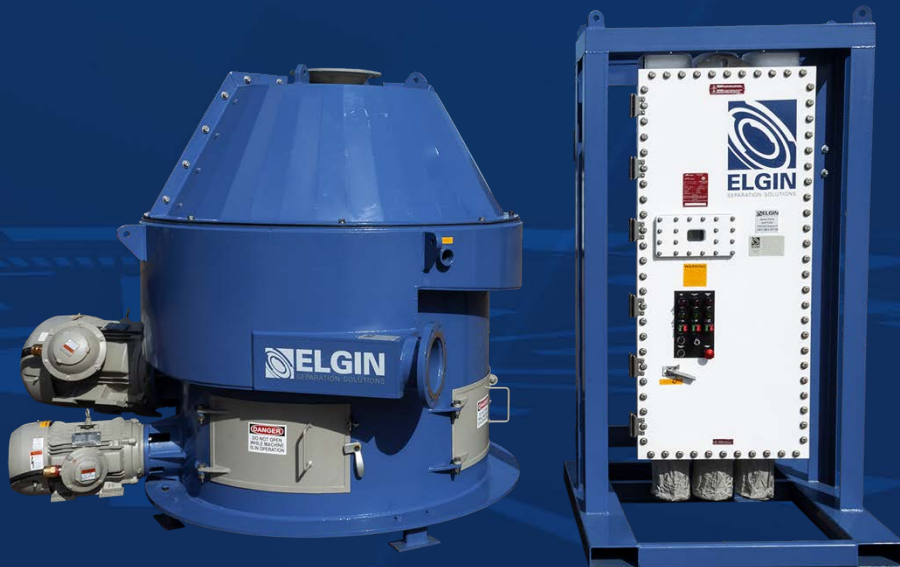




CSI-D4 Cyclone Pro™
Direct Dual-Drive Dryer
Deployment Case Studies



Revision A

Natural Resource Recycling • Product Classification • Dewatering • Fluid Recovery
Waste Management • Material Handling • Liquid/Solid Separation • Crushers • Feeders

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Elgin's Patented Direct Dual-Drive Dryer

Elgin is proud to introduce the industry's first VFD-operated differential speed-controlled VCD, the CSI-D4 Cyclone Pro™. Not only does Elgin's proprietary direct dual-drive dryer allow operators the ability to adjust the applied G-force (as may be dictated by operating conditions and/or by the physical characteristics of the cuttings), it allows for independent control of the cuttings dwell time.

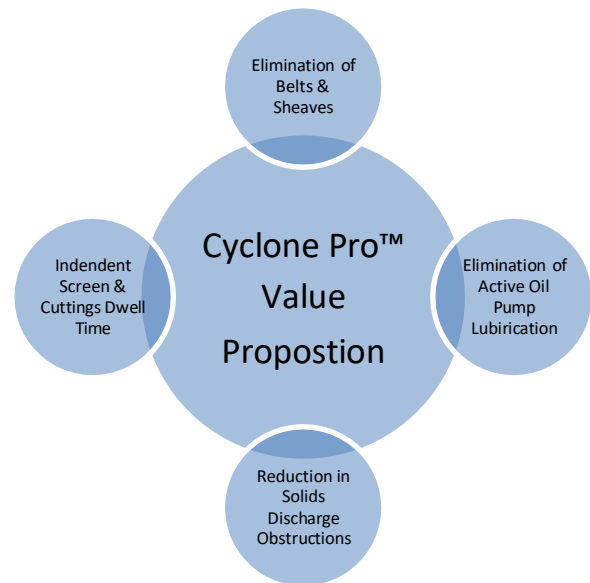
Elgin's CSI-D4 Cyclone Pro™ direct dual-drive drier provides operators the ability to adjust the solids residence time and the solids cake wall accumulation. This new proprietary feature provides a vertical cuttings dryer that can achieve unsurpassed control and fine-tuning when faced with ever-changing waste management conditions.

As an exclusive technology to Elgin, no other dryer available in the market can provide as much operating flexibility and sophistication as the CSI-D4 Cyclone Pro™.



Elgin's CSI-D4 Cyclone Pro™ provides the industry with a number of operational advantages never seen before. These advantages include, but are not limited to:

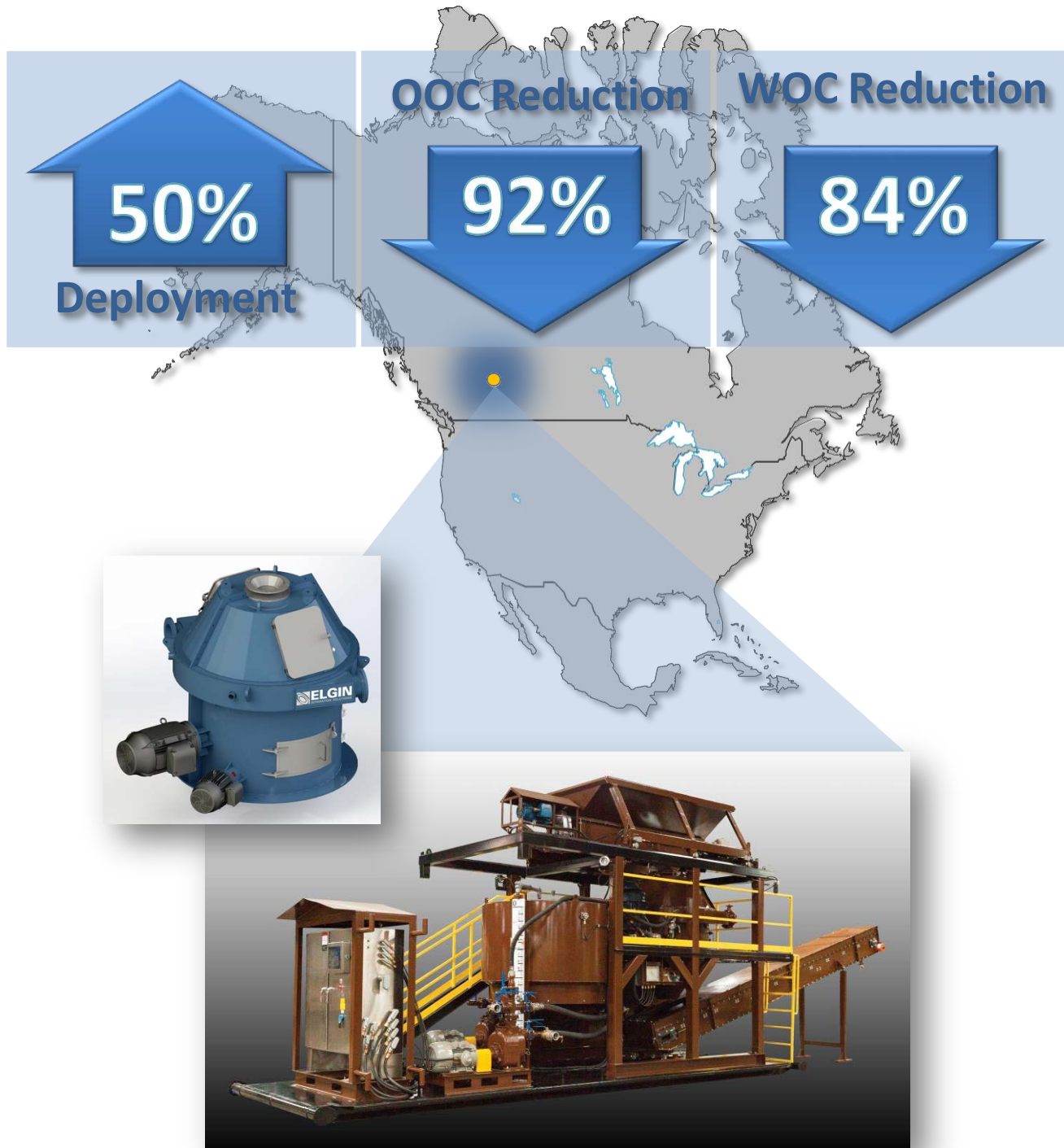
1. **Elimination of Belts & Sheaves** – Beyond the labor required to service and maintain the sheaves, belts must be routinely replaced. By removing the belt and sheave system, the cost of replacement parts is completely eliminated.
2. **Independent Screen & Cuttings Dwell Time** – No other dryer in the market provides for independent control of the cuttings dwell time. For the first time in the industry, operators will have the ability to adjust the cake wall accumulation and the residence time of the solids within the dryer. This very feature allows the CSI-D4 Cyclone Pro™ to be deployed in a variety of lithologies (including shale, clay and limestone) and industries (including microtunneling, horizontal directional drilling, rendering, and oil and gas drilling).



3. **Elimination of Active Pump Lubrication System** – Elgin's new oil-sealed gear box assembly eliminates the need for maintenance and service of an oil pump lubrication system. The CSI-D4 Cyclone Pro™ has no oil pump, oil reservoir, oil filtration system, flow switch or pressure switch. These systems require frequent service and are the root cause to many of the equipment failures experienced with historical dryer technology. Not only is the service support be lowered, but the cost of spare parts and maintenance has been dramatically reduced.
4. **Dramatic Reduction in Solids Build Up** – The more obstructions present below the screen, the more pervasive and rapid the solids build up. In Elgin's CSI-D4 Cyclone Pro™ the gear box obstructions have been dramatically reduced. The new drive shaft tunnel replaces the previous belt and sheave tunnel with an enclosure that is 70% smaller. Even more impressive is that the gear-box enclosure has been reduced in size by 40%. The combined size reduction of these two obstructions has effectively doubled the open area below the screens, therefore dramatically reducing solids accumulation.

In order to verify the value created by Elgin's CSI-D4 Cyclone Pro™ Direct Dual-Drive Dryer, a number of field trials had been coordinated. Each field trial has impressed Elgin's customers and has provided results far better than were originally anticipated. The following document summarizes the results of four of those field trials.

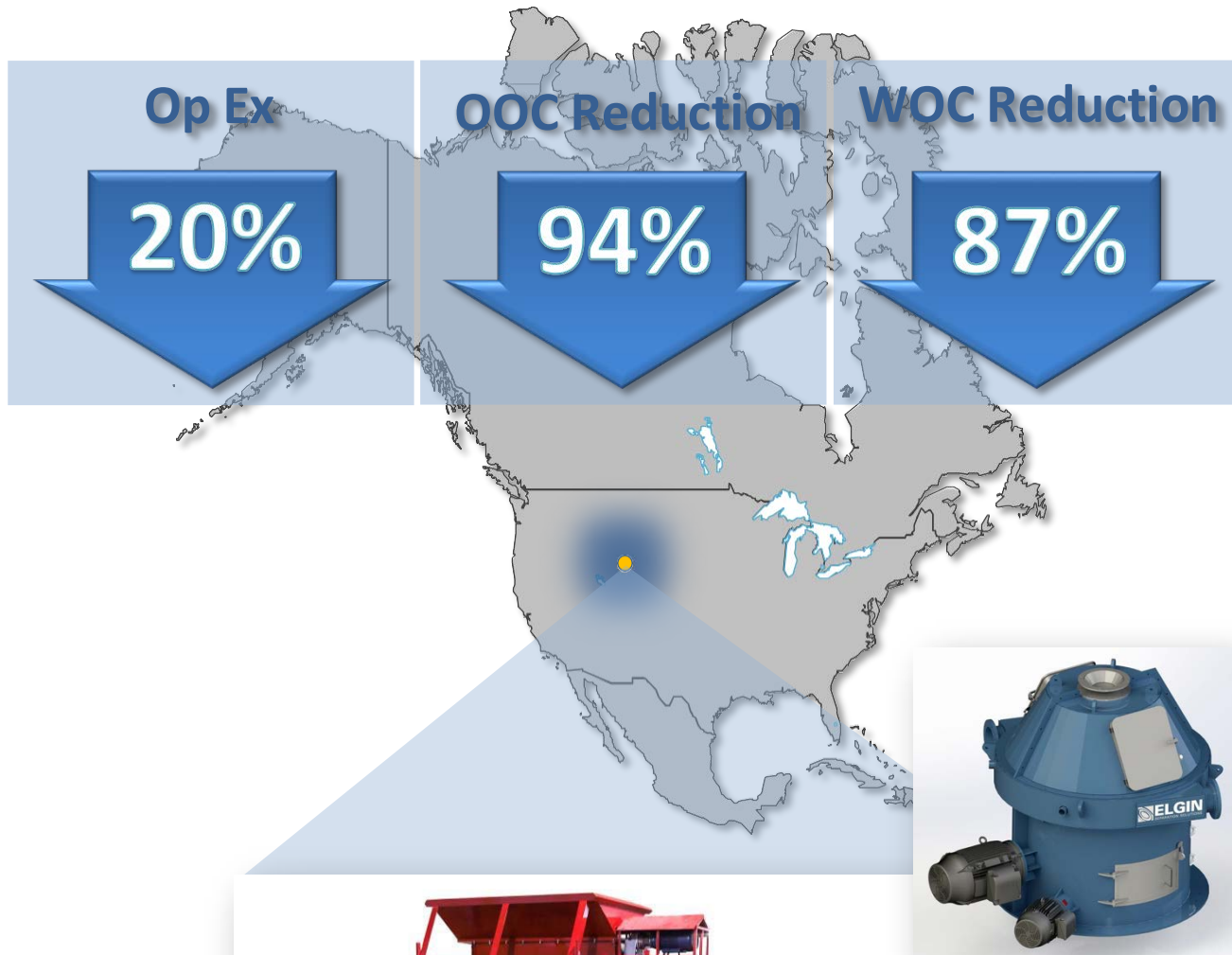
Case Study A - Project Alberta



Case Study A - Project Alberta Summary

Location:	Alberta, Canada
Application:	Oil & Gas Water-Based Drilling Fluid in the Vertical Section and Oil-Based Mud in the Lateral Section – 120 Total Wells Drilled.
System Configuration:	Turn-Key CSI-D4 Cyclone Pro™ Fully-Integrated Package
Challenges / Problems:	<ul style="list-style-type: none"> i. Canada has had a long history of unsuccessful vertical cutting dryer deployments over the last two decades. These unsuccessful deployments have hurt the reputation of the technology and have led many to turn to drying shakers and chemical binders to manage the combination of water-based cuttings and oil-based cuttings. ii. Another challenge in Alberta is the combination shale, clays, and sand that make up the subsurface lithology. This leads to a number of challenges for traditional dryers. Not only does it limit a traditional dryer to the oil-based section, when deployed in the oil-based section, the clays and fine solids frequently result in screen blinding. iii. Further, Alberta has banned the use of fluid binders, such as saw dust and polymers. This has been a long tradition in Canada in order to ensure that the solids could be transported legally without concern of fugitive oils being lost during transport.
Results / Solutions:	<ul style="list-style-type: none"> i. Without requiring a change to the screens or flites, Elgin's CSI-D4 Cyclone Pro™ dryer settings were adjusted to accommodate the vertical and lateral sections. As a result, not only did this result in a 50% increase in the number of deployment days that would have been normally achieved with a conventional dryer, the dryer operated without blinding. ii. Elgin's CSI-D4 Cyclone Pro™ Turn-Key Package provided for an efficient solution for quickly drilled wells. Wells were being complete within three days. The CSI-D4 Cyclone Pro™ Turn-Key Package allowed for complete mobilization, erection, and commissioning within 6 hours with just two personnel. iii. Specific to the oil-based section, the CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with an oil- on-cuttings ("OOC") percentage that ranged from 40% to 50%. Depending on the feed rate the solids discharge OOC ranged from 3.1% to 4.6%. All free oil was removed and the cuttings were transported to a traditional landfill for disposal. iv. Specific to the water-based section, the CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with a water-on-cuttings ("WOC") percentage that ranged from 40% to 60%. Depending on the feed rate the solids discharge WOC ranged from 6.3% to 8.4%. All free water was removed and the cuttings were transported to a traditional landfill for disposal. v. Given the results achieved from Elgin's CSI-D4 Cyclone Pro™ Turn-Key Package, Company A has proceeded to convert their entire VCD fleet to Elgin's CSI-D4.

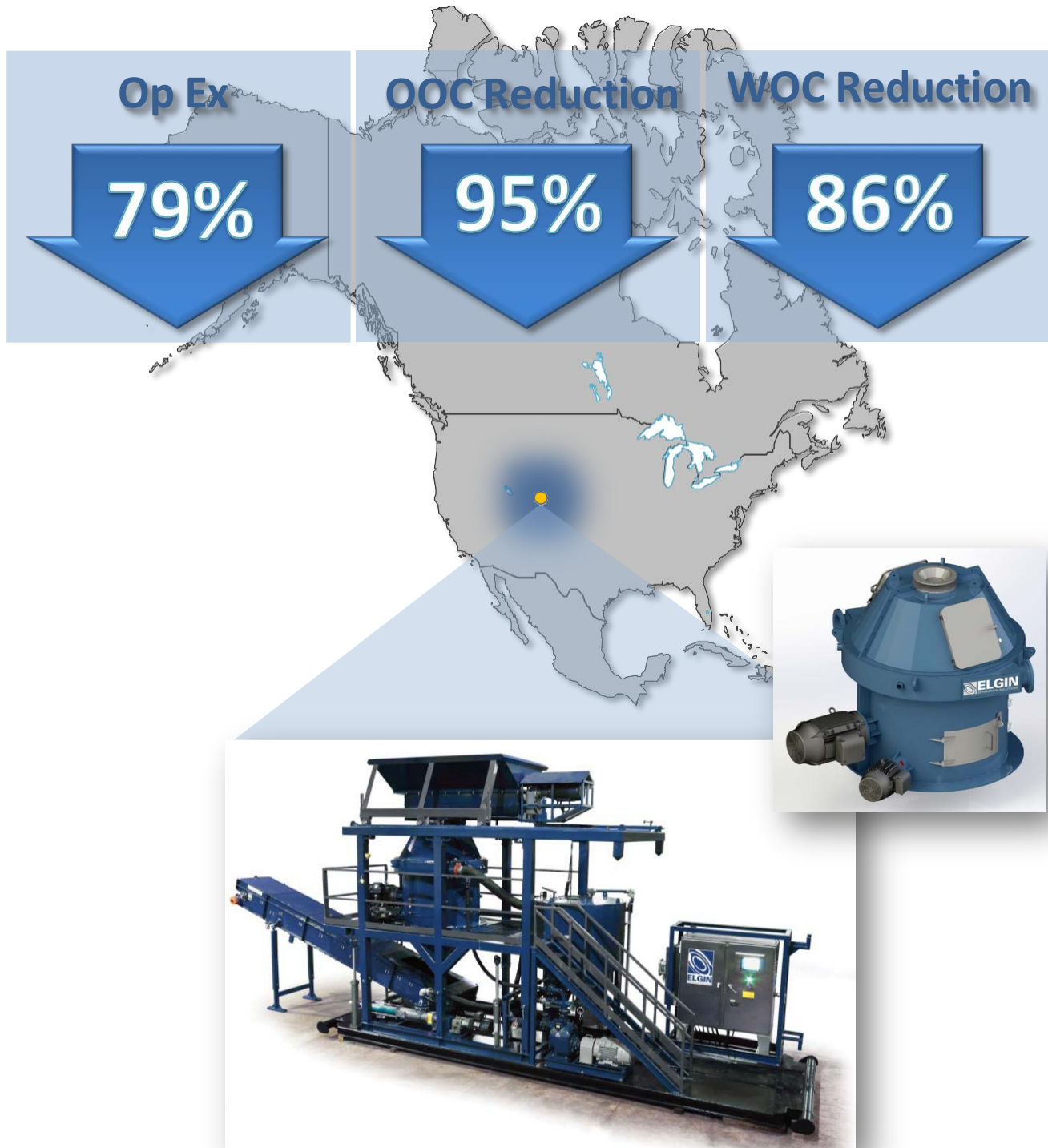
Case Study B - Project Big Red



Case Study B - Project Big Red Summary

Location:	Wyoming, United States
Application:	Oil & Gas Water-Based Drilling Fluid in the Vertical Section and Oil-Based Mud in the Lateral Section – Fourteen (14) Total Wells Drilled.
System Configuration:	Turn-Key CSI-D4 Cyclone Pro™ Fully-Integrated Package
Challenges / Problems:	<ul style="list-style-type: none"> i. Though Wyoming has had a long history of VCD deployments, the adoption rate has been hampered by the high volume of clay that makes up the subsurface lithology. Not only had this limited a traditional dryer to the oil-based section, when deployed in the oil-based section, the clays and fine solids would frequently result in screen blinding. ii. In addition, over the last few years, the prevalence of water-based drilling fluids has become popular in Wyoming. These new water-based drilling fluids are more expensive and recovery has become important.
Results / Solutions:	<ul style="list-style-type: none"> i. Elgin's CSI-D4 Cyclone Pro™ dryer was deployed to allow management of cuttings throughout the entire well. Without requiring a change to the screens or flites, the dryer settings was adjusted to accommodate the vertical and lateral sections. Not only did this result in a 30% increase in the number of deployment days, in comparison to what would have been normally achieved with a conventional dryer, the dryer operated without blinding. There were several sections of the well in which the dryer was exposed to heavy volumes of clay without blinding. ii. Elgin's CSI-D4 Cyclone Pro™ Turn-Key Package provided for an efficient solution for quickly drilled wells. Wells were being complete within three to five days. The CSI-D4 Cyclone Pro™ Turn-Key Package allowed for complete mobilization, erection, and commissioning within 6 hours with just two personnel. iii. Specific to the oil-based section, the CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with an oil- on-cuttings ("OOC") percentage that ranged from 55% to 75%. Depending on the feed rate the solids discharge OOC ranged from 3.3% to 4.9%. All free oil was removed and the cuttings were transported to a traditional landfill for disposal. iv. Specific to the water-based section, the CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with a water-on-cuttings ("WOC") percentage that ranged from 50% to 75%. Depending on the feed rate the solids discharge WOC ranged from 6.3% to 9.1%. All free water was removed and the cuttings were transported to a traditional landfill for disposal. v. Company Big Rig has dozens of traditional dryers within their fleet. After running Elgin's CSI-D4™, they observed a 20% reduction in operating expenses. This was the direct result of the fact that the CSI-D4 requires no belts or active pump oil lubrication system. vi. Given the results achieved from Elgin's CSI-D4 Cyclone Pro™ Turn-Key Package, Company C has earmarked their entire future cap-ex budget for VCD's to Elgin's CSI-D4.

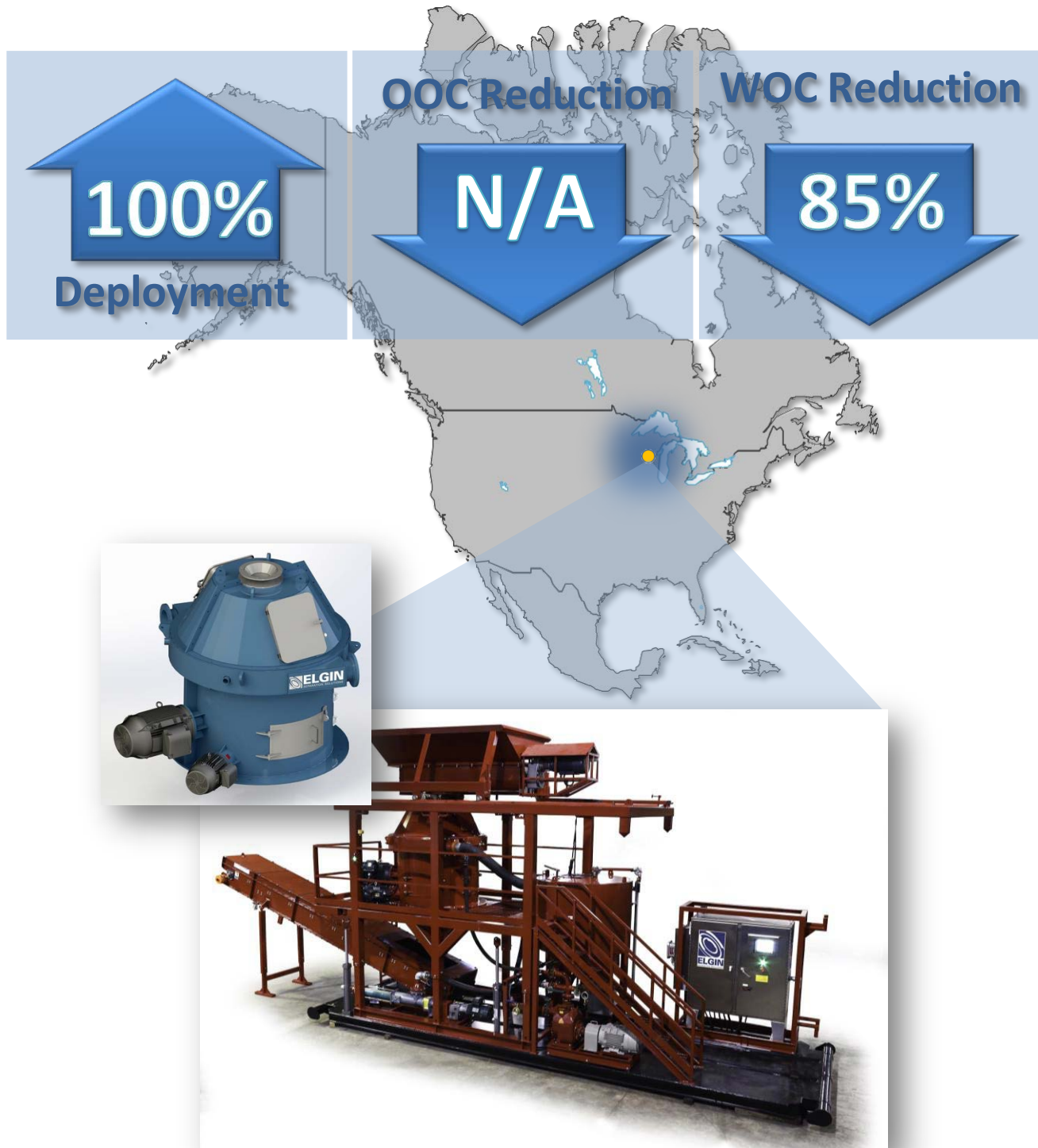
Case Study C – Project Terra



Case Study C - Project Terra Summary

Location:	Colorado, United States
Application:	Oil & Gas Water-Based Drilling Fluid in the Vertical Section and Oil-Based Mud in the Lateral Section – Eleven (11) Total Wells Drilled.
System Configuration:	Turn-Key CSI-D4 Cyclone Pro™ Fully-Integrated Package
Challenges / Problems:	<ul style="list-style-type: none"> i. Though Colorado has had a long history of VCD deployments, the adoption rate has been hampered by the combination shale, clays, sand and gravel that make up the subsurface lithology. Not only does it limit a traditional dryer to a the oil-based section, when deployed in the oil-based section, the clays and fine solids would frequently result in screen blinding. ii. For Company Terra, the solution was to deploy a specialized combination of in-line cuttings grinders and high-speed big-bowl decanter centrifuges. This process would normally provide discharge cuttings with an OOC that ranged from 7% to 11%. iii. Consequently, despite the effectiveness of the process in dewatering either water-based or oil-based cuttings, it resulted in accelerated equipment wear. Both the grinder and the high-speed big-bowl decanter centrifuge would require rebuilding every 45 to 60 days. This resulted in equipment maintenance costs that exceeded \$20,000 per month.
Results / Solutions:	<ul style="list-style-type: none"> i. As Company Terra's original process was able to support the oil-based and water-based section, the dryer did not achieve an increase in the number of deployment days in comparison to what would have been normally achieved with a conventional dryer. ii. Specific to the oil-based section, the CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with an oil- on-cuttings ("OOC") percentage that ranged from 45% to 60%. Depending on the feed rate, Company D was able to achieve the best results seen by an Elgin CSI-D4 Cyclone Pro™, with solids discharge OOC ranging from 2.3% to 3.7%. All free oil was removed and the cuttings were transported to a traditional landfill for disposal. iii. Specific to the water-based section, the CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with a water-on-cuttings ("WOC") percentage that ranged from 45% to 70%. Depending on the feed rate the solids discharge WOC ranged from 6.3% to 10.2%. All free water was removed and the cuttings were transported to a traditional landfill for disposal. iv. More importantly, the new cuttings management program, utilizing the CSI-D4 Cyclone Pro™, was able to reduce monthly equipment maintenance costs from approximately \$20,000 per month to just \$4,250 per month, a 79% reduction. v. Given the results achieved from Elgin's CSI-D4 Cyclone Pro™ Turn-Key Package, Company D has placed an order for four (4) CSI-D4 Cyclone Pro™ packages with the intention to expand their total fleet to twelve (12) units within the next year.

Case Study D - Project Tunnel



Case Study D - Project Tunnel Summary

Location:	Wisconsin, United States
Application:	Micro-Tunneling Water-Based Drilling Fluid – Three Projects
System Configuration:	Turn-Key CSI-D4 Fully-Integrated Package
Challenges / Problems:	<ul style="list-style-type: none"> i. Due to the nature of micro-tunneling, there can be hundreds-of-tons of waste solids (i.e. “cuttings”) generated. Complicating matters further is the fact that micro-tunneling is done at the surface, eliminating the option to use oil-based drilling fluids. Instead, high volumes of engineered drilling fluids are used. The more drilling fluid lost with the cuttings, the higher the cost of boring. ii. The application in question was to drill through large sections of limestone. Given the soft and hydrophilic nature of the limestone, dryer technology had never previously been considered. iii. For years, the micro-tunneling industry has been limited to application of drying shakers and/or polymer binders to recover as much of the drilling fluid as possible and to achieve as dry of a waste solids discharge. However, it was common that the solids required special handling and/or disposal, as it is difficult to remove all free liquids.
Results / Solutions:	<ul style="list-style-type: none"> i. Elgin’s CSI-D4 Cyclone Pro™ dryer was deployed to allow management of cuttings throughout the entire bore. Without requiring a change to the screens or flites, the dryer settings were be adjusted to accommodate different lithologies, particle size distributions, and percent solids throughout the horizontal drilling program. As a result, the drilling contract was able to manage all of the solid cuttings to achieve a stackable solid. ii. Unlike traditional O&G cuttings management systems, in this application the CSI-D4 system was applied to both the course cuttings and fine cuttings. This included cuttings that were discharged from the scalping shakers, hydrocyclone desander underflow and hydrocyclone desilter underflow. iii. The CSI-D4 Cyclone Pro™ Turn-Key Package received cuttings with a water-on-cuttings (“WOC”) percentage that ranged from 40% to 80%. Depending on the particle size distribution, the solids discharge WOC ranged from 5.9% to 8.5%. All free water was removed and the cuttings were transported via traditional dump trucks to a traditional landfill for disposal. In some cases, the company was allowed to land-farm the cuttings to the job site. iv. Given the results achieved from Elgin’s CSI-D4 Cyclone Pro™ Turn-Key Package, Company B has proceeded to secure two CSI-D4 packages.

Final Considerations

Elgin's CSI-D4 Cyclone Pro™ presents the market with a new value proposition not previously seen in traditional vertical cuttings dryers. Not only does the CSI-D4 Cyclone Pro™ reduce operating expenses, but it increases the number of days of deployment. Instead of attempting to manipulate performance through custom screens, modified sheaves, and VFD's, the CSI-D4 Cyclone Pro™ design basis inherently provides for a system that requires no gimmicks or smoke & mirrors. It does what it does because it was designed from the ground up as an answer to decades of customer feedback.

No other company in the world has deploy more vertical cuttings dryers and no other company in the world can provide Elgin's patent-pending CSI-D4 Cyclone Pro™. For more technical information regarding Elgin's CSI-D4 Cyclone Pro™ and video documentation relative to each of above-referenced case studies, please visit our website as www.ElginSeparationSolutions.com.

Model Number:	CSI-D3 Cyclone Pro™	CSI-D4 Cyclone Pro™	CSI-D5 Cyclone Pro™
Equipment Image:			
Feed Capacity ¹ :	40 TPH (605 kg/m)	70 TPH (1,058 kg/m)	90 TPH (1,361 kg/m)
Maximum G-Force:	460V / 60Hz 300 to 700 G's (VFD) 360V / 50Hz 300 to 500 G's (VFD)	460V / 60Hz 300 to 550 G's (VFD) 360V / 50Hz 300 to 450 G's (VFD)	460V / 60Hz 300 to 550 G's (VFD) 360V / 50Hz 300 to 450 G's (VFD)
Screen Opening Sizes:	0.008" (0.2mm) to 0.04" (1.0mm)	0.008" (0.2mm) to 0.04" (1.0mm)	0.008" (0.2mm) to 0.04" (1.0mm)
Gear Box Ratio:	VFD Variable	VFD Variable	VFD Variable
Lubrication System	Oil Sealed Gearbox	Oil Sealed Gearbox	Oil Sealed Gearbox
Screen Surface Area:	7.11 sq. ft. (0.661 sq. m.)	13.3 sq. ft. (1.25 sq. m.)	15.5 sq. ft. (1.44 sq. m.)
Motor Horsepower:	(1) 25 hp (18.3 kw) & (1) 5 hp (3.7 kw)	(1) 60 hp (44.74 kw) & (1) 15 hp (11.19 kw)	(1) 75 hp (55.16 kw) & (1) 20 hp (14.71 kw)
Voltage:	460v / 60Hz or 380V / 50Hz 3-Phase (Dual Rated Inverter-Duty Motor)	460v / 60Hz or 380V / 50Hz 3-Phase (Dual Rated Inverter-Duty Motors)	460v / 60Hz or 380V / 50Hz 3-Phase (Dual Rated Inverter-Duty Motors)
Electrical Classification:	Class I – Division I VFD Explosion Proof – Group D (Temp. Rating of 55° C)	Class I – Division I VFD Explosion Proof – Group D (Temp. Rating of 55° C)	Class I – Division I VFD Explosion Proof – Group D (Temp. Rating of 55° C)
Dimensions (without stand):	84" (2,134 mm) L x 62" (1,575 mm) W x 56" (1,422 mm) H	101" (2,565 mm) L x 71" (1,803 mm) W x 76" (1,930 mm) H	101" (2,565 mm) L x 74" (1,880 mm) W x 78" (1,981 mm) H
Weight (Without Stand):	3,900 lbs (1,769 kgs)	8,300 lbs (3,765 kgs)	9,400 lbs (4,264 kgs)