no longer necessary to use more than 800 man-hours per month to collect and record more than 600,000 data points, of which only 15% were previously being analyzed. Gathering information with RTS is much easier, and increases effectivity by 20%.

In addition, this tool provides access to Stork-generated reports and easy, quick navigation to share or download reports. Thanks to geo-tracking and navigation, every installation's operational focal points can be located easily.

Similarly, RTS supports consultation. It generates historical graphs of stored data from within the app. It also stores technical and comprehensive reports, and ensures that

What do our clients say?

"RTS has met our expectations and it will be of great value for our operations. We have worked for more than 12 years collecting data on paper. RTS is an innovative solution. Congratulations to Stork," Dani Nizama, auditor at CNPC.



Screen shot from Stork's RTS app.

reports and analysis, external to the operation, are easily traceable. RTS even enables information downloads, the printing of predetermined forms for data collection, and the quick and easy sharing of graphs by email.



RTS IN PRACTICE

Duvan concludes that with RTS, Stork provides its Peruvian clients with added value and helps them optimize their processes and ensure decision-making in real time, with reliable data. "It is an example of our human talent potential and a reflection of teamwork. We gathered everyone's knowledge and contributions, and addressed a specific client need. RTS offers multiple possibilities to preserve information. For example, it allows data-entry without an internet connection. Once there is connection, the application automatically sends the data to the RTS server."

HIGHLIGHTS

RTS is a trademark with industrial intellectual property rights. It can be implemented in any operation in which Stork provides its services. The RTS tool, developed by the Maintenance and Reliability Engineering team at Stork Peru, was designed for the oil & gas, petrochemical, energy, mining and industry sectors. In Peru, it continues to be implemented in new projects.



Stork employees in Peru are being trained to make full use of the RTS app in their efforts to increase their clients' operational efficiency.



STORK INNOVATES TO CREATE SUSTAINABLE VALUE

At the 2014 edition of ADIPEC, a client's integrity inspection team visited the Stork stand. The fertilizer company expressed interest in Stork's deaerators. Subsequent meetings and presentations led to the resolution of a unique challenge. The solution was the first of its kind in the Middle East.

MEETING THE CLIENT'S NEEDS

The client had two conventional deaerators with capacities of 305 metric tons (672.4 pounds) per hour (tph) and 280 tph (617.3 pounds per hour), respectively. The deaerators supplied feed water to four boilers at the plant. The client was dosing oxygen-scavenging chemicals and venting large quantities of steam to maintain the required 7 ppb of dissolved oxygen levels at the deaerator outlets. The steam venting resulted in high noise levels, and the use of hazardous chemicals posed a potential risk to people and the environment.

The solution Stork was asked to develop had to lower deaerator operating costs and lower its carbon footprint by reducing energy waste. Further, the elimination of oxygen-scavenging chemicals and the reduction in noise levels were top priorities.

A CUSTOMIZED SOLUTION

Stork Thermeq and Stork Emirates teams collaborated on the development of the solution. They came up with a strategy to retrofit the existing deaerators with Stork's spray-type technology. Stork conducted a Cost Benefit Analysis, focusing on the reliability of the new design, reduced operating costs after retrofit, and a payback period for the investment in a retrofit.

Stork provided the complete EPC retrofitting of the two deaerators. The complete solution included the engineering of deaerator modifications and supply of the Stork sprayer, plus all modifications to the deaerator's exterior. Stork pre-fabricated all components, and installed, modified and commissioned them on-site.

THE SIGNS OF SUCCESS

Retrofit of the two deaerators was completed within six months, from ordering to hand-over. Site modifications for this project had to be conducted during the 35-day plant turnaround. The site modifications were completed in a short timeframe: just 18 days.

The client was satisfied with Stork's execution, and most importantly, the deaerator performance after the retrofit. Among the key benefits were:

- An estimated \$75,000 reduction in operating costs, per year, per deaerator.
- A reduction in costs and potential environmental hazards through the elimination of oxygen-scavenging chemicals.
- A feed water sample result of less than 5 ppb at the deaerator outlet, without the use of oxygen-scavenging chemicals.
- An 80% reduction in steam venting, with the respective reduction in venting costs.
- A decline in noise levels from more than 85db to less than 80db.

What's more, by retrofitting their existing deaerators, Stork also helped the client achieve one of their internal project goals for energy conservation and improved safety.

This project is an excellent example of Stork's expert teams working together to customize and find specific solutions to a client's unique challenge.



Before retrofitting.



After retrofitting.

TURNING LIFE-SAVING RULES INTO LIFE-SAVING REFLEXES

Stork is committed to helping ensure that all employees go home safe at the end of each day or shift, so they can enjoy their lives, do the things they love and be there for their families, friends and loved ones.

This is no small challenge, as Stork works with clients in a wide range of so-called 'heavy' industries, such as oil & gas, mining, power and chemical. The vast majority of its 17,000-strong workforce operates in the field, day in, day out, in a risky environment.

SAFETY IN THE LINE OF FIRE

Safety is always at the heart of Stork's operations. There are detailed processes in place to allow for the safe execution of work. If employees do not follow the processes, they face serious potential safety risks, especially if employees are placed – or place themselves – in the line of fire.

Stork researched the categories in which this risk could result in injuries with dramatic consequences, or 'life-altering events'. They developed the REACH Beyond Zero

life-saving rules to help keep employees safe and prevent injuries in the future.

FROM RULES TO REFLEXES

There are 10 life-saving rules that cover: operations in confined spaces, driving, electricity, equipment and plant, excavations, hazardous release, lifting and rigging, manual handling, safe systems of work, and working at height.

The life-saving rules provide a clear framework and guidance for safety-critical tasks that are carried out day-to-day. The rules indicate the things that can hurt employees the most, so that taking extra care becomes instinctive. This turns the life-saving rules into life-saving reflexes.

Visit www.stork.com/reachbeyondzero/life-saving-rules for more information.



THE LIFE-SAVING RULES



CONFINED SPACE: Only enter a confined space if you are trained and authorized to do so, ensure attendant and rescue plans are in place, and gas-test as scheduled.



DRIVING: Operate vehicles safely, comply with local regulations, wear seat belts in all seats, practice defensive driving, follow the journey management plan and do not use handheld mobile devices.



ELECTRICITY: Obtain authorization before working on electrical equipment, and only if you are trained and certified to do so.



EQUIPMENT AND PLANT: Only operate certified equipment and plants that you are trained and certified to use, and always position yourself out of the line of fire in relation to moving and energized equipment and plants.



EXCAVATIONS: Only enter a trench or excavation through safe access and egress points, and only if it has been inspected and secured, and report any changing conditions.



HAZARDOUS RELEASE: Confirm that energy and chemical sources are isolated and depressurized before working on systems or equipment, and follow the isolation process in place.



LIFTING AND RIGGING: Follow a lift plan, only perform lifting and rigging operations with certified equipment for which you are trained and certified, and do not walk under a suspended load.



MANUAL HANDLING: Position yourself and your body parts safely when manually handling materials, chemicals, equipment, tools and when moving on foot.



SAFE SYSTEMS OF WORK: Comply with the Safe Systems of Work in place, use the specified protective equipment, and do not override safety-critical equipment.



WORKING AT HEIGHT: Protect yourself against falls and protect others from dropped objects, and use the specified protective equipment when working at height.

COLLABORATING WITH CLIENTS TO INCREASE SUSTAINABILITY

For Stork's clients, pressure is increasing to not only carry out maintenance trajectories more quickly and cost-efficiently, but also more sustainably. Based on expert knowledge of its clients' assets, Stork can provide a meaningful contribution to these objectives. This is increasingly becoming the starting point for intensive collaboration. And it is how Stork contributes to both its own sustainable growth, as well as that of the client.

DISTINCTION THROUGH DIVERSITY

Stork can contribute to sustainability in a variety of ways, from executing a project in response to a specific client question to, for example, helping develop a solution for a waste issue. The wide variety of solutions speaks to Stork's commitment to ensuring sustainability in ways that matter most:

- Stork installed a steam boiler with a burner, in which the by-product (BPA oil) is converted into useable energy. This results in more than 80% reduction in CO₂ emissions.
- One company in the western part of the Netherlands had a surplus of residual heat (steam) whilst another company needed warmth for its production process. Stork supplied a heat exchanger that allowed the energy flows to be coupled. Sustainability at its finest.
- A dairy producer achieved the reduction of 16,000 tons of CO₂ by switching over from natural gas to pyrolysis oil

for its steam production. For both the production of the pyrolysis oil as well as for the conversion of this oil to steam, Stork delivered the kettle installations.

- A boiler/burner combination delivered by Stork converts 12 different process gasses - which are released during production - into steam. This steam is then re-used in the same chemical installation.

BIOMASS FOR THE MASSES

Stork is also involved in another sustainable initiative to develop, deliver and install various biomass-powered installations. These will be used, for example, for regional heating and/or energy generation. In addition to the projects that involve converting waste products/flows/gasses, Stork is also actively involved in installations that convert plastic waste into oil. This results in more sustainability, less plastic waste and new energy.

PUTTING THE 'E' IN HSEQ

Environmental protection is also one of the pillars of Stork's HSEQ program. Stork constantly strives to reduce the negative environmental impact of its operations. Innovative management systems and HSEQ programs are major contributors to the effort. They help Stork set the right priorities and enable a reduction in energy consumption and CO₂ emissions.

SUSTAINABILITY ON THE WORK FLOOR

In addition to various maintenance efficiency initiatives, Stork also stimulates its employees to reduce their ecological footprint. One of the initiatives that aims to make employees aware of the importance of sustainable working is Stork's Sustainovation Challenge, a competition that kicked off for the second time this spring.



TAKING ON THE CHALLENGE

During the 2016 Sustainovation Challenge, the winning idea involved the use of a GoPro camera with a monitor on an extendable pole, which allows the quick inspection of issues in hard-to-reach areas (see left picture). The solution saves precious time and energy, and decreases risks. The many entries

in the last edition of the Sustainovation Challenge showed that countless Stork employees are able to develop and share sustainable and innovative ideas that can make a valuable contribution to society. Innovative solutions with a positive impact on the industries in which Stork is active

include sustainable ideas for the re-use, recycling, renewal and life-span extension of installations, materials and equipment. There were also exciting ideas for new technologies, new systems, and improved processes, procedures or working methods, among others.

SUSTAINOVATION CHALLENGE 2017

Stork believes in the innovative power of its employees, and challenges them to be a part of the Stork Sustainovation Challenge 2017. This is a call to share new, sustainable and innovative ideas:

"Challenge yourself and your colleagues: what can we do better, smarter, differently, more efficiently, more effectively and more sustainably?"



PARTNERSHIP ACCELERATES SUSTAINABLE INNOVATION

In 2016, Stork engaged in a partnership with the Technical University Delft. Since then, it has supported a team of students who are designing and building a high-tech boat that runs on solar energy. The team competes in international race events.

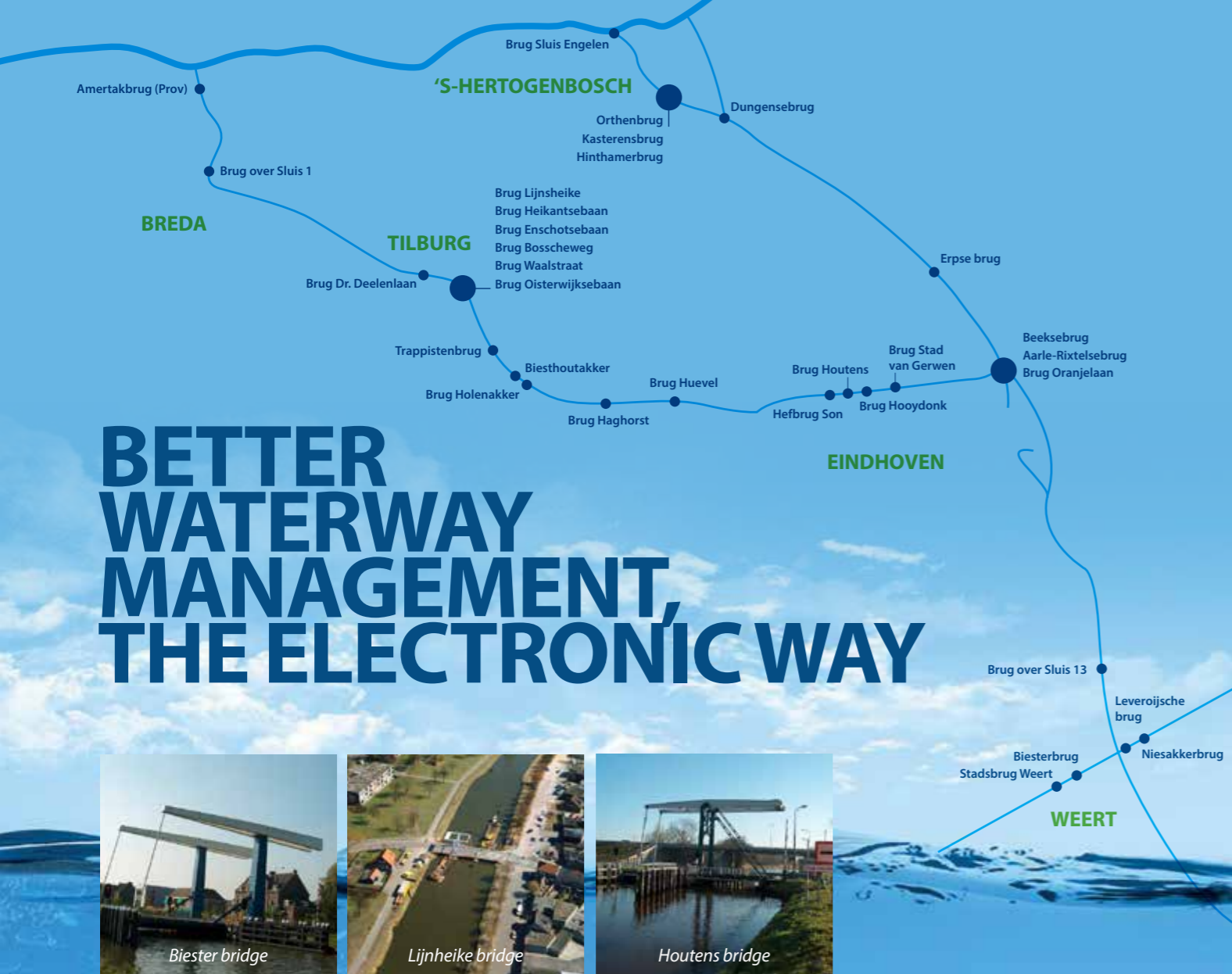
The solar boat project represents an innovative, sustainable application of existing and new technologies. Stork and the TU Delft Solar Boat Team share the same goals: operational excellence, innovation, sustainability, creativity and a focus

on teamwork and safety. Part of the collaboration involves the production of so-called 'air foils', the front and rear wings of the boat. Produced by Stork Turbo Blading in Sneek (NL), the air foils considerably improve the speed of the solar boat. TU Delft is an important supplier of industrial talent, and is a front-runner in innovative and sustainable technologies. The bi-annual collaboration with Stork will allow us to learn from and support each other, thus promoting sustainability and innovation even further within Stork, and continuing to add value for our clients.



The TU Delft solar boat, proudly sponsored by Stork.

BETTER WATERWAY MANAGEMENT, THE ELECTRONIC WAY



Biester bridge



Lijnheike bridge



Houtens bridge



Son bridge

A series of 27 bridges and locks, along a stretch of 140 kilometers (87 miles) of canals in the south of the Netherlands. That's been the workplace for E&I experts from Stork's Istimewa Elektro since 2012. The assignment? Modernize each individual control system and connect each one to a single, brand-new, central control unit. The last lock was connected to the central control unit in April.

Completion of this unique project supports a very important corridor for transport by boat in the region. The corridor connects regional industrial areas to the Rotterdam harbor, and to other locations in the Netherlands and abroad. Water transport is an important logistical means in the Netherlands. And its popularity is increasing, due to the economic up-turn, which has led to overcrowded highways in the country.

Reason enough for state-owned Rijkswaterstaat to improve the links and controls among the connections on its waterways. And thinking ahead, Istimewa made the system future-proof, too. The central control unit was designed to operate up to 50 structures along its route.



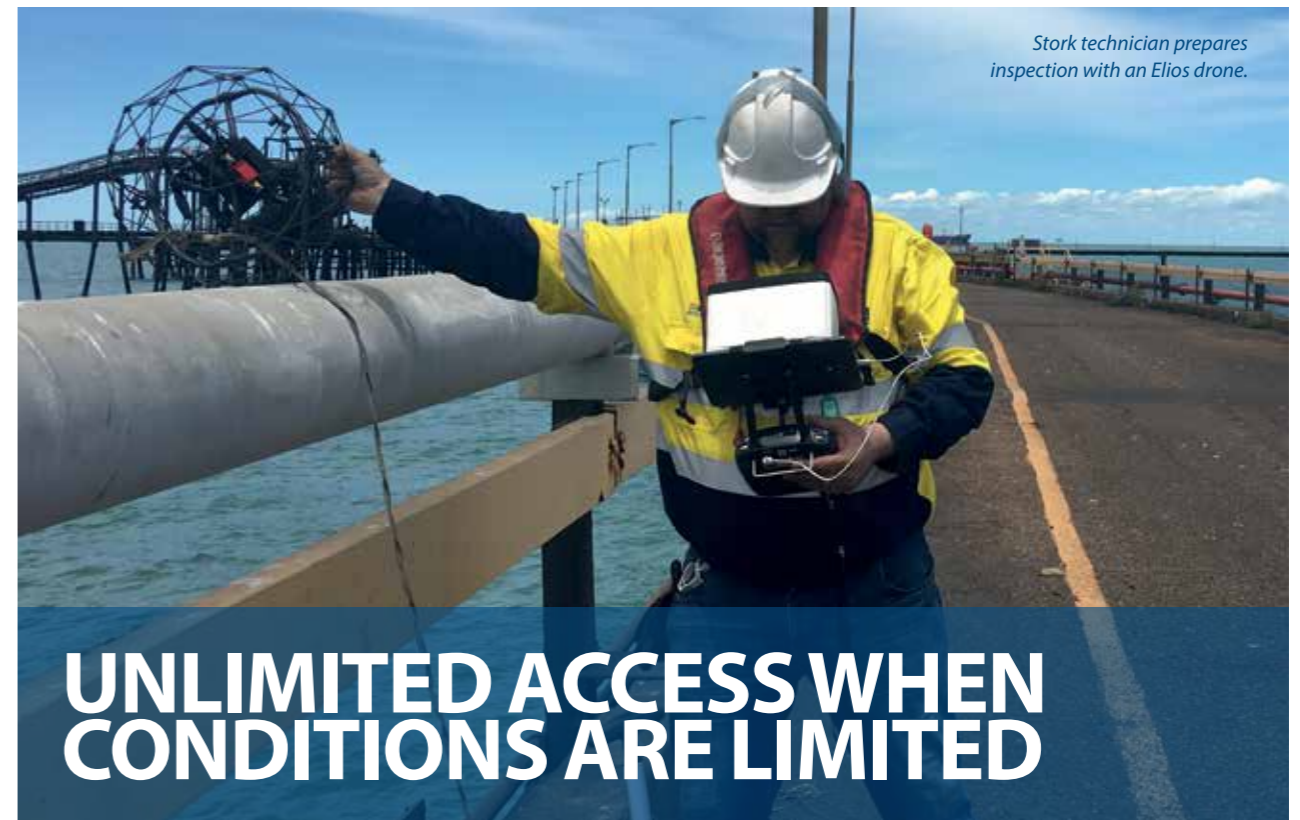
Central control unit Tilburg



Heuvel bridge



Son bridge



Stork technician prepares inspection with an Elios drone.

UNLIMITED ACCESS WHEN CONDITIONS ARE LIMITED

Let us take you back to 2012. Shell contracted Stork to conduct a structural and coating inspection of an offshore drilling derrick on the Brent Delta platform. The inspection involved accessing areas that would have been particularly challenging and time-consuming with traditional scaffold inspections. In conjunction with Cyberhawk, Stork used drones to fully assess the operational drilling derrick. Images and expert engineering analysis gave a clear picture of the asset to support the maintenance program. And in the meantime, the drone allowed equipment to remain fully operational during the inspection, with no disruption to operations.

This project was the world's first inspection of an oil platform by drones. It eliminated the need for costly shutdowns and safety risks associated with traditional access methods. The cost- and time-saving solution won the prestigious 'Business Efficiency' award at the 2012 Oil & Gas UK Awards.

DEMONSTRATING CAPABILITIES IN AUSTRALIA

Five years later, drones are considered a mature solution in Stork's global inspection portfolio. They improve efficiency, productivity and profitability. As the industrial usage of smarter and more flexible drones takes off rapidly, Stork specialists are now at the fore of bringing the potential to market. Like we are currently demonstrating in Australia. In the local arena of outdoor inspections, drones have already proven their merits by reducing the need to scaffold unless an issue has been detected. From mines and petrochemical sites to infrastructural projects in the country, the team structurally helps clients to bring down costs and downtime. But using drones inside of an installation is literally a whole different ball game.

REDUCING COSTS AND RISKS

Stork uses the Elios drone in Australia to inspect structures from within, jobs that would normally lead to costly shutdowns and exposure to safety risks in confined spaces. The ball-shaped drone can be used for many other applications. Recently, Stork inspected inside pipelines, large product bins, loading dump stations, anything that would be dangerous for a human to enter. As GPS or other signals are often not reliable -or available- within these kinds of environments, experienced experts navigate the ball drone manually to trace asset integrity issues. Leveraging a drone, a large tank inspection now only takes up to 5 hours.

SMARTER INSPECTION

Going forward, the team 'down under' will expand its range of solutions by introducing smart comparison software to track the asset state. For example, the team can pinpoint an area of corrosion, and during the next inspection period go back exactly to the same place to compare the corrosion rate. Next to this, Australian Stork experts worked to develop a new way to conduct thickness checking using drones. This new solution will be rolled out in 2017 and promises to be a game changer as it can take a thickness measurement in 2 to 3 seconds.



Elios drone inspecting a confined space.

GETTING STATOIL'S MARINER PROJECT

OFF TO A FLYING START

Through an effective combination of products and services, Stork supports a safe and reliable start to the Mariner A Platform in the North Sea, whilst also contributing to the hook-up and commissioning phase through Aker Solutions.

Statoil conducts a wide range of activities in the United Kingdom (UK), including offshore wind, upstream operations, natural gas trading and crude oil sales. Statoil is increasing their investment on the UK continental shelf (UKCS) through the development of the Mariner field. It is an ambitious 30-year project that represents one of the largest capital expenditure commitments on the UKCS in more than a decade; with a gross investment of more than USD 5.8 billion. Discovered in 1981 on the East Shetland Platform, approximately 150 kilometers (93 miles) east of

the Shetland Islands, the Mariner field is a sizeable prospect for oil and gas producers. In December 2012, Statoil and its partners decided to invest in the Mariner project.

With initial production expected in 2018, the development of the Mariner field will contribute more than 250 million barrel reserves, with average plateau production of around 55,000 barrels per day. It will also support a significant number of jobs in the UK supply chain.

The Mariner modules under construction in South Korea.



STATOIL IN PARTNERSHIP WITH STORK

Statoil awarded Stork the offshore services contract in the summer of 2014. A five-year deal, with two-plus-two-year extension options, which will see Stork's multi-skilled technicians provide a wide range of integrated fabric maintenance and access solutions. These include: coatings, passive fire protection, insulation, rigging, lifting technical assistance and scaffolding and rope access services. This is coupled with additional specialist services, such as heating, ventilation and air conditioning (HVAC), and the most recent contract award win, flange management, which is now to be included in the overall offshore services contract.

MANAGING PROCESS CONTAINMENT

Stork's onsite machining and bolting product line secured the flange management works in May 2017. The works include the utilization of Stork's advanced electronic flange management software package, iBolt. This pioneering software incorporates radio-frequency identification (RFID) and barcode reading functionality. Along with anomaly reporting and photograph storage capabilities, this provides an audit trail which exceeds current UK Health and Safety Executive (HSE) guidelines. Using RFID technology to identify flanged and small-bore tubing (SBT) joints, this technology mitigates the risk of misidentification on safety-critical, hydrocarbon joints.



iBolt software on a mobile device.

This advanced software, along with Stork's highly competent technicians and our proven Behavioral Changes in Flange Inspection and Assembly Techniques training course, all help achieve a leak-free start. This reiterates Stork's core belief that prevention, and not the repair of leaks, is fundamental in adding value to clients as part of their hydrocarbon leak-prevention plans. The system is soon to be implemented throughout the Mariner field development. Stork is currently providing Statoil personnel with training in how to use it.

AKER SOLUTIONS COLLABORATES WITH STORK

Also in 2014, Statoil awarded Aker Solutions, global provider of products, systems and services to the oil and gas industry, the Mariner maintenance and modification services contract. The five-year framework agreement will see Aker Solutions deliver the maintenance planning system in the pre-operations phase of the development, as well as support services during the hook-up and commissioning phase (HUC). Aker Solutions was additionally awarded the overall HUC support agreement by the main South-Korean-based contractor, who built the Mariner modules locally and is responsible for delivery of the offshore HUC scope up to mechanical completion. Its strong track record in HUC services made Stork the ideal partner of choice. As such, Aker Solutions awarded Stork the scaffold and fabric maintenance services contract for the HUC phase of the Mariner A platform.

FOCUS ON LIGHTWEIGHT SCAFFOLDING

During the contract, Stork will place a significant importance on the use of lightweight, aluminum system scaffolding, which will help increase productivity and generate overall cost savings for the project. Stork's onshore teams have already commenced work in Aberdeen, UK, mobilizing circa 40 metric tons of the system scaffolding to South Korea, where the component modules were under construction. Stork will continue to mobilize further shipments as the HUC work progresses. Stork will deliver rigging support, coatings, insulation, passive fire protection and rope access solutions to Aker Solutions during the HUC scope.



Twence management and contractors celebrate the start of the modernization project.

POWERING THE PRODUCTION OF RENEWABLE ENERGY

Every day, Twence utilizes waste and biomass from the Netherlands, Germany and the United Kingdom as a source for renewable energy and new raw materials. The Dutch cooperation of municipalities generates enough electricity to cover the needs of more than 75,000 households. This makes Twence one of the largest generators of renewable energy in the Netherlands. In addition, Twence produces enough heat and steam to satisfy the heating needs of around 57,000 households.

To keep up with the standards of efficiency and demand – today and in the future – Stork is modernizing Twence's biomass power plant in Boeldershoek, and will convert it to increase its heat production capacity. With the completion of this single project, the Twente municipalities – its shareholders – will achieve half of their sustainability objective: a renewable energy share of 14% in 2020.

The complete reconstruction of the biomass power plant will increase Twence's total steam capacity from 80 to 90 tons per hour. Starting in 2018, Twence will achieve a 300% increase in energy production. This amount of renewable energy is equivalent to the output of 75 large wind turbines. The extra heat will go partly to commercial parties for cooling, heating of buildings, process industry and drying processes, among other things. The rest will be used in Twence's own processes.

In the build-up to 2018, Stork will engineer and realize the complete on-site steam grid, connecting the new turbine to the biomass plant and to existing steam and heat grids. Stork will also integrate a heat exchanger into the biomass plant, to retrieve heat from the flue gases and add it to the regional heating network. Retrofitting and upgrading the plant's biomass boiler will complete Stork's work scope.



Stork president Taco de Haan officially opens new regional office.

BUILDING BUSINESS IN AUSTRALIA & NEW ZEALAND

In March, Stork opened a new regional office in Moorebank, Australia, to support its Australia and New Zealand operations. The office in the Sydney suburb will oversee the combined operations of Fluor Operations & Maintenance and Stork's businesses, including Giovenco Industries, which Stork acquired in 2015. The organizations share a more than 60-year history of serving the Australian oil & gas, metals & mining, rail, chemical, and power industries.

The Moorebank office perfectly illustrates the coming together of three organizations under one roof. With Giovenco previously headquartered in Ingleburn, Stork in Perth and Fluor's O&M teams in Melbourne, the central staff is now able to support its local offices and site teams at client locations throughout Australia and New Zealand from one location. Being part of the 'The Greater Western' part of Sydney, the Moorebank area is a dynamically growing industrial business hub. It is therefore ideally located to facilitate Stork's growth ambitions in the region, as Taco de Haan, president of Stork, explains.

"Our objective is to grow our industrial operations and maintenance business in this important region. Consolidating our regional office under one roof is part of Stork's onboarding process to increase value to our client base, reduce our cost and position for continued growth," said de Haan. "Moorebank will act as our hub, from which we can build upon a combined portfolio of unique capabilities that Stork, Giovenco and Fluor bring together. This office will also be connected with the larger Stork global organization, with its close to 17,000 employees, and the larger Fluor Corporation."

Stork is currently active at client locations in the Australian states of New South Wales, Queensland, West and South Australia and Victoria, as well as throughout New Zealand.



Regional Office
Local Offices



Stork has inhouse capabilities to perform complete power plant renovations.

Maintaining power stations: A MATTER OF TIME OR TIMING?

Maximizing uptime is the primary objective of power stations. They play a vital role in supplying energy for urban areas or industries. It is not unusual to stretch the asset lifetime, sometimes even to the point that maintenance is pushed to the extreme limits. In these cases, there is no other option than to shut down the plant for a complete renovation. Stork is then brought in to keep downtime to a minimum and to make sure that power supply is up and running as soon as possible. And of course, to ensure it will remain up for a long time.

RENOVATIONS IN PFORZHEIM

The thermal power station in Pforzheim, Baden-Württemberg, Germany, has been supplying heat and electricity to



Performing a challenging turbine overhaul in Germany.

the region since 1965. It has been modified and extended drastically since then, with the opening of a combined heat and power biomass plant in 2004. Stork's Power Services organization in Essen was brought aboard to overhaul a two-casing steam turbine in one of Pforzheim's older sections. The turbine had been in production for more than 20 years. The overhaul was a sort of marathon, with the need to repair severe wear and tear on essential parts like partial joints, blading, valve parts and housings. Within a time frame of six months, Stork replaced in total 10 blade rows on both turbine rotors. Due to heavy distortion of the casing joint, the outer casing of one turbine had to be machined on-site, as it was too big to transport out of the machine house. The casing lower half was left in place and the upper half had to be turned inside the machine house. A special mobile crane had to be used to turn the upper casing half upside down for machining and to turn it back for re-installation.

RE-ENGINEERING BY THE ESSEN TEAM

Time was also an essential parameter for a second renovation project, this one for a different German power installation. Stork replaced the rotor of an 8MW wood mill steam turbine in the northeast of Germany. Although the operation on-site had an operational window of only seven days, the complete project took a total of six months. In this timeframe, Stork prepared the work scope in its own facilities in Essen, using its reverse engineering and product redesign capabilities. Stork manufactured a completely new rotor, starting with a forged shaft.

This was part of a two-step strategy, in which Stork initially overhauled the turbine package. During this overhaul, potential risks to the long-term operations of the rotor were discovered. However, the client wanted to release the turbine for operations in short time. As all required measurements were already taken, and thanks to the experience of Stork turbomachinery experts, a new rotor was engineered remote. Due to the excellent network of qualified suppliers, Stork produced the rotor in minimal time and delivered it to the site just in time. There, the skilled crew removed the old rotor and mounted the new one. This allowed the client to restart its production process according to schedule.



Partnering with clients results in mutual trust.

IMPROVED GTL PRODUCTION IN QATAR

The Pearl site of Qatar Shell GTL (QSGTL) is part of the world's largest Gas-to-Liquid (GTL) plant. Every day, 22 offshore wells produce up to 1.6 billion cubic feet of wellhead gas. The Pearl site converts the wellhead gas into GTL. Mechanical failures in a plant of this size can seriously delay production, not to mention cost time and money.

IDENTIFYING THE CHALLENGE

In 2016, QSGTL faced a significant challenge: during start-up, gearboxes were experiencing a peak load of 63.9kN-m. But the maximum threshold for their existing gearboxes was 44.5kN-m. As a result, several of the gearboxes in a critical part of Pearl GTL were failing.

A PARTNERSHIP OF TRUST

Since Stork had successfully participated in major turnarounds for Shell in 2015 and 2016, QSGTL once again turned to Stork for a solution for the failing gearboxes.

Gears & Services in the Netherlands first conducted an in-depth engineering study, which revealed that the gear sets could be redesigned to enable them to withstand a minimum peak load of 65kN-m during start-up. As a result, QSGTL awarded Stork a three-year contract to deliver 100 redesigned gear sets for Pearl GTL.

REMARKABLE IMPROVEMENTS

The Stork solution delivered improved asset reliability, without the need for large and expensive asset modification. The project realized significant cost savings, since the price-per-unit was much lower than other solutions. What's more, Stork was able to offer its knowledge and expertise to QSGTL's engineers, thereby enhancing in-house knowledge.

The QSGTL solution is an excellent example of how Stork improves asset reliability and performance, while working together with clients to find optimal solutions to the challenges they face.



EXPANDING INTEGRATED SOLUTIONS OFFERINGS IN THE USA

Stork's journey to support clients in the USA as an integrated maintenance provider was accelerated through the newly opened service center in Pasadena, Texas. Target markets for the center include: refining, gas processing, petrochemicals, specialty chemicals, and midstream oil and gas production in onshore areas.

With Stork's hub in Houston, mainly offering a full range of asset integrity services for offshore clients, the Pasadena center contributes to Stork's product offering in the USA. The new service center can easily collaborate with other established Stork and Fluor Gulf Coast shops offices. Together with the 6,000-plus craft base, it contributes to a full suite of local, integrated solutions for its USA clients.

SOURCING FROM WITHIN

For equipment, Stork can utilize AMECO's Houston equipment yard, which manages a large stack of rental equipment and a wide range of small tools and consumables. Fluor subsidiary, Plant Engineering Services, operates an office in Texas City and provides both Fluor and Stork clients with electrical expertise and small capital engineering services to augment anything from large EPCM contracts to ongoing maintenance projects. Fluor's Baytown and Deer Park, Texas centers offer craft training and recruitment to assist in ramp-ups, turnarounds, shutdowns, and other client events.

Typical services provided from Pasadena include:

- Mechanical and piping
- Machining and bolting
- Heat treatment services
- Turnarounds and shutdowns
- Specialty welding
- Plant engineering
- Industrial maintenance
- Sustaining and small capital projects
- Special access systems
- Inspection and integrity services
- Non-destructive testing
- Hot bolt clamp
- Electrical and instrumentation services



EXTENDING VALVE SERVICE CAPABILITIES IN BELGIUM

By continuing the valve repair activities of Furmanite GSG's former Belgium operations, Stork has extended its valve services product line in Belgium. The new repair service capabilities are now fully integrated into Stork's local services portfolio, which now includes a complete range of activities, from maintenance engineering and diagnostics to overhaul and valve repair.

In addition to works performed at Stork's fully operational workshop, Stork's presence in the centrally located Antwerp harbor area allows for fast on-site response for Belgian clients. Stork's local team handles all required tasks to prolong the life of valves. That includes dismantling, transport, overhaul, repair, replacement, installation and commissioning of control valves, shut-off valves and pressure safety valves.

REVERSE ENGINEERING IN VIETNAM

Stork Gears & Services has a long history of repairing gearboxes, no matter where the client is located. In Vietnam, the team recently performed a challenging job repairing the broken casing of a Seisa gearbox that drives a large drum for cement production.

After performing reverse-engineering activities on-site, the team recalculated the design of the casing and made some improvements to the weaker parts of the gearbox casing at their base in Rotterdam, the Netherlands. After constructing the new design in their Dutch workshop, the team shipped the casing, weighing 14 tons, back to the client site in Vietnam. During a stop of two weeks, the original gearbox was disassembled and the new casing installed with support from the local machine shop. Despite a language barrier and the client's remote location in the Asian country, the Stork Gears & Services team performed the job on time and in good collaboration with personnel from the client's machine shop.



Onsite reverse engineering works by Stork.

GETTING A BETTER GRIP ON WATER PURIFICATION

Asset management is not only about taking care of hardware. Ensuring that IT structures and automation requirements are up-to-date and fully in-sync is equally important. Stork's Istimewa Elektro specializes in providing the complete E&I lifecycle to help clients better manage and control their installations for improved operational results.

Dutch water company Evides asked Istimewa to replace the process automation structure at its Berenplaat production location in the southwestern part of the Netherlands. Evides supplies more than 2.5 million households with fresh water. It operates nine water purification sites in the country, of which Berenplaat is the largest. And by implementing the same automation structure across all its sites, Evides aims to improve the efficiency of operations and management at its installations.



Aerial view of the Berenplaat purification site.

Stork supported the seamless implementation of the new process automation structure with two tests and the prefabrication of 22 control units at the Istimewa site in Vlissingen. There was no impact on uptime. This planned and positive outcome resulted in a request to Stork to provide follow-up in the next phase of Evides' journey to improve its asset management capabilities.



SAFETY AWARD FROM AIR LIQUIDE

At the annual Air Liquide Contractor Safety Meeting, Stork's Electrical & Instrumentation (E&I) team in the Netherlands was awarded a contractor safety award for its outstanding safety performance. The team contributed to Air Liquide's safety objectives by operating without any incidents, working in a tidy and efficient manner, and delivering in a timely way during the planned stops. In addition to E&I activities, Stork also supplies mechanical & piping services as part of its maintenance contract with Air Liquide. Stork also provides support during additional projects, like inspections.

ADDRESSING SCOPES IN HARD-TO-REACH PLACES

Maintenance is always on our clients' radar. But maintenance jobs in hard-to-reach locations come with their own unique challenges. Especially when they are rush jobs, like when systems malfunction. Or when preparations take weeks, but don't allow the proper time, or even the place, to set up scaffolding that would normally provide access at height.

Stork has – literally – tied up an alternative solution. It reduces project duration, and related project costs, by providing rope access. But the solution goes beyond simply providing a way to access hard-to-reach locations. It is a multi-disciplinary way to perform construction, rigging, inspection and maintenance. All with the highest safety standards. Stork's well-trained professionals carry out integrated services, such as specialist cleaning, bolt tensioning and machining & NDT services. All specialists are top-notch, since they are trained at one of the most highly acclaimed training facilities in Europe: Stork's own Training and Competence Assurance Center in Aberdeen.



Stork's rope access technicians can safely access hard-to-reach places onshore ...



... as well as offshore, as shown here in the Gulf of Mexico.

Industry professionals undergo rope access training in the Stork facilities in Aberdeen.

FLEXIBLE TRAINING SOLUTIONS

Stork fully understands the importance of having the right people, with the right skills, for the job. Training and competence lie at the core of safe and efficient operations. Our on-site Training and Competence Assurance Center, located in Aberdeen, UK, fits like a glove with this philosophy.

David Sharman, training center manager, explains more about the services and courses on offer.

What kind of training is delivered at the training center?

"We specialize in delivering training to the onshore and offshore energy industries. All courses are aligned with various accredited organizations, such as ARCA, ECITB, IRATA, OPITO, PASMA, Fit2Fit, BSIF and Oil & Gas UK, ensuring all training is consistently delivered according to industry-recognized standards.

"We have an extensive indoor rope access and working-at-height practical training area that provides the optimum location for IRATA certified courses, including Levels 1 to 3. The center also features a purpose-built vessel for confined space entry simulation and real-life breathing apparatus scenarios, as well as ECITB-accredited training for machining and bolting, torqueing and in-situ machining. The interactive classrooms are ideal for group and individual educational sessions, and ensure that all course attendees also understand the theory behind the practical skills."

For whom do you provide courses?

"We provide courses for everyone, starting with Stork employees. Most recently, we have expanded and welcomed external industry professionals who wish to refresh their skills or learn something new. The flexible environment provides the ideal solution for all course attendees. Our courses can be tailored to

meet both client and delegate needs; short timeframe turnarounds, adaptable course sizes and delivery times."

How important is people development?

"We fully believe that people are our industries' greatest asset. Our global award-winning competency division showcases Stork's commitment to the development of our employees as a safe and competent workforce in alignment with OPITO standards. The training teams work seamlessly to ensure all delegates attain the highest levels of competence and safety. Stork's specialist in-house technical authorities support the training teams for each of the course programs held at the Training and Competence Assurance Center."

How do you ensure a consistent high level of course delivery and effectiveness?

"We use attendee evaluations to monitor every course. This ensures that a consistent high standard of material is delivered at all times, and provides insight into first-hand improvements. Throughout 2016, Stork received a '98% /Very Good' or higher rating for all courses delivered within our in-house Training and Competence Assurance Center. This feedback was not only from Stork employees, but also external individuals who underwent the courses."



From aesthetics to integrity: THE EVOLUTION OF FABRIC MAINTENANCE



Fabric maintenance is integral to ensuring the integrity of an asset. But its potential was not always recognized. Stork's UK delivery director, Jim Chalmers, has seen Stork's fabric maintenance capabilities progress from a means to serve aesthetical purposes to an essential part of every asset integrity strategy.

Chalmers: "In the past, Stork was involved in the hook-up and commissioning of many assets in the North Sea, delivering what could be called 'traditional' fabric maintenance services, such as painting, blasting and scaffolding. Few people, if any, envisaged that these grand structures would still be operating today. So, although the term had not been coined at the time, fabric maintenance was more about aesthetics and making the asset look good, than it was about the operation of the plant. We'd often be mobilized to repaint sections of a platform to get it looking nice for a VIP visit!"

CHANGING TIMES

Today, integrated fabric maintenance services play an integral role in keeping an asset running safely, Chalmers says. The importance of fabric maintenance and asset integrity came to the fore with the Health and Safety Executive's Key Program 3 (KP3), which ran from 2004-2007. The industry report noted:

"Fabric maintenance is very poor on many platforms, showing inadequate long-term planning by the operators for the lifetime of installations...the levels of integrity in relation to inspection and corrosion prevention are low, and a significant amount of refurbishment work has been required.

"This marked a step-change for our business. The maintenance of a platform's fabric, often viewed as non-safety critical, was moved up the list of Operators' safety priorities. This led to better planning of fabric maintenance activities and the very beginning of integrating integrity services, such as non-destructive testing, with fabric maintenance repair," Chalmers explains. "That integration continues today, as clients benefit from intelligent fabric maintenance, for which we develop maintenance plans specific to asset life expectancy. Activities are led by integrity-driven, risk-based assessment and are combined with traditional fabric maintenance repair."

EFFICIENCY AT THE FOREFRONT

Along with integrity and safety, innovation and efficiency are key drivers in the continual evolution of fabric maintenance. "In 1978, I was involved with Stork in the hook-up and commissioning of the Brent Delta platform, and we used a four-coat paint system. More recently, we used a one-coat system during the decommissioning phase of the same platform, since a long-term coating solution was not required. This reduced cost and manpower requirements."

Chalmers is convinced that developments in surface preparation and coating are becoming more interesting, as the likes of sponge blasting and ice blasting are reviewed for applicability to the oil & gas environment. "As far as Stork is concerned, creating multi-disciplinary teams continues to be a priority to deliver integrated services as efficiently as possible. It is the best way to ensure asset integrity in the long term," Chalmers concludes.

Stork clients benefit from intelligent fabric maintenance, for which we develop maintenance plans specific to asset life expectancy.



STORK PROVIDES SAFER ACCESS TO OFFSHORE PLATFORM

A major Oil & Gas client in Trinidad and Tobago presented Stork with a challenge: develop a flexible way to access an offshore platform from a drilling rig, so that workers could conduct turn-around and rig readiness works. The client contracted Stork to develop the solution, since no efficient access to the platform was readily available.

Stork took on the challenge, and developed a safe and viable solution by fabricating and installing an access structure, 6.4 meters (21 feet) long, 3.1 meters (10 feet) high and 4.6 meters (15 feet) wide. This would accommodate easier access between the rig and the platform for workers.

By using an access platform instead of a so-called Frog lifting basket, workers now have safer, easier and faster access to the work area, and can traverse with tools. The solution was delivered and installed ahead of schedule.



Stork's flexible solution to safely access offshore work areas.

STORK PRODUCTS NOW AVAILABLE ONLINE!

Want to buy or rent Stork's original products online? Since more than a year ago, you can! After kicking off Stork's online sales strategy with the launch of the EQIN web shop for industrial equipment in 2016, clients can now use Stork's new online portal to buy or rent Cooperheat Heat Treatment products. The online assortment ranges from (spare) parts, cables and connectors to entire heat treatment ovens.

ONLINE RENTAL AND SALES FROM EQIN

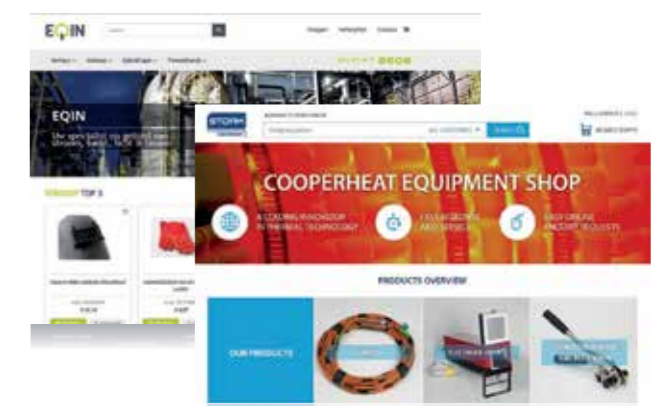
The EQIN web shop has been serving clients in the Netherlands and Belgium since 2016. EQIN, Stork's equipment rental division, offers the web shop for the rental or sale of its industrial material, tools and consumables. This shop offers an online product & service catalog, which allows clients to choose what they need and conveniently place an order right away. This even includes EQIN's range of technical welding courses.

The number of visitors to the EQIN web shop clearly demonstrates that online sales are interesting for clients. Visitation has doubled since the launch 12 months ago. An increase in promotional e-marketing activities has stabilized this level. Thanks to its success, the new sales channel has gained its own place as a service for Stork's rental branch clients. This has a clear parallel with the office and field staff's traditional commercial activities. In both cases, the EQIN team takes care of client communication, especially when it concerns large and/or complex orders. Personal contact follows any request made through the online platform, in order to fully satisfy the client's wishes.

Visit the EQIN web shop at www.eqin.nl

ONLINE COOPERHEAT QUOTATIONS

In the Stork Cooperheat web shop, clients can find extensive technical information about every heat treatment product in the Cooperheat Equipment range. The shop also makes it easy for clients to immediately request quotations for the products they need. Even quotations for non-standard products, or custom products tailored to their specifications. The quotation process is rapid and efficient, and can be conducted from anywhere in the world. Of course, the Cooperheat web shop is accessible 24 hours a day, 7 days a week. Visit the web shop at: www.stork.com/cooperheat-equipment-shop



EXCELLENCE IN ASSET MANAGEMENT

Stork continually improves the performance of our clients' assets through innovative and data-driven asset management and maintenance solutions.

With approximately 17,000 professionals in over 100 countries, we serve more than 4,000 clients across multiple industries.

Underpinned by our core values; Safety, Integrity, Teamwork, Client Focus and Excellence, we are fully committed to efficiently and sustainably enhancing our clients' operations.

WWW.STORK.COM

MAINTENANCE | MODIFICATION | ASSET INTEGRITY

STORK

A Fluor Company

 **REACH**
BEYOND ZERO