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PETRONAS

SPE Joint Industry Solutions Series

Change of Mindset - Remote Operations and Automation: Turning Plan B into Plan A

BLUEPRINT

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Disclaimers

- This blueprint is reflecting solutions presented in this SPE Joint Industry Solutions Series; it does not cover the entire technological solutions available in the market.
- The actual operations of reducing rig site manning is not limited to the solutions presented; this blueprint acts as a guide to start the process.
- The practicality of this blueprint requires re-skilling of rig personnel, in collaboration with your existing solutions provider. For more information on solutions in this blueprint, please contact the solutions provider for further discussion based your specific application / conditions.

Leadership Address by Workshop Advisor

Dear colleagues,

It has been a challenging year for all of us, nonetheless, I thank everyone for your contribution and participation throughout this exercise. It has been great to see how we all came together during these tough times, proving how resilient our industry is when crisis hits.

The COVID-19 pandemic is almost like a blessing in disguise; while it disrupts our operation and our normal way of working, it accelerates the need for us as an industry to innovate now by working remotely in our daily operations. Additionally, it requires us to further enhance our collaboration among our business partners in order to achieve a win-win situation in all aspects.

Hence, the SPE Joint Industry Solutions series is the first of many steps we have taken together, and this collaboration fastened the much-needed industry mindset shift. SPE has always been the platform to keep us reminded that this industry, while volatile, needs to work together to jointly achieve our objectives, and this Blueprint proves that we can reach higher gains in lesser time.

While this Blueprint acts as a guide for us to make that paradigm shift, without a doubt, safety remains our top priority. Together, we must continue to prioritise the well-being of our people and mitigate the HSE risks to our operations. Balancing this will be key to how we continue to operate in the future. The pandemic has changed the way we work, and we must be able to adapt and be agile in facing the new normal. Therefore, I look forward to our continued collaboration to pioneer the oil and gas industry's innovation, sustainability, and economic development.

Chen Kah Seong
Vice President, Centre of Excellence
Development and Production, Upstream Business
PETRONAS
Workshop Advisor

Leadership Addresses by Workshop Co-Chairs

Year 2020 had been a wake-up call for the oil and gas industry; the COVID-19 pandemic brought to fore our over-reliance on extensive, in-situ labour and supervision to run one of the riskiest jobs in the world. Drilling activities worldwide were threatened to come to a grinding halt with quarantine and travel restrictions, amidst safety concerns of rigs turning into death ships.

Fortunately, we rose to the occasion, as operators and services joined hands to explore remote operations and automation opportunities to enable our operations to keep going, and kept going it did while maintaining safety and performance too.

This opens our eyes to the reality of today, where many game changing technologies and solutions readily available out there waiting to be embraced.

Remote operations and automation will enable us to eliminate exposure to our personnel, shift more people out of harms way, and allow far greater resources to be invested in the fewer people that remain exposed. Significantly, every single person taken away from the rig directly translate into reduced carbon footprint, a benefit that no one can afford to ignore today.

In 2020, we were saved because we have remote operations and automation as our Plan B. But this SPE JIS had proven that we are ready to make it Plan A, for 2021.

Mohd Abshar Mohd Nor
Head of Wells Development Sabah and Sarawak
Wells Delivery Malaysia
PETRONAS Carigali Sdn Bhd

At a time when the industry continues to face the challenges of operating under tight budget while striving to maintain operational excellence, collaboration among the operators, service companies and rig owners has never been more critical. The blueprint, a result of our knowledge and input combined, puts us on a clear strategy to achieve our common goal for rig site operation. Let us put this shared solution to work!

Louay Louis Laham
Vice-President - Drilling Business
Chief Operating Officer - Sapura Drilling
Sapura Energy Bhd

"Progress is not in enhancing what is, but in advancing towards what will be."
- Khalil Gibran.

What will be, is a future where we would harm no people, drastically reduce operational carbon footprint and achieve significant operational efficiency. This Joint Industry Solutions effort through SPE, creates a blueprint that will break the century mark (<100 people) for offshore manning, at any one time, in the drilling and completions operations before the end of 2021.

Suresh Sinnappu
Country General Manager
Baker Hughes

Background

The drilling industry saw a steady increase in numbers of personnel on a drilling rig for over the past 20 years. It is estimated that 30% of rig operating cost comes from manpower. Higher safety concerns and increased complexity saw a shift towards having more supervisors and service personnel on board. In this regard, the drilling industry is unique, because most other industries (such as manufacturing, marketing, and more) had shifted towards remote and automation to reduce manpower requirement.

Drilling service sectors had long been offering solutions in remote and automation, but there was little uptake amongst operators. This is due to many factors, including non-integrated nature of most solutions, high-cost of entry, infrastructure limitation and a general lack of comfort to trust one of the riskiest jobs in the world to be run with no or fewer human beings at location.

However, the heavy manning requirement severely exposed the industry to the threat of the COVID-19 pandemic. Global travel restrictions and local quarantine requirements meant many personnel simply cannot get on the rig, and on certain phases of the operations, there were genuine risk of halting the business altogether. Fortunately, the industry responded decisively by quickly adopting remote operations and automation wherever a solution is available, and emerged from the pandemic with safety records intact.

Despite the obvious benefits in safety, cost and carbon footprint reduction, remote operations and automation remained as Plan B, ready to be deployed only in situations when it is not possible to bring a person on board. Together, we must work together to turn remote operations and automation into Plan A and reduce our manning on rigs down to **<100 personnel (breaking the 'century')**, by the end of 2021.

Executive Summary

The SPE JIS: Remote Operations and Automation is the first edition of the SPE JIS series. It serves as a neutral, conducive platform for technical professionals and businesses to pool their collective experience and knowledge, and jointly develop a holistic solution blueprint as a guide for rapid deployment in a specified timeframe.

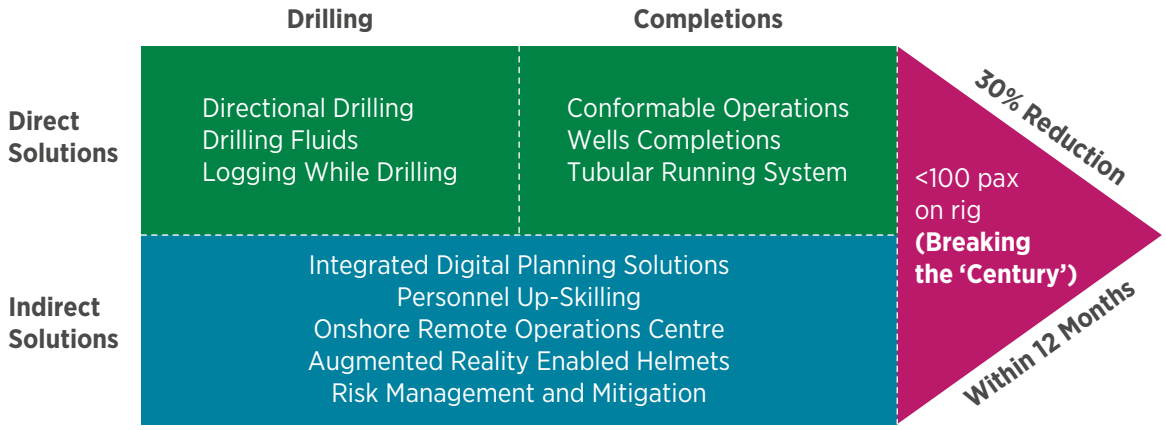
The target for this SPE JIS was ambitiously set at 30% rig site manning reduction within one year (by Q4 2021). The 21 solutions and case studies selected and presented for this JIS were used as the basis for this blueprint development. In the detailed content of the blueprint, it is demonstrated that up to 23% and 25% reductions in rig site manning in drilling and completion phases respectively are possible, by using various combinations of the 21 solutions presented.

The 21 solutions can be categorised into direct solutions and enabling solutions:

Direct Solutions	Indirect Solutions
• Supports the reduction of required personnel for its specific services, either through use of automation, lowering of operational complexity, or shifting supervision and control to a remote centre.	• Does not reduce manning on its own but enables manning reduction to take effect by addressing barriers and mitigating risks. From the presented cases, when combined effectively, indirect solutions have the potential to reduce a greater number of overall manning than direct solutions

All these solutions are packaged together in this blueprint to give a realistic, maximum manning reduction over a 12-month deployment, with phases of reduction timeline provided as a guide. It is also notable that many of the proposed solutions requires personnel upskilling and shifting majority of supervisory and coaching scopes to onshore centres.

Last but not least, all the presented case studies had undergone rigorous risk assessments involving all stakeholders prior to executions. This blueprint is designed as a guide only, and intended users are advised to contact the solutions providers and replicate a similar or more thorough risk assessment to ensure uncompromised operational safety.



Please refer to the disclaimers in Page 2

Achieving 30% Reduced Manning

DRILLING ACTIVITIES

Year 2020 (Today)	December 2021
123 pax	**95** pax **23% reduced by December 2021**

COMPLETIONS ACTIVITIES (With Gravel Pack)

Year 2020 (Today)	December 2021
150 pax	**121** pax **19% reduced by December 2021**

COMPLETIONS ACTIVITIES (With Comformable Technology)

Year 2020 (Today)	December 2021
150 pax	**112** pax **25% reduced by December 2021**

Through the meticulous review of the solutions presented, the Programme Committee has identified key areas of manning reduction in respective operations and processes. These figures are based on an estimated number of a universal project in Asia Pacific. A detailed breakdown will be shown in the following pages.

The manning reductions shown here are derived through several considerations, with key objectives and targets as below:

- Breaking the 'century' (<100 rig personnel) remote operation and automation technologies available in the market
- Onsite job scope shifts
- Re-skilling of rig crew
- Utilising existing technologies and services to enable the shift
- Overcoming current barriers faced on rig sites
- Prioritising safety and risk mitigation

Key determining factors to contribute to the reduction of people on the rig are:

Collaboration
- In-depth discussions between operators, service providers and technical experts to identify affected areas.
- Create synergies across all rig personnel work scope within an agreed timeline
- Through the use of remote operations technology, technical experts from contractors together with customers could monitor operations in real time

Technological Integration
- Cost-effective application of technologies to enhance and optimise operational activities
- Adoption of readily available technologies for immediate deployment
- Use of remote operations technology to allow experts to monitor and run the services offsite
- Sufficient and reliable internet bandwidth to avoid disruptions

Shifting of Rig Personnel Work Scope
- Lower training-to-field requirement for rig personnel who are covering additional work scope onsite
- Remote supervision and monitoring by technical experts

Please refer to the disclaimers in Page 2

How Did We Achieve the Reduction?

APPLICABLE SOLUTIONS

1. **Excellent Remote Operations Support to Assure Wellsite Operations Despite Logistic Challenges**, by PT PERTAMINA Hulu Sanga Sanga
2. **A Digital Approach to Well Design**, by PTTEP and Halliburton
3. **Embracing New Norms: When Remote Operation Becomes Essential for PETRONAS Subsea Wells Plug and Abandonment (P&A) Operation**, by PETRONAS Carigali Sdn Bhd
4. **World First Remote Monitoring of Gravel Pack Surface Equipment Rig Up on Offshore Rig for Field A; Setting a New Precedent in Industry**, by PETRONAS Carigali Sdn Bhd and Halliburton
5. **Digital Transformation for the Connected Worker**, by RealWear and Resources2 Energy
6. **Edge Device for Drilling Fluids Data Transmission**, by M-I SWACO, A Schlumberger Company
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11. **The Well Construction Digital Twin and its Application to Increase Remote Operations and Automation,** by Halliburton
12. **Journey Towards Remote Drilling Operations**, by National Oilwell Varco
13. **i-Trak Drilling Automation Improves Drilling Efficiency and Reduces Downtime**, by Baker Hughes
14. **The First Transformation of Real-Time Operations (RTOC) to Remote Monitoring Facility during Unprecedented Covid-19 Pandemic**, by EFTECH Drilling Solutions
15. **Vero Automated Connection Integrity**, by Weatherford
16. **Single Trip Completion Enabled by Conformable Sand Control System Combined with the Multi-Tasking Valve**, by Baker Hughes
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19. **Two-Way Acoustic Telemetry for Completion Installation, Control, and Monitoring**, by Halliburton
20. **Automation implementation of Intelligent Completion Operations for Production or injection Optimisation**, by Baker Hughes
21. **Remote Asset Integrity 4.0**, by INERTIA

Case Studies: Operators' Experience

Connectivity Enablers

Drilling*

Completions*

Asset Integrity

This blueprint features **21 solutions** presented in Phase 2, and where it can create value throughout the overall value chain.

The solutions cover sharing of technology applications and case studies throughout the planning and operational phases of drilling and completions.

Each solution presented covers identified key scopes as below:

Readiness and complexity of deployment
- Consideration of HSE throughout the overall process
- Deployment within a maximum of 12 months (Year 2021)
- Change management
- Risk assessment
- Operational efficiency

Level of Integration
- Single or multiple integration with other service providers
- Deployment leadtime

Value Creation
- Return of investment (Time/cost saving strategies)
- Re-manning or reduced manpower requirement
- Lower training-to-field requirement
- Carbon footprint reduction

Experience
- Number of projects/wells involved in the process of de-manning rig personnel

* *Solutions with touch points in **Production and Operations** phases, with impact to rig site manning during future interventions:* 16 17 19 20

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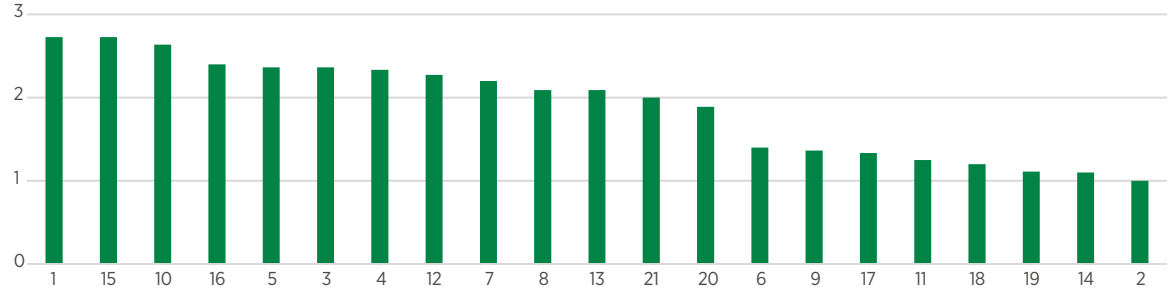
Applicable Solutions

% of Manning Reduced

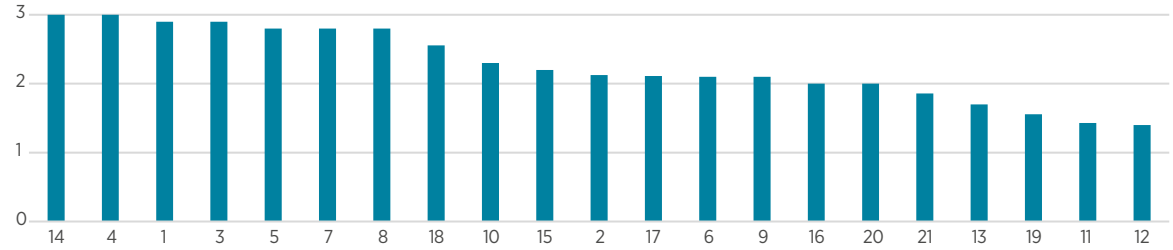


% of Manning Reduction

1 - 10%
2 - 20%
3 - 30%

Axis Y denominators reflect the numbered Applicable Solutions at the bottom of this page

Deployment Lead Time

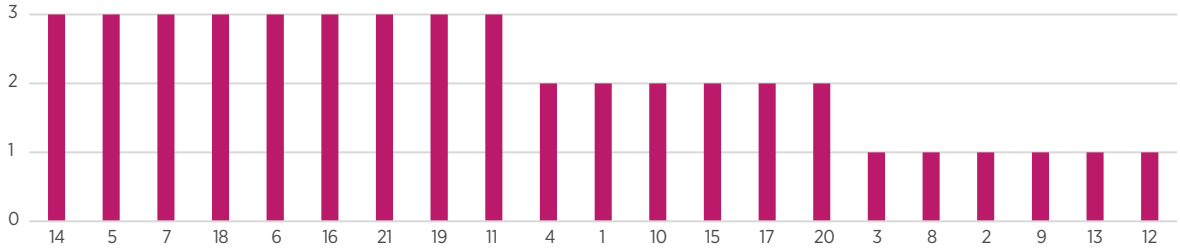


Deployment Lead Time

1 - 12 Months
2 - 6 Months
3 - 3 Months

Axis Y denominators reflect the numbered Applicable Solutions at the bottom of this page

Integration Level



Intergration Level

1 - High
2 - Medium
3 - Low

Axis Y denominators reflect the numbered Applicable Solutions at the bottom of this page

1. **Excellent Remote Operations Support to Assure Wellsite Operations Despite Logistic Challenges**, by PT PERTAMINA Hulu Sanga Sanga
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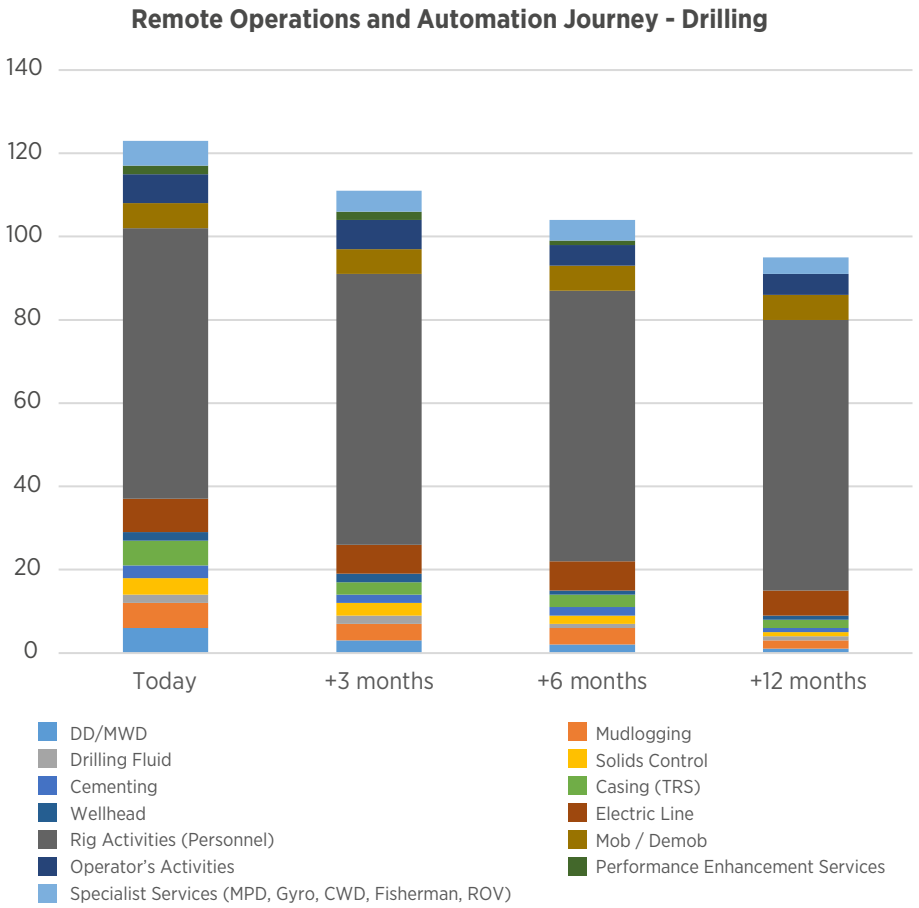
Manning Reduction in Drilling Activities



Driling Activities Breakdown	Applicable Solutions^	Current	+3 Months	+6 Months	+12 Months
DD/MWD	1, 5, 7, 8, 10, 13, 14	6	3	2	1
Mudlogging[1]	1, 4, 5, 7	6	4	4	2
Drilling Fluids[1]	4, 5, 6, 7	2	2	1	1
Solids Control[1]	4, 5, 7	4	3	2	1
Cementing[1]	4, 5, 7, 18	3	2	2	1
Casing (TRS)[1]	4, 5, 7, 15	6	3	3	2
Wellhead[1]	4, 5, 7	2	2	1	1
Electic Line	3, 5, 7, 8	8	7	7	6
Rig Activities (Personnel)[2]	5, 7, 12	65	65	65	65
Mob / Demob	5, 7	6	6	6	6
Operator's Activities	2, 5, 7, 9, 13, 21	7	7	5	5
Performance Enhancement Services[3]	2, 5, 7, 9, 11, 13	2	2	1	0
Specialist Services[4]	5, 7, 21	6	5	5	4
Total Rig Personnel (% of reduction)		**123**	**111 (↓10%)**	**104 (↓15%)**	**95 (↓23%)**

^ Suggested solutions are based on general application in these phases (where necessary).
[1] Activities with support from rig operator crew.
[2] With opportunities of re-skilling existing crew to support additional services.
[3] Performance and safety coaching
[4] Other specific expert to support activities such as MPD, Gyro, Fisherman, ROV.

APPLICABLE SOLUTIONS FOR DRILLING

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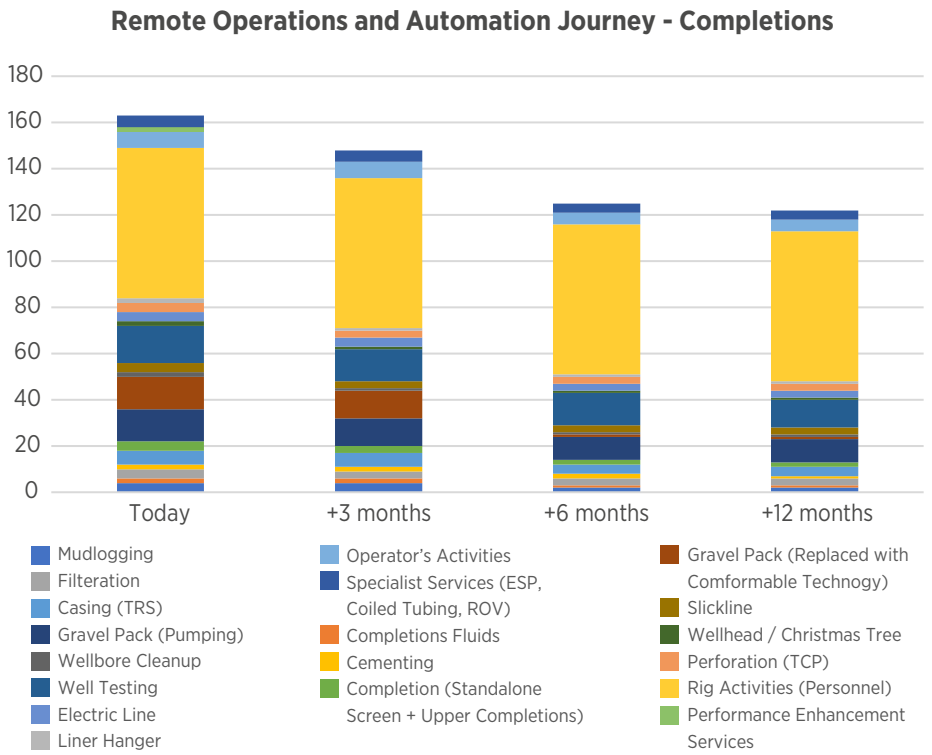
No. 16: *Applicable solution for completions phase only*

No. 17 and 20: *Applicable solutions to support production phase after completions (automation resulting in de-manning)*

Please refer to the disclaimers in Page 2

Manning Reduction in Completions Activities



Completions Activities Breakdown	Applicable Solutions^	Current	+3 Months	+6 Months	+12 Months
Mudlogging[1]	1, 5, 7	4	4	2	2
Completions Fluids[1]	4, 6	2	2	1	1
Filtration[1]	4	4	3	3	3
Cementing[1]	4	3	2	2	1
Casing (TRS)[1]	4, 15	6	6	4	4
Completion (Standalone Screen + Upper Completions)[2]	19	4	3	2	2
Gravel Pack (Pumping)[1]	1, 4, 5, 7	14	12	10	10
Option to replace gravel pack using Conformable Technology from 6months onwards	*16*	*N/A*	*N/A*	*1*	*1*
Wellbore Clean-Up[3]	3, 5, 7	2	1	1	1
Slickline	4, 5, 7	4	3	3	3
Well Testing	1, 4, 5, 7	16	14	14	12
Wellhead / Christmas Tree	4	2	2	1	1
Electric Line	1, 3, 19	4	4	3	3
Perforation (TCP)	5, 7, 19	4	3	3	3
Liner Hanger[3]	3, 5, 7	2	1	1	1
Rig Activities (Personnel)[3]	2, 5, 7, 9, 12	65	65	65	65
Operator's Activities	2, 5, 9, 11, 21	7	7	5	5
Performance Enhancement Services[4]	5, 7, 11	2	0	0	0
Specialist Services[5]	4, 5, 7, 21	5	5	4	4
Total Rig Personnel - with Gravel Pack (% of reduction)		**150**	**137 (↓9%)**	**124 (↓17%)**	**121 (↓19%)**
Total Rig Personnel - with Comformable Technology (% of reduction)		**150**	**137 (↓9%)**	**115 (↓23%)**	**112 (↓25%)**

^ Suggested solutions are based on general application in these phases (where necessary).
[1] Activities with support from rig operator crew.
[2] Single-trup solution may reduce the number to zero, depends on the well type.
[3] Opportunities to synergise of skillset on resources for this scope (e.g., contracting strategy, upfront planning)
[4] Performance and safety coaching.
[5] Other specific expert to support activities such as MPD, Gyro, CWD, Fisherman, ROV.

APPLICABLE SOLUTIONS FOR COMPLETIONS

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No. 17 and 20: *Applicable solutions to support production phase after completions (automation resulting in de-manning)*

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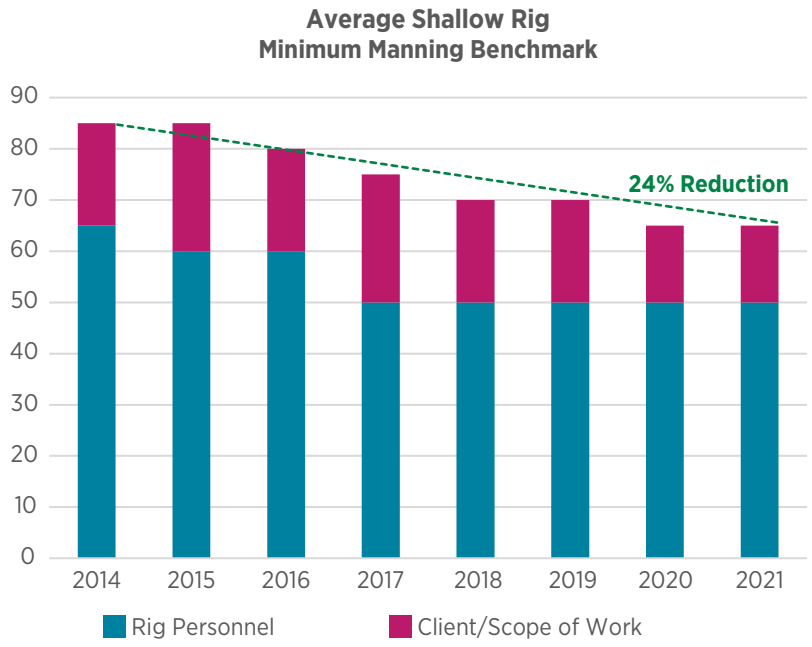
Manning Reduction in Rig Activities

Rig operators have actively initiated rig site manning reduction in the last 6 years, as an effort to reduce cost and provide a safer environment for rig personnel. Below is an average of rig crew trend since 2014:



Year	Total Personnel on Board
2014	85
2015	85
2016	80 **(↓6%)**
2017	75 **(↓12%)**
2018	70 **(↓18%)**
2019	70
2020	65 **(↓24%)**
2021	65

Based on the plan for year 2021, rig personnel will be more involved in other work scopes as part of the effort to reduce overall rig site manning. While current plan is to remain with **65 rig personnel (inclusive of additional support functions) for year 2021**, these are the areas identified where opportunities of re-skilling are available and where the applicable solutions may support the reduction of people on the rig in other work scopes (where necessary):

		Applicable Solutions^	Current	+3 Months	+6 Months	+12 Months
Drilling Activities	Mudlogging[1]	1, 4, 5,7	6	4	4	2
	Drilling Fluid[1]	4, 5, 6, 7	2	2	1	1
	Solids Control[1]	4, 5, 7	4	3	2	1
	Cementing[1]	4, 5, 6, 18	3	2	2	1
	Casing (TRS)[1]	4, 5, 7, 15	6	3	3	2
	Wellhead[1]	4, 5, 7	2	2	1	1
Completions Activities	Mudlogging[1]	1, 5, 7	4	4	2	2
	Drilling Fluids[1]	4, 6	2	2	1	1
	Filtration[1]	4	4	3	3	3
	Gravel Pack (Pumping)[1]	1, 4, 5, 7	14	12	10	10

^ Suggested solutions are based on general application in these phases (where necessary).
[1] Activities with support from rig operator crew.

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7 **Augmented Reality Solution for Remote Operations**, by Tienovix Oilfield Technologies

15 **Vero Automated Connection Integrity**, by Weatherford

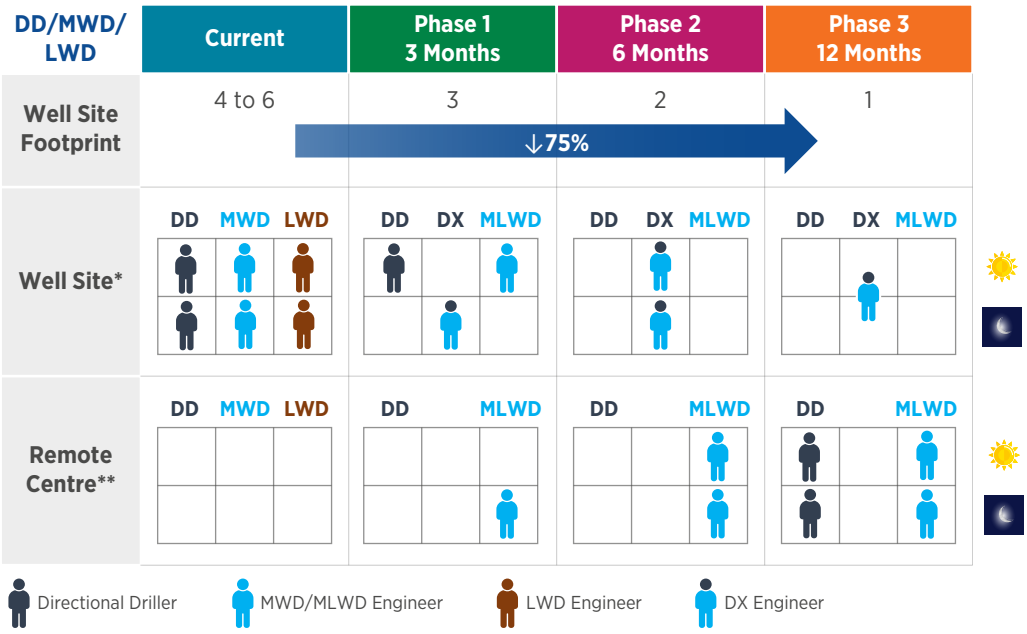
18 **Optimisation of Cementing Operations Through Real-Time Monitoring and Evaluation Combined with Remote Expert Support**, by Schlumberger

Please refer to the disclaimers in Page 2

Illustration of Manning Reduction in Phases

The blueprint aims to achieve up to 30% of manning reduction for 2021. The upcoming charts indicate areas where the number of personnel can be lowered. Below are illustrations of how each of the evaluated services could achieve this goal, covering various work scopes within the Drilling and Completion activities, and reduction in phases.

Drilling Activities

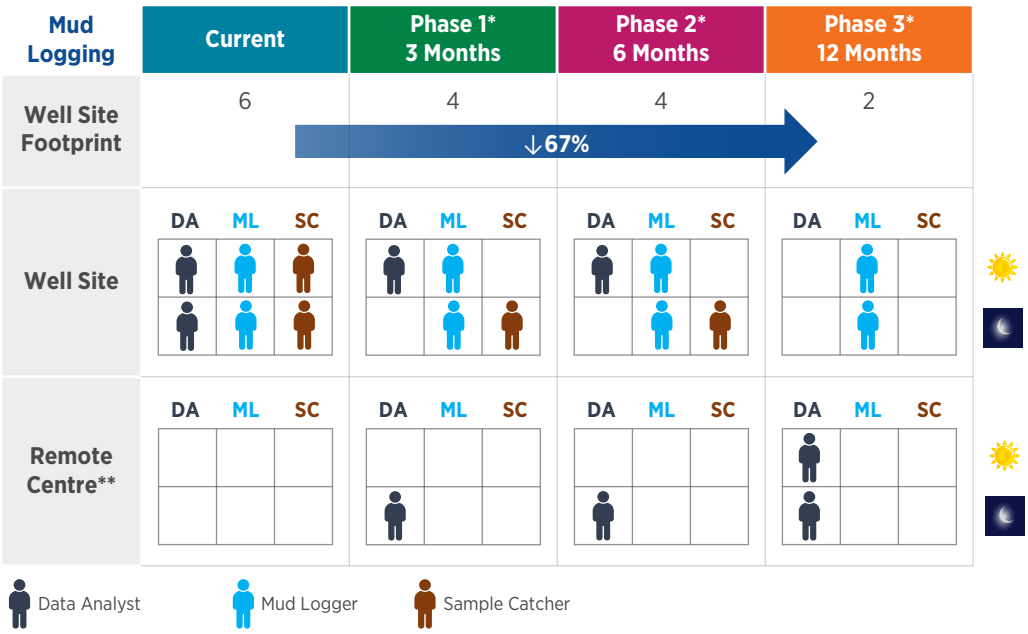


* DX - a DD with a strong MLWD background, competent to run DD, MWD and LWD services.
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup.

DD/MWD/LWD services could potentially reduce rig manning by **75% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow DD/MLWD personnel offsite to monitor and support DX personnel at the wellsite

UPSKILLING OF DIRECTIONAL DRILLER
- Directional Drillers are required to be competent in MWD/LWD



* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Mud Logging services could potentially reduce rig manning by **67% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow Data Analysts offsite to monitor and support Mud Loggers at the wellsite

INCREASED WORK SCOPE OF RIG PERSONNEL
- Support from rig personnel for sample collections during drilling operations

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Drilling Activities

Drilling Fluids	Current	Phase 1 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	2	2	1	1
	↓50%			
Well Site	ME	ME	ME	ME
Remote Centre**	ME	ME	ME	ME

Mud Engineer

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Drilling Fluids services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of automation technology to measure mud rheology
- Use of remote operations technology to allow Mud Engineer at remote centre to monitor and advise onsite operations

RE-SKILLING OF RIG PERSONNEL
- Support from rig personnel to assist Mud Engineers in operating and maintaining real time mud rheology testing ‘ equipment

Solids Control	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	4	3	2	1
	↓75%			
Well Site	SC H	SC H	SC H	SC H
Remote Centre**	SC H	SC H	SC H	SC H

Solids Control Engineer Helper

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Solids Control services could potentially reduce rig manning by **75% within a 12-month period**. The key factors to contribute to this reduction are:

RE-SKILLING OF RIG PERSONNEL
- Support from rig personnel to operate and maintain the equipment during drilling operations

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Drilling Activities

Cementing	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	3	2	2	1
	↓67%			
Well Site	Cem H	Cem H	Cem H	Cem H
Remote Centre**	Cem H	Cem H	Cem H	SME H

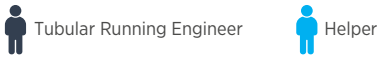
* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Cementing services could potentially reduce rig manning by **67% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow Subject Matter Experts offsite to monitor and support the Cementer personnel at the wellsite

INCREASED WORK SCOPE OF RIG PERSONNEL
- Support from rig personnel during cementing operations

Casing Running (TRS)	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	6	3	3	2
	↓67%			
Well Site	TRE H	TRE H	TRE H	TRE H
Remote Centre**	TRE H	TRE H	TRE H	TRE H



* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Casing Running (TRS) services could potentially reduce rig manning by **67% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Mechanised make-up and evaluation systems allowing autonomous and consistent make up connections

INCREASED WORK SCOPE OF RIG PERSONNEL
- Support from rig personnel casing handling during operations

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Drilling Activities

Wellhead	Current	Phase 1 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	2	2	1	1
Well Site	WH	WH	WH	WH
Remote Centre**	WH	WH	WH	WH

↓50%

Wellhead Engineer

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Wellhead services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

RE-SKILLING OF RIG PERSONNEL
- Support from rig personnel during operations

Electric Line	Current	Phase 1 3 Months	Phase 2 6 Months	Phase 3 12 Months
Well Site Footprint	8	7	7	6
Well Site	WE CC EO	WE CC EO	WE CC EO	WE CC EO
Remote Centre*	WE CC EO	WE CC EO	WE CC EO	WE CC EO

↓25%

Wireline Engineer Crew Chief Equipment Operator

* The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Electric Line services could potentially reduce rig manning by **25% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow Wireline Engineers to monitor, advise, and run the services offsite

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Mud Logging	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	4	3	2	2
		↓50%		
Well Site	DA ML SC	DA ML SC	DA ML SC	DA ML SC
Remote Centre**	DA ML SC	DA ML SC	DA ML SC	DA ML SC

Data Analyst Mud Logger

SC: Sample Catcher
** Operations will be supported by Rig Personnel from the drilling company*
*** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Mud Logging services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

COLLABORATION
- Synergy with DD/MWD/LWD service providers may result in further optimisation

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow experts to monitor and run the services offsite

INCREASED WORK SCOPE OF RIG PERSONNEL
- Support from rig personnel for sample collections during completions operations

Completions Fluids	Current	Phase 1 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	2	2	1	1
		↓50%		
Well Site	ME	ME	ME	ME
Remote Centre**	ME	ME	ME	ME

Mud Engineer

** Operations will be supported by Rig Personnel from the drilling company*
*** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Completions Fluids services could potentially reduce rig manning by **50% within a 12-month period**.

This activity involves the same personnel in the Drilling Fluids activity during Drilling phase.

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow Mud Engineer at remote centre to monitor and advise onsite operations

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Filtration	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	4	3	3	3
Well Site	FE H	FE H	FE H	FE H
Remote Centre**	FE H	FE H	FE H	FE H

↓25%

Filtration Engineer Helper

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Filtration services could potentially reduce rig manning by **25% within a 12-month period**. The key factors to contribute to this reduction are:

INCREASED WORK SCOPE OF RIG PERSONNEL
- Support from rig personnel during operations

Cementing	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	3	2	2	1
Well Site	Cem H	Cem H	Cem H	Cem H
Remote Centre**	Cem H	Cem H	Cem H	SME H

↓67%

Cementer Helper Subject Matter Expert

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Cementing services could potentially reduce rig manning by **67% within a 12-month period**. The key factors to contribute to this reduction are:

COLLABORATION
- Technical experts from contractor and customer could monitor operations in real time

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow Subject Matter Experts to monitor and advise the services offsite

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Tubular Running (TRS)	Current	Phase 1 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	6	6	4	4
	↓67%			
Well Site	TRE H	TRE H	TRE H	TRE H
Remote Centre**	TRE H	TRE H	TRE H	TRE H

Tubular Running Engineer Helper

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Tubular Running (TRS) services could potentially reduce rig manning by **67% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Mechanised make-up and evaluation systems allowing autonomous and consistent make up connections

INCREASED WORK SCOPE OF RIG PERSONNEL
- Support from rig personnel for casing handling during operations

Completions (Standalone Screen + Upper Completions)	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	4	3	2	2
	↓50%			
Well Site	CE CT	CE CT	CE CT	CE CT
Remote Centre**	CE CT	CE T	CE CT	CE CT

Completions Engineers Completions Technician

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Completions (Standalone Screen + Upper Completions) services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

RE-SKILLING OF COMPLETIONS ENGINEER AND RIG PERSONNEL
- Completions Engineer are required to take over the work scope of their technicians

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Gravel Pack (Pumping)	Current	Phase 1* 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	14	12	10	10
		↓29%		
Well Site	CE CT EO	CE CT EO	CE CT EO	CE CT EO
Remote Centre**	CE CT EO	CE CT EO	CE CT EO	CE CT EO

Completions Engineer Completions Technician Equipment Operator

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Gravel Pack (with Pumping) services could potentially reduce rig manning by **29% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of augmented reality enabled remote operations technology to allow experts to monitor and supervise the services offsite

INCREASED WORK SCOPE OF COMPLETIONS AND RIG PERSONNEL
- Support from rig personnel during operations especially for equipment rig up/down

Conformable Technology	Current	Phase 1 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint**	N/A	N/A	1	1
Well Site	CE CT EO	CE CT EO	CE CT EO	CE CT EO
Remote Centre***	CE CT EO	CE CT EO	CE CT EO	CE CT EO

Completions Engineer

* Operations will be supported by Rig Personnel from the drilling company
** This technology will be available for application from the 6th months onwards.
*** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Conformable Technology services could potentially Reduce rig manning by **92% within a 12-month period** as compared to the number of people required for Gravel Pack (Pumping) operations.

The key factors to contribute to this reduction are:

COLLABORATION
- Synergy with Upper and Lower Completions personnel

TECHNOLOGY APPLICATION
- New technology to replace Open Hole Gravel Pack system

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Wellbore Clean-Up	Current	Phase 1 3 Months	Phase 2 6 Months	Phase 3 12 Months
Well Site Footprint	2	1	1	1
Well Site	WC	WC	WC	WC
Remote Centre*	WC	WC	WC	WC

↓50%

Wellbore Clean-Up Engineer

** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Wellbore Clean-Up services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

COLLABORATION
- Synergy with Drilling Fluids personnel

Sickline	Current	Phase 1 3 Months	Phase 2 6 Months	Phase 3 12 Months
Well Site Footprint	4	3	3	3
Well Site	SS EO	SS EO	SS EO	SS EO
Remote Centre*	SS EO	SS EO	SS EO	SS EO

↓25%

Sickline Supervisor Equipment Operator

** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Sickline services could potentially reduce rig manning by **25% within a 12-month period**. The key factors to contribute to this reduction are:

UPSKILLING OF EQUIPMENT OPERATORS
- Increasing competency of Equipment Operators to compensate lesser supervisors on-board

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Well Testing	Current	Phase 1 3 Months	Phase 2 6 Months	Phase 3 12 Months
Well Site Footprint*	16	14	14	12
Well Site	TS CO EO DA SS TP	TS CO EO DA SS TP	TS CO EO DA SS TP	TS CO EO DA SS TP
Remote Centre**	DA	DA	DA	DA

↓25%

Well Test Supervisor · Chief Operator · Equipment Operator · Data Acquisition Specialist · Sampling Specialist · Third Party Personnel

* The number of personnel may vary based on equipment layout and well test types (flow back, full well test with/without flaring)
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

Well Testing services could potentially reduce rig manning by **25% within a 12-month period**. The key factors to contribute to this reduction are:

TECHNOLOGY APPLICATION
- Use of augmented reality enabled equipment and/or remote operations centre to allow experts to monitor and supervise the services offsite

Wellhead / Christmas Tree	Current	Phase 1 3 Months	Phase 2* 6 Months	Phase 3* 12 Months
Well Site Footprint	2	2	1	1
Well Site	WH	WH	WH	WH
Remote Centre**	WH	WH	WH	WH

↓50%

Wellhead Engineer

* Operations will be supported by Rig Personnel from the drilling company
** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup

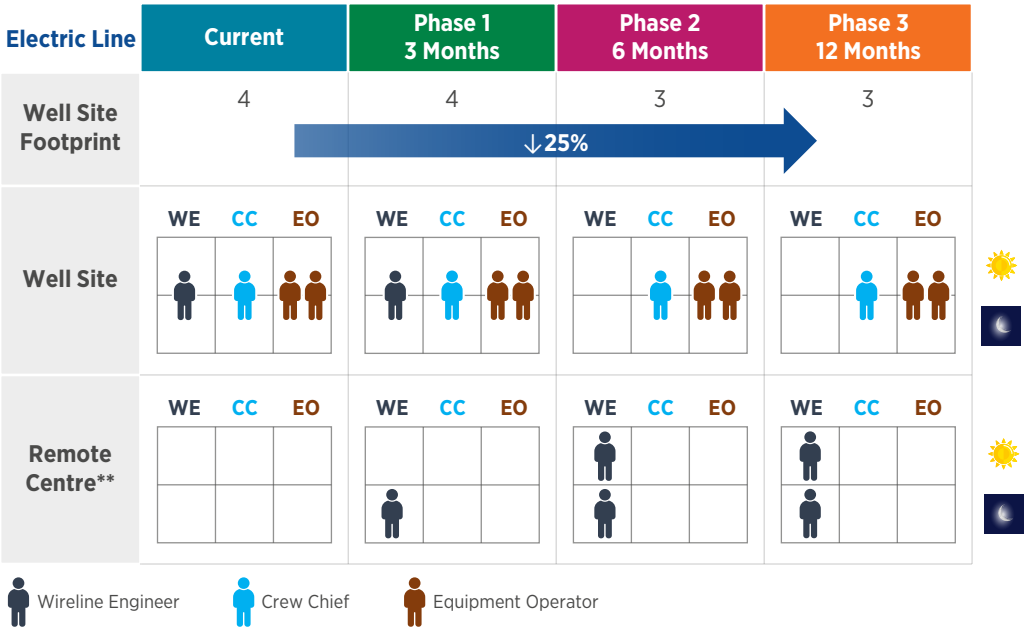
Wellhead / Christmas Tree services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

RE-SKILLING OF RIG PERSONNEL
- Support from rig personnel during operations

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

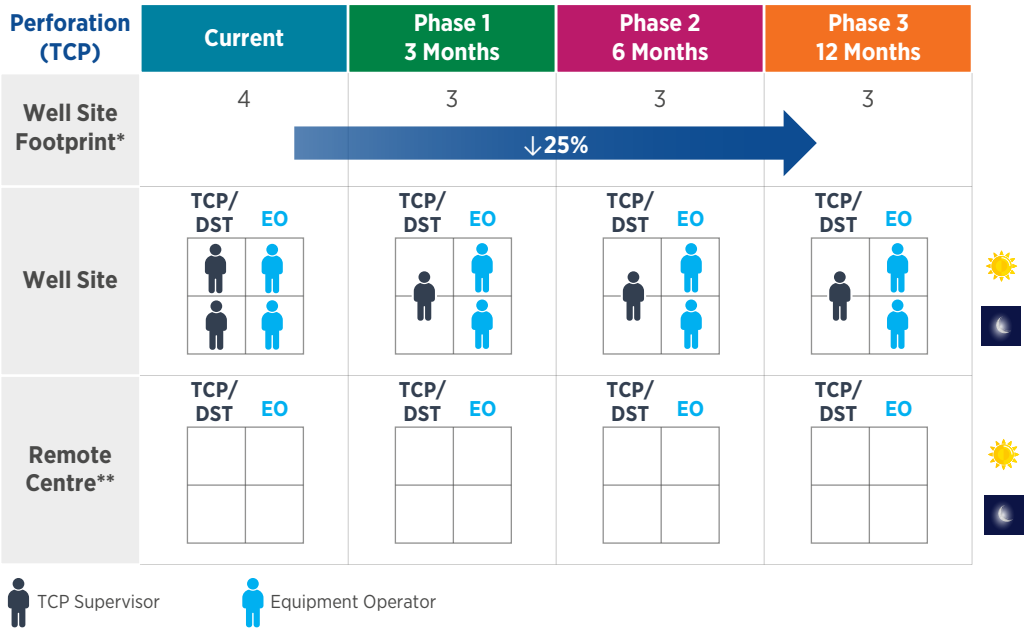


** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Electric Line services could potentially reduce rig manning by **25% within a 12-month period**. The key factors to contribute to this reduction are:

COLLABORATION
- Technical experts from contractor and customer could monitor operations in real time

TECHNOLOGY APPLICATION
- Use of remote operations technology to allow Wireline Engineers to monitor, advise, and run the services offsite



** Types of personnel reduction may vary depending on TCP job type (with or without DST) and length of perforation interval*
*** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Perforation (TCP) services could potentially reduce rig manning by **25% within a 12-month period**. The key cfactors to ontribute to this reduction are:

UPSKILLING OF EQUIPMENT OPERATORS
- Increasing competency of equipment operators to compensate lesser TCP Specialist on-board

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Illustration of Manning Reduction in Phases

Completions Activities

Liner Hanger	Current	Phase 1 3 Months	Phase 2 6 Months	Phase 3 12 Months
Well Site Footprint	2	1	1	1
Well Site	LH	LH	LH	LH
Remote Centre*	LH	LH	LH	LH

↓50%

Liner Hanger Engineer

** The Remote Centre personnel covers multiple projects in single or multiple countries; therefore, the net number of personnel required per project is lower than the total number in the current setup*

Liner Hanger services could potentially reduce rig manning by **50% within a 12-month period**. The key factors to contribute to this reduction are:

INCREASED WORK SCOPE OF LINER HANGER ENGINEER

- Requires extensive planning to ensure liner hanger timing suits a single shift personnel

Note: *The crew reduction shown in these illustrations is not limited to the solutions presented in this series*

Solution Enablers

1 Case Study: Operator's Experience

Excellent Remote Operations Support to Assure Wellsite Operations Despite Logistic Challenges

By PT PERTAMINA Hulu Sanga Sanga

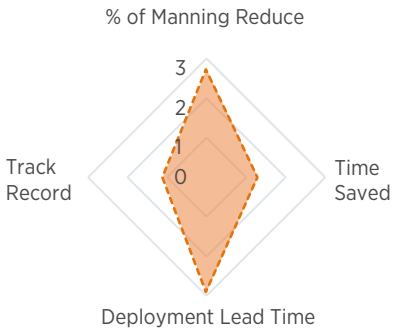
Summary

COVID-19 pandemic has escalated very rapid globally. To prevent the spread of the virus, the Indonesia government has started to implement large-scale social restrictions (semi lockdown), exert their focus on applying social distancing in large groups, and halting transportation modes to prevent mass movement from point to point. Travel restrictions declared on April 2020 was a tipping point for every sector, especially the Oil and Gas industry.

The pandemic has been pushing us, PHSS, to initiate flexible contingency plans that could reduce or even prevent human exposure to the virus, while maintaining the tap running to ensure demands still can be met.

When we were about to begin a three-rig drilling operation simultaneously, crew optimisation through Remote Operations was introduced and has become the solution to avoid any operation disruptions.

Radar Map



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2 Case Study: Operator's Experience

A Digital Approach to Well Design

By PTTEP and Halliburton

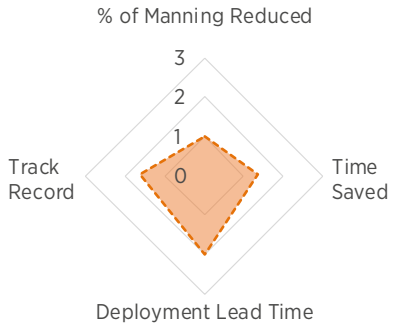
Summary

One of the building blocks of the 'Digital Twin' concept for well construction is the digitalisation of the well design process. The process involves various stakeholders such as geoscientists, drilling engineers, field engineers, and asset managers. Several tasks associated with well design require significant manual effort, which is both time consuming in terms of the design iterations and approvals and increases the potential for human error.

In order to address these challenges, the digital well delivery process solution has been implemented to integrate, automate and standardise the well planning and design process across Company P.

The system encompasses the end-to-end well design workflow from feasibility study, concept selection and detailed design to create a 'living' digital well programme. It is built on a single, integrated platform, customised for Company P's standards and procedures.

Radar Map



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% of Manning Reduction	Deployment Leadtime	Integration Level	Time Saved
1: 10%	1: 12 Months	1: High	1: <10%
2: 20%	2: 6 Months	2: Medium	2: +10%
3: 30%	3: 3 Months	3: Low	3: +20%

Solution Enablers

3 Case Study: Operator's Experience

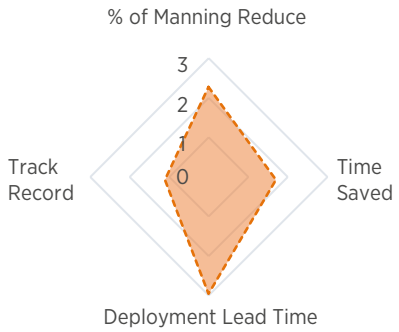
Embracing New Norms: When Remote Operation Becomes Essential for PETRONAS Subsea Wells Plug and Abandonment (P&A) Operation

By PETRONAS Carigali Sdn Bhd

Summary

During the P&A operation, Downhole Electrical Cutting Tool (DECT) was used to cut the 7-5/8" production tubing remotely. Real time supervision was conducted by the specialist who supervised and monitored the tubing cut operation real time remotely from town. In total, the team performed 7 tubing cut operations successfully via remote operation. Post tubing cut verification (log) indicated that the tubing cut operation was successful. The remote operations allowed the tubing cut operations to be conducted without having to resort to rig suspension due to personnel unavailability, generated cost savings nearly USD 5 million.

Radar Map



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4 Case Study: Operator's Experience

World First Remote Monitoring of Gravel Pack Surface Equipment Rig Up on Offshore Rig for Field A; Setting a New Precedent in Industry

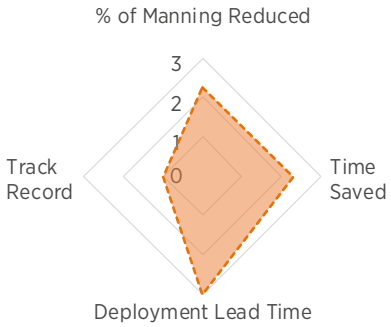
By PETRONAS Carigali Sdn Bhd and Halliburton

Summary

Field A is a mature hydrocarbon producing field located in east Malaysia that begun production in 1968. With multi-stacked reservoirs between the heights of 4000 – 8000 feet, the reservoirs are predominantly unconsolidated requiring sand exclusion since beginning. Most of the wells in the field were completed with Internal Gravel Pack (IGP) for the main reservoir, especially the shallower reservoirs. With these shallower reservoirs being continuously targeted as good potentials, the challenge of achieving a sustainable sand control solution presents itself. The well was planned to be completed with the sand consolidation system as the sand control measure.

Nevertheless, from March 2020, the Government of Malaysia imposed the Movement Control Order (MCO) which restricts interstate movement within the country, as well as international movement. The order was imposed in the middle of the drilling campaign of Field A redevelopment. This resulted in huge challenges as personnel needed to be mobilised from all over Malaysia to the mobilisation point in Miri, Sarawak, prior to going offshore.

Radar Map



% of Manning Reduction	Deployment Leadtime	Integration Level	Time Saved
1: 10%	1: 12 Months	1: High	1: <10%
2: 20%	2: 6 Months	2: Medium	2: +10%
3: 30%	3: 3 Months	3: Low	3: +20%

Solution Enablers

5 Connectivity Enablers

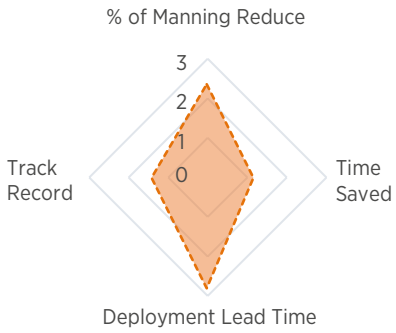
Digital Transformation for the Connected Worker

By RealWear and Resources2 Energy

Summary

Remote video enables remote coaching/training and support thus reducing the number of expert personnel required at the rig site. This intrinsically safe wearable device responds to audio commands, and has noise cancellation and displays designed for outdoor and hazardous area use. Options for adding AR overlays exist. RealWear remote video provides flexibility to be deployed at any location on the rig, enabling remote support for many different activities. Required manpower should be assessed in line with this technology to determine best use cases for different scopes and enable a functional operation with minimal onsite crew.

Radar Map



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6 Connectivity Enablers

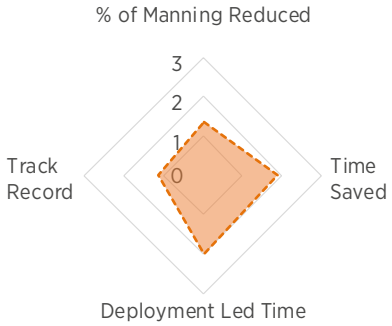
Edge Device for Drilling Fluids Data Transmission

By M-I SWACO, A Schlumberger Company

Summary

The Edge Device for Drilling Fluids uses sensors to automatically take measurements of mud conditions at the rigsite, generate reports, and is capable of performing advanced analytics on the readings. This ultimately enables better data quality, as well as the movement of one drilling fluids engineer from the rigsite to a remote location. Currently this system has been deployed in multiple regions around the globe.

Radar Map



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Solution Enablers

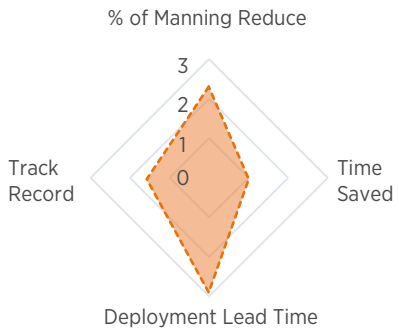
7 Connectivity Enablers

Augmented Reality Solution for Remote Operations
By Tienovix Oilfield Technologies

Summary

Augmented Reality Solution for Remote Operations is a standalone system that can be donned by rig personnel and connect with shore-based personnel enabling remote support and thus reducing the number of expert personnel required at the rig site. Suitable for service company, operator, and drilling contractor crews, this intrinsically safe device provides flexibility for deployment anytime, anywhere, and has been previously used in a case study offshore. The capability of AR overlays provides opportunities to further assist the rig crew without the use of remote support. Required manpower should be assessed in line with this technology to determine best use cases for different scopes and enable a functional operation with minimal onsite crew.

Radar Map



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8 Drilling

Integrated Remote Operations, Machine Learning, and Drilling Automation at the Edge
By Halliburton

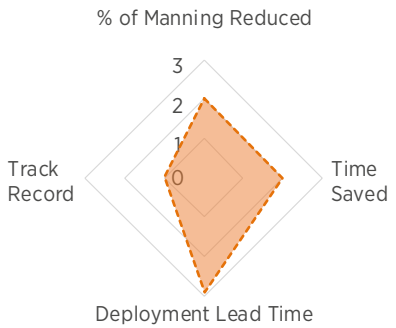
Summary

The solution showed how transformative edge technologies have been used to transform well plan, design and execution into a unified process that interoperates and automates across both remote operations and the drilling rig system.

Built on a modern platform that extends cloud capabilities to the wellsite, Edge technologies have been extended to create a well site IOT HUB that combines all of the syntactic, semantic and process data from planning, remote operations, wellsite advisory services and the drilling rig itself. Additionally, it was demonstrated how an open architecture system has enabled us to close the loop with the drilling rigs operating system and enable plug and play integration and automation of any combination of any application or service and from any company.

Case studies were shared on how this solution demonstrated the material value and effectiveness that operators have achieved from implementation of the edge system as part of a modernised operating model for well construction.

Radar Map



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Solution Enablers

9 Drilling

Implementation of Digital and Automation Technologies to Enable a Step Change in Operational Efficiencies Onsite and Remote

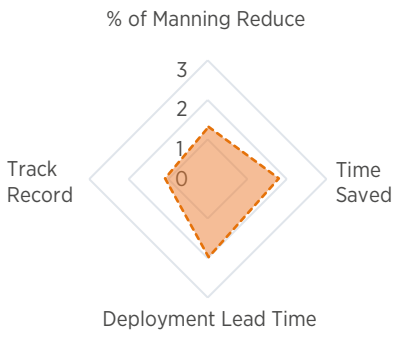
By Schlumberger

Summary

In the past several years, our world has been reshaped by the adoption of more and more digital and automation technologies as a consequence of the intrinsic value they deliver to our lives and productivity. If applied correctly, these technologies can also reshape and transform the way we operate in our industry, help us overcome the performance inconsistency experienced throughout projects and deliver new levels of operational efficiency.

This solution briefly described the use of AI technology in the digitisation and automation of drilling workflows as well as the collaborative deployment process (including the change management both from a technical and commercial perspective) it must go through to guarantee a successful adoption and delivery of the expected value as experienced in recent applications. An overview was shared of how these technologies are evolving to target additional workflows and enable an optimal execution of operations including remote drilling. The value creation comes in several areas that go from safety, consistency and standardisation, NPT reduction and performance improvement.

Radar Map



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10 Drilling

How Does 75% Less Sound? Driving Change with DD and MWD Remote Operations

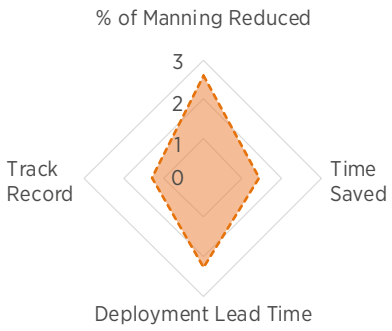
By Schlumberger

Summary

Directional Drilling (DD) and Measurement While Drilling (MWD) services have historically been run with crew sizes of up to six people. Advances in downhole tool technology and acquisition software have allowed that number to be reduced and the industry has settled on a four person well site crew to provide 24hr coverage for DD and MWD services. Whilst there is scope to reduce the crew size further by utilising only the well site crew, this is limited to simple trajectories, typically vertical wells, and basic logging services up to gamma ray and resistivity: any more complicated trajectory or service can result in the crew being overwhelmed and fatigued, significantly increasing the risk of an HSE or SQ incident. To achieve the next step change reduction in DD/MWD crew size, tasks which were traditionally completed at the well site must be transferred off the rig to be done remotely.

By implementing remote operations, the crew size can be reduced by up to 75% following a phased approach, this is the objective of DD/MWD remote operations.

Radar Map



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Solution Enablers

11 Drilling

The Well Construction Digital Twin and its Application to Increase Remote Operations and Automation

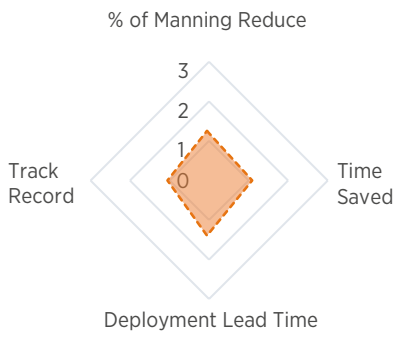
By Halliburton

Summary

The concept of integrated oil and gas Digital Twin is at the heart of the industry's vision to enable remote and automated drilling operations. The digital twin, particularly as it applies to drilling, provides a digital representation of the well construction process, from well planning, design to execution. One of the key objectives of such an implementation is to reduce manual effort, to provide the workforce with all the required data and information at their fingertips and to enable them to focus on high-value activities and tasks such as critical decision-making to mitigate risks, maximise reservoir contact and achieve repeatable drilling performance.

Integrating with supply chain and operations management, a digital framework enables optimisation of the well construction process by learning, predicting and adjusting drilling activities with minimum human intervention, to drill high quality wells in a faster, safer and more efficient manner.

Radar Map



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12 Drilling

Journey Towards Remote Drilling Operations

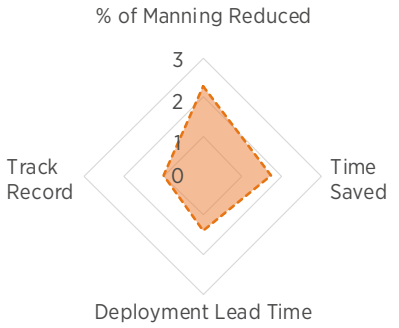
By National Oilwell Varco

Summary

In the past several years, the drilling industry has embarked in the automation journey with gradual adoption of automated systems resulting in multiple documented case studies reporting high operational consistency with industry best performance indicators. These case studies are important to demonstrate the business case benefits in the short-term; however, the industry must see this as only the first step in a long journey towards remote drilling operations. This presentation explores a high-level technology roadmap and implementation progress from an OEM perspective and with an end goal of remote drilling operations. It also focuses on the progress achieved in technology gaps already identified including automation software, advanced sensors, robotics and situational awareness.

Going from status-quo to remote drilling operations will not happen overnight through a "breakthrough" technology. This is particularly true with the current market outlook requiring new technology be compatible with existing drilling equipment. In order to focus technology development efforts that will lead to remote drilling, a holistic gap analysis of processes and activities within a drilling rig needs to be performed as a collaborative effort between the operator, drilling contractor and service companies.

Radar Map



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Solution Enablers

13 Drilling

i-Trak Drilling Automation Improves Drilling Efficiency and Reduces Downtime

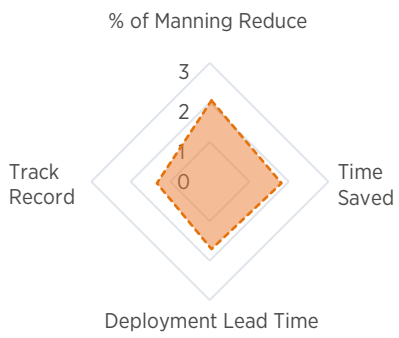
By Baker Hughes

Summary

i-Trak Drilling Automation is a service with several applications ready to deploy today, with many more applications currently in development. As of today, it is capable of steering a well (calculating distance from well plan and sending downlinks to correct course) completely on its own, plotting high-frequency data on T&D broomstick charts, and utilising real-time engineering calculations to improve hole cleaning and advise tripping speeds in order to improve efficiencies, prevent events, and reduce NPT. This results in reduced risk to personnel at the rigsite due to downhole problems, and automates menial tasks to allow personnel to focus more on risk management and performance optimisation, as well as enable remote operations and associated reduction in HSE risks and costs. Implementation requires thorough understanding of the system by the FSE on rigsite, and agreement with the customer and rig crew to act on the output of the system.

Implementation requires the deployment of a single computer to the rigsite, which is set up in the MWD cabin, and ideally connected to the rig system (for highspeed data from rig sensors). i-Trak also has been an enabler for the remote operating model used in Europe.

Radar Map



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14 Drilling

The First Transformation of Real-Time Operations (RTOC) to Remote Monitoring Facility during Unprecedented Covid-19 Pandemic

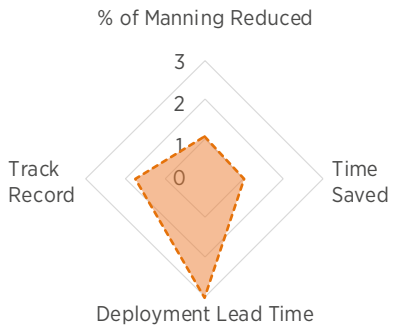
By EFTECH Drilling Solutions

Summary

Real-time monitoring services are no longer foreign to offshore oil and gas operations. A Real-Time Operation Center (RTOC) has always been the pride of an operator as it is the heart of drilling operations. Typically, RTOC is equipped with sophisticated and high technology software and hardware, with the idea of gathering people under one roof for collaborative discussion. However, the recent unprecedented COVID-19 pandemic has shifted how an RTOC operates, accelerated the needs to incorporate remote operation, and connecting in virtual space to stay ahead of the game. We have witnessed how COVID-19 has created a new norm transforming the way we operate on a daily basis.

Within a few weeks, the number of COVID-19 cases in Malaysia has spiked and became a major threat to the safety of the people. When it comes to total lockdown, almost all economic activities were shut down including offices and Real-Time Centre located at the operators' building. Taking into consideration the importance of having zero Non-Productive Time (NPT) and zero tolerance for people's safety, EFTECH Drilling Solutions (EDS) as the local RTOC service provider together with the Oil & Gas operators performed risk assessment and set the Management of Change to address and react to this unprecedented situation.

Radar Map



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Solution Enablers

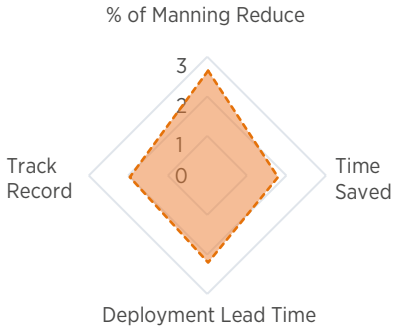
15 Completions
Vero Automated Connection Integrity
By Weatherford

Summary

Automation during tubular-running operations is paramount to enhancing wellbore integrity through consistent, accurate, safe and fast pipe makeup.

A new automated system combines a hydraulic tong with an onboard computer that includes connection makeup evaluation software. The system-mounted computer monitors several parameters and proactively adjusts the outputs to achieve accurate and consistent torque results with each connection. Using the recorded high-resolution data from the makeup, the computer then autonomously appraises the results for conformance with OEM criteria. By utilising computer control for these processes, the solution eliminates human factors that could both waste rig time and jeopardize well integrity.

Radar Map



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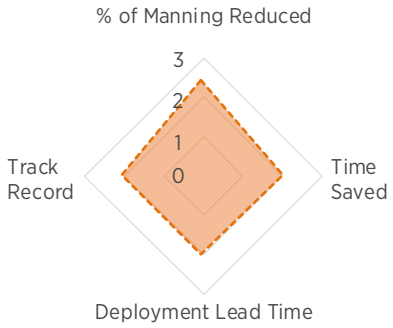
16 Completions
Single Trip Completion Enabled by Conformable Sand Control System Combined with the Multi-Tasking Valve
By Baker Hughes

Summary

As part of reducing rig site manning via remote operations and automation for completing a traditional upper and lower completion, a Single Trip Completion Solution has been introduced that leverages the conformable sand control system technology combined with the multi tasking valve (MTV).

The conformable sand control system technology offers an alternative to conventional open hole gravel pack by providing an equivalent and in most cases, superior performance. Compared to a conventional open hole gravel pack operation, the conformable sand control system is run like a standalone screen without the personnel, logistics and complex requirement for pumping the slurry/gravel at the rig site.

Radar Map



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Solution Enablers

17 Completions

Efficiency, Autonomy, Reliability - The Promise of Electric Completions. It is 2020 – How Are We Doing?
By Schlumberger

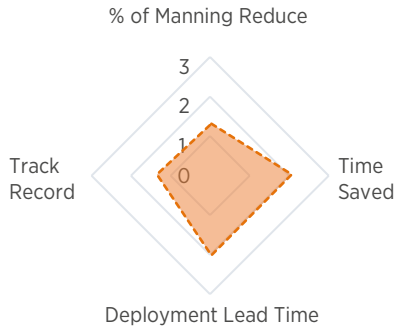
Summary

The industry has been dipping its toes into "electrification" through intelligent completions. With the reliability of downhole electronics now fully accepted, the industry is moving electric and starting to adopt higher levels of control and surveillance as a result.

The integrated flow surveillance and infinite resolution inflow control offers unprecedented insights to production engineering and operations, radically improving the efficiency in asset management, reliability and speed of reaction to reservoir uncertainty.

The ability to deploy such capability in single or two trip completions with robust fully metal enclosed downhole electrical connector simplifies, speeds up the installation and reduces personnel on board and complexity.

Radar Map



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18 Completions

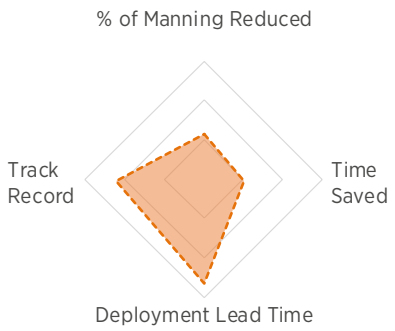
Optimisation of Cementing Operations Through Real-Time Monitoring and Evaluation Combined with Remote Expert Support
By Schlumberger

Summary

Cementing is a critical aspect of well operations considering that every cement job involves placement of a well barrier. The primary objective of cement is zonal isolation.

A new software tool enables evaluation of the cement while it is being placed in the well. The tool incorporates simulation models which help to predict unstable wellbore conditions. This allows implementing corrections on-the-fly to reduce the impact of such conditions in zonal isolation. This process enhances operational efficiencies by providing critical information in real-time enabling control of the cementing operation to reduce the risk of costly errors and assure long-term well integrity. This translates into reduction in total cost of ownership.

Radar Map



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Solution Enablers

19 Completions

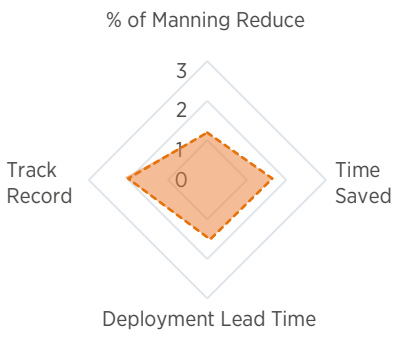
Two-Way Acoustic Telemetry for Completion Installation, Control, and Monitoring
By Halliburton

Summary

While current completion methods have been successful using pressure and applied mechanical loads to actuate tools, there are certain scenarios where operations are difficult to execute and it can be challenging to confirm that a piece of equipment has functioned as desired.

Technological advances are enabling the completion phase of well construction to evolve from interpreting surface-measured pressure and load charts to more direct communication for determining downhole activity and well bore conditions. Bi-directional acoustic telemetry provides a method for communicating with downhole tools in real-time, where commands can be given to trigger an operational activity in lieu of traditional mechanical means, such as dropping a ball and building pressure, and in addition receive feedback that the activity has occurred.

Radar Map



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20 Completions

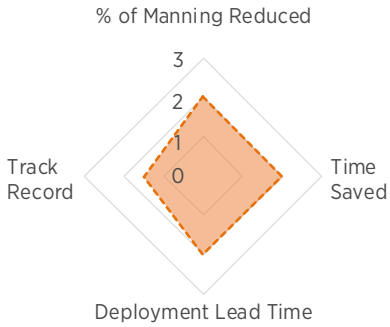
Automation Implementation of Intelligent Completion Operations for Production or Injection Optimisation
By Baker Hughes

Summary

Reducing rig site manning via remote operations and automation have been the goal of the Oil and Gas sector for many years, but despite many false dawns, the remote operations and automation future appears to be as close as ever. The COVID-19 pandemic situation, with all its consequences in travel restrictions, HSE concerns and a very long etcetera, market situation and the advancement in technology - cloud platform, analytics and computing power - and the advances in Intelligent Completion technology - all electric completions intelligent completions, advanced electronics and fiber optics well monitoring - have accelerated the adoption of remote operations and field automation.

Baker Hughes advance technology enhance remotely operate Intelligent Completion Hydraulic ICVs (HCM-As) and provide real time downhole pressure temperature monitoring through real time HMI platform. This real time system being remotely actuated avoiding personnel mobilisation to the wellsite.

Radar Map



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Solution Enablers

21 Asset Integrity

Remote Asset Integrity 4.0

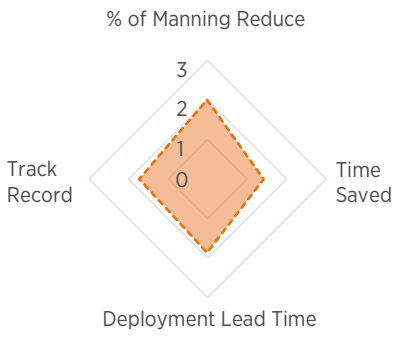
By INERTIA

Summary

INERTIA's Remote Asset Integrity 4.0 solution provides services to guarantee the integrity of assets, personnel, and the environment. This solution also allows continuous improvement of productive assets and a comprehensive solution across the entire value chain. The Remote Asset Integrity methodology is based on the utilisation of resources present on site to perform tasks that are normally carried out by external resources when following conventional methods.

- HSE performance improvement
- Deployment within a maximum of 12 months
- Risk assessment
- Change management
- Operational efficiency
- Integration with solution providers
- Return of Investment
- Lowering training-to-field requirement
- Carbon footprint reduction

Radar Map



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Looking Into the Future

This blueprint focuses on immediate and actionable solutions based on our current situation. With the cost of full-scale rig automation still relatively high, the bulk of the effort is on remote supervision and shifting of work scope to rig personnel.

Moving forward, the scope of automation needs to be expanded to achieve the next step change in safety, performance, and carbon emission. Risk appetite and general acceptance towards full automation is expected to increase, with the advent of AI and Machine Learning becoming the next game changer in improving the sophistication and effectiveness of rig site automation.

While the technology will eventually mature, the industry would also need to focus on business enablers. With remote operations and automation becoming more widespread, innovative business solutions may soon become a necessity to overcome new challenges such as legal liabilities, win-win contracting models, and effective risk management.

Ultimately, the industry today need to embrace remote operations and automation, not just for HSE and cost reduction, but also as a key enabler to reduce carbon footprint in drilling operations. With our journey just beginning, this blueprint will set us onto a path of continuous improvement, and endless opportunities for us to realise a safer and more sustainable tomorrow.

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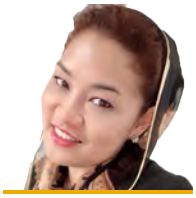

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