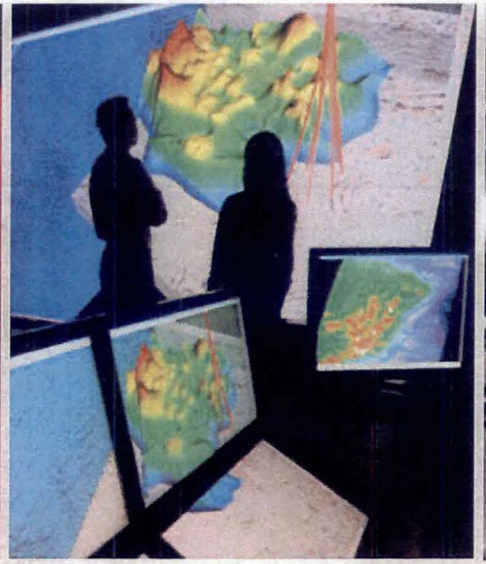
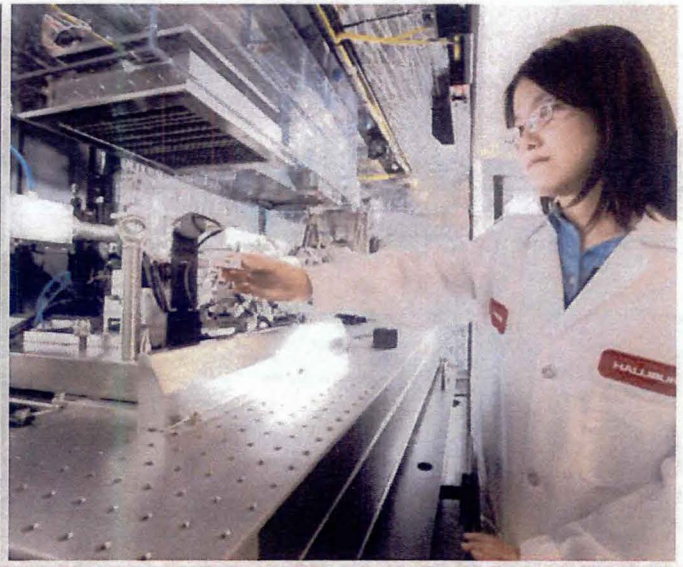
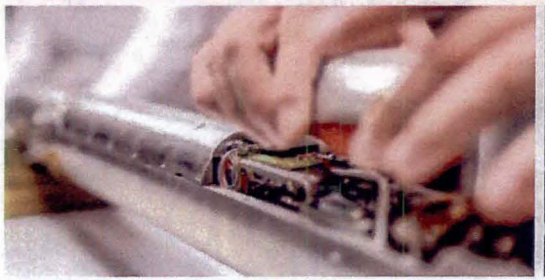






ND Tour/ Statoil pad

Sept 6. 2017

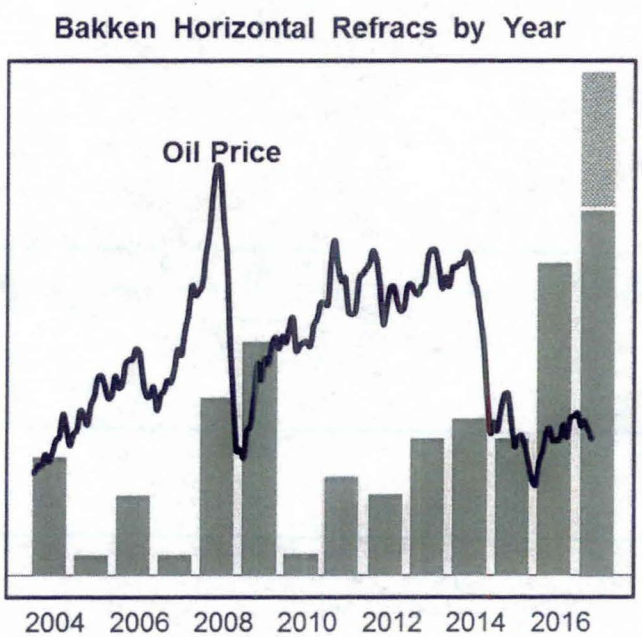
HALLIBURTON

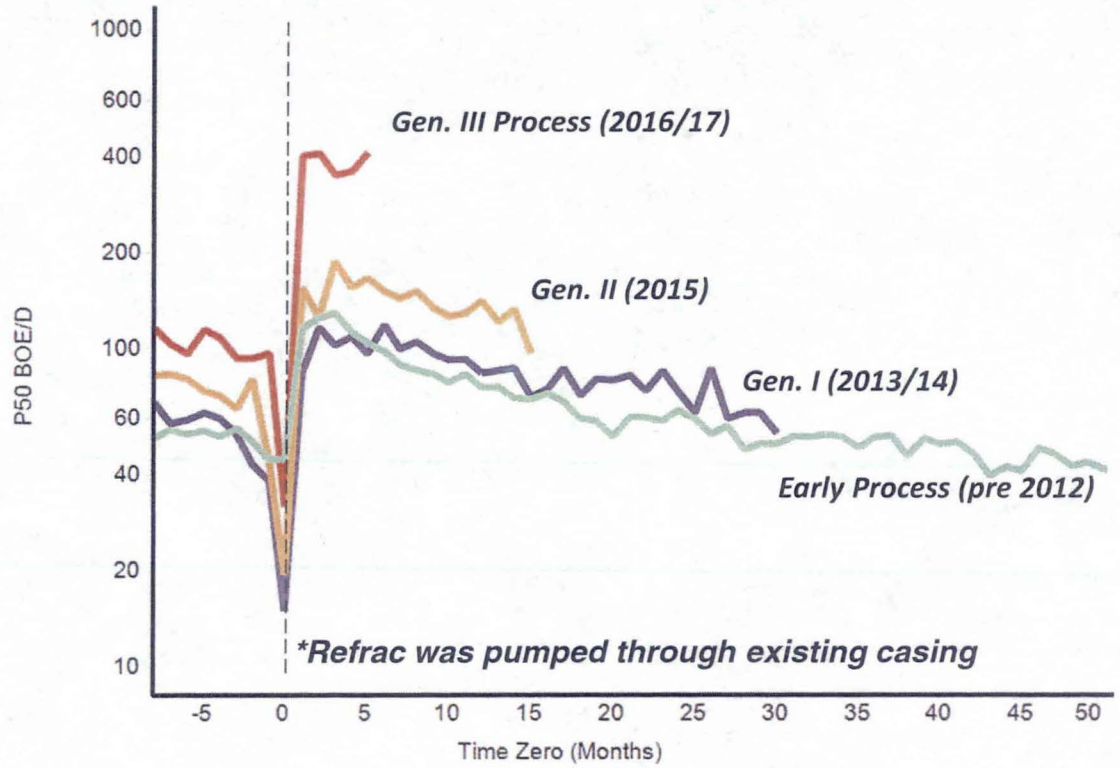
Refrac Technology

HALLIBURTON

An Evolution of Refrac Process in the Bakken Formation

Production gains are 3x greater than 2-years ago.





HALLIBURTON

Refrac

- We continue to use diagnostics to improve our design and execution of refracs. The production gains from our Generation III refrac design is 3x greater than it was 2 years. This has resulted in more refracs being pumped than ever before. The cost per flowing BOE for these refracs are less than many new drills in the Bakken, so refracs are becoming a part of capital portfolios.

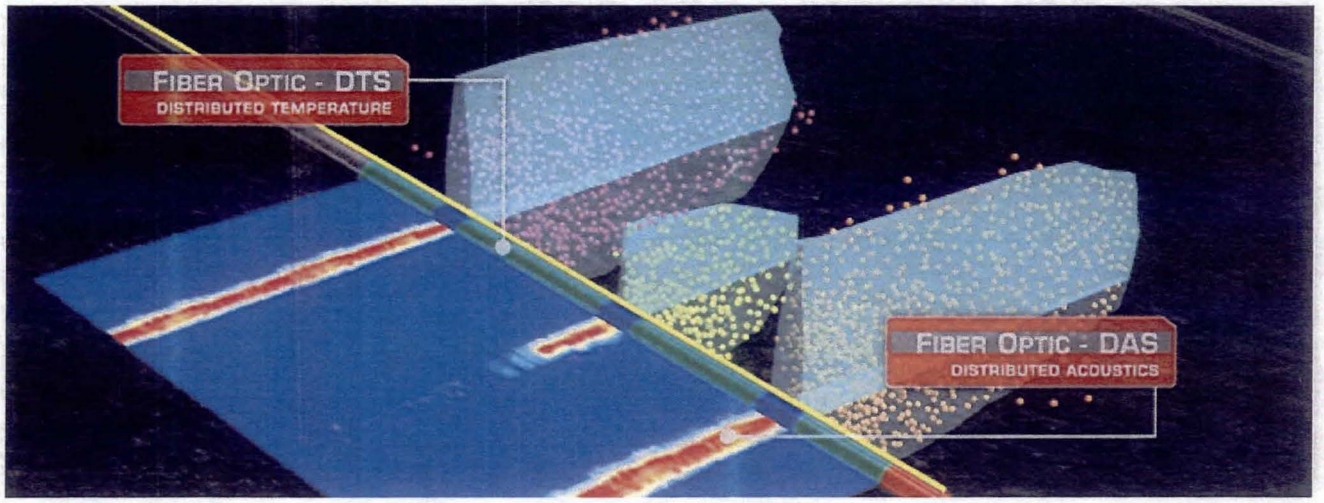
Increased Deployment of Fiber Optic Services

FiberWatch® is Permanent Fiber Optic Services

- *3x job count in 2017 over 2016*

Spectrum® is Retrievable Fiber Optic Services

- *5x job count in 2017 over 2016*



HALLIBURTON

Refrac

- The Bakken is utilizing more Fiber Optic diagnostics as a tool to evaluate where the fluid is distributed during the frac and where is comes from during the production. In 2017 we have deployed more projects using both Spectrum (retrievable in coiled tubing) and FiberWatch (permanent on casing) than ever before in the Bakken.

Equipment Innovations/Technology

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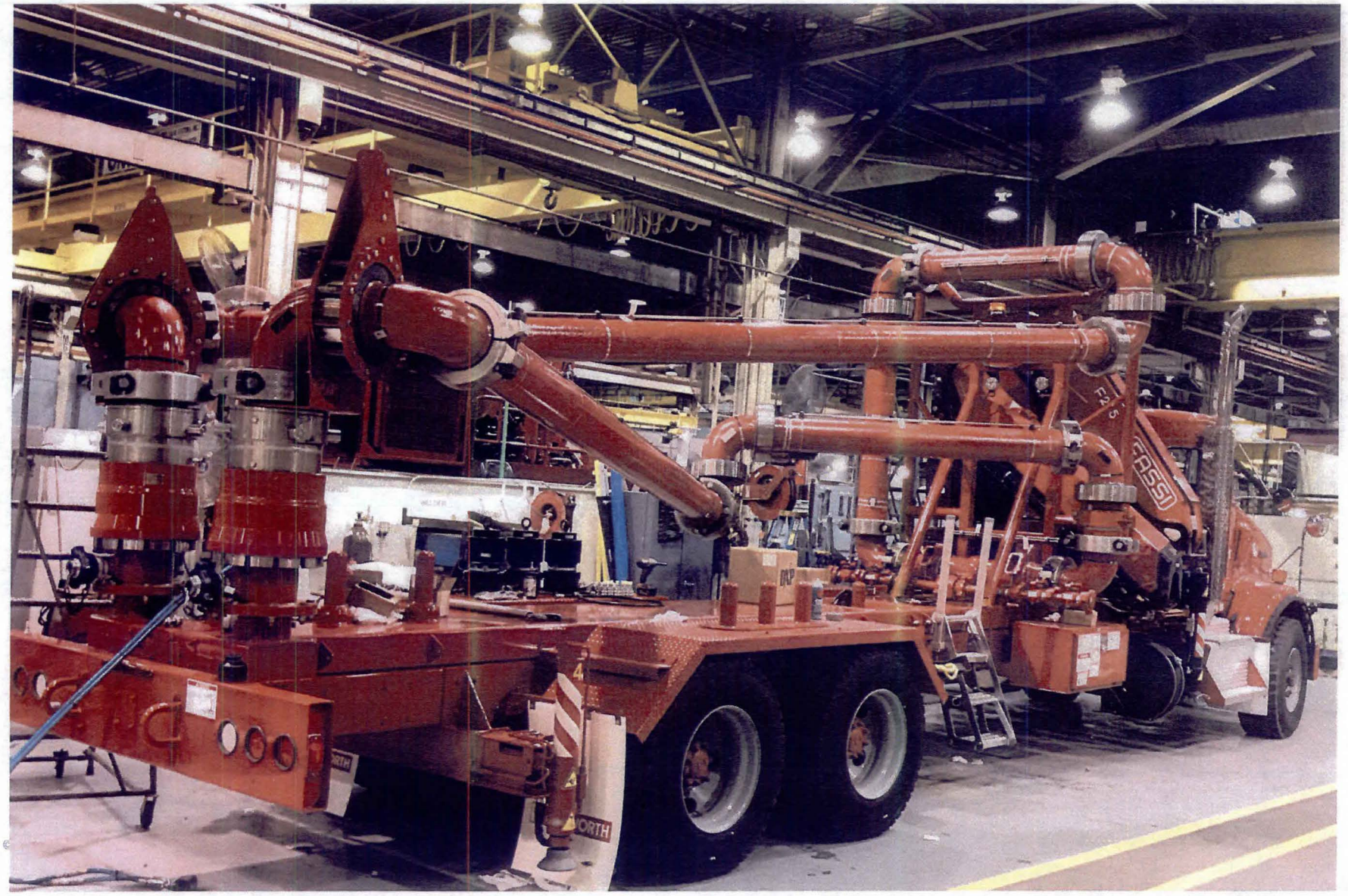
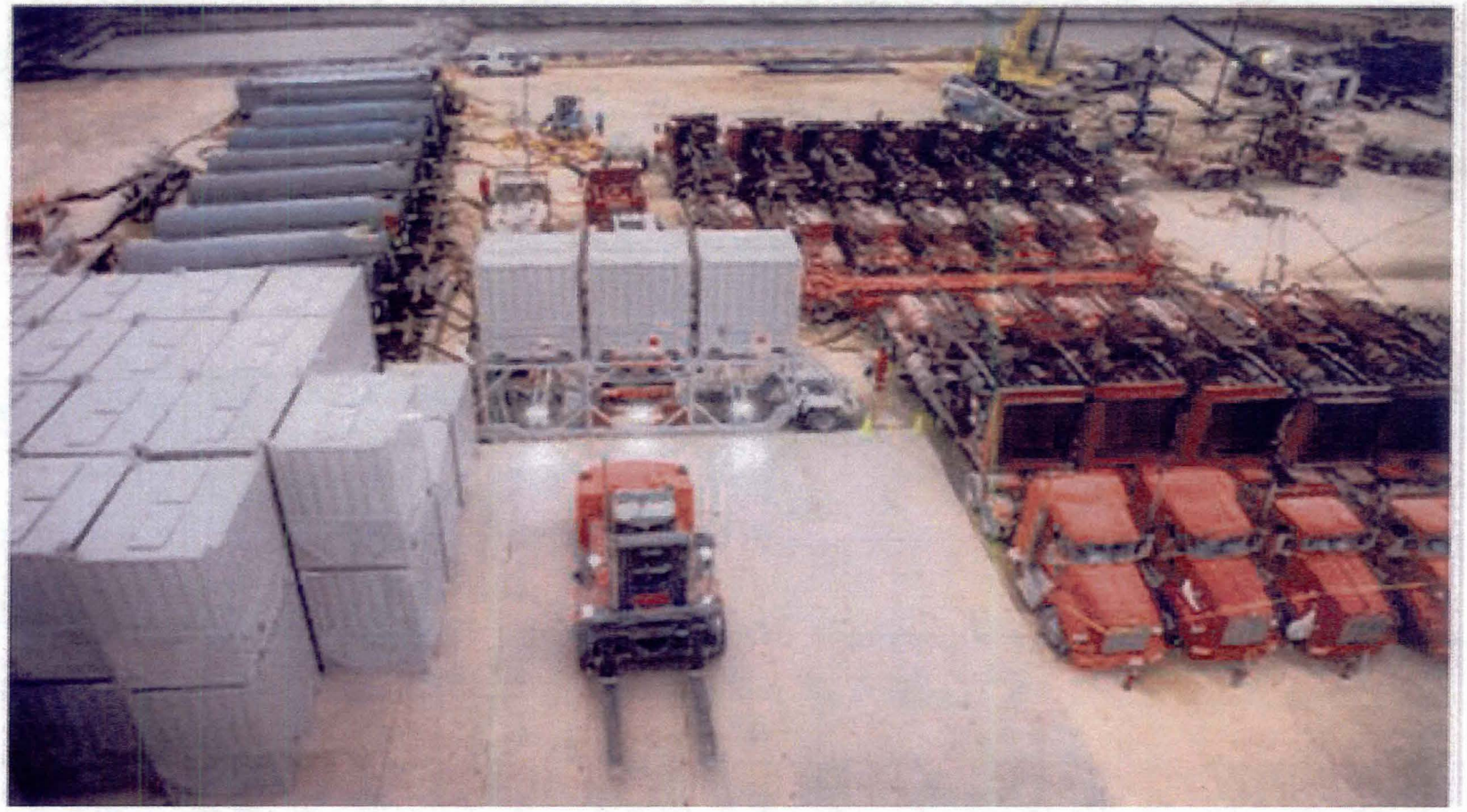
Halliburton WCU (Well Head Connection)unit



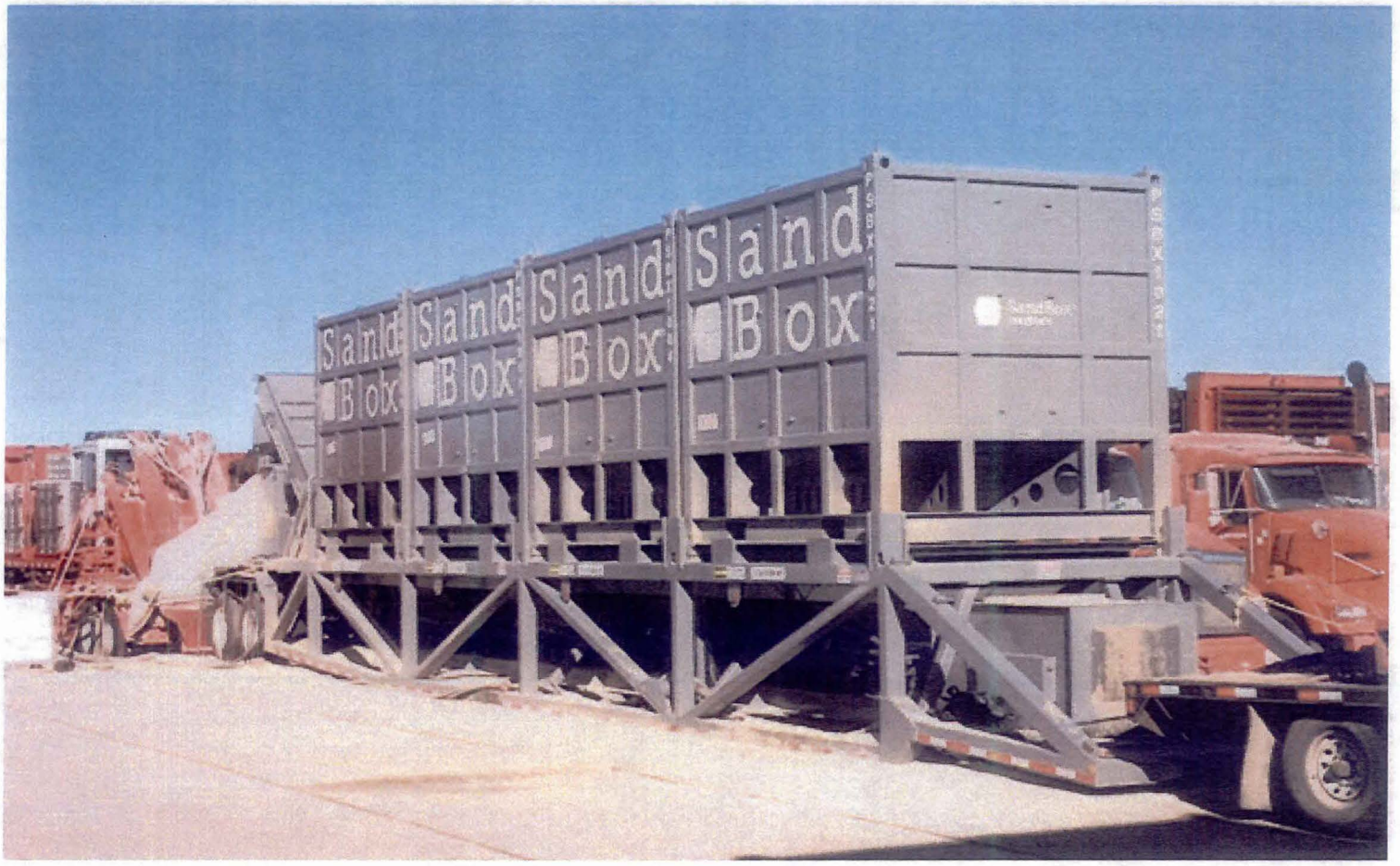
HALLIBURTON

Sand Box Systems



HALLIBURTON

Sand Box delivery systems



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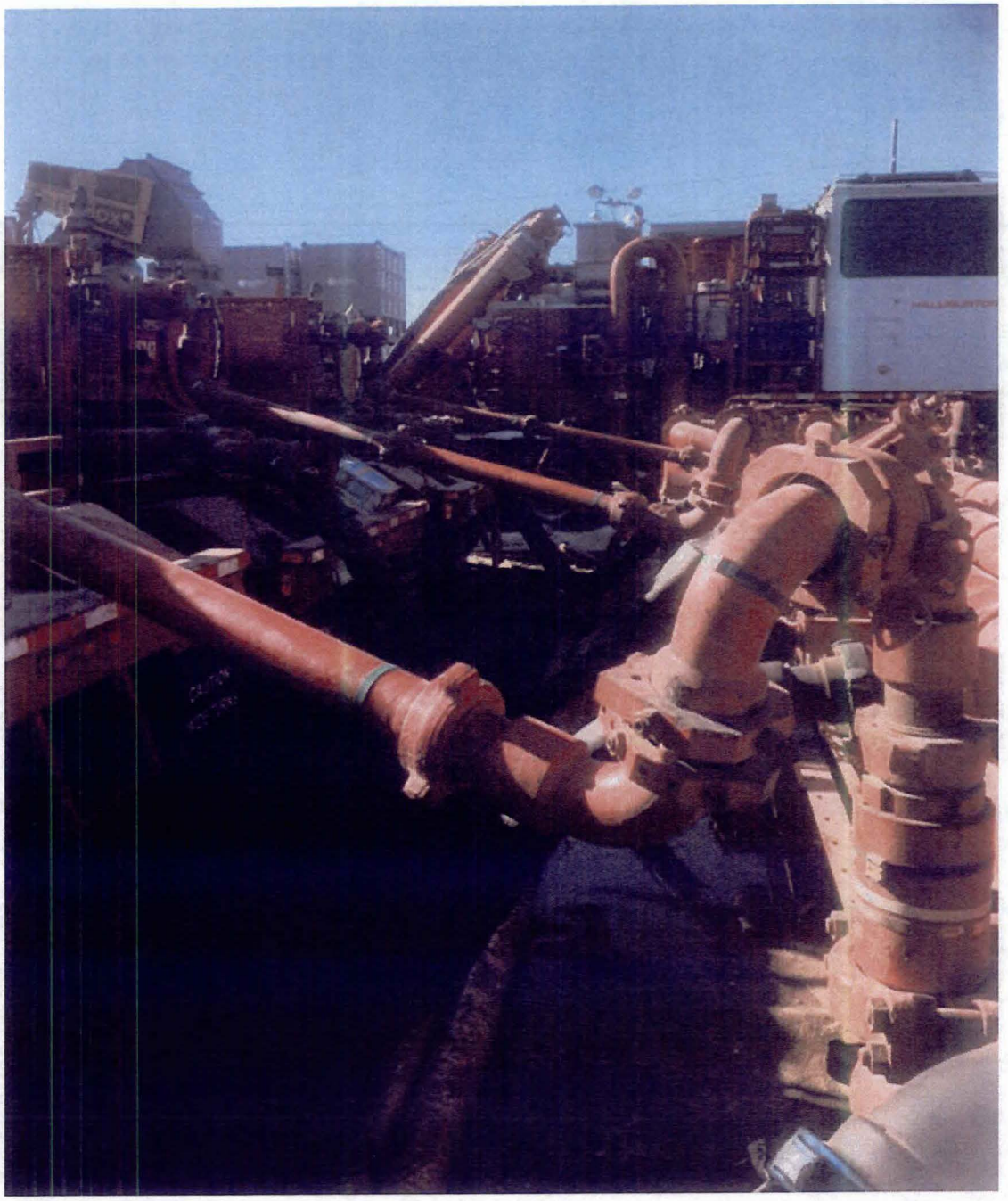
Express Connect Manifolds

HALLIBURTON



HALLIBURTON

Halliburton Facts/Info

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Community & Government Relations

- Several Managers sit on Boards for various groups
  - Williston Work Force Training board member
  - Williston Stakeholder Committee
  - Energy Out Reach Committee- $100K donations last year- various groups
  - BSC Engineering Advisory Board
- API and SPE involvement- committee and board members (past and present)
  - 2014 Industry Innovation Award winner from Williston API Chapter
- "I Will Clean Williston"- 50 employees attended
- Participated in Minot and Dickinson Pick Up the Patch events
- Work closely with NDPC on regulations / rule changes
- NPDC conference-HAL BBQ for ~4100 attendees (May 20-22nd)
- NDPC- Oil Can Community BBQ- Kenmare and Dunn Center this year (July 15th-17th)-Yearly
- NDPC- Teacher tours- visit Drilling and Completions sites (June 9-12)-Yearly
- Several tours for Legislators- educate
- Miss ND Pageant- Dinner and Halliburton Review at Bear Paw Lodge (June 3rd)
- 4th Grade – Halliburton tour/education (May 30th)
- Work Closely with TERO on Tribal regulations (ongoing)
- TERO- HAL BBQ for Annual TERO conference
- NDPC- 1M BBL per day Celebration- HAL BBQ- (June 25th)
- YES committee- for District # 1 School District- (Halliburton homes annexation- June 10th)
- Work closely with City/County Commissioners on Halliburton needs
- Multiple ImPACT functions during the year- Donating time to Charitable events
- Working closely with Robert Moran, Steven Flattery, Susie McMichael on any Political /Interview type requests – pretty much every National Magazine/TV channel has been in the Bakken

Local Contributions / Donations

- 2010- Mercy Medical Foundation- $25,000
- 2010- Williston Community Builder - $10,000 – Oil Field Playground
- 2011- Mercy Medical Foundation- $25,000
- 2011- New Vehicle- Mercy Medical Foundation- $10,000
- 2011- Minot Area Community Foundation (Flood relief)- $100,000
- 2012- Mercy Medical Foundation- $25,000
- 2012- Williston School District- $20,000
- 2012- Donated 2 used Pickups to Williston Vector Control group
- 2013- Mercy Medical Foundation- $50,000
- 2013- St. Joseph's Hospital Foundation- $50,000
- 2013- ND Safety Council-Safe Driving Video- $20,000
- 2013- Energy Out Reach Committee- $100K donations various groups
- 2014- Equipment Donation to ND Heritage Center for display at Capital - new Oil & Gas wing- $40,000 (In Kind Donation)
- 2014- Equipment and vehicles-$150,000K in kind donation to WSC- Train ND program
- 2014- Mercy Medical Foundation- $50,000
- 2014- St. Joseph's Hospital Foundations- $50,000
- 2015- Mercy Medical Foundation-$ 50,000
- 2015- St. Joseph's Hospital Foundation- $ 25,000
- 2015- North Valley Hospital Foundation- $50,000

Local University Donations / Grants

- 1996- Montana Tech- $5,000
- 1997- Montana Tech-$750
- 1997- SD School of Mines-$750
- 2003- Montana Tech-$5,000
- 2004- Montana Tech-$50,000 (3 grants-Engineering)
- 2005- Montana Tech-$45,000 (2 grants-Engineering)
- 2006- Montana Tech-$350,000 (Natural Resources Building construction)
  - http://www.halliburton.com/public/news/pubsdata/press_release/2006/esgnws_120706.html
- 2008- SD School of Mines-$30,000
- 2010- Montana State University-$5,000
- 2010- Montana Tech-$15,000
- 2011- Montana Tech-$30,000
- 2012- Montana State University-$15,000
- 2013- Montana State University-$20,000
- 2013- Montana Tech-$8,000
- 2014- Montana State University-$25,000
- 2014-North Dakota State University-$12,000
- 2014-SD School on Mines-$12,000
- 2015-Montana State University-$20,000 (1 grant- Engineering)
- 2015-North Dakota State University-$23,000 (2 grants-Engineering)
- 2015- Montana Tech-$1.6M Match $1.6M donation with Cop and APC for $5M total
  - http://www.mtech.edu/news/2015/01/011620151.html

ND Headcount

- Current Williston / Dickinson HC (Sept 2017)
  - 864 Employees (Local-assigned to ND)
  - At peak ~2500 Employees working in ND

- ND Job Service stats
  - Ranked # 1 Employer in Williams County-2014
  - Ranked # 15 Employer in ND- 2014 (Highest Oil Field related company in the State)
  - Still largest employer in Williams County (Oil Field)

ND Housing

- Halliburton was one of the few companies that actually built housing properties for employees to address high rent costs during boom period
  - Built 50 Halliburton owed homes in Williston
  - Built 48- 3/4 Bedroom Town Homes in Williston
  - Built 2 Apartment complexes in Williston
  - Purchased Muddy River Lodge
  - Utilize Target Logistics lodges in Williston and Dickinson

THANK YOU


THE BAKKEN

1951 **NORTH DAKOTA'S FIRST WELL**
Clarence Iverson #1

Where It All Began...

On April 4, 1951, the first successful well in North Dakota was drilled outside the community of Tioga. Since the success of the first well, named *Clarence Iverson #1*, the oil and gas industry has remained an important employer and source of tax revenue in North Dakota.

Decades of conventional drilling technologies

For more than 50 years, nearly every North Dakota well utilized the same basic technology that enabled *Clarence Iverson #1*. Termed "conventional drilling," wells were drilled with the hope of hitting a pocket of oil that would flow with relative ease.

North Dakota was a steady, reliable producer

Until 2006, North Dakota's oil and gas industry produced a steady supply of oil that averaged 37,000 barrels of oil per day (bopd). Output fluctuated little over the decades, ranking North Dakota as the 8th largest producer among states in 2006.[1]

[1] US Energy Information Administration

The Bakken Today...

In 2006, discoveries in oil and gas technology, specifically advancements in horizontal drilling and hydraulic fracturing, made it possible for companies to explore new formations across the United States. North Dakota's Bakken formation became one of the most promising formations in the country.

Soon, North Dakota became the second largest oil-producing state in the nation, bringing with it unprecedented economic prosperity, tens of thousands of jobs, the lowest unemployment rate in the nation, and a valuable domestic energy resource that has helped reduce our nation's dependence on foreign oil.

The Bakken Changed North Dakota

With more than 72,350 direct and secondary jobs and $34.25 billion of activity in 2015, the North Dakota oil and gas industry makes up 20 percent of jobs and 30 percent of total wages in the state's private sector.[1]

$98,384 Average wage in North Dakota's oil industry

Oil and gas employment could grow to more than 130,000 direct jobs before 2040[2]

NEW NORTH DAKOTA JOBS in oil and gas since 2005[1] **52,129**

The Bakken created prosperity in nearly every economic sector in North Dakota where every type of worker is needed from skilled tradesmen to engineers to daycare providers and nurses. Sectors in high demand:

Technology & Software
Drilling and production operations utilize millions of dollars in the latest software and hardware technology to optimize operations and increase production.

Manufacturing, Welding & Transportation
Truck drivers, welders, and manufacturing workers are employed from Williston to Fargo to produce and move the equipment and materials needed by the industry.

Construction, Real Estate & Engineering
Adding thousands of new residents and businesses has created construction demand across North Dakota.

[1] North Dakota State University Economic Study

Boost to the Budget

North Dakota's oil and gas industry is the primary source of revenue for the state government, including these types of taxes and fees:

Severance (Production & Extraction) Taxes
Oil and gas producers pay 10 percent of the revenues from each well as s*everance taxes* to state government, estimated to total $3.15 billion in the 2017-19 budget.[3]

Sales Tax on Equipment & Other Purchases
Oil producers pay $200,000 or more in sales taxes on on each of the 500 to 2,000 wells drilled annually.

Personal & Corporate Income and Property Taxes
In 2013, North Dakota oil and gas companies and their workers paid more than $223 million in these taxes.[1]

Additionally, the industry paid $898 million in other taxes, fees, permits, and royalties to the state in 2013.[1]

Where do production & extraction taxes go? [3]

Distributions for the 2017-19 Budget:	Estimate
Counties & Cities	$ 512,269,770
Tribal Allocations	236,327,604
Legacy Fund	874,542,091
Foundation Aid Stabilization Fund	132,244,690
Common Schools Trust Fund	132,244,690
Resources Trust Fund	260,289,380
Renewable Energy Development Fund	3,000,000
Energy Conservation Fund	1,200,000
Research Fund	10,000,000
Oil & Gas Impact Grant Fund	104,277,412
North Dakota Heritage Fund	21,701,852
Well Plugging & Site Reclamation Fund	10,850,926
General Fund	300,000,000
Tax Relief Fund	300,000,000
State Disaster Fund	-
Strategic Investment & Improvements Fund	252,519,491
Total Revenues	**$3,151,467,906**

89% **SEVERANCE TAXES EQUAL 89%** of the state's general fund[3]

[1] North Dakota State University Economic Studies, [2] North Dakota Dept. of Mineral Resources, [3] North Dakota OMB (March 2017)

Getting to Production

Long before a well produces oil, operators begin with months or years of preparation which includes acquiring royalty leases; site planning; navigating state, federal, and local regulatory processes; attaining a drilling permit from the appropriate governing bodies, most often the state; and drilling and completing the well.

Geological Surveys:
Years before exploration, teams of surveyors study entire regions for data suggesting oil is recoverable in a given area.

Acquiring Leases for Mineral Rights:
Operators use landmen to negotiate leases for privately-owned mineral rights and pay a royalty based on production to the mineral owner.

Applying for a Permit to Drill:
Every well in North Dakota must be approved by the North Dakota Industrial Commission. The NDIC considers each well's proximity to bodies of water, unstable soils, floodplains, nearby homes or military facilities, roads, city limits, wildlife management areas, historical sites and public recreation areas, as well as each operator's plan for capturing and transporting natural gas.

[1] U.S. Energy Information Administration

Careful Planning

Horizontal drilling, the technology that allowed the development of the Bakken, is a new approach for oil exploration that requires up to 90 percent less land than conventional drilling did in the past. As a result, the land and the environment are impacted to a far lesser extent.

Spacing Units

The North Dakota Dept. of Mineral Resources developed a grid of two mile long by one mile wide "spacing units" that covered the Bakken.

Spacing units help to organize development and minimize the amount of land used for well pads.

Energy Corridors

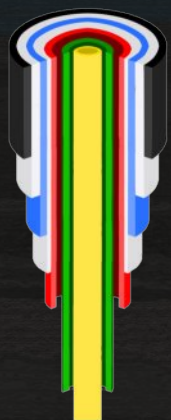
Spacing units are set end-to-end along existing roads and section lines titled "energy corridors."

Energy corridors contain pads to limited roads spaced four miles apart, allowing 99.5 percent[1] of the land to be unaffected by oil and gas.

[1] North Dakota Department of Mineral Resources

0.5% **PERCENT OF THE LAND** utilized for well pads

Innovative Casing



North Dakota has among the strictest regulations for well casing.

In all, four or more layers of casing and cement are placed between the production tubing and the soil. They extend 200 feet below the bottom of the water table, some 2,000 feet or more below the surface.

These regulations ensure our water supplies remain safe.

Drilling the Well

Drilling a well requires three to six weeks of around-the-clock work from a team that lives on-site. The team includes the rig superintendent, the company man (operator representative), rig hands, mud loggers and geologists, and the directional driller.

How are wells drilled differently today?

Drilling today begins much the same as in the past.

A drilling rig is positioned above the intended wellhead and a vertical well is drilled downward to the target depth, which is 10,000 to 11,000 feet for the Bakken formation.

Now, however, companies utilize horizontal drilling to curve 90 degrees at the target depth and drill two miles horizontally.

Horizontal drilling allows operators to drill 6 to 28 wells on a single well pad. These multi-well pads use 90 percent less land than vertical drilling.[1]

[1] North Dakota Department of Mineral Resources

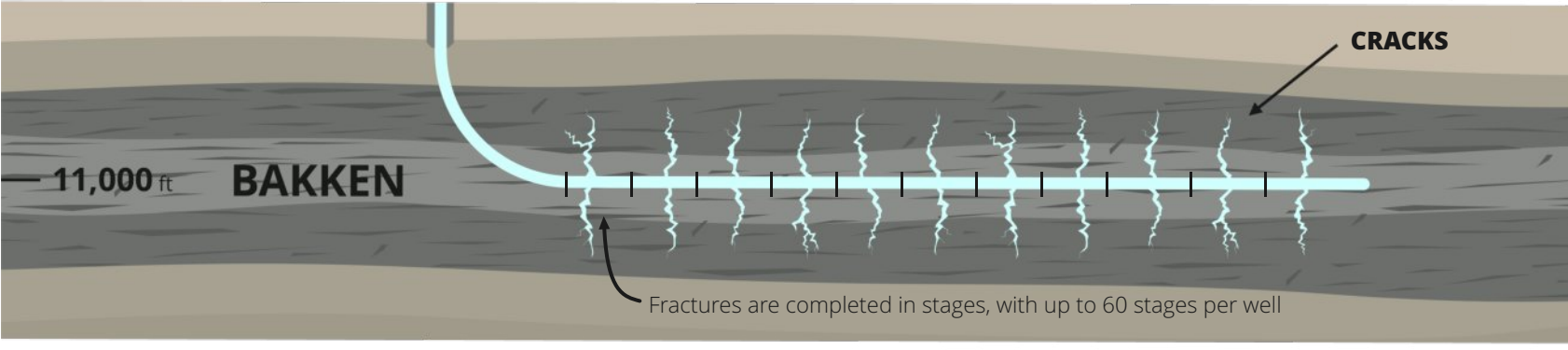
Completion and Stimulation

Well completion and stimulation (*commonly known as "hydraulic fracturing"*) is the final stage before a well produces oil and gas. Technologically-advanced completion and stimulation techniques allowed operators to economically develop the Bakken formation beginning in 2006.

Completion begins by installing the production casing (a steel pipe) vertically to the base of the curve and a liner is run through the horizontal leg of the well. Then the liner and shale are perforated, and the well is ready for stimulation.

Stimulation has been safely used for oil and gas production since 1947 in more than 1.2 million wells. The process pumps fluid down the well under high pressure to create hair-width cracks in the dense shale rock. The fluid contains 99.5 percent water and quartz sand or ceramic proppant, which prevent the cracks from closing and allowing oil and gas to flow more freely.

The fluid is made up of 0.5 percent chemicals that suspend the proppant, eliminate bacteria and build-up of scale, and protect the pipe and protective casing from corrosion.



The Production Phase

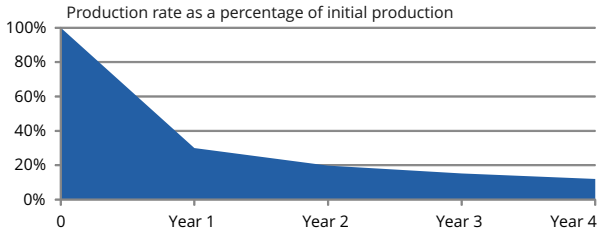
Each Bakken well is expected to produce oil for 45 years, and over that time, daily production will fall and operators will periodically *refrac* the well to increase production.

Initial Production
As the chart shows, production from Bakken wells falls quickly, requiring continued drilling to maintain total statewide production, revenues, and economic activity.

Enhanced Oil Recovery
Scientists at UND and other facilities are experimenting with new techniques to increase the amount of oil recovered from the Bakken formation.

Long-term Production Jobs
One to three permanent jobs will be created for each producing well. With 13,632 wells as of March 2017 and 65,000 wells planned for the Bakken, North Dakota's oil industry will need as many as 80,000 new employees!

678k **EACH BAKKEN WELL PRODUCES** 678,000 barrels of oil[1]



Most production occurs early in a well's life[2]

5-10% Percent of oil recovered with current technology[3]

$150 billion Value of producing one more percentage point[3]

[1] NDIC and/or Department of Mineral Resources, [2] David Hughes, Tight Oil: A Solution to U.S. Import Dependence?, [3] Energy & Environmental Research Center

Reclaiming a Well to the Natural Environment

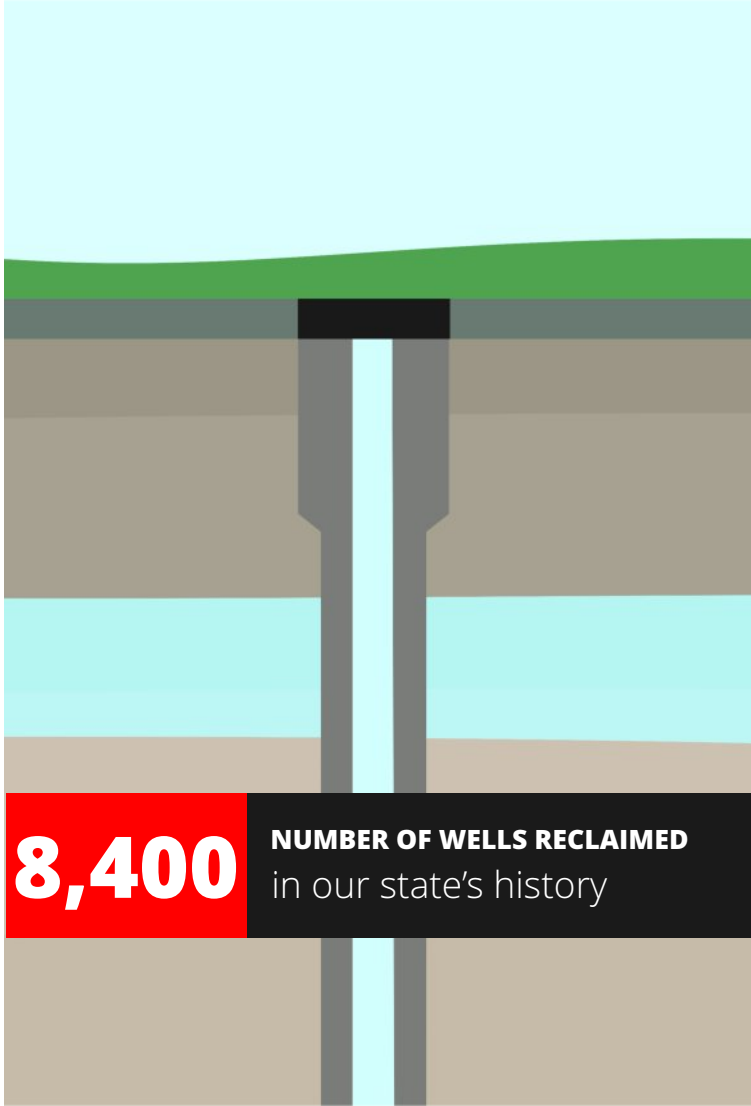
The operator is required by law to start the reclamation process one year or less after a well has stopped producing economically.

During the reclamation process, the casing is cut three to four feet below the ground, and the pipe is cemented in three different places. Soils removed during the initial well pad construction are returned to the site and the land is returned to the best condition possible.

An operator is not released of its bond until both an inspector from the Department of Mineral Resources and the landowner are satisfied with the job.

Restoring the Original Soil:

The reclamation process returns the original top and sub-soils to the former site of a well pad.



8,400 **NUMBER OF WELLS RECLAIMED** in our state's history

From the Wellhead to Market

Producing oil and gas at the well is only the first step in a long chain of events that turns the raw material into usable products for people and businesses.

Each Bakken wellpad is equipped with heater treaters, separators, and tanks needed to separate water, oil, natural gas liquids (NGL's), and natural gas from one another. These products are transported by truck or gathering pipelines to midstream facilities such as gas processing plants and tank batteries before final distribution via large pipelines to downstream facilities such as refineries and chemical manufacturers.

Petroleum: Modern Life's Essential Raw Material

Petroleum is most often used for transportation fuels, heating fuel, electricity generation, asphalt, and road oil. In 2012, businesses and consumers in the United States used about 75 percent of all petroleum consumed for these purposes.[1] Petroleum, however, is an essential ingredient in more than 6,000 products used every day.

These various plastics, synthetic materials, and chemical products ensure a reliable food supply, keep us clean, and protect our safety and health.

Our modern quality of life would be impossible without the petroleum to produce these products.

[1] U.S. Energy Information Administration

Shale Oil Strengthened America

Shale Gas and Tight Oil Boom

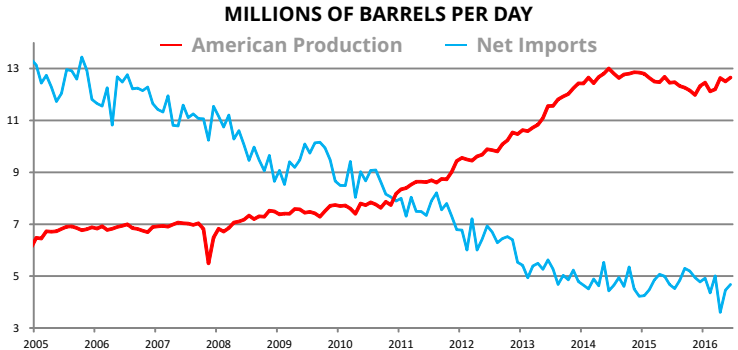
Discoveries in horizontal drilling and stimulation have unlocked shale oil and gas formations across the country. These advancements have made the United States the top producer of both natural gas and oil in the world, providing millions of jobs across the country.

The Largest Shale Formations

The Bakken joins two Texas formations, the Eagle Ford and Permian Basin, as the most developed American shale oil formations. These three formations are among a select group of only 10 formations in the world to ever produce 1 million bopd.

Developing America's Energy Security

After decades of relying on OPEC nations for its petroleum supply, America has decreased net imports from 69 percent in November 2005 to only 27 percent in April 2017.[1]



The combination of horizontal drilling and hydraulic fracturing, applied in North Dakota and Texas, reduced the power of OPEC and turned America into the world's largest producer of petroleum in 2014.[2]

[1] U.S. Energy Information Administration, [2] Bank of America via Bloomberg News, [3] Forbes

$180 billion SAVED ANNUALLY BY Americans at the pump[3]

BAKKENBACKERS

A COALITION OF CITIZENS, WORKERS, BUSINESSES, AND LEADERS WHO SUPPORT THE BAKKEN AND ITS BENEFIT TO NORTH DAKOTA

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