DRILLING SOLUTIONS FOR ASIA PACIFIC’S CURRENT CHALLENGES
Dr Andrew Palmer & Dr Michael Gibson, IDEAS Singapore Pte Ltd

ABSTRACT
This paper offers a number of solutions to improve the cost-effectiveness of drilling in the Asia Pacific arena in the currently difficult oil and gas market. These solutions have been observed to be effective in other regions of the world (albeit with sometimes different drivers and infrastructures). They are hereby presented for consideration for use throughout this region both singly and collectively to decrease cost through increasing performance, efficiency, safety, hydrocarbon production – and decreasing “untoward event” risk.

BACKGROUND
As we all know, the oil industry faces very challenging times, some would say more challenging than at any other time due to the time period so far of the oil price slump and its predicted length (many oil company executives and analysts predict an average range of $40 - $60 for 3 years).

There are three sets of major problems facing us: 1) The low oil price itself; 2) The length of time the oil price is expected to stay low and 3) The long period it has been low for now, which has all but choked investment.

Choked investment poses severe challenges in particular to the drilling sector of the industry – which has invested heavily in recent years in brilliant engineering and technological achievements and first class people.

Yet again, as we have had to do before, we have to find new ways of working to reduce lifting costs.

The term “working” implies many things, ranging from how we think through to what we do and how we do the things that we do.

To address some of the immediate quick wins, this paper addresses four key areas which can immediately help reduce lifting costs in South East Asia (or at least reduce / share the risk of capital outlay, namely:- 1) The use of advances in technology; 2) The management of design
and operations phases; 3) Efficiency improvement; 4) Profitability Improvement and Contracting Strategy.

INTRODUCTION
As a consultancy company we have been fortunate to have worked for many of the world’s operators, drilling contractors and service companies in different locations around the world on many different projects, ranging from exploration, appraisal and development wells through to interventions and workovers on “brownfield” re-developments. We have worked on land rigs, jack-ups, semi-submersibles, tender-assist vessels, platforms and drill-ships offshore, on land, in the ship-yard and in the office in many parts of the world.

This allows us to see where some companies excel and where some companies perform poorly.

Because of this experience we are able to compile a series of listings in terms of performance improvement which should prove beneficial to those conference delegates attending this IADC Conference and subsequently those whom might read this paper; simply this paper has been written from an “experience transfer” perspective.

It is vital that industry leaders see through the current difficult oil market (of which there have been several during the last 35 years). This requires remembering history (i.e. not repeating the same mistakes), remembering that the world still runs on oil (and there’s no sign of actual oil consumption slowdown other than “headline banner news”), maximising everything we can right now in terms of proficiency and foresight as regards both the present and the future.

Stacked Rigs, Moray Firth, Scotland, U.K.

Easy to say but difficult to do when you’re driven by quarterlies and the dividend yield insatiability of shareholders – and the willingness of senior management of certain companies to keep raising dividends. This means less capital available for the retention of people and R & D – which means the future is being sacrificed for the present. Yet review of world-wide successful companies’ show that those companies which are the most successful are in business for the long-haul, not just the present.

So what can we do to help drilling become “more attractive” to Operators who have radically squeezed budgets? Well, at current and projected prices, we have to learn from the past and look forward to the future. We must look at every possible opportunity available to us
to see where we might improve efficiency, productivity and profitability – without, of course, compromising safety or the environment. Let’s look at the four areas identified.

In the interest of this paper not being excessive in length, the authors have elected to include the top six subjects of the key four areas referenced above which have been written specifically from a Drilling Contractor’s perspective. The remaining subject areas are also included - but in bullet-point format.

ADVANCES IN TECHNOLOGY
There have been some terrific advances in technology over the years, across a whole range of areas, resulting in brilliant economic and technical achievements. As worldwide consultants, though, we are often surprised at many Operator’s and Drilling Contractors’ lack of knowledge in certain areas; thus these areas are “quick wins” for the industry, which can readily translate into performance and profitability. The key things which seem to be missing are that staff of certain Operator’s / Drilling Contractors either do not see the opportunity for the application or they are simply unaware that the technology exists.

When comparing South East Asia with other parts of the world in recent years, we have observed that South East Asia would benefit from the use / increased use of the following technologies:-

Dual Activity Rigs
Without doubt, dual activity rigs, despite their increased incremental day rate, are paying dividends to Operators, particularly on deep-water projects. They are typically new, maintenance standards are high and the personnel working them are typically extremely competent. It’s important not to be put off by their initial high day rate; think, rather, of the potential cost savings associated with dual activity.

![Example of a Dual Activity Rig – the Scarabeo 9, Well Jaguey-1, Cuba](image)

Drilling contractors who own single derrick / single activity rigs need to look toward how they market the performance of their rigs. For example, is it possible to demonstrate improved connection / tripping time / drilling time? Are there areas where the drill crew can also improve
the time-line (e.g. when running casing for example if it’s the rig crews responsibility to run casing).

**Improvements in MTBF Tool / Equipment Systems**
Many manufacturers have made excellent progress with regard to tool / equipment system reliability – examples range from surface equipment systems (e.g. top-drive systems, pipe handling systems, mud circulation systems etc.) through to downhole equipment (e.g. MWD / LWD systems, jars, other BHA components etc.). Unfortunately, many Operator engineers / purchases / buyers / contract personnel do not always take MTBF into account when arranging contracts – they often choose “lowest price” or “lowest bid” which are often not synonymous with improved MTBF. Ignoring MTBF figures during contract negotiation can radically increase drilling costs, whereas choosing the most reliable systems / equipment (even though they may be more expensive) can significantly reduce well costs.

**NPT**
As with MTBF, great improvements have been made in reducing NPT. Dual activity rigs, modern, reliable equipment and highly competent drilling crews and service / supply personnel have all greatly contributed to NPT success stories over the years. As with MTBF, this is an area which all Operators should take into account when assessing contractors during the contract bidding stage; and also it’s something which should be advertised by both Drilling Contractors and Service Companies alike as performance / value differentiators. One point of caution is that with training budgets being radically cut (e.g. no more stuck pipe prevention training for example) NPT could rise considerably.

**MPD Managed Pressure Drilling**
It is typically the case that MPD equipment is “retro-fitted” for the length / period of just one well or one campaign. There are many types / kinds of MPD equipment available on the market; some are similar, some are not so similar. It would benefit the marketability of the rig if MPD equipment came already fitted and the crew were competent in its usage. One such Drilling Contractor is currently considering this.

**EKD Early Kick Detection**
Similar to MPD, EKD (often the “Coriolis” system) equipment is “retro-fitted” for the length / period of just one well or one campaign. As with MPD, there are many types / kinds of EKD equipment available on the market. It would benefit the marketability of the rig if EKD equipment came already fitted and the crew were competent in its usage. A small influx – and knowing the size of the influx – would help the Operator enormously with the drilling of difficult, complex wells, particularly where fracture zones are weak and where there’s a small margin between pore pressure and fracture pressure.

**QRA Quantitative Risk Analysis**
All too often risk analysis is carried out by the Boston Square / red / amber / green matrix system, typically by the Operator. This is not adequate for highly demanding or refined situations which require thorough, detailed, rigorous analysis which should now be routinely used (particularly on highly expensive HPHT / Deepwater wells for example) in order to be able to identify and mitigate risks which in turn will maximise efficiency and thereby reduce costs. (Please see References section for further information). The Drilling Contractors need to
become involved with Risk Analysis at the same level. For understanding risk is key to performance improvement.

The other areas which are particularly important with regards to Advances in Technology are:

For the Drilling Contractors:-

- The need for Global Management & Operating Standards
- ECD Management for Deepwater
- Smart flow-backs for finger-printing
- Riser Gas Handling
- “Closed Loop” MPD
- Further Drilling Rig Equipment Automation
- Systemization

For the Operators / Service Contractors:-

- HPHT Drilling & Completions
- Deepwater Drilling & Completions
- Extended Reach Drilling
- Multi-laterals (all the way up to self-sealing Level 6)
- Seismic / Geology & Geophysics
- Data Acquisition, Presentation & Interpolation
- Complex / “Smart” Completions
- Intelligent use of computer modelling
- Wellbore Stability

SOLUTIONS TO COMMON PROBLEMS
This section of the paper addresses, in overview, the advantages to be gained from Drilling Contractors working synergistically with Operators. There are great benefits to be gained through working synergistically (even though this may not actually happen: sometimes Operators can be “difficult”).

People / the Workforce: How they might feel in the current downturn
During downturns (for many, this will be the first major oil industry downturn they will have seen), people are naturally worried about their jobs / their security. Generally, we have noticed this area to be poorly addressed by Drilling Contractors, Operators and Service Companies alike. Thus, it is essential that personnel within companies HR departments communicate regularly with their staff and keep them up to data as regards their companies / the industry’s situation. Failure to do so produces poor morale (and so poor performance) at the rig-site. A healthy crew is a hard-working crew. So HR Departments need to work hard during downturns. Also, Drilling Contractors do not want to lose their best crews to competitors due to the amount of money invested and the loss of rig competency. For its people that make rigs work.

People / the Workforce: Managing Diversity
During recent years, the oil industry should be applauded for hiring a wide range of differing nationalities from a diverse background of cultures and value systems. Generally, due to careful approaches from key personnel on board rigs such as OIM’s, Toolpushers, Drillers and Assistant Drillers for example things work well. Where, however, things haven’t worked well
(e.g. offshore to India) there can be clashes and low morale as a result. These areas need to be addressed before they happen, ideally, with standards and behavioural working patterns being put into place early-on otherwise the rig’s performance standards may suffer.

**People / the Workforce: Training**

Today’s low oil price market requires that rigs come with the absolute best people. There’s little point in having a latest generation drilling unit if the driller keeps getting stuck through stuck pipe issues. There’s little point in having all the latest bells and whistles if the driller runs into hole too fast and surges / fractures the formation or pulls out of hole too fast and swabs in an influx. These typically “extra” areas of training are icing on the cake in terms of cost savings for the Operators. The sad thing is, not spending $5,000 for a Driller to do Stuck Pipe Prevention Training can easily result in a $5 million dollar side-track example. Sad but true: Training is often regarded as a cost rather than as an investment.

**People / the Workforce: Retention**

During its travels on various projects throughout the world, we have been lucky to see so many companies carrying out so many projects in so many different locations. What we see is very often different to what you actually might imagine to be the case.

Retaining your best people through a downturn is crucial. With luck, the Drilling Contractors still have existing contracts to supply money to head office. This money should be utilised for all the positives we have mentioned so far; not least the retention of good people.

Sadly, many of the largest companies (that promote “excellence”) simply go into slash and burn mode – further promoting the view that they simply cannot be trusted (the case of the world’s largest Drilling Contractor for example).

The best Drilling Contractors are those who retain their best staff. For they will be ready for the upturn when it comes.

**People / the Workforce: Managing the “Big Crew Change”**

Our observance is that many Drilling Contractors (particularly land rig owners in the USA and Canada) are simply cold-stacking rigs and laying-off people. This is also happening to a lesser extent with offshore rigs, which are being both cold and warm stacked.

Once the rig is stacked many (if not all) of the crew are laid off. Everyone suffers. The crew through loss of morale. The rig through reduced efficiency. And of course the Industry. We never seem to learn.

When the industry picks-up, what have you got? A less than optimal rig that’s required to go back to work which will give you high NPT or downtime.

As the older guys are phased out, the only source of personnel is from the colleges / universities / streets. We start all over again.

**Drilling Contractors becoming involved in Well Design & Well Construction**

Some people may reject this concept. However, please be careful: For it is our experience that drilling expertise generally now resides with the Drilling Contractors (especially those who have graduate training programmes) as opposed to the Operators. Yes, some of the larger Operators still have excellent in-house expertise, but in many cases, due to attrition over the years, they no longer have the expertise which they once had.
So in many cases the Drilling Contractor has the knowledge, the “edge” to ensure successful Well Construction if not Well Design.

It would behove Drilling Contractors to move into this area, especially if they are large enough / or specialist enough to do so. Or expand their current services in this area.

The other areas which are particularly important with regards to Solutions to Common Problems are:-

For the Drilling Contractors:-

- Well Construction Optimisation
- Process Management
- Clearer Communication
- Reducing Risk through QRA
- Further Drilling Rig Equipment Automation
- Systemization
- Clear Understanding of Goals / Well Task
- Management Systems & Standards
- Operational Systems & Standards
- Understanding Well Integrity

For the Operators / Service Contractors:-

- Well Design Optimisation
- Process Management
- Clearer Communication
- MOC Management of Change
- Reducing Risk through QRA
- Creative / Lateral Thinking
- Improved Use of Data Management & Its Utilisation
- Clear Understanding of Goals / Well Task
- Management Systems & Standards
- Operational Systems & Standards
- Understanding Well Integrity

EFFICIENCY IMPROVEMENT

Without a doubt, there have been some marvellous improvements in efficiency over the past few years. Micro-chips, electronic circuit boards, computers, computerised systems and computer-controlled components have all made fantastic leaps forward in technology possible.

On the drilling rig this translates into automated pipe-handling systems, automated pipe make-up and automated stand make-up systems etc., which translate into time and so cost savings.

However, there are other areas where efficiencies can be improved, such as:-

The Drilling System

The rig has to be looked at as a system – each “function” is co-related within the whole. As mentioned above, Dual Activity Systems are ideal – they typically represent 25 – 40% savings as compared with a conventional rig. However, that doesn’t mean that the single derrick rig cannot be improved. Drilling contractors who own single derrick / single activity rigs need to
look toward how they market the performance of their rigs. For example, is it possible to
demonstrate improved connection / tripping time / drilling time? Are there areas where the drill
crew can also improve the time-line (e.g. when running casing for example if it’s the rig crews
responsibility to run casing).

Crew Competence
Very few of the major drilling contractors do not have a crew competency system in place.
And yet we’re still incurring well control events, stuck pipe, death by crane accidents etc.
One key observation is that the drilling contractors very often manage and administer their
competency systems themselves.

As any major industrial corporation which is successful will tell you, it’s advisable to
utilise independent 3rd parties so that there is complete objectivity and no biasness.

Coaching
Coaching is an excellent way of utilising highly experienced personnel to help the Driller / Rig
Crew drill through difficult environments such as the transition zone on HPHT wells for
example; or, indeed other difficult / problematic areas such as problematic well control events.
The $millions saved far, far outweighs the slight cost of having a small expert coaching team
on board the rig.

Accidents
During the past sixteen years that IDEAS has been working for the drilling industry, we have
literally lost count of the number of events which were preventable. These “accidents” range
from collapsing jack-ups due to poor sea-bed soil integrity through to shallow gas blowouts,
stuck pipe events, surging weak rock formations so inducing lost circulation, swabbing-in
influxes, causing influxes etc. The lost time associated with these events runs into $millions.

One way to reduce / eliminate these accidents is to have the drilling programme
independently reviewed – i.e. through Peer Review or Well Examination methodologies. As
an absolute minimum, the well should at least warrant a DWOP (recognising that this is
typically in the hands of the Operator, although it needn’t be).

Optimised Drilling Practices
Very often, Toolpushers, Drillers and Drill Crew are so focused on the task at hand that they
may, due to time / task pressure, fail to see the bigger picture and how they might be able to
improve things.

Over the years, IDEAS has taught many, many Optimised Drilling Practices courses
around the world, and there has never been a delegate who has not said “I did not know that”.
Optimised Drilling Practices courses can greatly improve efficiency.

DWOP Drill the Well on Paper
A DWOP is an excellent opportunity for Operator, Drilling Contractor and Service Companies
to come together in advance of drilling the well to see what they’re expected to do by
PowerPoints, Hand-outs, Manuals, and Speakers etc. If carried out in an informal environment,
where the atmosphere is such that people feel free to speak, a great deal can be “unearthed”
about the Operator’s Drilling Programme.

The other areas which are particularly important with regards to Efficiency Improvement
are:-

For the Drilling Contractors:-
Use of Systems Approaches (gap analysis)
Human Factors (Reliability & Performance)
Clearer Communication
Optimised Drilling Practices
Use of Lessons Learned Register
Equipment Training
Equipment Servicing
Partnering / Alliancing
Integrated Services / Project Management
Technical Limit
Micro KPI’s
Increased Simulator Training
Increased Inter-facing

For the Operators / Service Contractors:

Use of Systems Approaches (gap analysis)
Human Factors (Reliability & Performance)
Improved Well Planning
Use of Lessons Learned Register
Partnering / Alliancing
Integrated Services / Project Management (a fractured group of service suppliers is inefficient)
Technical Limit
Efficient use of real-time data
Increased FEED Front End Engineering & Design
Planning / QA / QC
Micro KPI’s
Logistics
Integrated Management of Discrete Technologies

PROFITABILITY IMPROVEMENT & CONTRACTING STRATEGY

In today’s extremely challenging market, the key question is: “Is it still possible to make a profit at the currently low oil prices?” According to experts and analysts, the answer is “yes” and “no”. It is hard to imagine Deep-water wells yielding a profit with their drill-ships costing circa $1 million per day; whereas it may be possible to imagine cheap land rigs and cheap jack-up rigs yielding sufficiently low-cost oil to make a profit, particularly if they are drilling prolific producers.

This is a tough question and area to tackle. We all remember stacked rigs several times in the past; and it always seems as though the Drilling Contractors are the first to be hit, then the Service Companies.

Since this is an IADC Conference, we have to ask: - “What might a Drilling Contractor do to stay in business?”

This is an extremely difficult question to answer. Hopefully the Drilling Contractor still has existing contracts in place and therefore positive cash-flow.
Banks, Investment Houses, various forms of Indebtedness etc. aside (money and funding and debt are very complex issues and out-with the scope of this paper), there are a few practical things we could consider doing based upon past experience:-

**Synergy**
A great deal can be done regarding synergy. For example, a basin’s “supply chain” can work together with an increased number (or all) of Drilling Contractors / Operators working in a basin to reduce service, supply and logistics costs. Examples include supply boat cross-utilisation, helicopter cross-utilisation, sharing tools and equipment as opposed to “multiple” contracts. We have also seen successes with regard to “Integrated Services” from the service companies. However, relationships between Drilling Contractors and Operators could be improved so that the well to be drilled is more deeply understood; and if the well to be drilled is more deeply understood then various simulations can be carried out in advance with equipment / hardware / simulators etc. Integrated or synergistic services have also been carried out with success by the Drilling Contractor on behalf of Operators: the Drilling Contractor, in effect, managing all “services” ranging from boats to helicopters to service companies etc. There should also be scopes to develop synergies between Drilling Contractor & Operator. It would behove Operators with deep pockets to maintain contracts with their best performing Drilling Contractors.

**Consistent Standards**
Notwithstanding the excellent work by the august bodies API, IADC (including Well Cap), SPE, DEA, NACE etc. there is considerable room for improvement with regard to how wells are drilled. It must be bewildering for Drilling Contractors to work to different parameters / standards on each well they drill when there’s a change of Operator. Perhaps the Operators, through their various forums, may “unite” in terms of how wells should be drilled, but this is likely to take quite some time. Thus, perhaps the Drilling Contractor can adopt its own standards in order to improve NPT and performance etc.

**Value**
There is often a view when times are tight to “cut costs”. For example, many rigs are being “cold stacked” at the moment, with crews who have spent years on the rig being laid off. Is cold stacking wise? Is complete crew lay-off wise? Value is often attained over the long term. There’s a very wise saying from yore: - Buy cheap, pay dear.

**Performance Contracts**
Drilling Contractors might consider offering a deal with an Operator whereby if the time-depth curve is “beaten” then the Drilling Contractor is given a bonus. This would require utilising personnel whose area of expertise is in drilling engineering / drilling operations, but it is an option and Drilling Contractors have been known to make money through such contracts.

**Risk-Based Contracts**
Drilling Contractors may elect to consider “Risk-Based Contracts” should they have access to expert drilling engineering / operations personnel. These contracts are similar to Performance Contracts but take on-board a higher degree of risk. One way of “accepting” or averting risk is to plan things through and through to a high degree of detail to ensure success.

**Turnkey Contracts**
If you have an excellently performing rig, why not use it? Offer it for turnkey projects in conjunction with drilling engineering experts and drilling operations experts. Such an offering is particularly amenable to cash-strapped Operators today, many of which would welcome an alternative to the “traditional day-rate model”.

The other areas which are particularly important with regards to Profitability Improvement & Contracting Strategy are:-

For the Drilling Contractors:-

- Do not take a short-term view: Take a long-term view
- Personnel Retention
- Invest through this major slowdown if you have the money: don’t keep it locked in the bank
- Consider your personnel just as much as you consider your share-holders
- Consider adding “extras” to your rig like MPD, EKD etc.
- Down-time re Sub-sea BOP’s & Control Systems needs to be improved (consider standardisation across your fleet of rigs)
- Training (simulator / classroom)

For the Operators / Service Contractors:-

- Do not take a short-term view: Take a long-term view
- Look at your design standards. Could a slim-hole well be drilled instead of a standard well? Do the Service Companies have slim-hole tools available in your region?
- Design wells for Zero Intervention / Zero Well Workover (i.e. Maximum Well Integrity over the Life of the Well)
- Personnel Retention
- Operators need to make long-term commitments to both Drilling Contractors and Service Suppliers
- Consider your personnel just as much as you consider your share-holders
- Design wells which are fit-for-purpose
- Operators should not contract a rig just on cost alone – rather they should look at its overall efficiency
- There’s no such thing as a “low cost bid”. Buy cheap, pay dear.

CONCLUSIONS

The oil industry currently faces challenging times; in today’s dollar monetary value, the current “crisis” is every bit as bad as the one faced in 1986 which left the industry reeling. We still feel the effects of the poor decisions made then in a “lost generation” of skills due to people being made redundant and graduates / technicians not being hired for years – and of course which bright young person would truly want to join a “hire and fire” industry.

Also, companies did not invest in R&D / technology as much as they might due to short-term thinking. Unfortunately senior management of many of the world’s companies have not learnt the lessons of the past: just look at the recent firing numbers.

We need to keep our bright, keen, committed people not only for the industry to work per se but especially so in today’s high technology era – not just for effective economic solutions now but for the future. For it is peoples’ ingenuity, advances in technology and how people work which will make oil production economic in this low price oil era, which, by many expert accounts, will run for circa 3 years at circa $60.
So we need to not only retain our best and brightest people but also to continually hire so that technology can keep advancing and working practices improve.

The oil price collapse chart above is, indeed, alarming. Perhaps what’s most alarming is that to IDEAS’ knowledge, no-one predicted the crash. And yet large oil company CEO’s and various analysts are predicting $40 - $60 oil for the next three years.

How much the oil-price crash is in-line with other commodities and minerals remains to be seen. However, China is experiencing a slow-down and commodity industries generally are suffering (e.g. iron ore mining in the Pilbara or North West Australia where job losses have been devastating).

Thus, it is difficult to know where things are heading. However, one thing we do know is that, eventually, the world’s best Operating, Drilling Contractors and Service Companies will come out on top. They always do. For the world still runs on oil and will for a long time to come.