What can the North Sea teach the world?

Richard C. Beynon

In many ways the North Sea is unique, not only because of its environmental challenges, but also because of its proximity to a stable, technically advanced, mature economy.

As well as providing a financial base, this stable economy provides a local market for the product and a thoroughfare into an even greater market in mainland Europe.

So forty years after the first discoveries were made, what can the North Sea teach the world? What have we achieved? What are we proud of and what would we rather forget?

Challenges have been met, the oil and gas has been brought ashore, but, as is always the case with hindsight, it could it have been done better, more safely and more economically.

In researching for this paper, I met the daunting fact that I have been involved in more than 50 North Sea construction projects over a period of about 25 years now. Some, like the CATS Pipeline into Teesside, were very large, and some, like strapping a new riser on to an existing platform, relatively small. Some went well, some not quite so well, but they have led me to an overall conclusion that we have not, and will never, conquer the North Sea. We have learned to understand it better but whenever our arrogance suggests that we know it all, then, like it did to the Titanic 91 years ago, the North Sea will come up with something to kick us in the teeth.

So in terms of what we have learned and what knowledge and experience we can export to developing areas and markets, I have come up with a few ideas that I would like to divide into The Good, The Bad or the downright Ugly!

So let’s start with The Good. Blow our own trumpets a little.

The Good things –

Many good things have come from the offshore oil and gas industry and it is only right that these should be considered first. In this forum I won’t present them in extensive technical detail, but instead I’ll summarise a few of them thus:

? We have enabled the UK to be self sufficient in gas production for nearly 40 years, making a huge contribution to the nation's trading position.

? We have fostered a whole new industry and created thousands of new jobs.

? We have seen huge technical improvements in the way hydrocarbons are extracted and brought to shore.

? By good inspection and maintenance regimes and the use of Enhanced Oil Recovery techniques, we have extended the lives of fields well beyond those originally predicted.
We have developed subsea solutions tying new, smaller and previously uneconomic discoveries into existing but underused infrastructure. We have also developed FPSO and other reusable facilities for potential redeployment to a new location when one is depleted.

We have developed new technical solutions for High Pressure High Temperature fields as well as those with a highly corrosive product, so these may also be economically developed.

All this at a reduced cost ($/barrel or equivalent) and under an increasingly difficult tax regime.

We have improved safety figures gaining experience and knowledge from nearly 40 years production and

We have improved awareness of the environment in which we work and those aspects of our operations that have the greatest impact upon it. These impacts have to be formally assessed and, where appropriate, plans put in place to mitigate them before a development is allowed to proceed. Flaring has always been the publicly unacceptable face of the North Sea – now it is closely licenced and those licences will not be renewed if the operator has an alternative course he can take.

**The Bad things** –

These become a bit more contentious, but a little self criticism is always good for the soul, particularly if we are looking for things that we might perhaps avoid passing on to developing markets.

Four examples come to mind.

1) **The loss of the Major’s** (not John and Norma).

With the evolving maturity of the North Sea the Major operators have seen better opportunities elsewhere and have sold on their assets to an evolving breed of small, independent operators.

Unfortunately, the timing is such that many of their most experienced personnel have taken the opportunity to retire, rather than transferring with their technical knowledge to these new owners. Couple this to the independent’s need to run “lean and mean” if they are to maximise their return from their investment, and you find that many of the lessons learned and much of the experience gained the hard way, are now in danger of being lost.

The new operators take the view that they are just that – oil and gas producers, not technical wizards, and that they can buy in any technical expertise they need from outside sources. I would take issue with that view in that those outside sources (contractors) are fuelled by different drivers from the operators and they too need to make their profit. In short, they might well answer a technical challenge with a solution that optimises their own commercial position rather than best serving the operator who commissioned them.
The traditional operators also had much higher internal financial resources so that they were less dependent on external funding from banks and similar institutions. They could therefore take a longer term view on an investment and how it suited their overall aims and objectives, rather than just meeting the needs of the single development. The biggest example of this is oversizing a facility to allow for anticipated growth of other future prospects.

2) Changes to our ways of doing business

Contracting strategies have also changed. In the early days there was a profile of shared risk with each party looking out for their own part. From that we moved to EPIC arrangements where the Contractor was paid a “lump sum” for his overall workscope, so that the risk was all his. Now the game is for everyone to pass on as much risk as possible to another party, so that they are themselves left with as little as possible at the end of the negotiation. In an increasingly litigious world, this approach seems to lead more and more to acrimony and dispute.

Knowledge that there was always a “next job” to consider used to give rise to a “status quo” that was always part of a Project Manager’s thoughts. Contractors would never sue an operator (for the fear that they might never work again), and operators would never exercise their right to liquidated damages in the event of project delays. Major contracts were completed and substantial disputes settled without a need to resort to litigation. All that has now gone – there are now several major contractors who seem to have permanent residence in the courts and the operators’ financiers look for every possible cost saving.

Understanding the risk that is being forced upon you is crucial. For technical solutions that use proven technology, the potential hazards are mostly understood and can be priced accordingly. But what will be the impact of the loss of the experienced staff as they retire from the business? And how will the development of subsea solutions and other forms of unproven technology effect the risk allocation model? Already we see major contractors declining EPIC contracts in new technology areas, because they see their risk profile as just being too high. And FPSO’s are famous (or is it infamous?) not for their technical prowess but more for their high chance of ending up in litigation. The reasons for this last point are interesting to consider. FPSO’s usually come from the conversion of an existing marine vessel, designed and used under one set of rules and regulations, into an offshore production facility where the rules and regulations are entirely different. Add to that the use of foreign shipyard facilities for the conversion, where the working practices do not necessarily match our own, and you have a recipe for disaster before you even start.

There has never been a clear industry standard on contracting strategy. There have been some attempts at standardisation - the CRINE initiative, for example, gained some favour. I personally rejected it during my time at Amoco because it would have meant us adopting the BP “gold plated” specifications which were being proposed as the industry standard, and that would have cost Amoco a lot of money. Ironic how things later turned out…

And there are no standards for dispute resolution – which I guess is where you fine people can play your part. Proposals for including Arbitration or Adjudication clauses into contracts have never found much favour, so Litigation it is then!
3) Lack of International Co-operation.

For once, this is nothing to do with the French, but in August 2002 the UK and Norwegian governments issued a report entitled “Unlocking Value through Closer Relationships”. This called for greater co-operation between the two countries in further developing the resources of the North Sea, and in particular the 37.5 mile wide oil & gas corridor that straddles the UK/Norway meridian.

After the early successes of Ekofisk exporting to Teesside via Norpipe, many projects have been started which would have seen the export of Norwegian products into the UK (and onward into European) markets, but for one reason or another they have floundered in the face of legal issues and delays.

One of the gains we have made in the North Sea is the speed with which developments now move through from initiation to completion and to date I think it is fair to say that the international treaties and approvals have not always kept up with the game, particularly as the bureaucratic regime has intensified.

The industry is now watching with great interest how the new proposed Ormen Lange gas field fares. This development is proposing a 1200km long export line from Norway to Dimlington on the UK east coast near Hull. It is interesting that an apparent easing of the UK/Norwegian relationship only seems to come when the UK needs to start importing gas to meet its own requirements.

4) A decline in exploration while much remains unmapped.

In 1990, 159 exploratory wells were drilled in the UKCS. By 2002, this had fallen to one tenth of this figure. The number of exploration wells drilled in the first half of 2002 was the lowest since the first discoveries were made in 1965.

However, away from the more densely explored areas of the North Sea, parts of the UKCS are relatively unexplored, particularly areas to the west of Britain where deep water, harsh conditions, high costs and a relatively poor record of exploration success have to be taken into account.

The British Geological Survey, whose maps are used by the DTI, still has large unmapped areas where the exploration potential has not been adequately defined. The DTI’s estimates of technical reserves, particularly in the area west of Scotland have been, and remain, significantly higher than those indicated by the industry. The reasons for these differences need to be better understood.

Much of the North Sea is now regarded as mature. Commercial discoveries are now on average about 30 million barrels of oil equivalent (compare that to Brent and Forties whose reserves were estimated at over 2,500 million), and they are too small to support their own pipelines and production facilities. Most of these small discoveries now rely on existing but ageing infrastructure for their economic development.
There is therefore some urgency to complete a thorough programme of exploration, both in the undeveloped areas and those with existing infrastructure, to ensure that the best use is made of all the reserves before that infrastructure is allowed to decline.

Perhaps we are declaring that the North Sea has entered the “end game” phase rather too early and that with more encouragement, notably from our tax regime, a more rigorous and reliable inventory of our reserves might reveal that the game is far from over.

And, finally the downright Ugly

Events in our North Sea history that really did not show us in our best light.

There are unfortunately quite a few of these, more than any of us would like, but I have chosen three that stick out in my memory as being pivotal for the offshore industry, not just for their immediate impact but for the long term effect they had.

1) Brent Spar

Underlining the powerful development of the environmental lobby and how even they can get it wrong, but also showing that the operators must not take public opinion for granted.

The Brent Spar was a loading buoy which initially handled the oil export from the Brent Field. With the commissioning of new oil export pipelines the Spar was decommissioned and plans were laid for its removal and disposal.

In 1995 Shell received permission to tow the Spar into the mid-Atlantic and sink it in very deep water. However, the environmental lobby (which was not then an addressee of the statutory consultation process) got hold of the issue and protested strongly about it. They maintained that the Spar was heavily contaminated with over 5,000 tons of toxic and radioactive waste, and began a campaign of “non-peaceful demonstrations”.

This text is still on their website:

“On 16 February last year (1995), Greenpeace learned that the UK government had granted permission for Shell Oil to dump a huge, heavily contaminated oil installation, the 4,000 tonne Brent Spar, into the North Atlantic despite it being loaded with toxic and radioactive sludge. Dumping operations, just west of Ireland and Scotland, were expected to begin in May.

Greenpeace went into action with plans to take over and occupy the rig to prevent the dumping. More than two dozen activists from six North Sea countries pulled operations together. Video and photo staff were called upon to document the Brent Spar platform and the occupation. The Moby Dick delivered activists to the platform and remained in the area to provide back up. Following eviction by Shell, Greenpeace activists re-occupied the Brent Spar and continued to protest Shell’s plans.”
In turn, Shell maintained its innocence and commissioned an independent research organization Det Norske Veritas (DNV) to investigate Greenpeace's allegations.

In October, DNV’s report confirmed that Shell's studies were sound and called Greenpeace's figures "grossly overestimated". As it turned out, Brent Spar contained only 75 (not 5,000) tons of oil, and no PCBs. The study also showed that most of the waste was a substance chemically similar to rust.

Greenpeace was forced to admit its mistakes and to apologise for its actions. UK media sources also admitted sensationalistic and unfair coverage of the story.

But the damage had been done. The issue was an embarrassment to both the offshore oil and gas industry, (in that the public perception was, perhaps unfairly, of an industry hell bent on profit with at best a cavalier attitude to the environment in which it worked) and ultimately to the Greenpeace lobby who clearly “got it wrong” and lost a lot of credibility. The sad thing about this whole issue is that it ever got to the position it did. While I had moved to Amoco by the time it reached its peak I was working for Shell until 1991 and knew how much care they took over issues of this kind. Similarly, Greenpeace was staffed by incredibly committed individuals who saw this as another example of an oil company having no regard for their environment. The media also played their part – they made great play of Greenpeace’s claim that the oil platform still carried 5,500 tons of oil without any effort of verification.

Ultimately, Greenpeace was forced to admit that its methodology had been flawed, and concurred with Shell that the rig was actually empty. However, the environmental lobby continued to flourish and Shell announced early in 1998 that it would instead break the Spar up in Norway and recycle it for further use as the base of a ferry terminal. UK Legislation calling for Environmental Statements and Environmental Impact Assessments for offshore developments then came into effect in April 1998.

2) Alexander Kielland

The offshore accommodation platform Alexander Kielland capsized on the Ekofisk field in the Norwegian sector of the North Sea on March 27, 1980. 123 people perished among them twenty-seven UK and two US citizens. The Norwegian government in charge at the time immediately appointed a committee to investigate the cause of the disaster.

However, while the Committee presented their report one year later in March 1981 (concluding that the cause of the disaster was a fatigue crack in one of the six bracings) no significant outcome came of it and no lessons were learned from it.

Indeed the Committee stated that they never looked into any other possible cause to the disaster and a popular view exists to this day that the whole incident was caused by an explosion caused by sabotage.

3) Piper Alpha

I have purposefully left this till last as it an incident that should be highlighted to anyone going to work in any aspect of North Sea developments, or taking their experience to any
other part of the world. It highlights what can happen, and despite the lessons learned from it, what could happen again if complacency is allowed to set in. It must never be forgotten.

On July 6, 1988, 167 lives were lost when the Piper Alpha Platform blew up and was totally destroyed.

It began with the routine maintenance of a backup condensate pump in the processing area, and the check of its pressure safety valve. The valve had to be removed, leaving a hole in the pump, and because the job could not be completed by shift end at 6:00 PM, permission was sought and granted to leave the rest of the work until the next day.

Later, a little before 10:00 PM, the primary condensate pump failed. Routinely, the control room switched to the backup unit, not knowing that it was under maintenance. High pressure gas immediately escaped from the hole left by the valve and, at about 10:00, it ignited and exploded.

The firewall separating different areas of the processing facility could not withstand the blast and the fire spread to large quantities of stored oil.

The automatic deluge system, which was designed to spray water on such a fire to contain it or put it out, was never activated because it had been turned off.

After about 20 minutes the fire had spread and intensified to such an extent that it weakened and burst the risers bringing in high pressure gas from other platforms. The failure of these and the resultant jet fire dramatically increased the size of the inferno so that flames were estimated to rise up to 400 feet in to the air, be felt over a mile away and be seen from 85 miles distant. The heat on the platform itself must have been terrifying to say the least.

Upon the alarm the platform crew mustered in the accommodation area as they had been trained to do, and waited for helicopter evacuation. Unfortunately, the accommodation was not designed to be smoke proof and generally was not up to the situation.

Many men concluded that the only way to possibly survive was to get off the platform as soon as possible, by whatever means. However, access to lifeboats was blocked by fire and debris so the only desperate alternative was jump from a height of over 150 feet into a freezing North Sea that was covered in burning oil. Sixty-two men survived this way, while most of the 167 who died suffocated on carbon monoxide and fumes by following their training and staying in the accommodation area.

The gas risers were only shut off by their supplying platforms about an hour later and the gas inventory in the pipelines continued to burn for a long time thereafter. After three hours the whole platform topsides collapsed into the sea, leaving a smoldering mass of stumps that would form the photos on the front of the next day’s newspapers.

Away from the immense tragedy of it all, overall reasons for the loss can be summarized thus:

? Lack of an effective Permit-to-Work System - This was a system of paperwork designed to promote communication between all parties affected by any maintenance procedure done on the platform. It had become relaxed and ineffective. Had it been implemented properly, the back up pump would have been properly isolated and the control room would have known that it was not available.
Ineffective Firewalls - The firewalls on Piper could have stopped the spread of a mere fire but were not deigned to withstand explosion. Newer platform design has included for this possibility.

Disabled Deluge System – divers who were in the water inspecting the structure, were perceived to be at risk from being near the water intakes. The system was therefore turned off.

Inadequate Safety Training - The workers on the platform were not adequately trained in emergency procedures and initial crisis management. Drills were carried out but they bore no resemblance to the situation that was then experienced. Also, there was inadequate training in emergency communication with neighbouring platforms that did not automatically shut off their flow of gas.

Auditing – While on many occasions inadequate systems and facilities were identified they were not improved by the management, largely through reasons of expense.

Lack of Risk Assessment - The presence of high pressure gas risers clearly lifted the incident from serious to catastrophic but their potential had never been identified. More modern platforms specifically assess risks they live with, and take steps to mitigate them where appropriate.

So did we learn from all that? In July 1988 Lord Cullen was commissioned to establish the circumstances of the accident. He made 106 recommendations – 57 aimed at the Health and Safety Executive, 40 for the Operators and 8 for the industry as a whole.

In summary, he recommended extensive restructuring of the UK offshore safety legislation and shifted the primary onus of responsibility for offshore safety away from the regulatory authorities and towards the operating companies. He also recommended the introduction of the Safety Case concept for the North Sea to align offshore safety management with existing onshore health and safety legislation.

But this brings us back to the new set up in the North Sea, where our new operators are “outsourcing” much of their offshore operations to contracting organizations and are attempting to delegate their responsibility for the safety of their facilities. But as you will remember from your management training – you can delegate authority but you will always retain responsibility, so I only hope this does not bring us back to the situation before Piper Alpha when the onus of responsibility was unclear.

Summary

So after that gloomy review of Piper Alpha, where are we now and where we are going from here? What can we export to developing markets? I would suggest:

The achievements:

- Subsea Completions and the new technology it has spawned
- Stepouts from existing facilities to allow development of a previously uneconomic part of the reservoir
- Enhanced Oil Recovery (EOR) technology
- Use of existing infrastructure after the original field production has declined
Improved inspection and maintenance techniques allowing extensions to design life
Improved assessment of RISK (commercial, environmental, safety)

But with these come some downsides:

- Increased tax regimes that hinder further development
- Increased bureaucracy and legislative obligations
- Piper Alpha in 1988 gave a wake up call.

And more than a couple of challenges:

- We must manage change – the early halcyon days of high returns has given way to an intensely cost conscious approach. UKOÖA has recently published its latest review of the North Sea as a sustainable development and the Renewables sector is struggling to find its feet. Moving wind farms into the offshore environment is a huge task and legislation is not yet in place to fully support it.

- We must encourage the youngsters into the business - I have been going to the Pipeline Industries Guild Annual Dinner for 20 years, and I still feel I am the youngest there!

- The new breed of “Slimline” operators have few technical hands and little will to explore technical innovation. They are in place to maximise the return from an ageing infrastructure with a minimum of further capital expenditure.

- Could this bring on the conditions that brought about the Piper Alpha disaster? After all, the oil companies of the time were blamed for putting profit before every other consideration and having a cavalier attitude to safety.

So how do we export all this? Technology is easy. It is the tangible product of those imaginative minds that are constantly looking for new markets from which to make money.

But the lessons of management, safety and environment are more difficult to pass on, particularly if they are thought to cost money.