

ENERGISE.



OPTIMISING THE PERFORMANCE OF ENERGY INFRASTRUCTURE

ISSUE 01

Expert insight from our highly experienced technical teams

Innovation to maximise operational efficiency and support our net zero future

Technical articles from across our four specialist divisions

Case studies demonstrating the depth and breadth of our capability



CONTENTS

04

HEAT TRANSFER

Performance enhancing solutions to solve our clients' energy efficiency challenges

06

REFURBISHMENT CASE STUDY

Showcasing the value of our heat transfer refurbishment expertise

08

HTX DIGITAL

Introducing an innovative predictive maintenance tool to optimise heat exchanger performance

10

INSPECTION SERVICES

Expert insight from Alastair Gibbons, Advanced Inspection Services Manager

12

WELDING SOLUTIONS

Learn more about our track record and pioneering welding solutions capability

14

MACHINING SOLUTIONS

Over 70 years of delivering specialist machining equipment including bespoke solutions

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Scott Martin
Group CEO

WELCOME TO THE FIRST ISSUE OF OUR NEW GROUP MAGAZINE, ENERGISE.

As a company with such broad capability, history and heritage, we felt the launch of a Group-wide publication would be the ideal platform to showcase the depth of our service offering and how we are using our rich expertise to add-value to our clients' projects across the energy sector.

For those of you who know the company well, you may have noticed that we have refreshed our brand identity and evolved our company name from 'Glacier Energy Services' to Glacier Energy. This evolution in our name and company logo represents our strategic intent to continue growing our market share across the wider energy sector and capitalise on the growing number of opportunities available to us as part of the energy transition. It is also representative of our ethos as a service business and helps better reflect our agility, flexibility, dynamism and responsiveness.

At the core of the Glacier Energy brand is our deep-rooted capability amassed through the acquisition of some of the most technical and reputable brands in the industry. Like many companies that have been through similar acquisition growth journeys, our clients are often unaware about the depth of our offering and our integrated solutions capability. From design and manufacturing, through to life extensions projects, Glacier Energy specialise in a comprehensive range of products, services and solutions to ensure our

clients' critical assets and infrastructure runs at peak performance throughout its lifespan.

In this first issue of Energise, we share the insights of our technical experts and showcase how we're using our ingenuity and expertise to solve our clients' productivity and performance challenges across our four specialist divisions.

We hope you enjoy reading the first issue of our magazine and that it provides you with a clear understanding of how our expert teams can support the safe, efficient and reliable delivery of your projects. Also, please do not hesitate to get in touch should Glacier Energy be able to support you in any way.

By Andy Scott, Director -
Heat Transfer Division

PERFORMANCE ENHANCING HEAT TRANSFER SOLUTIONS

Like the rest of the industry, the heat transfer market has been heavily influenced by factors such as cost, technology advancements and energy efficiency and we continue to invest in these areas to help our clients achieve safer, more profitable and sustainable operations.

At Glacier Energy, we offer a full turnkey service comprising the design, manufacture, repair and maintenance of heat transfer equipment including full failure analysis to help restore assets to optimal working condition, saving significant time and money. Over the years, we have bolstered our expertise with the acquisition of several leading and specialist brands including Ross Offshore, MSL Heat Transfer, Aberdeen Radiators and Whiteley Read Engineering, further strengthening our heat transfer expertise and capability.

Operating internationally, we are at the forefront of thermal technology, offering innovative and effective heat transfer products, with a strong focus on managing energy efficiency.

Design & Manufacturing

We provide standardised off-the-shelf equipment, pioneering & bespoke new-build solutions and the reverse engineering for obsolete units, to meet exact technical specifications. As one of the only dedicated design & manufacturing companies in the UK with specialist thermal and mechanical

engineering capabilities, we support clients across the entire energy sector including renewables and alternative energy, as part of our collective efforts to achieve net zero by 2050.

Preventative Maintenance

Now more than ever, Operators are under continued pressure to optimise the performance of their essential equipment

to maximise productivity and reduce maintenance downtime. Preventative maintenance is essential to make sure equipment performs at its best to improve integrity, safeguard operational efficiency and mitigate the need for a major shut-down. This is even more pertinent for the aging assets in the North Sea, where the focus is on extending the life of critical equipment, at the lowest possible cost.

'2020 has been a very challenging year so far and one of great uncertainty. But at Glacier Energy we are here to give our clients complete peace of mind when it comes to looking after their most critical assets and infrastructure.'



Andy Scott, Director
Heat Transfer Division

Repair & Refurbishment

One of the biggest changes I have seen over recent years is the volume of refurbishment work coming through the door, mostly down to clients not wanting to spend upfront and hold spare units in stock.

As well as offering re-tubing, resealing, reconditioning and the replacement of spare parts, we can carry out health checks of equipment to improve performance, reliability, energy efficiency and prevent unplanned downtime, giving our clients complete peace of mind.

Failure Analysis

When failures do occur, Glacier Energy's subject matter experts provide key insight into the workings of the equipment to ensure we get to the root of the problem and find a solution that can restore the asset to optimal working condition.

Examples of these failures, include: fatigue cracking; stress corrosion cracking; fouling; freezing; mechanical fatigue due to vibrations; welding problems; corrosion due to tube sheet crevices; thermal fatigue; erosion; liquid drop-out change in operating conditions; lack of maintenance and more.

Innovation & Technology

In support of our digital future and to provide greater efficiencies for our clients, we will soon be launching a new predictive maintenance tool for monitoring heat exchanger performance. HTX Digital is a non-intrusive monitoring tool that uses existing data combined with predictive analytics to trend and predict the future performance and degradation of heat exchangers

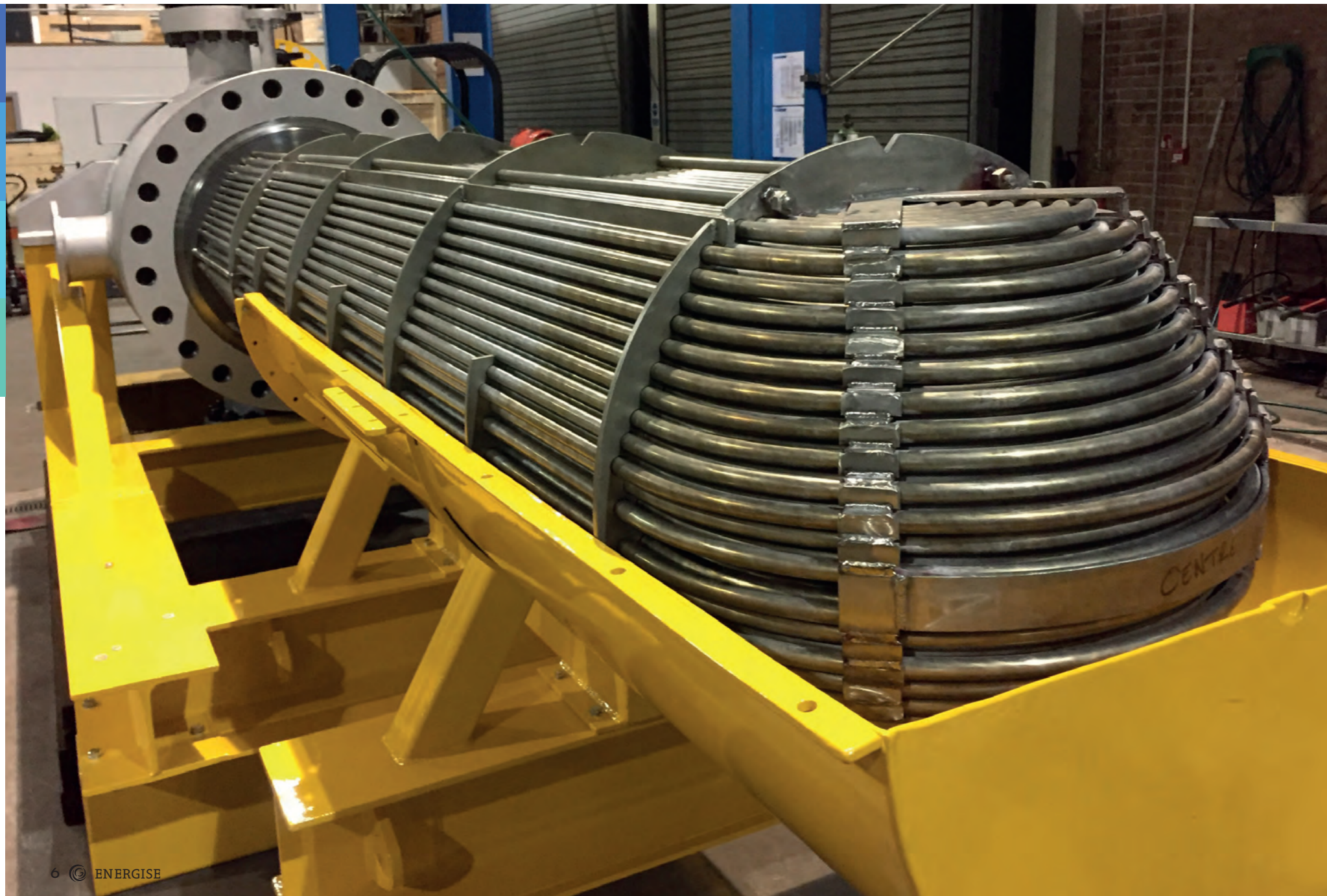
leading to smarter decision-making and more effective maintenance scheduling. A dedicated article on HTX Digital features later in this magazine.

2021 is likely to be a difficult year for the industry and Glacier Energy will not be immune to any of the challenges. However, with our strong in-house technical capability combined with the development of more innovative and sustainable heat transfer solutions, we remain committed to growing our market share across the oil & gas, onshore and alternative energy sectors and working towards a net zero future with our clients and partners.

International Oil Company

CASE STUDY

NORTH SEA



Scope:

Due to historic crevice corrosion at the inlet gas pass, Glacier Energy carried out the refurbishment of an E6 final stage high pressure gas cooler. The process began with a complete deconstruction of the tube bundle, including:

- Separating the U-tube bundle from the header
- Parting the double tube sheets to remove the rear tube sheet from the header
- De-stubbing the tube holes to remove remaining C22 tube in the header
- Prepping the header for re-welding

Solution:

Following a technical survey completed on both tube sheets, the tube holes were found to be considerably outside TEMA tolerances. Glacier Energy proposed and procured a new forged shell side tube sheet to replace the old tube sheet to rectify the issues with the tube holes. Our welding division then provided weld overlay on the new tube plate with C22 hastelloy properties. Our team then reassembled the header by aligning the two tube sheets before carrying out sub arc welding.

Mid-way through the process, the client carried out a Computational Fluid Dynamics (CFD) review which recommended that the flow be redirected through the baffle plate. Due to the pressure differential in the cooler, Glacier Energy carried out a finite element analysis (FEA) and proposed a design modification that would redirect cooling water via the high temperature inlet pass at the tube plate.

Value:

- Integrated services providing heat exchanger design & refurbishment services, weld overlay and onsite machining
- Work scope completed in 16 weeks, 8-10 weeks less than similar work scopes
- Delivered within schedule even after modifications were made
- Additional modifications had no cost implications to the client
- Quick turnaround ensured integrity of the platform was maintained with minimal disturbance



PREDICTABILITY AT YOUR FINGERTIPS

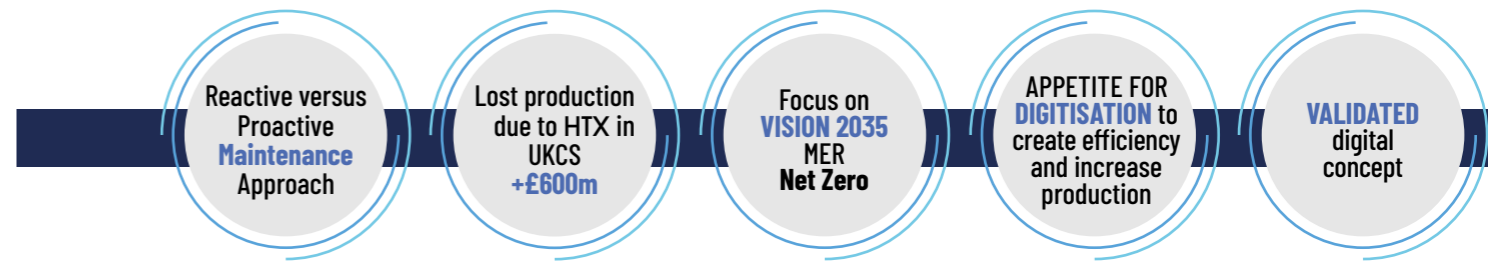
As market leaders in the provision of full turnkey heat transfer solutions, Glacier Energy has developed an innovative, predictive maintenance tool, that provides a proactive approach to heat transfer equipment maintenance, to better manage risk through mitigating unplanned downtime.

HTX Digital is a non-intrusive monitoring tool that uses existing data combined with predictive analytics to trend and predict the future performance and degradation of heat exchangers leading to smarter decision-making and more effective maintenance scheduling. As well as providing significant cost and time efficiencies, it helps reduce our clients' carbon footprint by optimising cleaning routines through using less energy.

'HTX Digital is based on innovation & collaboration, using the inherent value of Glacier Energy's technical experts to analyse and interpret client data into actionable insight, for smarter decision making.'



'Using a range of statistical analysis and algorithms, Glacier Energy's in-house experts can analyse client data to provide an intelligent heat exchanger maintenance schedule to ensure your equipment performs at its best throughout its lifetime.'



DIGITALLY ENABLED HEAT EXCHANGER SERVICE

Glacier algorithms and technical expertise ensure meaningful, actionable data

Glacier's experts analyse your data to provide an intelligent heat exchanger maintenance schedule



DATA FROM HTX



DATA SCIENCE



HTX KPIs



GLACIER SUBJECT MATTER EXPERTS



MAINTENANCE & REPAIR



Making Maintenance Smarter

Lost production in the UKCS due to heat transfer equipment failures, is estimated to be around £600million. HTX Digital can potentially reduce maintenance costs and unplanned downtime by 25% and 30% respectively. Furthermore, we can help clients save £millions in early warning catches using our proactive and preventative maintenance programme that maximises return on asset investment.

'Using a unique blend of people, processes and technologies, HTX Digital is about working with our customers to provide the information they need to take the right actions, at the right time.'

Our Expertise

With an impressive track record spanning several decades, Glacier Energy is the go-to partner for heat transfer solutions. We offer a full turnkey service comprising the design, manufacture, repair and maintenance of heat transfer equipment including full failure analysis to help restore assets to optimal working condition, saving significant time and money. Over the years, we have bolstered our expertise with the acquisition of several leading and specialist brands including Ross Offshore, MSL Heat Transfer, Aberdeen Radiators and Whiteley Read Engineering, further strengthening our heat transfer capability.

INSPECTION SERVICES YOU CAN COUNT ON

Expert Insight:



Alastair Gibbons
Advanced Inspection
Services Manager

Alastair Gibbons, Advanced Inspection Services Manager, joined Glacier Energy in 2015 and has over 30 years' experience in the delivery of advanced non-destructive testing (NDT) services and techniques. Here he gives his insight on the industry challenges, how Glacier Energy is playing its part in the energy transition and the ways our advanced inspection teams are helping to improve the safety, reliability and efficiency of our clients' critical assets and infrastructure.

Tell us about your role within Glacier Energy's Inspection Services division

I am responsible for the day to day running, operations and technical delivery of the advanced inspection department. In addition, I act as a level 3 technical authority for Glacier Energy's Inspection Services division. Even though my role is primarily operational and technical, I also engage with customers regularly and carry out business development activity, when the time allows. I also remain involved 'on the tools' to supplement the advanced team when we have extremely busy spells and get the opportunity to travel offshore or overseas, although not as much as in previous years.

Talk about Glacier Energy's Advanced NDT capabilities and what sets us apart

When I first started in Glacier Energy's Inspection Services team (formerly Professional Testing Services) my initial role was to establish an advanced inspection services business unit, mainly to support Glacier Energy's heat transfer department on matters relating to tube inspection techniques.

At that time, it was also hoped that we would be able to 'phase in' additional advanced NDT techniques as and when it was feasible and depending on client requirements. Today, we can not only offer 5 or 6 different techniques for tube

inspection activities, but have added numerous other advanced techniques into our portfolio, including: PAUT; corrosion mapping; ToFD; eddy current array; ACFM; pulsed eddy current for CUI & scabbed pipework and various techniques for tank inspection, including MFL. A major advantage for us is that we are UKAS certified.

What sets Glacier Energy apart from the competition is our ability to deliver and the agility, flexibility and responsiveness of our teams. Our experienced and high performing team have good sound knowledge in nearly all industry sectors and each of these individuals are committed to carrying out our inspection services with pride, professionalism, efficiency and enthusiasm.

What are some of the project challenges/highlights that have stood out for you during your time within Glacier Energy?

A frequently occurring highlight is when we are asked back by a client to support additional projects based on the success of past jobs and the quality of our work. We have completed various challenging overseas projects, in the Middle East and West Africa - even though the incumbent for the inspection services contract changed hands over the years, the client instructed they engage with Glacier Energy based on

the quality, flexibility and commitment of our teams. We have since re-visited the same sites and worked on different gas trains and associated equipment, not only carrying out tube inspection techniques but also eddy current surface inspection on turbine blades.

How can Glacier Energy's Inspection team play its part in the energy transition?

Our NDT and advanced NDT capabilities are transferable across most industry sectors. In the renewable energy sector particularly, we are heavily involved in the construction stage of the project, however as we offer full lifecycle services, we can also inspect and maintain at any point and be ready to deliver to the highest standard.

What's the future outlook for Glacier Energy's Inspection Services division?

Although we are operating in very challenging times, we continue to see strong demand for our services particularly across the oil & gas, renewable energy, agricultural and pharmaceutical sectors. Having built up such strong capability and track record across our core offering, we will focus on maximising these strengths to our growing client base. As the market slowly starts to improve, we still hope to be able to invest in our people and our equipment in order to maintain the professional, efficient and quality services our clients have come to expect from Glacier Energy.

For over 20 years, Glacier Energy has been providing specialist corrosion resistant alloy (CRA) weld overlay solutions and welding and fabrication services to clients world-wide.

PIONEERING WELDING SOLUTIONS

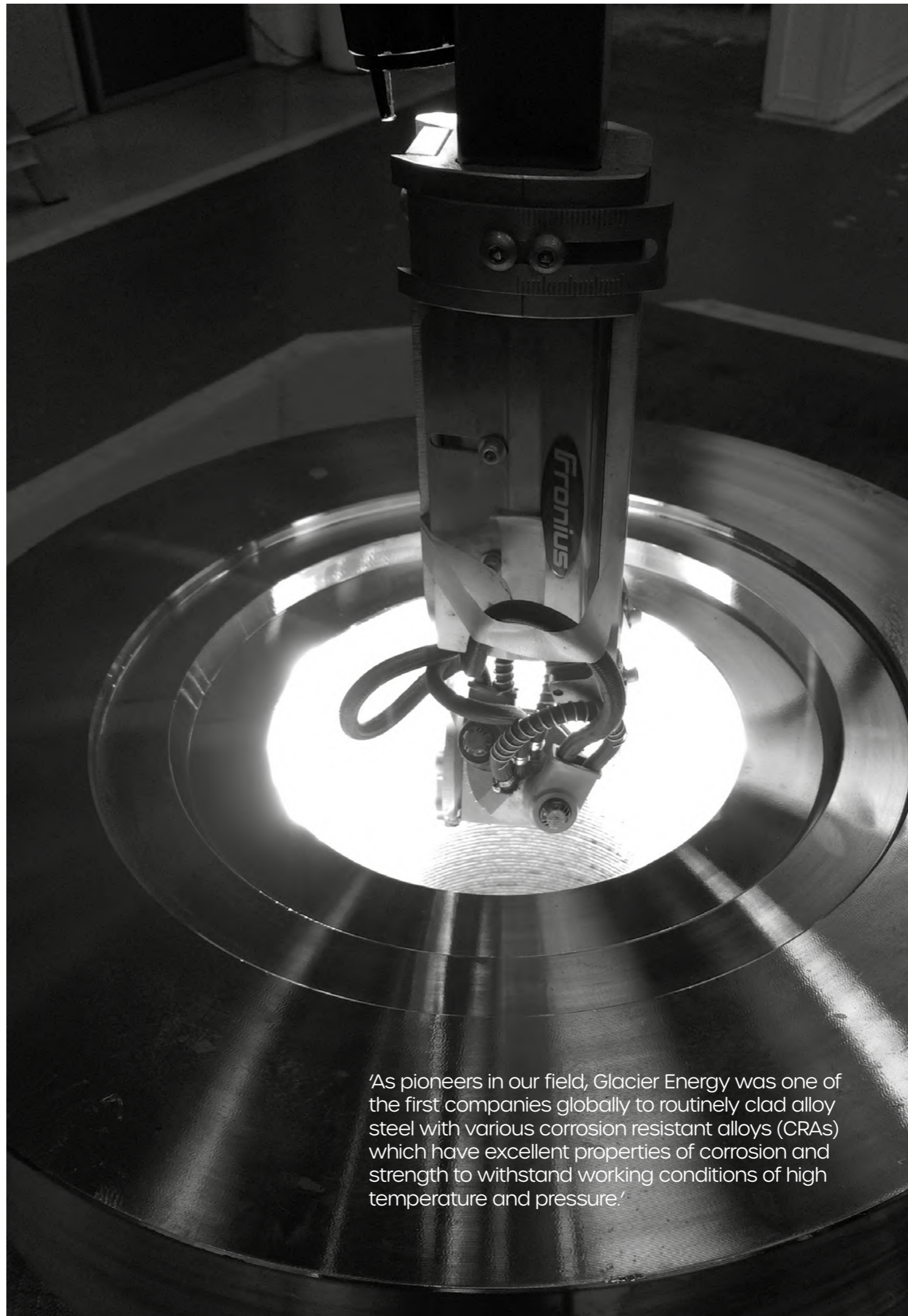
In 2011, Glacier Energy acquired Wellclad, a renowned weld overlay and cladding services provider for offshore subsea equipment since 1997. Over the years, Glacier Energy has continued to strengthen its expertise across the energy sector to become the go-to partner in the provision of world-class welding solutions based on our proven track record and commitment to the highest quality standards. As pioneers in our field, we also strive to remain at the forefront of the industry by applying the latest innovations and techniques in order to reduce project

lead times and pass on further cost efficiencies to our clients.

Glacier Energy's specialist welding services can prolong the life of critical surface and subsea components to enable their use in harsh offshore environments.

As well as the provision of weld overlay solutions, Glacier Energy can provide turnkey project management services comprising welding provision, planning & scheduling, management reporting and technical expertise incorporating weld engineering and metallurgy, as required.

'As pioneers in our field, Glacier Energy was one of the first companies globally to routinely clad alloy steel with various corrosion resistant alloys (CRAs) which have excellent properties of corrosion and strength to withstand working conditions of high temperature and pressure.'



CASE STUDY

Client:
International Valve Manufacturer

Location: UK

Challenge:
A client had in-house weld overlay capability but was encountering various ongoing issues mainly relating to quality and delivery as well as lacking technical knowledge internally relating to Procedure Qualification Records (PQRs) for specific projects.

Scope:
The client initially asked for an internal audit of its own in-house welding facility and then for Glacier Energy to make recommendations for performance improvement.

Following this review, Glacier Energy was asked to assume management responsibility for the client's in-house facility on an interim basis to improve quality, efficiency and delivery performance.

Solution:
The period of review and interim management by Glacier Energy confirmed that weld overlay was not the client's core competence and that greater value could be added by outsourcing to a specialist.

Both parties agreed to the development of a long-term weld management solution agreement. Defined as an Exclusive Outsourcing Agreement, it involved complete welding provision, planning and scheduling, management reporting, and technical expertise incorporating weld engineering and metallurgy.

RELIABLE, ROBUST, RESPONSIVE

Pipeline machining equipment you can count on

For almost 70 years, Glacier Energy has been providing specialist onsite machining products including a range of bespoke solutions, to multi-sector clients world-wide.

In 2011, Glacier Energy acquired Roberts Pipeline Machining, renowned specialists in the design and manufacture of precision on-site portable cutting machines since 1952. Today, the Roberts Pipeline Machining

name remains synonymous with the highest standards of precision, efficiency, quality and reliability. The company also founded the 'Clyde' product range which set the benchmark in pipe cutting technology when it was first introduced to the market over 40 years ago.

Pipeline Cutting Expertise

From general routine maintenance work, through to emergency repair services, Glacier Energy specialise in a wide range of equipment and services for cutting, bevelling, transitioning, coating removal and caisson cutting. To date, Glacier Energy has delivered hundreds of machining solutions

projects to subsea and land pipeline construction companies globally based on our broad knowledge and experience in solving the most technically challenging work scopes.

Equipment Availability

With over 1000 Clyde and LC Clyde machines currently in operation globally, Glacier Energy has a large pool of assets available for sale and

rental. However, a key question facing many operators and service companies is whether to rent equipment over an outright purchase.

Whilst there are pros and cons for both options, there has been a growth in the rental market based on speed, cost, flexibility, risk and obsolescence factors.

Norman Roberts, Director of Glacier Energy's Products Machining division, said, 'For those with budgetary control, they know that costs are required up front for asset purchases, so having monthly rental costs can be easily viewed as a more attractive prospect. Rental models can also help reduce risk as renting suitable equipment from suppliers and assigning the cost using an Opex budget will lower risk when companies are accessing harder to reach fields.

'As technology becomes an increasing part of business operations, outright ownership of equipment can bring about uncertainties relating to the speed of which technology becomes outdated and equipment becomes unfit for purpose. Renting allows businesses to take advantage of equipment that's built with the latest technology, completely removing the risk of being stuck with an outdated or obsolete asset further down the line.

'Lastly, a key factor in the rental versus purchase debate comes down to the element of human capital. If a company does not have employees with the technical knowledge to run the equipment, they may be forced to hire new staff - and this means additional cost.'

The growth in the rental model comes down to speed and flexibility and based on the current economic climate, this trend is likely to continue for some time.



Case Study

Challenge:

An international oil company approached Glacier Energy as it had a collapsed stainless-steel liner on a pipeline, where the test plug could not be retrieved and as a result production could not be re-started. Glacier Energy was asked to develop a solution to allow the plug to be retrieved within an extremely short timescale of 14 days.

Solution:

Glacier Energy designed a bespoke solution, proactively managing internal resources and the external supply chain to manufacture the machine and deliver it to the client within the 14-days, after successful testing. The client was delighted with the outcome, especially due to the creativity applied and the speed of response within the tight deadline.

The problem had a direct impact on production therefore the turnaround was time critical.

Value:

The team's experience and in-house design and manufacturing capabilities meant that a solution could be delivered in a tight deadline and with minimum disruption to production, resulting in reduced downtime and cost.



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