



Optimising your assets

Network extra

TECHNICAL SUPPLEMENT

Issue 1 2009

performance enhancement

structural assessment

modifications

safety improvements

integrity analysis

corrosion management

capacity increase

field life extension



The golden rules of FEED

Keeping our design studies on the right track.

Optimisation and integrity

How we keep your assets performing at their best.





Right at the heart of our business is a core service capability based around the multiple disciplines of engineering. In this new supplement we cover this capability at a greater level of technical detail as John Kearney, technical director explains.

As a services contractor our work covers engineering, construction, operations and maintenance activities. Our work is completely global from Calgary in Western Canada to Sakhalin Island off the east coast of Russia, and from Kharyaga, edging into the Arctic Circle to Melbourne in the south of Australia and many locations in between. We're involved in oil and gas plants both on and offshore, we support water systems, refineries and petrochemical plants.

Much of what we do in engineering and construction is managing projects for existing facilities. We have to understand the complex environment of an operation and design our modifications so that they can be installed efficiently and used without impacting the ongoing safety of the installation.

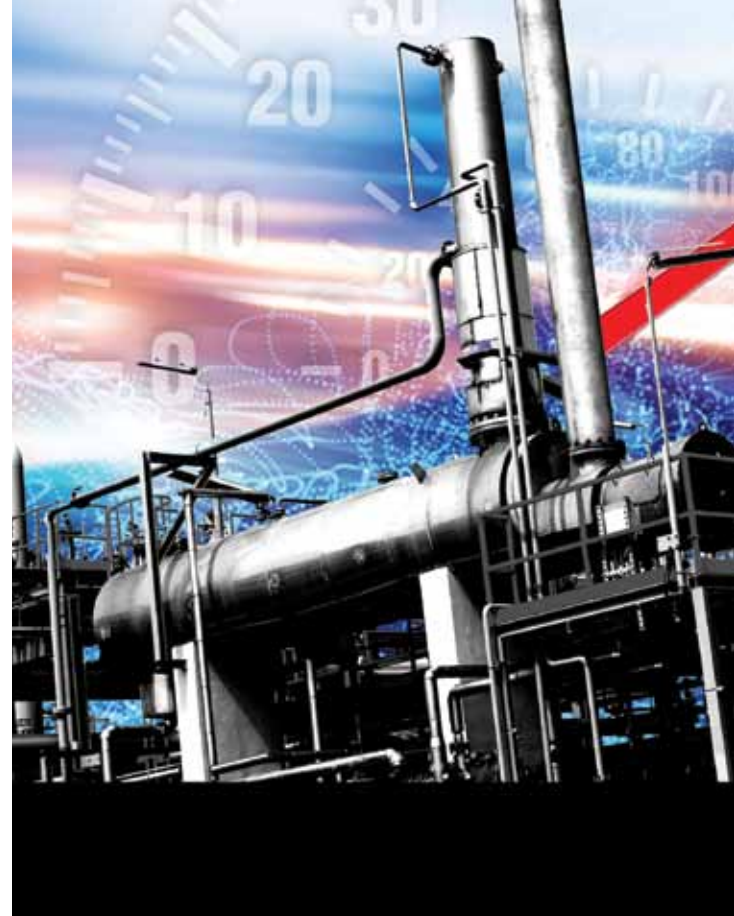
The majority of our engineering and construction work is conducted in project based groups who are focused on their client's assets. The type of work will vary according to the age of the facility and where it is in its lifecycle. On an older plant much of the work can be on integrity issues and developing additional facilities to improve capacity. We

look after some plants that are over 40 years old and others that are state of the art. It's important to remember that we also undertake many stand alone projects and studies which can range in value from a few million dollars to hundreds of millions.

In terms of operations and maintenance we offer the full range of support from provision of personnel through maintenance management to full facilities management.

In addition, we are involved in many consultancy and specialist activities ranging from structural integrity, rotating equipment, systems design, safety and environmental, to reliability engineering, maintenance builds and operational reviews to name but a few.

One of the challenges imposed by such a widespread skill set and geographical base is communicating the full extent of the company's experiences and competencies. We have many means of transferring that knowledge already but it's my intention that this supplement should provide another vehicle for detailing our different project experiences and also our available skills.



To get truly excellent performance from your plant, in terms of safety, regulatory compliance, low operating costs and optimum production, you know you have to focus on people, plant and processes – but in which order? Some of PSN's plant optimisation experts explain how we can help you make impressive improvements to the equipment at your plant and we can write excellent new processes on how to run your plant, but the most important thing we can do for you is to help you get the very best from the people on your plant.

First rate compliance for triple benefit safety cases

If you can't show that your plant is a safe place then you can't call it a workplace. Maggie Leitch, our chief safety and environmental engineer, describes how writing a formal Operational Safety Case for an onshore and offshore development in Bangladesh, helped the plant comply with leading regulations and supported it in the development of optimal maintenance routines.

Maggie takes up the story: "New facilities must provide Safety Cases, which document how the facilities will run, how they'll be managed and demonstrate that the risks associated with their operation have been managed to their lowest practicable level so that the facilities will be operated in a consistently safe manner. The Bangladesh plant included a normally unattended gas production platform, a subsea raw gas pipeline, an onshore gas treatment plant and treated gas export pipelines. To ensure that the plant would be run in the safest and most productive way, we wrote a formal Operational Safety Case, based on best practice developed through the application of the UK Safety Case Regulations and the UK Control of Major Accident Hazards Regulations, which cover the requirement for Safety Cases for offshore and onshore facilities respectively. We tailored the Sangu Safety Case to meet specific local needs and satisfy regional standards and expectations.

"We also conducted a full review of safety critical elements on the plant and set the performance standard for each safety critical element. By doing this, we set the framework in place for optimised equipment performance and maintenance routines, which have the triple benefit of keeping our customer's operating expenditure down, enabling operations and maintenance activity to be proactive rather than reactive and keeping exposure of personnel to potential safety hazards at an absolute minimum."

The new generation approach to maintenance management systems

Delays in populating maintenance management systems can lead to expensive delays in start-up and achieving first oil. Maintenance engineer Phil Woodmansey explains how we have integrated our engineering, operations and maintenance teams to ensure swift



Plant optimisation and asset integrity

and clean data handover and also created a tool that slashes population time.

Phil: "On BP's OCTIP project in the north of England, we input 250 000 data items into our customer's maintenance management system. An audit of those 250 000 items found that over 99.99% were completely free of error. To improve on this, we have been building closer relationship between our engineers and operations and maintenance experts so that the data gathering and formatting done by the engineers is already in sync with the needs of the maintenance systems into which it will be input. To improve on the speed of populating maintenance management systems, we have developed a maintenance build tool. This has been shown to reduce the time spent on preparing maintenance build information for uploading into maintenance management systems by up to 50%. Our maintenance build tool also reduces the opportunity for error by eliminating reliance on one of the most common carriers of formatting errors and typos – the spreadsheet."

Rapid and lasting results from industry-leading corrosion management

Dr. Ali Morshed is our principal corrosion engineer and he gives us one example of how his approach to corrosion management has delivered KPI-busting results in Bangladesh.

Over to Ali: "Implementing an asset-specific corrosion management strategy enabled our project team in Bangladesh to improve their monthly compliance with the agreed corrosion key performance indicator (KPI), from 20% to over 70% within only seven months. In turn, we have been able to raise the KPI target twice.

"Our approach to corrosion management includes improving personnel safety and environmental protection, reducing repair and maintenance costs, maintaining production and asset value through reducing the number of unplanned shutdowns, optimising inspection activities and chemical treatments leading to lower associated costs, and establishing and maintaining compliance with industry regulations, such as The UK Health and Safety Executive's KP3 initiative."

Super model quality with real life reliability

Our innovative use of modelling can incorporate the effects of human interaction on different parts of plant. PSN senior reliability engineer, Tom Noden, explains how our 10 years of experience in modelling technology means we can put more reality into reliability.

Tom says: "We use Maintainability, Availability, Reliability and Operability Simulator (MAROS) to bring down unit costs by streamlining operations. We also have experience of using Miriam, AVSIM and BP's proprietary

modelling system P-choke.

MAROS enhances how we identify areas for potential improvement by looking specifically at maximised plant efficiency, production efficiency, reliability levels, product generation and throughput. With well over a decade of experience in MAROS, we can innovate with complex dependencies, for example, our models can incorporate the effects of human interaction on different parts of plant and accommodate both the latest and most mature plant technology.

"With all availability modelling software, our recommended improvements are targeted and designed to minimise costs whilst maintaining contractual nominations and safety and environmental requirements."

25% increase in production efficiency, the ODF way

Bob Hutcheon is the maintenance manager who led the changes that improved production efficiency from 68% to 93% on two North Sea platforms using systems and processes within our Operations Delivery Framework (ODF).

Bob says: "ODF provides our framework for operations excellence, based on extensive cross-industry research into strategic areas such as leadership and accountability, performance management and cost management. We use a gap analysis tool called Value Finder to identify areas in need of improvement and then follow through with the necessary support to make the change.

"With Chevron's Captain and Alba platforms, we implemented a behavioural-based approach to reliability, creating a culture of ownership and improvement among the workforce. A key element in achieving success was dividing the platform into systems with system owners. This improved relationships between technicians, supervisors and managers and ensured that all losses were reported and fully investigated by root cause analysis. The improvement in morale, performance and efficiency resulted in a 25% increase in production efficiency, with each per cent being equal to around 250 000 barrels of oil per annum."

Training and competence for a global workforce

"Technical training takes many forms, from bringing new entrants into the industry, through to enhancing the skills of an already competent workforce," says Lynne Duncan, our global training manager, "The backbone of any training is the competence framework it is aligned to and at PSN our competence management system has been accredited by OPITO, the oil and gas academy."

John Bailey, our technical training services manager, adds: "Our technical training creates well prepared,

highly motivated and competent people to deliver sophisticated engineering solutions, smart tools, strategies, processes, procedures and innovation."

One example of where we have brought new entrants into our industry is through the ground-breaking career conversion programme, Re-engineer. This fast-track course gets highly skilled personnel into the oil and gas industry with all they need to make a safe and effective start in their new career. In its first two years of operation, we took 35 ex-service people and turned them into offshore electrical, mechanical and instrument technicians.

We delivered the Re-engineering training in partnership with ASET, the commercial arm of the internationally recognised Aberdeen College. This partnership has led to a formal alliance with ASET, through which we deliver industry-recognised, tailored training packages for all levels of technical people, anywhere in the world.

PSN coaches have been used by one major international operator to introduce new ways of working that have increased maintenance effectiveness across their organisation, while a leading independent operator has used our expertise in training and coaching on team behaviours to improve maintenance performance on their North Sea facilities.

The future...

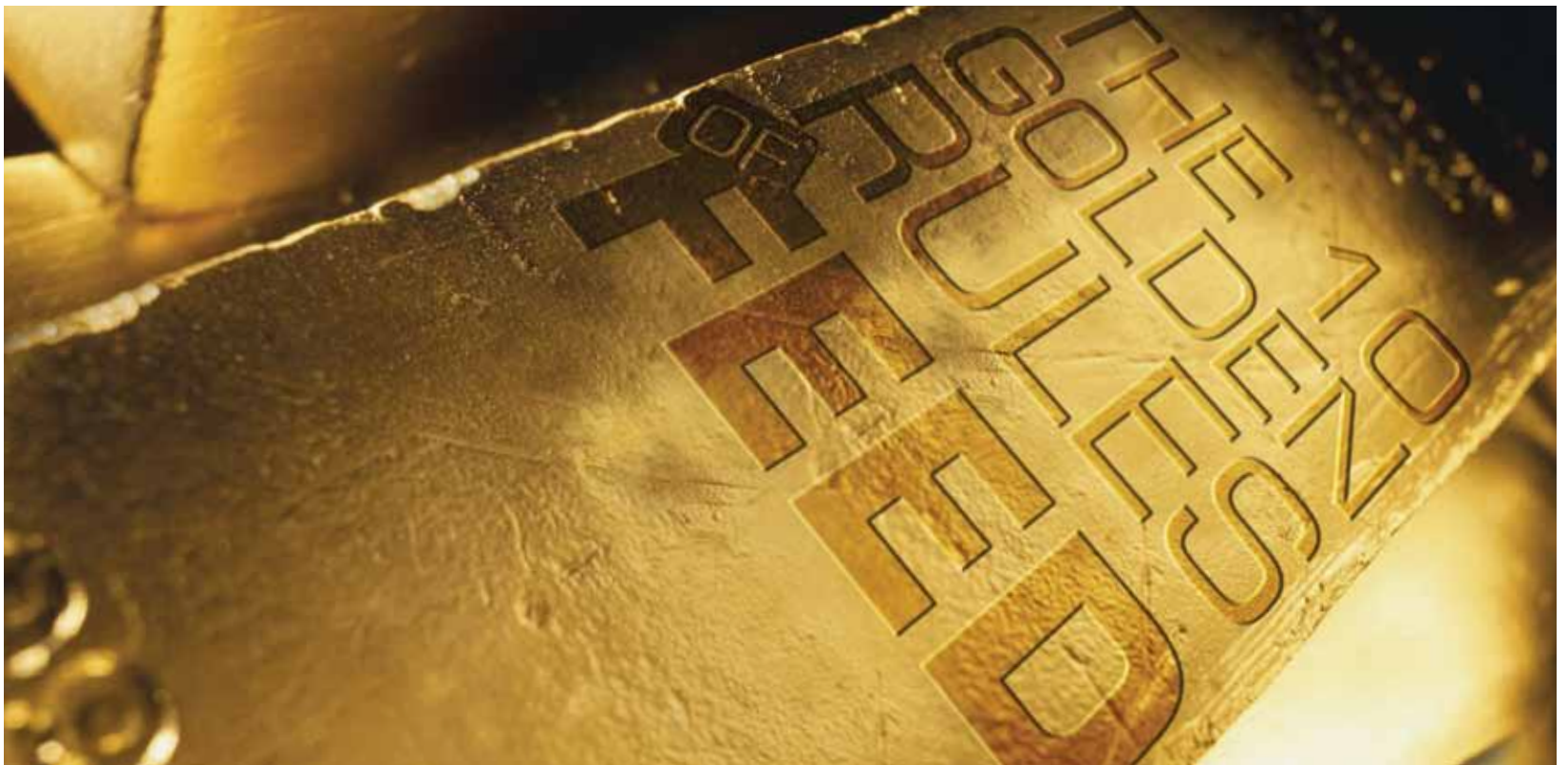
We recently combined all our plant optimisation expertise in a study to find the optimum operating range of an oil and gas facility in Canada. Stuart Young, our global operations manager said, "By integrating the best in specialist tools and approaches, we are getting the very best out of people, plant and equipment, no matter what challenges we have to contend with."

Ian McKay, our global operations and maintenance manager, agreed: "We have tools and processes to deliver best in class operations and maintenance performance, however, people are key to this delivery and our focus on coaching and mentoring people through the peaks and troughs of the change process and on to world class performance is a key differentiator."

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George Budge has spent 30 years in the oil and gas industry – the last 10 of those, managing front end engineering design studies, known as FEEDs. When he told us he'd written a paper on how to avoid the most common mistakes made in FEEDs, we had to see a preview:

The first potential cause of FEED failure is confusion in terminology. All projects have a development stage and an implementation stage. FEEDs occur in the development stage but quite where is the source of much debate; the fact that many companies use their own terminology and acronyms instead of 'FEED', adds to the confusion.

Rule 1: make sure everyone is agreed on the meaning of the terminology being used.

As in life, what you think you need and what you really need can be two quite different things. In order to provide a viable solution for a customer, there needs to be agreement on and clarity about the problem.

Rule 2: use a formal process or methodology to identify the real drivers on the project.

Knowing the project drivers is only useful if they are communicated and acted upon.

Rule 3: make sure your whole project team knows what the project drivers are and that those drivers are used

to influence the outcome of the FEED.

The margin of error built into estimates for the cost of a project reduces as the project matures. In FEED estimates the margins are very wide and a common mistake is to take the mid-point value in the FEED estimate as the expected cost. However, due to the level of uncertainty at this stage, the mid-point figure has no greater chance of being accurate than any other figure within the range.

Rule 4: understand that the cost can be anywhere within the range covered by the estimate.

Customers are renowned for forcing an estimate down to meet their expectations, only to see actual costs land in the upper bounds of what was originally estimated.

Rule 5: understand the range of the estimate and resist the temptation to drive it down at this early stage of the project.

On a typical project, engineering is between 8% to 12% of the project cost and the FEED costs around 10% of the engineering cost. Therefore, if you're itching to start managing costs:

Rule 6: spend a little more on basic engineering and FEED engineering so that there will be a narrower margin of uncertainty in the estimates.

Monte Carlo methods are a class of algorithms that rely on repeated random sampling. These methods are used when it is unfeasible or impossible to compute an exact result.

Rule 7: use Monte Carlo simulations to establish the uncertainty within the estimate.

The level of deliverables is the most contentious area of a FEED after the cost estimate. For a contractor, deliverables = manhours = cost, so cutting the cost of a FEED means cutting the deliverables, which means producing less reliable estimates.

Rule 8: agree the type and level of deliverables required to meet customer requirements and base this on the required accuracy of the estimate.

Schedules are primarily driven by the lead time for major equipment, which is often in the hands of market forces.

They are also affected by operational requirements such as shutdowns and the number of available beds.

Rule 9: understand the impact of external forces.

Confusion over how risks and uncertainties impact a project is another reason why a FEED fails, for example, people may mean very different things by terms such as 'acceptable level'.







Rule 10: use an experienced multi-discipline team to develop a risk register at an early stage in the project, so that risks can be better understood and managed.

FEED work is a specialism of the Central Studies group, a flexible team of experienced multi-discipline engineers developing unique solutions for some of the most challenging projects around the world.

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Hear more from our experts

Our technical experts are widely regarded as leaders in their fields and regularly attend industry events to present their innovative engineering solutions.

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