Full-Service OEM
Engineering, Design, Manufacturing, Commissioning and Servicing.

Solids Control
Waste Management
System Integration and Modular Construction
Fluid Management and Conditioning

As a division of the Elgin Equipment Group, Elgin Separation Solutions is able to tackle both the small and the big projects, regardless of location or well complexity.
Organizational Footprint
And Key Customers.
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 Device.

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 capability

As 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.

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

Screen and Basket
Fully welded basket secures the screen in place during operation.

Water Shield Inspection
Two inspection / clean out hatches are located on each side of the water shield.

Maintenance / Inspection Hatch
Three maintenance / inspection hatches are located around the body of the VCD.

Lube Pump Filter
Filter change is easy and efficient when operating the lube pump on the VCD.

Lube Pump Configuration
The VCD lube pump is conveniently located for easy maintenance with pressure gauge reading.
Intelligent Design
Elgin’s Patent-Pending Direct Drive Dryer Technology

Elgin’s new patent-pending 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.

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:

<table>
<thead>
<tr>
<th></th>
<th>CSI™-03</th>
<th>CSI-D3™</th>
<th>CSI™-04</th>
<th>CSI-D4™</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed Capacity:</td>
<td>25 - 40 TPH (6.2 - 10 kg/s)</td>
<td>25 - 40 TPH (6.2 - 10 kg/s)</td>
<td>40 - 80 TPH (10 – 20 kg/s)</td>
<td>40 - 80 TPH (10 – 20 kg/s)</td>
</tr>
<tr>
<td>G Force (Sheave Size Denoted in Inches):</td>
<td>Up to 642 G’s</td>
<td>Up to 700 G’s</td>
<td>Up to 526 G’s</td>
<td>Up to 550 G’s</td>
</tr>
<tr>
<td>Screen Opening Sizes:</td>
<td>0.008” (0.2mm) to 0.04” (1.0 mm)</td>
<td>0.008” (0.2mm) to 0.04” (1.0 mm)</td>
<td>0.008” (0.2mm) to 0.04” (1.0 mm)</td>
<td>0.008” (0.2mm) to 0.04” (1.0 mm)</td>
</tr>
<tr>
<td>Gear Box Ratio:</td>
<td>74:1</td>
<td>74:1</td>
<td>71:1</td>
<td>VFD Variable</td>
</tr>
<tr>
<td>Lubrication System:</td>
<td>Active Oil Pump Circulation</td>
<td>Grease Packed</td>
<td>Active Oil Pump Circulation</td>
<td>Oil-Sealed</td>
</tr>
<tr>
<td>Differential Speed:</td>
<td>15.4 RPM</td>
<td>15.4 RPM</td>
<td>12.5 RPM</td>
<td>VFD Variable</td>
</tr>
<tr>
<td>Screen Surface Area:</td>
<td>7.11 sq. ft. (0.661 sq. m.)</td>
<td>7.11 sq. ft. (0.661 sq. m.)</td>
<td>13.3 sq. ft. (1.25 sq. m.)</td>
<td>13.3 sq. ft. (1.25 sq. m.)</td>
</tr>
<tr>
<td>Motor Horsepower:</td>
<td>30 HP (22.71 KW)</td>
<td>30 HP (22.71 KW)</td>
<td>75 HP (60 KW)</td>
<td>(1) 60 HP (22.7 KW) (1) 15 HP (12 KW)</td>
</tr>
</tbody>
</table>

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, and conveyors sets us apart from other non-integrated equipment suppliers.
Elgin’s engineering team can also provide full plant engineering services for semi-permanent and permanent waste management systems.
VCD Screen Selection Guides

Elgin Manufactures a Large Variety of Screens to Ensure Performance:

Be sure to talk with one of Elgin’s Applications Engineers to determine the best scraper and screen selection.
### Comparative Economic (Daily Rig Drilling Fluid and Waste Management Savings)

**Evaluation of VCD’s With Traditional Drying Shakers**

<table>
<thead>
<tr>
<th>Prepared By: Michael Rai Anderson, PE - President</th>
<th>Revision C</th>
<th>Friday, May 01, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Wet Cuttings per Well in Tons</strong></td>
<td>No Waste Management</td>
<td>Drying Shaker System</td>
</tr>
<tr>
<td>Tons</td>
<td>500</td>
<td>1,000,000</td>
</tr>
<tr>
<td><strong>Total Wet Cuttings per Well in Pounds</strong></td>
<td>1,000,000</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Pounds</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td><strong>Bulk Density of Inlet Cuttings (Pounds Per Gallon)</strong></td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>PPG</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td><strong>Average Oil on Cuttings (&quot;OOC&quot;) Percentage</strong></td>
<td>820,000</td>
<td>820,000</td>
</tr>
<tr>
<td>Per</td>
<td>180,000</td>
<td>180,000</td>
</tr>
<tr>
<td><strong>Total Drilling Fluid Contained in Wet Cuttings per Well</strong></td>
<td>820,000</td>
<td>820,000</td>
</tr>
<tr>
<td>Pounds</td>
<td>12%</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Wet Cuttings Efficiency OOC Percentage</strong></td>
<td>13%</td>
<td>20%</td>
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<tr>
<td><strong>Weight of Recovered Drilling Fluid Unrecovered</strong></td>
<td>180,000</td>
<td>120,000</td>
</tr>
<tr>
<td>Pounds</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Weight of Recovered Drilling Fluid Recovered</strong></td>
<td>15,000</td>
<td>12,000</td>
</tr>
<tr>
<td>Pounds</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Number of Recovered Barrels</strong></td>
<td>0</td>
<td>0</td>
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<tr>
<td>BBL</td>
<td>$110</td>
<td>$110</td>
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<tr>
<td><strong>Average Total Value of Recovered Drilling Fluid</strong></td>
<td>$13,095</td>
<td>$15,095</td>
</tr>
<tr>
<td>$</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Equivalent Pounds per Well of Solids Discharge</strong></td>
<td>1,000,000</td>
<td>940,000</td>
</tr>
<tr>
<td>Pounds</td>
<td>40,000</td>
<td>40,000</td>
</tr>
<tr>
<td><strong>Maximum Weight per Truck Load</strong></td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td>GPH</td>
<td>$1,750</td>
<td>$1,750</td>
</tr>
<tr>
<td><strong>Average Cost per Truck Load for Disposal</strong></td>
<td>$43,750</td>
<td>$43,750</td>
</tr>
<tr>
<td>$</td>
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</tbody>
</table>

*Maximum Weight Highly Influenced by Level, or Lack Thereof, Solids Scalification. The Drier the Solids, the More Solids That Can Be Disposed Per Truckload.*

**System Comparison (% Difference):**
- N/A
- 50%
- 50%
- 133%
- 202%
- 15%

**Total Well Savings Generated With VCD:**
- $17,460

**Average Annual Dry Shaker System: 4700%**

Be sure to talk with one of Elgin’s Applications Engineers to ensure the greatest return on your investment.
Weather Proof Containerized

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.
Elgin’s product portfolio provides a “one-stop” shop for any solids control management or waste management challenge.
Elgin Value
Definitive Value Proposition in Utilizing Elgin VCD’s.

Unsurpassed Experience

Elgin has shipped more than 500 newly manufactured decanter centrifuges, 200 remanufactured centrifuges, 800 newly manufactured VCD’s and over 100 remanufactured VCDs’ to over 40 different countries.

Unsurpassed Durability

With more than 25 years of experience building centrifuges for the oil and gas industry, Elgin has developed a reputation for the most durable systems in the market. The average asset life exceeds 10 years with proper preventative maintenance.

Full-Scale Engineering Support

Elgin’s dedicated Engineering team evaluates system hydraulics, frictional losses, predictive reliability, and failure mode evaluation analysis (“FMEA”) for each VCD designed. Months of product validation testing is performed prior to the release of any Elgin VCD.

Elgin manufactures its own spare parts and consumables ensuring 100% integrated accountability for the entire VCD.
Vertical Cuttings Dryers Overview

Maximizing WBM and OBM Drilling Fluid Recovery