



Good morning Ladies and Gentlemen.

Let me start by thanking Scotia Howard Weil and Bill Sanchez in particular for the invitation to speak here today. I always enjoy coming back to New Orleans and participating in this conference.

This morning I will cover four topics that we believe are critical for the industry to restore its strength and advance its capabilities after one of the most devastating downturns on record.

First, is the need for higher E&P spending to meet growing hydrocarbon demand over the coming years.

Second, the need to protect and encourage continued investments in research and engineering (R&E) throughout the entire oil and gas value chain.

Third, the need for new business models that foster closer technical collaboration and commercial alignment between operators and the supplier industry.

And fourth, is the need for broader and more integrated technology platforms capable of delivering revolutionary improvements to system performance by replacing the fragmented and evolutionary technologies of today.

Over the past couple of years, I have spoken regularly about the importance of these subjects so in some ways today's agenda items are not new. However, given the importance we put on these topics we are doing more than just talking

about them. We continue to monitor the underlying industry trends relating to these topics and today I will share with you our latest analysis and what the implications are for Schlumberger.

We are also actively positioning Schlumberger in the forefront of these trends by responding to the ongoing pressures of commoditization and by actively expanding our opportunity set in a period where the industry in many ways lacks overall direction. In this respect I will also provide an update on what we are doing to navigate the challenging industry landscape by leveraging the size of our global footprint, the unique capabilities of our workforce, and most importantly the willingness and appetite we collectively have to think new and to act new.

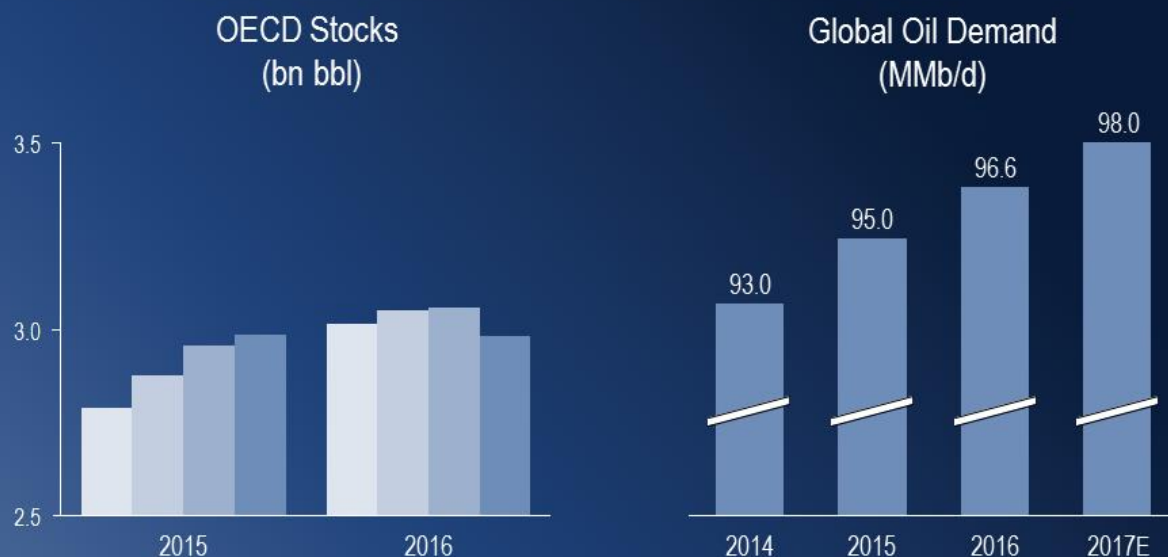
This presentation contains "forward-looking statements" within the meaning of the U.S. federal securities laws — that is, statements about the future, not about past events. Such statements often contain words such as "expect," "may," "believe," "plan," "estimate," "intend," "predict," "anticipate," "should," "could," "will," "see," "likely," and other similar words. Forward-looking statements address matters that are, to varying degrees, uncertain, such as statements about our financial and performance targets and other forecasts or expectations regarding business outlook, including in North America land; growth for Schlumberger as a whole and for each of its Groups and segments (and for specified products or geographic areas within a segment); oil and natural gas demand and production growth; rig count; oil and natural gas prices; improvements in operating procedures and technology; capital expenditures by Schlumberger and the oil and gas industry; the business strategies of Schlumberger's customers; targeted mergers and acquisitions; the success of Schlumberger's joint ventures and alliances, including the Weatherford joint venture; the anticipated benefits of our transformation efforts; future global economic conditions; and future results of operations. These statements are subject to risks and uncertainties, including, but not limited to, global economic conditions; changes in exploration and production spending by Schlumberger's customers and changes in the level of oil and natural gas exploration and development; demand for our integrated services and new technologies; the inability to reduce the cost-per-barrel of hydrocarbon developments; Schlumberger's future cash flows; the success of Schlumberger's transformation efforts; general economic, political, security and business conditions in key regions of the world; country risk; pricing erosion; foreign exchange rates; weather and seasonal factors; operational modifications, delays or cancellations; production declines; changes in government regulations and regulatory requirements, including those related to offshore oil and gas exploration, radioactive sources, explosives, chemicals, hydraulic fracturing services and climate-related initiatives; the inability of technology to meet challenges in exploration and production; the inability to realize expected value from SPM and other projects; the inability to realize expected benefits from the Weatherford joint venture, the inability to retain key employees; and other risks and uncertainties detailed in our most recent Forms 10-K, 10-Q, and 8-K filed with or furnished to the U.S. Securities and Exchange Commission. If one or more of these or other risks or uncertainties materialize (or the consequences of such a development changes), or should underlying assumptions prove incorrect, actual outcomes may vary materially from those reflected in our forward-looking statements. The forward-looking statements speak only as of the date of this presentation, and Schlumberger disclaims any intention or obligation to update publicly or revise such statements, whether as a result of new information, future events or otherwise.

But, before we begin let's get the formalities out of the way.

Some of the statements I will make today are forward-looking. These statements are subject to risks and uncertainties that could cause our results to differ materially from those projected in these statements.

I therefore refer you to our latest 10-K and other SEC filings.

Supply-Demand Gap is Tightening



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Source: IEA

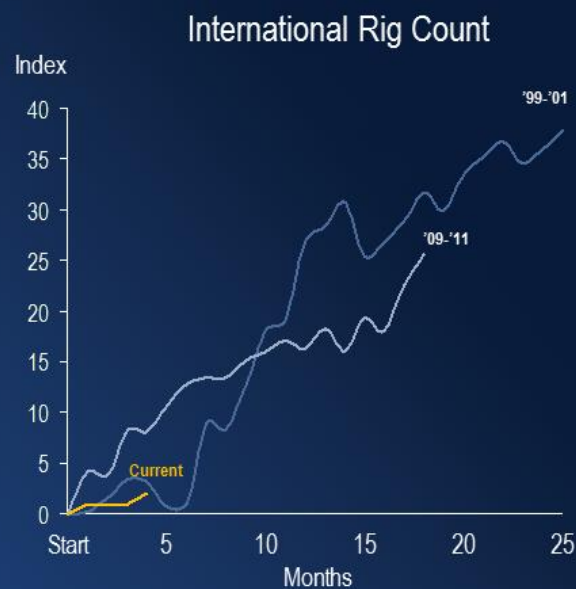
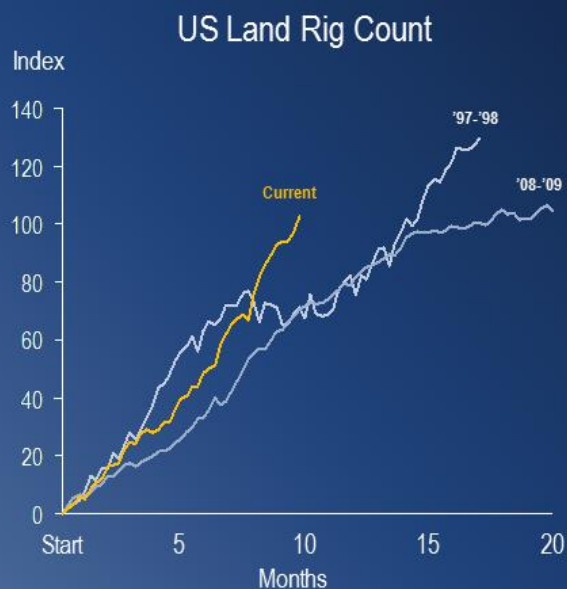
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So let's first discuss the need for higher E&P spending to meet the growing hydrocarbon demand.

Over the past year, we have maintained our constructive view of the oil market, which is supported by the fall in OECD oil stocks that began in July of 2016. At present OECD stocks are around 3 billion barrels as demand remains strong and supply has levelled off through a combination of lower oilfield activity and production cuts from both OPEC and key non-OPEC countries. The reporting agencies continue to increase their global demand growth estimates, which now stand between 1.0 and 1.5 million barrels per day for 2017 and the following years.

So far this year, Brent prices have oscillated between 50 and 55 dollars per barrel as the record OPEC production from the fourth quarter of last year works its way through the global distribution system, and as the market awaits the inventory impact from the recent production cuts.

North America Land is Leading the Recovery



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Source: Baker Hughes, Bardsley, Schlumberger Analysis

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At present the only region in the world showing clear signs of increased activity and investment compared to 2016 is North America land where E&P operators appear unconstrained by a sixth year of negative free cash flow.

Assuming the strong growth in North America land activity continues, US crude production is set to increase in 2017 and in the years to come, however, it is unlikely that North American unconventional production alone can address the emerging global supply deficit for the following three reasons:

First, the full-cycle financial viability outside the Tier 1 acreage continues to be challenging and the industry balance sheets and cash flows are attracting more focus from both lenders and private equity players.

Second, while the E&P operators rightfully state that break-even costs have come down significantly over the past couple of years, there is an impending cost inflation avalanche coming from the service industry, which continues to operate at unsustainable pricing levels. This inflation will ultimately end up in the financial results of the E&P operators.

Third, if the only source of global production growth in the coming years ends up being the ultra-light crude from North American unconventional basins like the Permian, this will likely create an oversupply of light oil and a shortage of the heavier crudes required for refinery blending.

This could result in a widening spread between Brent and WTI prices and potentially another financial headwind for the North America land operators.

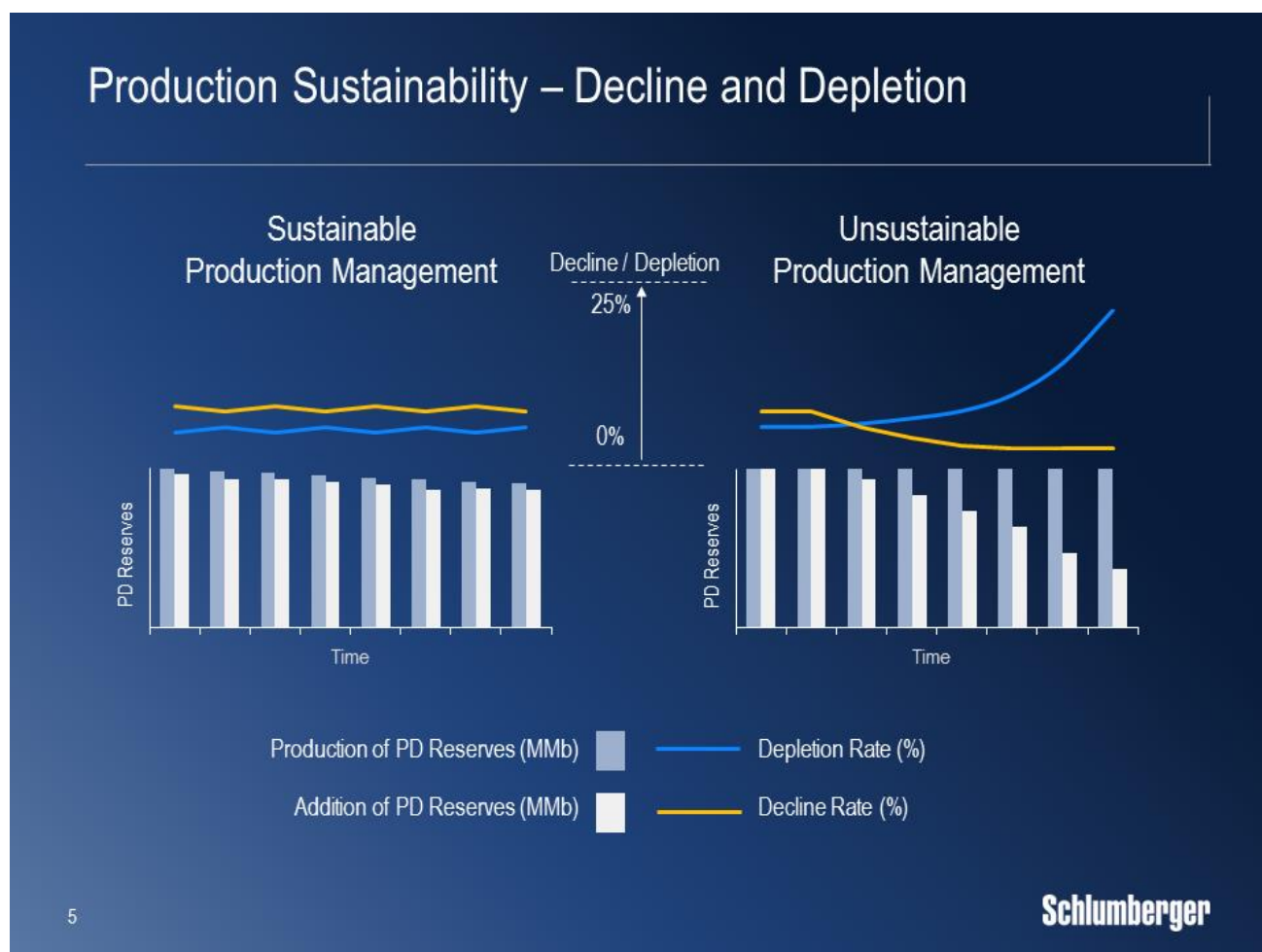
Globally, we are at this stage expecting a third year of significant under-investment outside the Middle East, Russia, and North America land.

The 2017 E&P spend for this part of the global production base, which still makes up around 50 million barrels-per-day of production is expected to be down 50% compared to 2014. At no other time in the past 50 years has our industry experienced cuts of this magnitude and this duration.

While the market continues to focus on the headline numbers which suggest that production is holding-up well even in the third successive year of underinvestment, a closer look at the underlying data reveals that the current situation is not sustainable.

A complete picture of the sustainability of supply can only be established by analyzing the interplay between production rates reserves replacement and decline-and-depletion rates.

We have done this analysis so let me next share our findings.



First of all, traditional stewardship of conventional oil fields is based on a continuous investment cycle that aims to replenish, as much as possible, the reserves that are being produced until the resource base is drained and the field is abandoned. This cycle starts with increasing the reserve base through additional exploration activity thereby moving contingent and prospective resources to reserves.

Following this, the reserves are moved to the proven category from probable or possible reserves through further appraisal delineation and development activity.

The proven developed reserves are the source of ongoing production, and the investments in each step of the replenishment cycle are essential to maintain the long-term production potential of the system.

Two important indicators describe the state of the production system in any field or basin.

The decline rate measures the percentage drop in production volumes year-over-year and this rate can be minimized by either adding production capacity through E&P activity or by producing the existing wells harder.

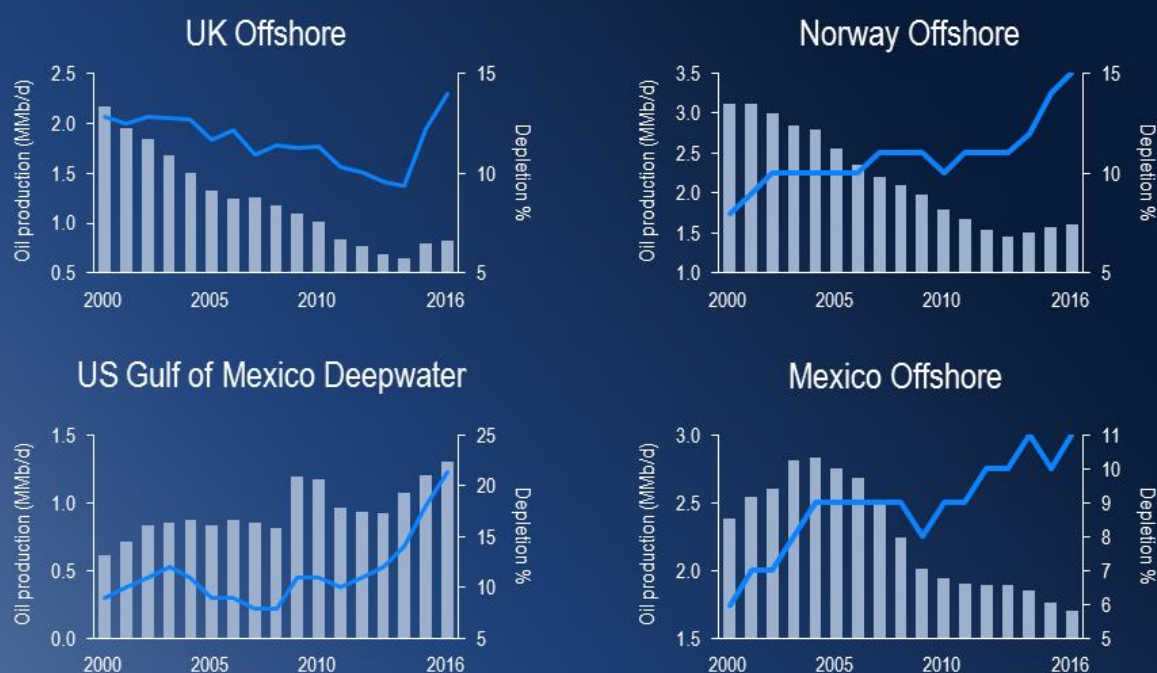
So, this indicator does not provide any forward view on production sustainability.

The depletion rate, on the other hand, indicates how fast the proven developed reserves are being produced, where a zero or low depletion rate implies that the addition of proven developed reserves is in line or close to the rate of production, which is a sign of a sustainable production base.

In a scenario where the additions of proven developed reserves are curtailed through lower investments while production is upheld by producing the wells harder, the decline rate will be low and the production base will falsely appear to be very resilient.

However, the real picture in such a scenario is told by the depletion rate, which will show an increasing trend since production is kept at high levels with little to no additions of proven developed reserves.

Depletion Rates Point to Long-Term Production Decline



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Source: Energy Aspects. *Depletion calculated as annual production divided by proved-developed reserves at end of same year

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A closer look at the underlying production and reserves data from many of the countries outside the Middle East, Russia, and North America land reveals that depletion rates are indeed rapidly increasing as seen from the examples on this slide.

Production from the continental shelves of Norway, UK, and the US Gulf of Mexico has been held flat or even increased over the past three years, which represents a flattening and even reversal of the established decline rate trends.

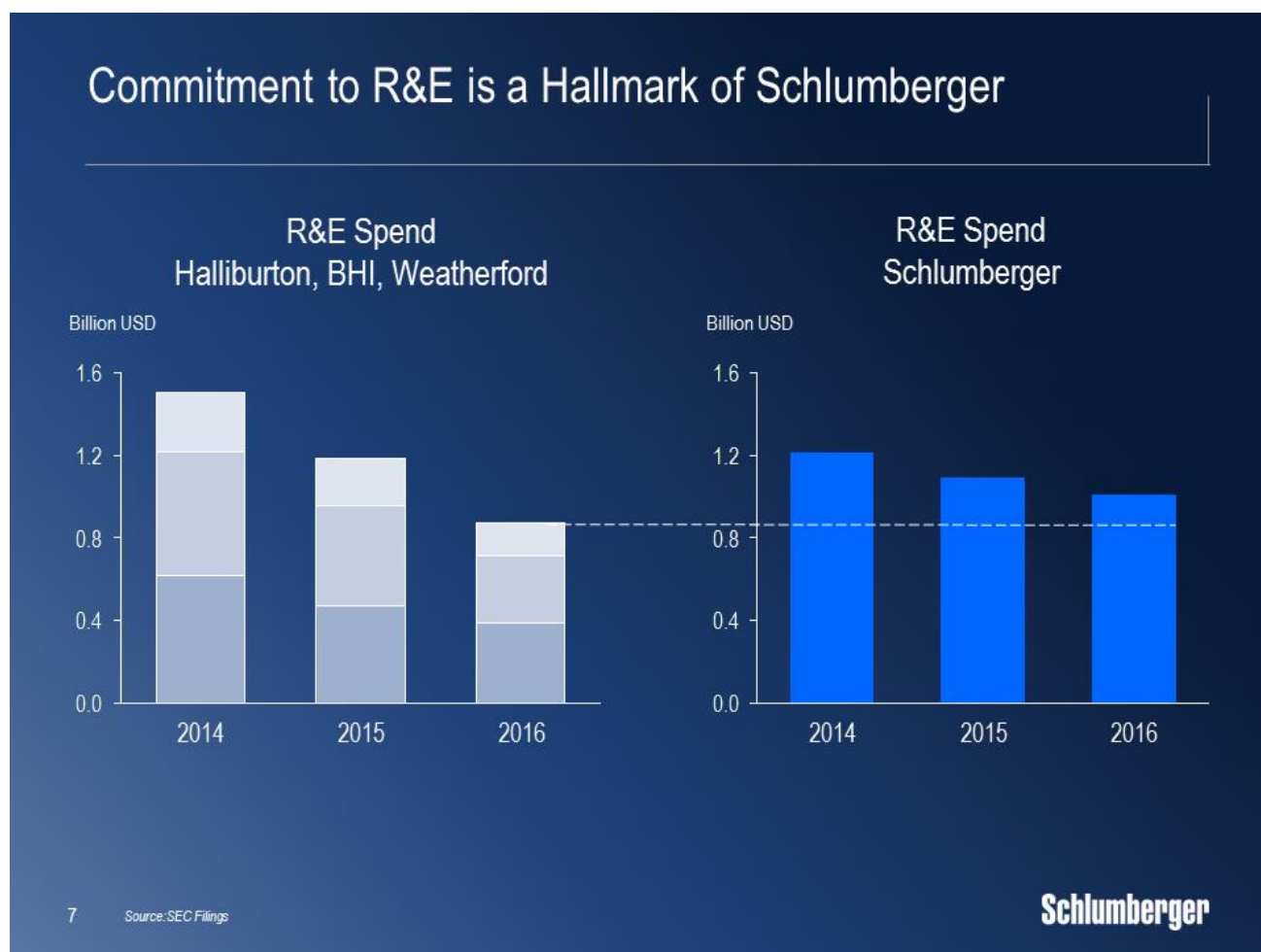
This decline rate performance, in spite of the dramatic reduction in E&P spend, is interpreted by the market as a surprising sign of production resilience.

However, the real story is told by the depletion curve, which has shown a significant increase in all three examples and is already between 15 and 20% in these major basins.

In Mexico offshore, the depletion rate is also increasing, but not as fast, and not to the same level as in the other three basins. This is because the production is actually declining, which helps dampen the rate of depletion when there is little to no additions of proven developed reserves.

These depletion rate trends will only accelerate going forward if production continues to be upheld without significant additions to proven developed reserves through increased capex spend.

Given the fact that these four examples are already 2-3 years into the depletion rate increase, it seems clear that the industry indeed is heading towards a supply crunch in the coming years unless there is a significant global increase in E&P investments.



Next, let us turn to R&E and the importance of protecting and encouraging investments in innovative and performance driving technologies.

In the E&P industry, the majority of the R&E spend on hardware and software technologies comes from the supplier industry.

With the cash and cost pressures experienced over the past two years, the investment levels were in 2016 already down by more than 40% compared to 2014 for our three closest competitors.

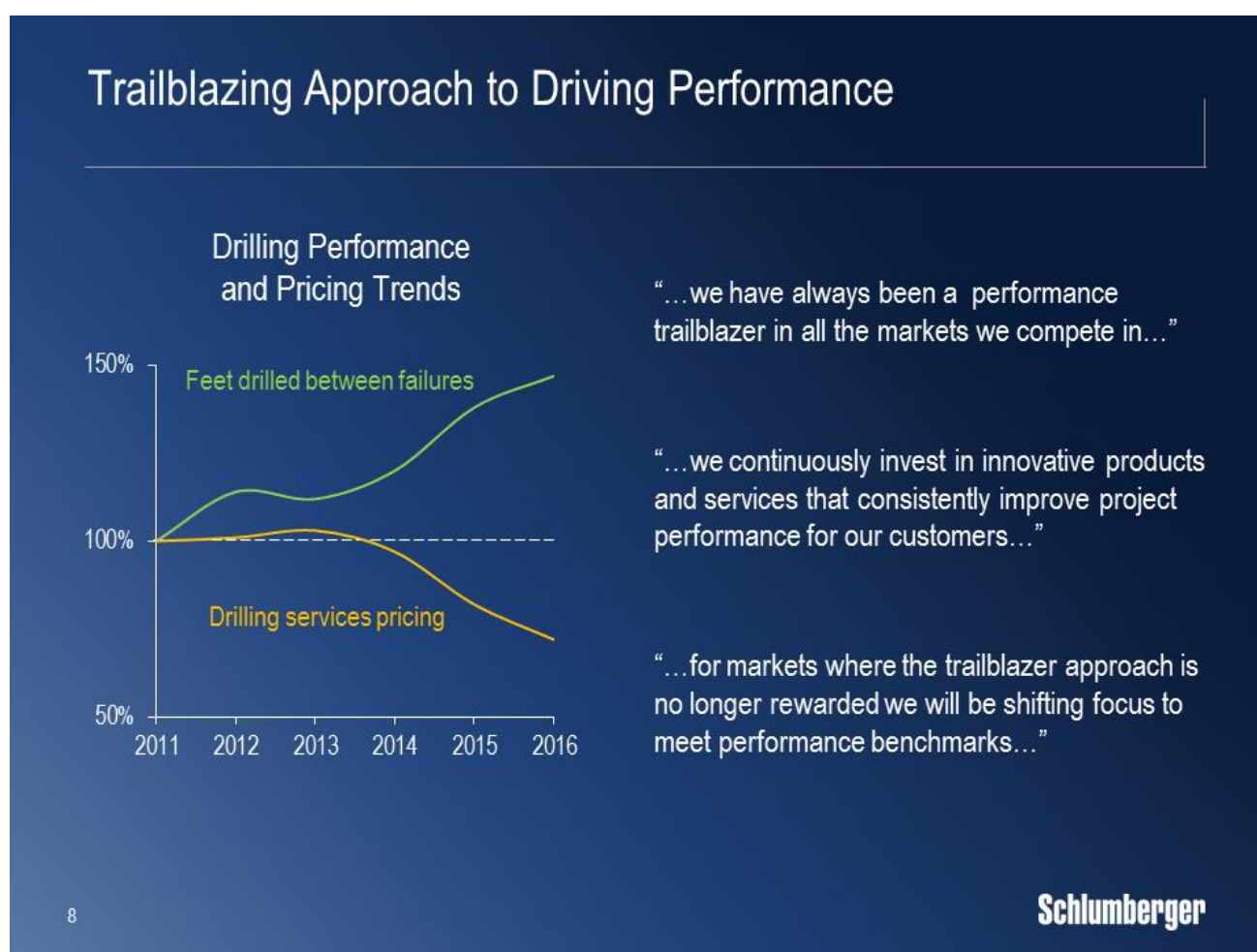
In Schlumberger, we still spent close to 1 billion dollars on R&E in 2016, which is more than our three closest competitors put together, and our commitment to protect our technology investments throughout the hardship of every down-cycle is a hallmark of our company.

Still, even we are now in the process of re-assessing both the level and the focus of our R&E spend for two distinct reasons:

First, the unprecedented drop in activity and revenue seen over the past two years will make it difficult to justify current R&E investments unless there is a clear line of sight to a meaningful topline recovery.

Second, the financial pressures of the past two years have also created a new wave of 'procurement is king' in a large part of our customer base where the procurement departments frequently override the technical and operational sides within the oil companies.

The outcome in these situations is that the lowest price for the lowest common denominator of technology wins and that the concepts of value performance and differentiation are reduced to an afterthought.



In markets with a low barrier to entry, the procurement approach is well established and generally understandable but transporting the same model to more challenging operating environments makes little sense from an overall project performance standpoint.

Nevertheless, this trend is forcing us to adjust our approach to these markets as follows:

First, in complex operating environments, the costs of meeting performance expectations, mitigating contractual risks, and generally upholding our internal operating standards are substantial, and these requirements are something we will never be willing to compromise on.

Therefore, any contract where the cost of complying with internal operating standards will bring our returns below what we consider adequate is simply not a viable business proposition for us and we will instead re-deploy people and equipment elsewhere.

Second, we have always been a performance trailblazer in all the markets we compete in, and we continuously invest in innovative products and services that consistently improve project performance for our customers.

Furthermore, these products and services have traditionally been rewarded by a reasonable pricing premium compared to the market rate. The pricing premium helps offset both the additional R&E costs we carry compared to the fast followers and it covers some of the additional trailblazer costs associated with more frequent field testing, training, and certification asset deployment, and internal and external technical support.

For markets where the trailblazer approach is no longer rewarded, we will be shifting focus to simply meet the prevailing technology and performance benchmarks rather than looking to set the pace for any improvements. This will allow us to significantly reduce our related R&E and operating costs in these markets and thereby ensure an acceptable level of return to our shareholders.

Still, for the markets where we continue to be rewarded for our traditional performance driven approach, whether through pricing premiums for individual services, or through our various performance-based integration models, we will of course maintain our established approach, including our R&E investments.

I will comment further on this later in my talk.

Collaboration and Alignment Models



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While many of our customers are deploying an aggressive procurement approach to address their current financial challenges, other parts of our customer base are heading in the opposite direction seeking business models focused on further technical collaboration and closer commercial alignment.

As we adjust our approach to meet the procurement drive, we still believe that the best solution to the current industry challenges is for the E&P operators and the leading service companies to create more productive business relationships.

We are therefore actively engaged on many fronts to establish these new partnerships.

The starting point for these discussions is often our broad integration offering and the corresponding risk-based commercial models.

The first level of this offering is Integrated Services Management where specially trained project managers provide scheduling planning and activity coordination for the various Schlumberger product lines involved in the project. This greatly simplifies the interface management for our customers and helps drive safety quality and efficiency in the projects.

The next level of the offering involves our Integrated Drilling Services and Integrated Production Services where we house a large part of our engineering design and technical optimization capabilities as these contracts include significant performance elements.

Both of these models leverage greater collaboration with our customers where the focus of the joint teams are to develop fit-for-purpose solutions that can improve productivity and help drive costs out of the system.

The highest level of collaboration and commercial alignment comes through our SPM offering where we take full-field management responsibility using the complete range of our technology and expertise. Here we invest the entire value of our products and services, and in certain cases additional cash for contracts that can reach up to 20 years in duration and where our compensation is directly linked to the production we generate from the field.

Over the past 15 years, we have gradually expanded the size, complexity, and number of SPM projects we undertake to the point where we today manage around 235,000 barrels per day of oil production covering 11 projects, and we also have a very rich opportunity pipeline now spanning all parts of the world.

Schlumberger Special Venture Fund



Ophir/OneLNGSM



Sound Energy



Borr Drilling

- New avenue for E&P project investment
- Fostering closer collaboration
- Unlocking more E&P investments
- Preferred supplier status for associated activity
- Offered to all of our customers

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In addition to the collaboration discussions we have around our existing integration offering, we are now also opening up for even more innovative alignment models.

To demonstrate our openness to new types of business relationships with our customers, we have recently created a special venture fund offering a new avenue for project investment together with our customers.

The objective, in addition to fostering closer collaboration and alignment, is to help generate more E&P investments and to secure preferred supplier agreements for the related activity, whether this is for standalone services or any of our integration models.

We realize that many of our customers may not see a need for this, however, some customers will likely find it interesting. Very importantly, we will make this new part of our offering available to all customers, which is a fundamental principle of how we do business.

And, to be clear, with this investment fund we are not in any way intending to compete with our customers.

We have, for the past 90 years, worked closely with all our customers to help improve their project performance through our technology and expertise and in this way supported all of them as they compete in the market place. With our new venture fund we are simply expanding our offering from technical support to now also include financial support, where needed, with the ultimate goal of securing more activity for our 18 product lines.

Examples of some of the investments we have made so far include the Fortuna Project with Ophir and OneLNGSM, the Tendirara project with Sound Energy, and most recently our investment in Borr Drilling.

The governance of this investment fund will be subject to the same oversight we have in place for our existing businesses, and any investment decision will ultimately be approved by our CFO to ensure it meets both the risk profile and the return criteria we have established as a company.

Rethinking Technology Development

End-to-end industry workflows



Domain expertise and knowledge

Integrated software and hardware



Data, modelling and machine learning

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Let us now turn to the need for the industry to develop broader and more integrated technology systems capable of delivering revolutionary improvements to project performance. This ambition can only be realized by completely rethinking the current approach to technology development and the way we today operate as an industry.

First, the new systems will need to tackle complete industry workflows such as for instance all aspects of drilling a well. The technology solutions will also need to identify and model every tasks that make up every processes in the total workflow and then integrate this with all the available data together with a completely new software and hardware platform.

This is not a small undertaking, and deep domain knowledge, complete software and hardware ownership, coupled with the latest capabilities within data analytics, modeling, high performance computing, and machine learning are all keys to success.

Today, Schlumberger already has most of these means and capabilities in hand, and for the rest, we are teaming up with companies like Google and Microsoft who are working with us to bring oilfield technology systems to an entirely new level.

To illustrate our approach to these new technology systems, I would like to walk you through how we have built out our drilling portfolio over the past 6-7 years and how we are now using this industry leading technology platform as a launch pad for our drilling system of the future.

From Technology Portfolio to Future Drilling System



Schlumberger first entered into the directional drilling business in the early 1960s as part of our Dowell joint venture and, through a combination of M&A activity and organic R&E investments, we had by the early 2000s built an industry-leading position in directional drilling, measurement-while-drilling (MWD), and logging-while-drilling (LWD).

In 2010, we further extended our downhole-drilling offering through the acquisitions of Smith and Geoservices, which added leadership positions in drill bits, drilling fluids, drilling tools, and surface data measurements.

With a complete downhole hardware offering in place, we started to analyze and model the total drilling process by using data from the millions of feet we drill every year.

Between our research centers in Cambridge, UK and Boston, US we created a numerical model describing how the entire drill-string behaves and interacts with the wellbore during the drilling process. This modelling tool quickly became a very powerful way to optimize both well design and the make-up of the bottom-hole assembly which allowed us to start breaking drilling records in all parts of the world.

The most recent of these are the groundbreaking performances in the super-laterals of the Wolfcamp shale in the Permian basin where we are now drilling at double the speed of conventional systems.

This has earned us a solid pricing premium and unprecedented demand for our drilling technologies in US land.

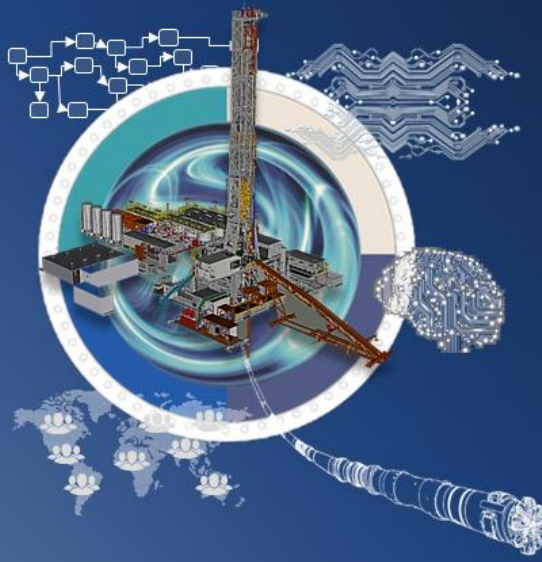
With the downhole portfolio completed, we next turned our attention to the surface part of the drilling system, and it became clear that the interactions between the downhole and the surface are critical to the overall performance.

We therefore decided to launch our own land rig concept, incorporating our latest thinking around workflow optimization as well as software and hardware integration.

Building on the rig engineering group from Saxon, which we acquired in 2013, we added industry leading rig design capabilities from T&T Engineering in 2015, and rig control systems from Omron Oil & Gas in 2016. The latest addition to our Drilling portfolio came through the acquisition of Cameron, who has industry leading expertise in the areas of blowout preventers, pipe handling, and top drives, which will help us accelerate the integration of the surface and downhole parts of the drilling system.

With all the hardware components of the system in place, we next switched our focus to software data management and high performance computing by leveraging the capabilities of our SIS and WesternGeco product lines.

OneDrillSM Integrated Drilling System



- Next step integration of surface and downhole
- Understanding the entire drilling workflow
- Connecting hardware, software, data and expertise
- Enabled by automation and machine learning
- Fundamentally new drilling platform

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In 2014, we established a new software organization fully dedicated to drilling by extracting the required programming and domain expertise from various parts of the company.

The new software team started by breaking the entire drilling process into more than four thousand tasks which was then organized into a hierarchy of domain driven process.

Based on this, the team built a fundamentally new software platform that integrates all aspects of the surface and downhole drilling system, and spans the entire workflow of planning, executing, and evaluating the well.

In this new system, all participants work in a circular and seamless collaboration mode, avoiding any inefficiency in the handoffs between different services, and with the system providing actionable insights to all the relevant participants.

A large part of the activities are standardized to bring efficiency, while the tasks which have uncertainty, or can have environmental departures, are dealt with by an innovative planning process, which is governed by rules of safety and regulation. At the onset, this system will be an intelligent aid to all the participants on and off the drilling rig.

However, as the use-case data is recorded, big data analytics and machine learning techniques will be used to implement increasing levels of automation bringing a new paradigm of digital efficiency and productivity.

This new drilling system, which will be called OneDrillSM, will be introduced to the market in the second half of this year and will initially be focused on US land, Saudi Arabia, and Ecuador.

In parallel with the development of the OneDrillSM integrated drilling system, we are also working on a number of other future technology systems building on the same principles that I just outlined for OneDrillSM.

OneStimSM Joint-Venture in North America Land



Scope

- Pressure Pumping
- Completions
- Pump Down Perforating

Ownership

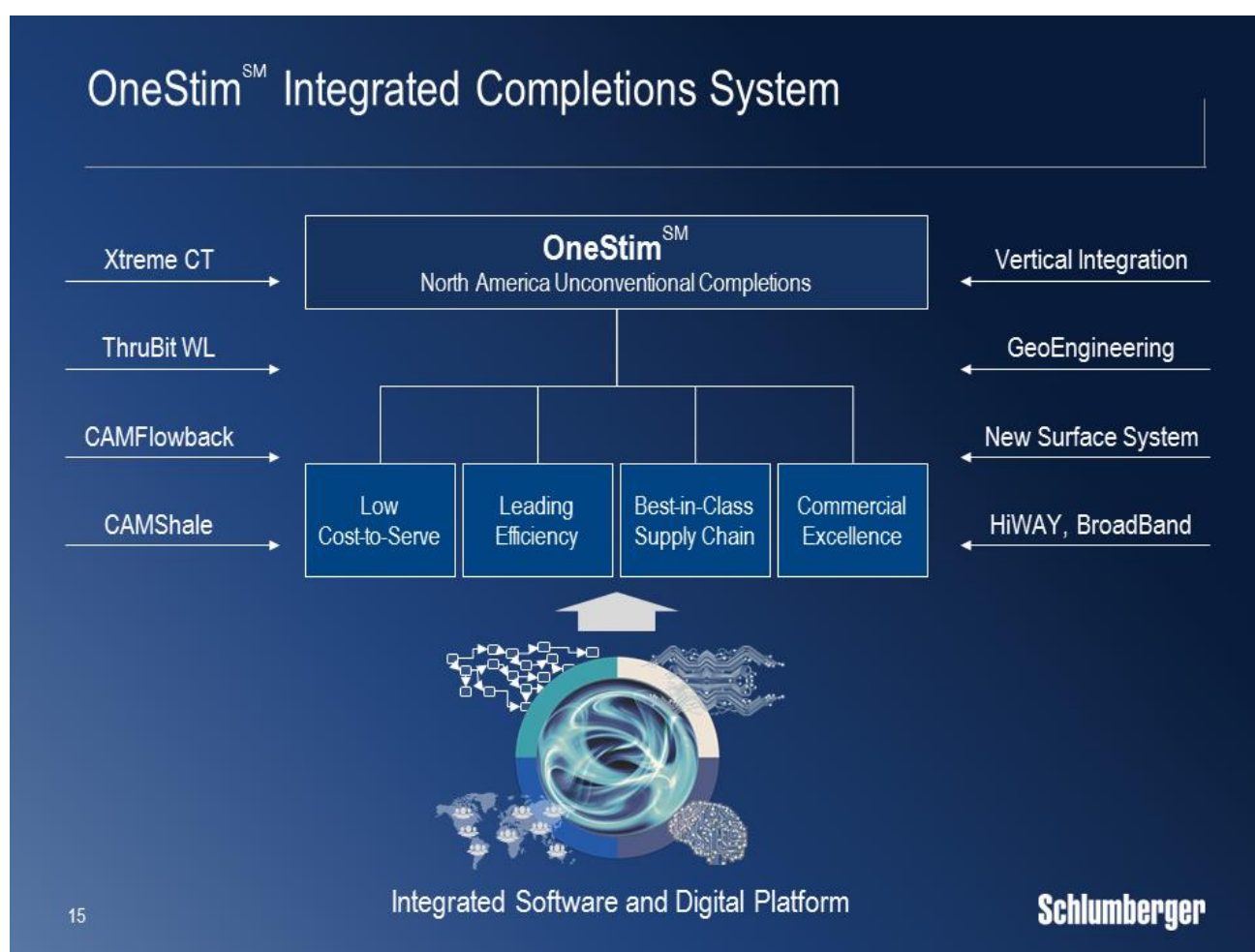
- 70% owned and consolidated by SLB
- 30% owned by WFT

“...the joint-venture creates a new industry leader in terms of hydraulic horsepower and multistage completions technologies in North America land...”

Last week we announced the OneStimSM joint venture with Weatherford for North America land, which will serve as the launch pad for our future hydraulic fracturing and completions technology system.

In addition to a market leading position in hydraulic horsepower from the combination of the two fleets, the JV will also have a very strong position in multistage completions through the cost-effective and fit-for-purpose offering contributed by Weatherford.

The majority of the cash payment we made as part of the deal was linked to the value of the Weatherford multistage completions business, which is an area we have been looking to invest in for a number of years.



The OneStimSM JV will provide us with the market leading scale that is required to drive operational efficiency and improve full-cycle returns in the large, but challenging North America land production market.

OneStimSM will be working closely with our other production-related businesses in North America land, like Extreme coiled-tubing services, Wireline ThruBit logging, and the Cameron flowback and CAMShale offerings.

The JV will also benefit from our ongoing vertical integration program as well as the deployment of unique high-end technologies such as our latest fully automated surface delivery system, our Geo-engineered completions, and the HiWAY and BroadBand fluid systems.

Conclusions

There is an industrywide need for...

“...higher E&P spending...”

“...protecting our investment in R&E...”

“...new business models that promote collaboration...”

“...technology platforms that combine hardware, software, data and expertise...”

- Schlumberger is positioned to remain at the forefront of these industry trends
- The market is full of opportunity for companies prepared to think new and act new

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In summary, this morning I have covered four topics that we see as critical for the industry to restore its strength and advance its capabilities.

They are—the need for higher E&P spending, the need to protect investments in R&E, the need for new business models, and the need for broader and more integrated technology systems.

Against this backdrop, I have outlined how we are positioning Schlumberger to remain in the forefront of the evolving industry trends.

So far, 2017 has started with a number of challenges, in particular in the international markets, where a more severe seasonal reduction in activity, further pricing pressure on new tenders, and continued payment issues in Ecuador are negatively impacting our Q1 results.

However, we remain confident and optimistic about the future of Schlumberger as we continue to carefully navigate the current industry landscape, which remains very challenging but also presents significant opportunities to the players that are ready to think and act new.

Thank you.

OneStimSM Supplemental Information

OneStimSM Supplemental Information

OneStimSM – A Joint Venture focused on North America Land Unconventional Completions

Schlumberger and Weatherford announced an agreement to create OneStimSM, a joint venture to deliver completions products and services for the development of unconventional resources in the United States and Canada land markets. The joint venture will offer one of the broadest multistage completions portfolios in the market.

The OneStimSM Completions Portfolio

Weatherford was an early entrant in the North America completions market. Its portfolio reflects a broad, and mature product offering, for both upper and lower completions, and across all lower completion types, including open hole, cased hole, sleeves or plugs.

Weatherford also brings the benefits of a well-established manufacturing organization to the JV, facilitating a cost-competitive manufacture of completions products with the assurance of reliability and product quality.

The Schlumberger product catalog, in contrast, is technology-driven, reflecting its more recent introduction of such services. The Infinity* dissolvable plug-and-perf system, as an example, is the industry's only fullbore interventionless plug-and-perf system. Similarly, the Diamondback* composite drillable frac plug was one of the early composite plugs to incorporate an anti-preset mechanism, a feature that is standard across the industry today.

The OneStimSM integrated completions system consolidates differentiating Schlumberger technologies, with Weatherford's mature multistage completions portfolio, covering the entire range of operator requirements for a value-driven completions offering. Through this comprehensive range of products, the OneStimSM system will have a

direct impact on well economics, ensuring an optimized and operationally efficient fracture treatment, and continued support for activity projected through its working life.

	Upper Completions Products	Lower Completions Products						
		Composite Plugs	Open Hole Sleeves	Cemented Sleeves	Coiled Tubing Sleeves	Toe Initiation Sleeves	VI Manufacturing	Dissolvable Technology
Weatherford	●	●	●	●	●	●	●	
Schlumberger	●	●		●	●	●		●

Well Completions involves a two-step process—starting with the lower completion and followed by the upper completion. It commences during the final stages of drilling, when the associated completions products are lowered into the well as part of the final casing string.

Well Completions—The Lower Completion

The lower completion is initially deployed. Its primary function is to establish contact with the reservoir, and therefore has a direct bearing on the well's productivity. Hydraulic fracturing is the largest step in this process. Wells are fracture stimulated with multiple fracture stages along the reservoir (i.e. multi-stage fracturing). Multi-stage fracturing is enabled by a range of completion hardware products, depending on the operator's preference.

Plug-and-perf completions was the earliest multi-stage completion technique. It was used in conjunction within a cemented liner set across the reservoir. Each fracture stage treatment is isolated with “composite plugs”, deployed on electric line. The composite plugs serve as a pressure barrier to facilitate the next treatment in the shallower part of the well. All plugs are finally milled out with coiled tubing after the last fracture treatment is completed.

Open hole completions became popular next because of the ability to deliver higher fracture treatment efficiency, measured as stages per day, or equivalent. An un-cemented liner consisting of “open hole sleeves” is typically deployed across the reservoir. A graduated metallic ball with a progressively increasing diameter is pumped during the penultimate phase of the fracture stage. This ball follows the fracture fluids, eventually fitting into a “seat” designed within the open hole sleeve, isolating the lower fracturing stage, simultaneously shifting open the upper sleeve to conduct the next fracturing treatment. The annular space between the liner and the reservoir is segmented by open-hole packers, with the swellable packers being the more prevalent products used for this purpose. The early generation of ball-based open hole completions eliminate electric line- or coiled-tubing-deployed operations, leading to a faster completions sequence.

A disadvantage of open hole completions is their inability to control the point of fracture initiation. Several operators reported lower well productivity indices (PI) because of this drawback. Coiled tubing-deployed sleeves were introduced to overcome this limitation - controlling fracture initiation, and providing operational efficiency. The fracturing treatment is injected with the presence of coiled tubing within the wellbore. The coiled tubing string is progressively translated to facilitate a sequential fracture treatment along the wellbore length. Zonal isolation is achieved through “coiled tubing sleeves” that also contain a receptacle to hold a resettable coiled tubing-deployed packer, containing the fracturing treatment within the well segment of interest. Coiled tubing fracturing can be done both in an open hole and cased hole well.

Finally, and for cased hole plug-and-perf operations in particular, electric line-deployed plugs and perforating guns cannot be deployed initially because the wellbore represents a “closed system.” No fluid movement, a necessary requirement to “pump” guns, is possible. The first fracturing stage therefore requires perforating with coiled tubing-deployed TCP guns. This is a costly and time-consuming operation. The Toe Initiation sleeve is a specific technology that eliminates this initial coiled tubing-deployed TCP perforating guns that commence a fracturing sequence. It's use is optional, however, this technology is gaining popularity since these sleeves reduce cost and overall time of the lower completion.

The lower completion has a bearing on the well cost, and its productivity, therefore directly impacting the overall well economics. Its specific choice (plug-and-perf versus sleeves, open hole versus cased hole wellbore) varies across reservoirs, and even within a particular reservoir in select instances. Today, cased plug-and-perf completions are more prevalent in the United States, while sleeves continue to dominate in Western Canada.

Well Completions—The Upper Completion

An upper completion refers to a suite completion hardware products that are deployed in all well types – vertical, deviated, or horizontal.

Broadly speaking, these consist of:

- Packers to seal the lower completion from the reset of the wellbore,
- Safety systems, such as subsurface safety valves to control the well's flow during unanticipated events,
- Completion accessories that facilitate initial deployment and well maintenance over its producing life,
- Well remedial technologies, including casing patches,
- Gas lift mandrels to support this specific artificial lift methodology, and,
- Permanent downhole sensors to provide data in a continuous manner, without requiring a well intervention. Such information is used to optimize the well's recovery.

The upper completion design architecture is governed by multiple drivers, including well productivity, cost, choice of artificial lift system, regulatory requirements, anticipated workover and intervention activity, and other considerations.

References

Overview:

<http://www.weatherford.com/en/products-services/completion-and-stimulation/lower-completions>

Composite Plugs

<http://www.weatherford.com/en/products-services/completion-and-stimulation/lower-completions/composite-plugs>

Open Hole Sleeves

<http://www.weatherford.com/en/products-services/completion-and-stimulation/lower-completions/openhole-isolation>

Cemented Sleeves

<http://www.weatherford.com/en/products-services/completion-and-stimulation/lower-completions/stimulation-sleeves>

Coiled Tubing Multistage Completions:

<http://www.weatherford.com/en/products-services/completion-and-stimulation/lower-completions/coiled-tubing-stimulation-systems>

Infinity Dissolvable Plug and Perf System

http://www.slb.com/services/completions/multistage_stimulation_systems/dissolvable_plug_and_perf/infinity.aspx

Saltel Expandable Steel Products

http://www.slb.com/services/completions/packers/expandable_steel_packers.aspx