



Cyclone VCD™ Overview

Maximizing WBM and OBM Drilling Fluid Recovery

2023 – Revision T

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

TERRASOURCE
GLOBAL

OUR FLAGSHIP BRANDS

GUNDLACH
CRUSHERS

JEFFREY RADER

Pennsylvania
Crusher

ELGIN

Full-Service OEM

Engineering, Design, Manufacturing, Commissioning and Servicing.



Elgin Separation Solutions is able to tackle both the small and the big projects, regardless of location or well complexity.

VCD Application

VCD Application is Driven by Three Key Objectives:



Drilling Fluid Reclamation

VCD's recover OBM and WBM from drill cuttings discharged from the flow line shakers. Shakers can discharge cuttings that are up to 25% by weight "wet". When unrecovered, this lost fluid will cost the rig thousands per day.



Waste Solid Reduction

By reclaiming drilling fluid from the cuttings, the overall volume (or weight) of the cuttings is lowered, therefore lowering transport and disposal costs by the same percentage of fluid recovery, generating further savings.



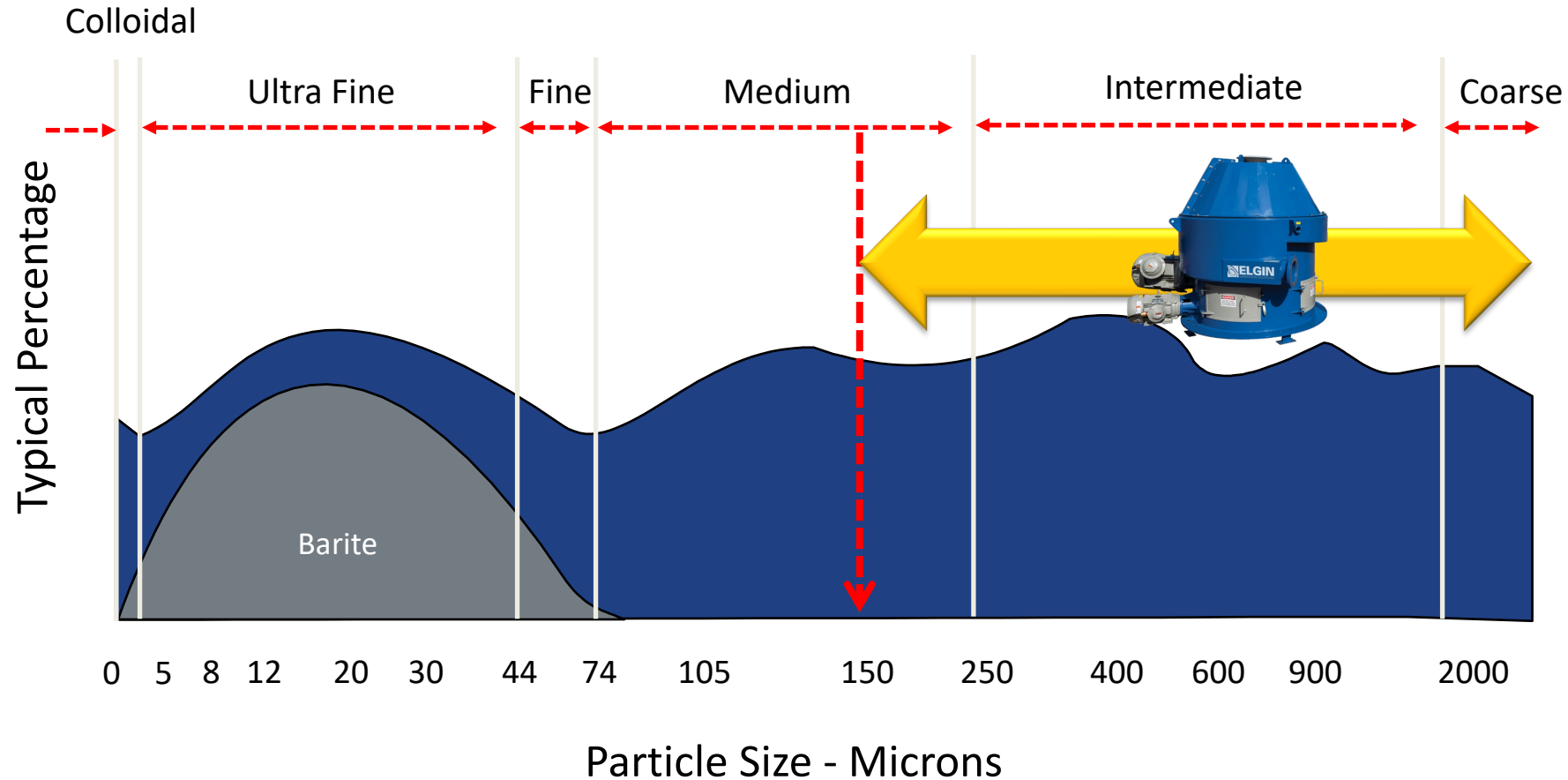
Waste Solid Declassification

Depending on the rig site (offshore vs. onshore) or even on the region in which the drilling activity is occurring, the reduction of the fluid content can lower the hazard classification of the waste solids.

The application of a VCD is driven by return on investment generated from the above three goals.

VCD Application

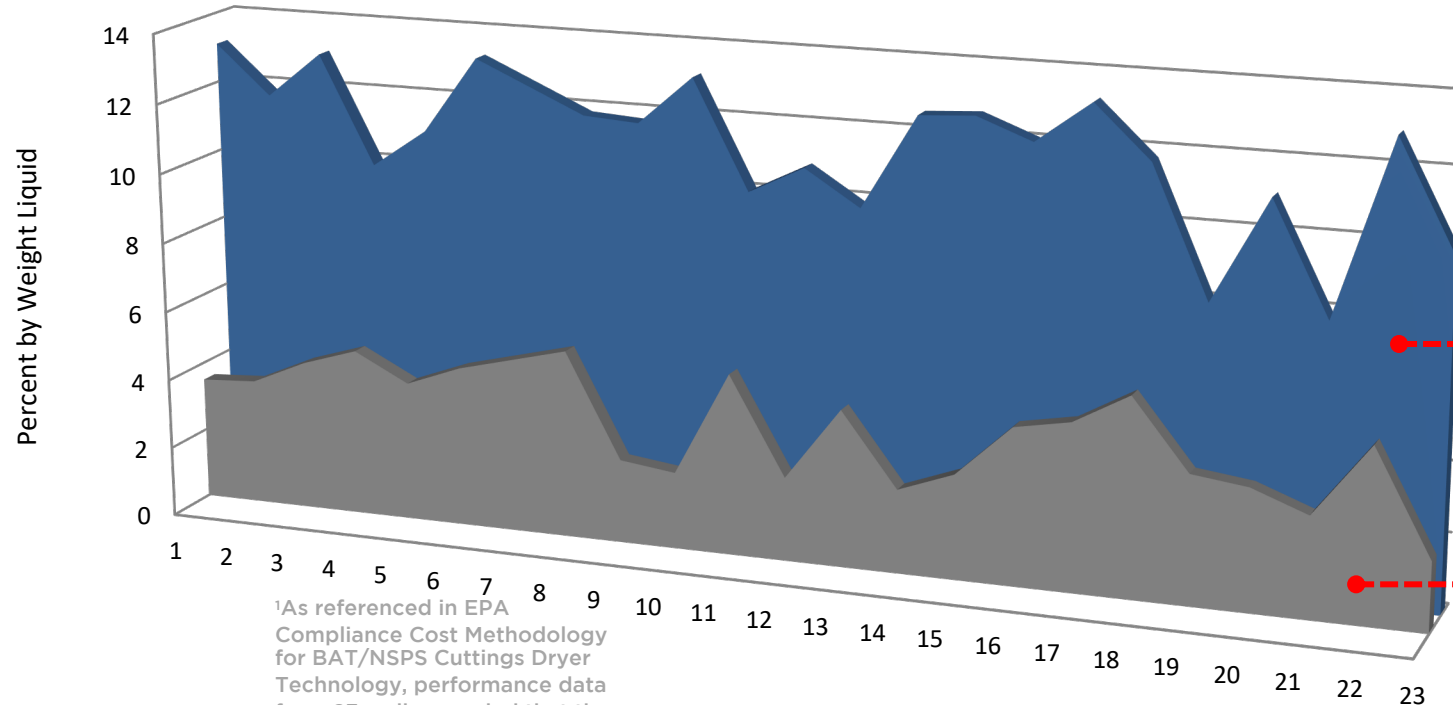
VCD's as a Waste Management Application.



VCD's are not a solids control system, they are strictly designed for waste management and fluid recovery.

VCD Application

Representative vertical cuttings dryer performance capability¹.



¹As referenced in EPA Compliance Cost Methodology for BAT/NSPS Cuttings Dryer Technology, performance data from 23 wells revealed that the Synthetic On Cuttings (SOC) was reduced from 11.7% to 4.15% by weight after being processed.

■ Standard VCD Discharge Liquid Content (% Weight)

■ Shaker Discharge Liquid Content (% Weight)



BEFORE – Drill cuttings prior to feeding through a VCD.

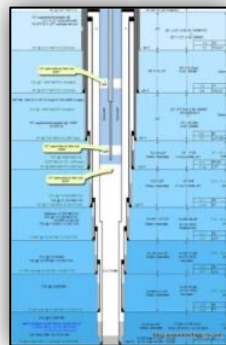


AFTER – Drill cuttings after being processed by a VCD.

A 2/3 reduction in drilling fluid loss can be achieved depending on the formation being drilled.

VCD Application

There are Several Considerations to Keep in Mind:



Consistent Feed Rate

Consistent feed rates will optimize VCD performance and ensure that the system is not over-taxed. Screw conveyor feed is highly recommended in lieu of bucket loading.

Moisture Content

Cuttings transport and the solids reduction efficiency can be hampered by cuttings that are too dry. Though counter-intuitive, sometimes it is best to reduce the cleaning capacity of the shakers.

Large Bore Limitation

VCDs operate best when the particle size distribution of the cuttings is large. Fine cuttings and clays will impact will require additional oversight and maintenance.

Fluid Inhibition

Though VCD's can be used with both WBM and OBM, VCD's work best when applied in drilling fluid applications that are highly inhibited.

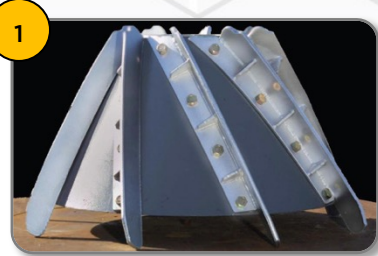
VCD Post-Treatment

Post-treatment, via centrifuge, is recommended to remove the fines from the centrate before being returned to the active mud system.

VCD operation requires qualified personnel. Elgin has a full team of specialists available for training and certification.

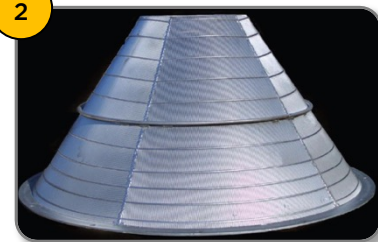
Intelligent Design

With Over 800 Worldwide Installations, No One Has More Expertise.



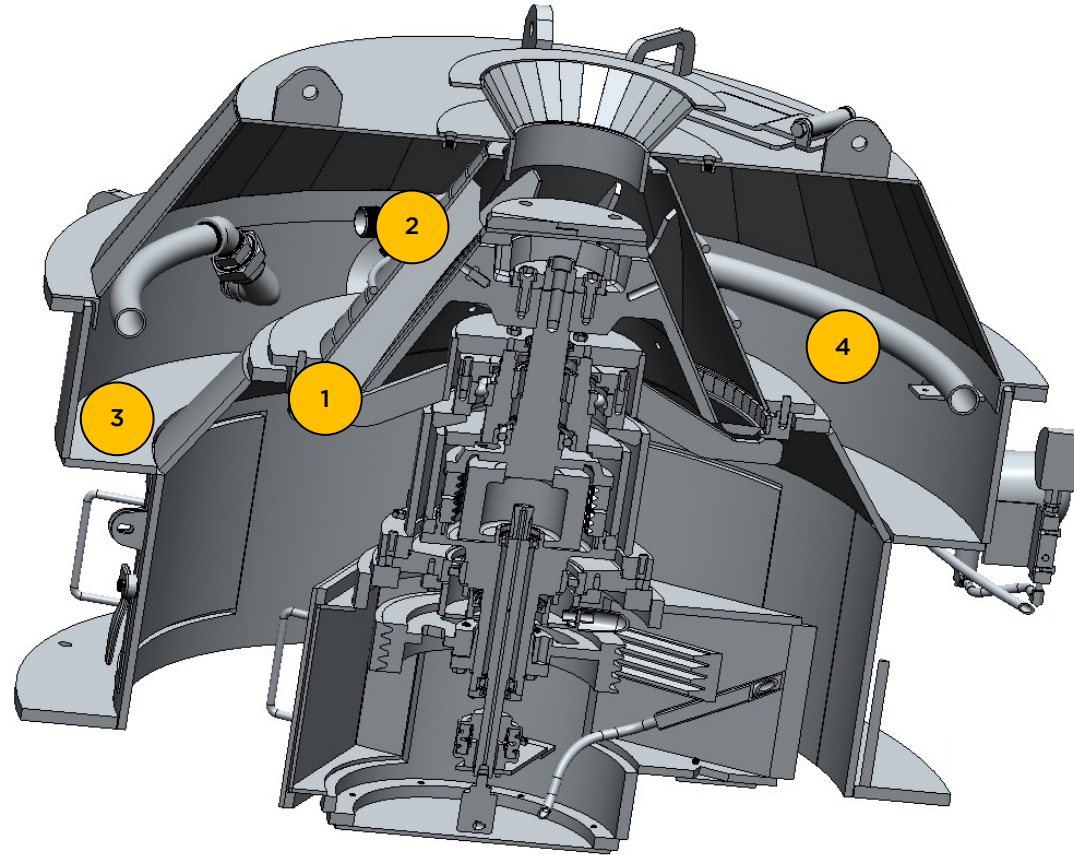
1. Engineered Flights

With various blade materials and coatings available, Elgin has developed the industry's most durable and precise flights in the market. Single piece conical sections also available.



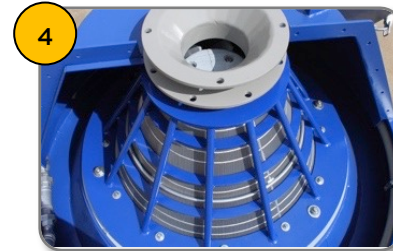
2. Screens

The heart of a VCD is the screen. By using a fully TIG welded, chromed screen, Elgin customers can experience screen life as long as a year. Screens with a slot size between 200 and 800 microns are available.



3. Spray Nozzles / Bar

By integrating the spray bar into the launder section, Elgin VCD's can withstand the longest operating periods between service.



4. Tapered Launder

By tapering the launder section collected fluids flow more efficiently and significantly lower the risk of a back-up within the VCD.

Elgin's Engineering Team continues to develop unique and proprietary improvements to maximize performance and durability.

Intelligent Design

Elgin's Patented Direct Drive Dryer Technology



CSI-D3 Cyclone Pro™

Elgin's new patented direct drive dryers incorporate a proprietary assembly that includes an alignment compensating drive shaft, greased-for-life 90-degree torque inverter, and the industry's most durable and field-proven gear-box drive system.



CSI-D4 Cyclone Pro™



The installation of grounding brushes and other static dissipation devices are rare. It is even more uncommon to have such devices maintained properly.



Inadvertent damage to the belt tunnel and/or removal of the access doors leaves static-electrical discharge or excessive heat exposed to a potentially combustible atmosphere.



Static electricity is the ignition source in approximately 10% of all chemical fires & explosions. Between 1980 and 2010 there were 351 dust fires and explosions in US.

Not only does Elgin's technology eliminate the need to enter the dryer to service the drive belt system, but it provides guaranteed Class I – Division 1 and Class I – Division 2 drive system compliance.

Vertical Cuttings Dryers

Quality Field-Proven Products Available:

Model Number:	CSI-E3 Cyclone™	CSI-E4 Cyclone™	CSI-D3 Cyclone Pro™	CSI-D4 Cyclone Pro™	CSI-D5 Cyclone Pro™
Equipment Image:					
Feed Capacity:	40 TPH (40 m³/h)	80 TPH (80 m³/h)	40 TPH (40 m³/h)	80 TPH (80 m³/h)	100 TPH (100 m³/h)
Maximum G-Force (Sheave Size Denoted in Inches):	460V / 60Hz 518 (8.0") or 642 G's (9.0") 360V / 50Hz 445 G's (9.0")	460V / 60Hz 403 G's (10.5") or 526 G's (12.0") 360V / 50Hz 426 G's (13.0")	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)	0.008" (0.2mm) to 0.04" (1.0mm)	0.008" (0.2mm) to 0.04" (1.0mm)
Gear Box Ratio:	74:1	71:1	VFD Variable	VFD Variable	VFD Variable
Lubrication System	Oil Sealed Gearbox	Oil Sealed Gearbox	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.)	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:	30 hp (22.71 kw)	75 hp (60 kw)	(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 Motor)	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 Explosion Proof – Group D (Temp. Rating of 55° C)	Class I – Division I 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)	Class I – Division I VFD Explosion Proof – Group D (Temp. Rating of 55° C)
Dimensions (without stand):	7' (2.1 m) L x 6' (1.8 m) W x 5' (1.5 m) H	8.10' (2.5 m)L x 7.3' (2.2 m)W x 5.9' (1.8 m)H	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):	4,400 lbs (1,995 kgs)	7,700 lbs (3,492 kgs)	3,900 lbs (1,769 kgs)	8,300 lbs (3,765 kgs)	9,400 lbs (4,264 kgs)

Today, Elgin stands as the only full-portfolio supplier of VCD's for both water-based and oil-based drilling environments.

Integrated Mobile VCD Packages

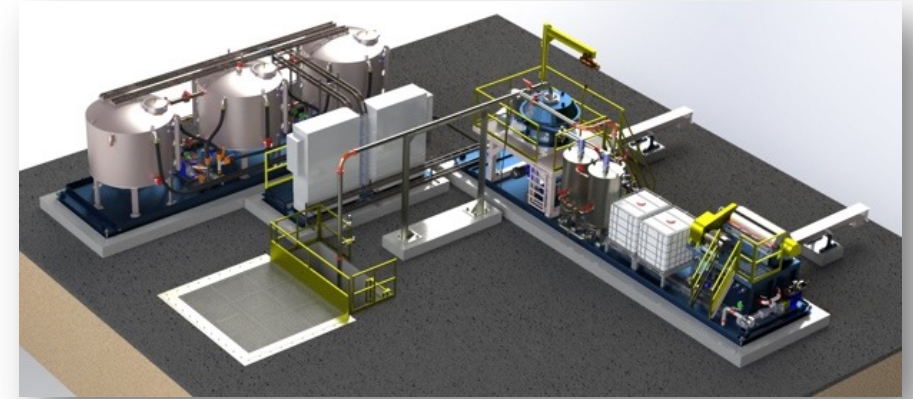
Elgin Full-Service Engineering, Manufacturing & Commissioning



Elgin's diversified product line, inclusive of lighting, pumps, & conveyors sets us apart from other non-integrated equipment suppliers.

Turn-Key Plant Packages

Elgin Full-Service Engineering, Manufacturing & Commissioning



Elgin's engineering team can also provide full plant engineering services for semi-permanent and permanent waste management systems.

VCD Screen and Flite Selection Guides

OEM Screens and Flites to Ensure Maximum Performance:



CSI-04™ / CSI-E4™ / CSI-D4™ Vertical Cuttings Dryer Screen and Flite Selection Guide

Elgin Vertical Cuttings Dryer Screen Features



Enhanced abrasion resistance via proprietary chrome hardening process.



Full penetration TIG welded structure for maximum durability.



Dynamically balanced screen for even surface wear and mitigated system vibration.



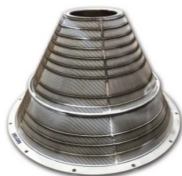
Full stainless-steel construction for maximum corrosion resistance.

Revitalize your CSI-03™ & CSI-04™ VCD by eliminating lubrication system failures with Elgin's oil-sealed gearbox retrofit solution.

Elgin's CSI Cyclone Pro™ direct, dual-drive VCD's are capable of processing water-based and oil-based waste without the need for a conversion kit.

Need a complete turn-key waste cuttings management system? Elgin has the perfect solution for today's operational needs.

0.010" (250 micron)
Profile Wire Screen



Universal Drilling Fluids Cuttings Treatment

Minimizes Centrate Fines, But Lowers Solids Discharge Dryness. Best Utilized for Fine Cuttings.

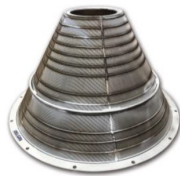
0.015" (400 micron)
Profile Wire Screen



Universal Drilling Fluids Cuttings Treatment

Balances Centrate Fines and Discharge Dryness. Good Starter Screen for Average to Large Cuttings.

0.020" (500 micron)
Profile Wire Screen



Universal Drilling Fluids Cuttings Treatment

Balances Centrate Fines and Discharge Dryness. Best Starter Screen for Average to Large Cuttings.

Individual Hard Chrome
Flites (Set of 8)



Universal Drilling Fluid Cuttings Treatment

Hard-Chrome is Applied to Increase the Time Required Between Changes and Ensures a Precision Fit Each Time.

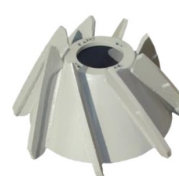
Tungsten Carbide Flites
(Set of 8)



Universal Drilling Fluid Cuttings Treatment

Tungsten Carbide Tiles Dramatically Increases the Time Required Between Changes. Will Provide the Longest Life.

Ceramic Single-Piece
Conical Flite Set
(Only for water-Based
Conversion Kits)



Universal Drilling Fluid Cuttings Treatment

Dramatically Reduces the Time Required to Change Scrapers & Ensures a Precision Fit. 12-24 Month Life.

*Be sure to talk with one of
Elgin's Applications Engineers
to determine the best flite and
screen selection.*

TERRASOURCE



VCD Economic Evaluation Guides

Elgin Has Prepared a Series of ROI Calculators To Ensure Proper Decision Making

Comparative Economic (Daily Rig Drilling Fluid and Waste Management Savings) Evaluation of VCD's With Traditional Drying Shakers					
Prepared By: Michael Rai Anderson, PE - President		Revision C		Friday, May 01, 2015	
		No Waste Management	Drying Shaker System	Vertical Cuttings Dryer System	Total Well Savings Generated With VCD
total Wet Cuttings per Well in Tons	Tons	500	500	500	
total Wet Cuttings per Well in Pounds	lbs	1,000,000	1,000,000	1,000,000	
Bulk Density of Inlet Cuttings (Pounds Per Gallon)	PPG	30	30	30	
Bulk Density of Drilling Fluid (Pounds Per Gallon)	PPG	12	12	12	
Average Oil on Cuttings ("OOC") Percentage	%	18%	18%	18%	
total Dry Cuttings per Well in Tons	lbs	820,000	820,000	820,000	
total Drilling Fluid Contained in Wet Cuttings per Well	lbs	180,000	180,000	180,000	
Average Effluent OOC Percentage	%	18%	12%	4%	
Weight of Recovered Drilling Fluid Unrecovered	lbs	180,000	120,000	40,000	
Weight of Recovered Drilling Fluid Recovered	lbs	0	60,000	140,000	
Gallons of Recovered Drilling Fluid Unrecovered	Gallons	15,000	10,000	3,333	\$17,460
Gallons of Recovered Drilling Fluid Recovered	Gallons	0	5,000	11,667	
total Number of Recovered Barrels	bbl	0	119	278	
Average Value per Recovered Barrel	\$	\$110	\$13,095	\$30,556	
Average Total Value of Recovered Drilling Fluid	\$	\$0	\$13,095	\$30,556	
Equivalent Pounds per Well of Solids Discharge	Tons	1,000,000	940,000	860,000	
Maximum Weight per Truck Load*	Pounds	40,000	40,000	42,000	
Number of Truck Loads	GPH	25	24	20	
Average Cost per Truck Load for Disposal	\$	\$1,750	\$1,750	\$1,750	
Average Cost per Truck Load for Disposal	\$	\$43,750	\$41,125	\$35,833	
Total Savings					\$5,292
Maximum Weight Highly Influenced by Level, or Lack Thereof, Solids Solidification. The Drier the Solids, the More Solids That Can Be Disposed Per Truckload.					\$22,752

Be sure to talk with one of Elgin's Applications Engineers to ensure the greatest return on your investment.

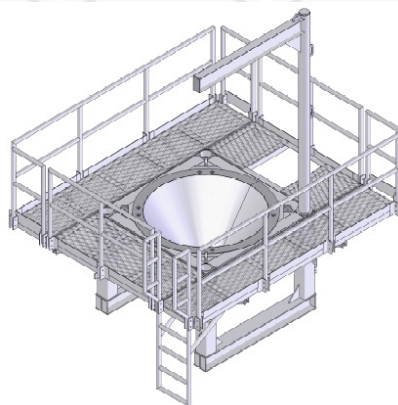
VCD Options

Elgin can provide a host of VCD options.



Weatherproof Containerized Systems

VCDs can be installed within fully enclosed, weather-proof structures for easy transport or operation in extreme weather conditions.



Telescoping Stands with Decks

Depending on the manner in which the VCD will be installed, telescoping stands, with or without walkways, can be provided. Cantilevered cover removal system included.



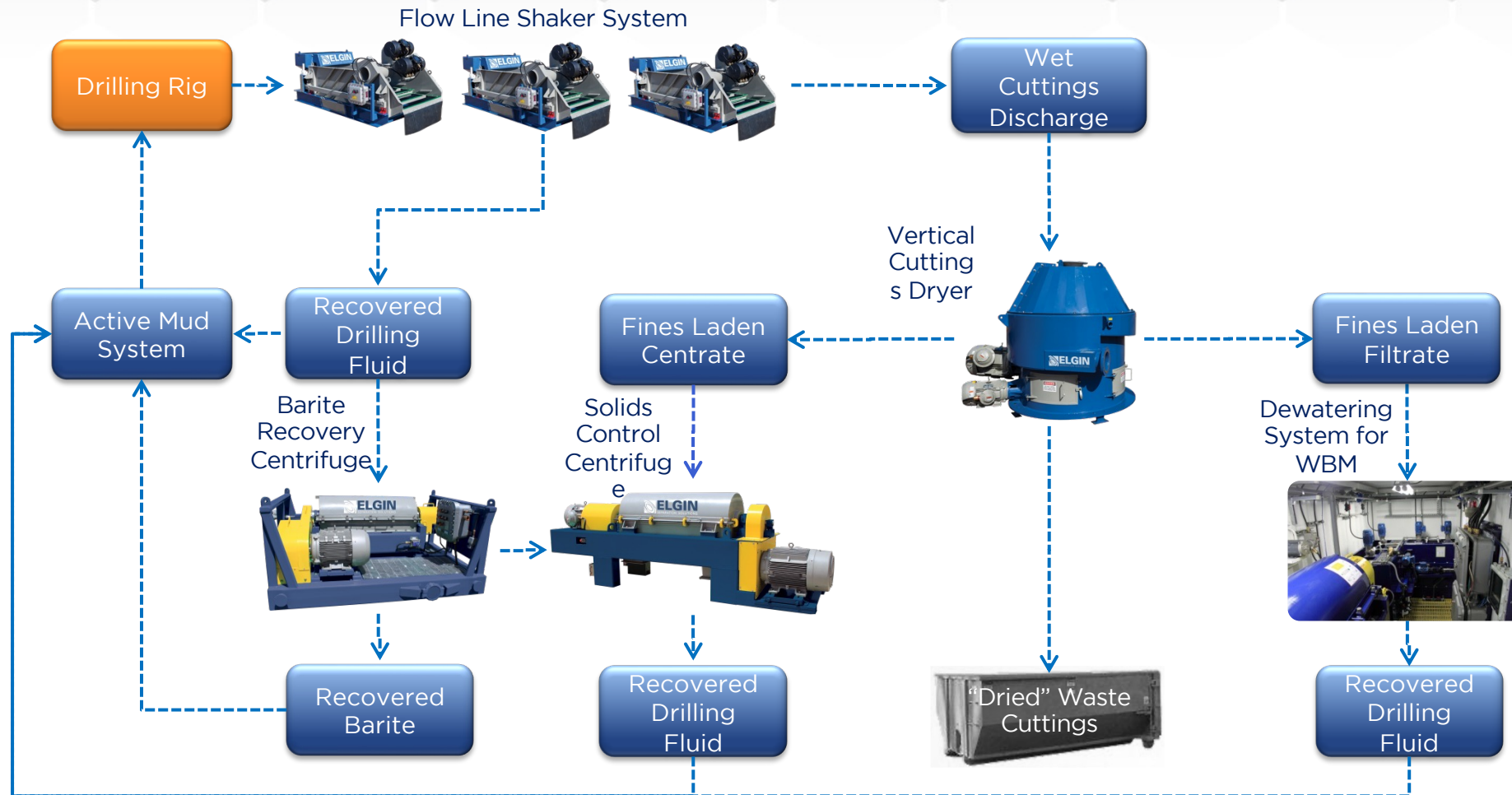
VFD Controls with HMI Interface

To control the imparted G-force, a VFD system can be added to the VCD. Explosion proof VFD Panel available.

There are a myriad of options available for each installation that should be considered before finalizing the system configuration.

Closing the WBM & OBM Loop

While at the Same Time, Eliminating the Need for Drying Shakers.



Elgin's D-Series VCD's eliminate the need for deployment of drying shakers, which were previously deployed to manage WBM cuttings.



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