Process Equipment
Coarse Coal Centrifuges

FLSmidth Ludowici manufactures a range of centrifuges that have established an unequalled track record of performance and reliability. The range includes coarse and fine coal centrifuges boasting high capacity, advanced technology, durability, value and efficiency. All centrifuges are backed by professional support and on-site service.

Coarse coal centrifuges

Ludowici’s VM coarse coal centrifuge range are horizontal vibrating basket style machines which use the principle of centrifugal force to separate water from coal. The VM1650 is the world’s largest capacity coarse coal centrifuge.

How it works

The centrifuge is equipped with a slightly conical screen basket, which is open at the larger diameter. The basket rotates around its horizontal axis and is simultaneously rapidly vibrated in the direction of this axis. The feed is pressed to the basket by centrifugal force and, by vibration; it is conveyed along the inner side of the conical screen basket. During this process, surface water is removed from the particles and forced through the apertures of the basket. The dewatered solids are discharged at the front part of the water housing.

VM1650 is the world’s largest capacity Coarse Coal Centrifuge

Additional Features

1. Effluent Chamber (outside of basket) lined with Wear Resist ceramic
2. Feed chute and product discharge chute lined with alumina ceramic tiles for extended life
3. Feed chute is mounted on the door and swings away for fast basket maintenance access
4. Basket changed safely and easily using convenient removal mandrel
5. Wedge wire constructed centrifuge basket can be customised
6. Sample Access Inspection door (not shown)
7. Safety access platform for removal (not shown)

Ideal For

• Coal nominally less than 50mm.
• Dense medium cyclone products.

Feed size

• -50mm to +0.5mm
• Feed moisture to 18% to 25%
• Surface moisture of product to 4% to 9% (dependant on particle size distribution of feed material).

Ideal For

Features and Benefits

Advanced design

• Easy operation and maintenance.
• High capacity and availability.
• Easy access to vibration motor.

Proven results

• Consistently superior dewatering results.
• More than 650 units manufactured since 1992.
• Machines still operating after 14 years.

Motor lubrication system

• Bolt on/off components and assembly.
• Easy access.
• Simple delivery/return of oil.
• Oil flow switch.

Nominal Capacity (tph)*

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>150</td>
<td>250</td>
<td>300</td>
<td>350</td>
<td>410</td>
</tr>
</tbody>
</table>

Diameter of Basket (mm)

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>1100</td>
<td>1300</td>
<td>1400</td>
<td>1500</td>
<td>1650</td>
</tr>
</tbody>
</table>

Basket Angle

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

Basket Aperture (mm)

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4/0.5</td>
<td>0.4/0.5</td>
<td>0.4/0.5</td>
<td>0.4/0.5</td>
<td>0.4/0.5</td>
<td>0.4/1.0</td>
</tr>
</tbody>
</table>

Main Drive Motor (kW)

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>30</td>
<td>37</td>
<td>45</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>

Vibrator (2x) Motors (kW)

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>3.0</td>
<td>3.0</td>
<td>3.0</td>
<td>5.5</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Oil Pump Motor

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>NA</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Weight of Centrifuge (t)

<table>
<thead>
<tr>
<th>VM600</th>
<th>VM1100</th>
<th>VM1300</th>
<th>VM1400</th>
<th>VM1500</th>
<th>VM1650</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.6</td>
<td>7.0</td>
<td>8.1</td>
<td>8.2</td>
<td>11.9</td>
<td>13.5</td>
</tr>
</tbody>
</table>

* Depending on Particle size
FC1200 Vertical Fine Coal Centrifuge

The Ludowici FC1200 is a high capacity, vertically mounted scrolled basket style centrifuge.

It has a reputation for high availability, low product moisture and a long service life for baskets and "wet end" components. It incorporates robust mechanical components and has a basket/scraper drum life that is superior to competing fine coal centrifuges.

How it works
The differential speed of the scraper drum to the basket, combined with the basket angle and gravity, conveys material from the feed end of the basket to the product discharge.

Feed enters through the top of the machine, falls onto the scraper drum cover and is dispersed over the vertically mounted basket. The rotational speed of the basket creates high G-forces, which forces surface water through the apertures of the basket and discharged via two effluent pipes at the side of the centrifuge. The dewatered fine coal is scraped off the basket surface by the scraper drum blades and then falls down past the gearbox and out through the bottom of the centrifuge.

Ideal For

• Simplified routine maintenance procedures.
• Dewatering of fine coal nominally less than 6mm.
• Dewatering of reflux classifier product.
• Dewatering of coal spiral product, nominally less than 2mm and greater than 0.1mm in size.

Feed size

• Feed size -6mm to +0.1mm.
• Feed % solids 50% to 65% by weight.
• Surface moisture of product 9% to 13% (dependant on particle size distribution of feed material).

Features and Benefits

Value and efficiency
• Low installation and maintenance costs.
• High efficiency.
• Maximum solids recovery.
• Low final moisture.
• Robust gears, shafts and bearings capable of trouble free operation for many years.

Advanced design features
• Pressurised lubrication system for long bearing life.
• Re-usable oil filter with built in magnet and bypass indicator.
• Large throat opening in feed chute for greater throughput.
• Abrasive resistant wear parts as standard supply.

Basic Components

Abrasion resistant linings

(A) Internal base of spoke piece lined with 12mm thick alumina ceramic tiles.

(B) Product wear ring lined internally with 12mm thick alumina ceramic tiles.

(C) Centrate chamber high density alumina wear tiles (not shown).

(D) Centrate launder trevailable ceramic (Wear Resist).

(E) Scraper drum abrasive resistant scraper blades (Wear Resist).

(F) Scraper drum cover / feed distribution zone (Wear Resist).

(G) Velocity arrester (optional extra). When feed pipe head exceeds 3 metres or feed velocity is greater than 1.5 metres per second, a velocity arrester complete with a Wear Resist lined impact area is recommended.
Drive arrangement

The arrangement of the drive shows the horizontal input drive shaft driving through spiral bevel gears to the helical gear train.

The spiral bevel gears drive a vertical intermediate shaft carrying a pair of helical gears, which in turn drive the central main and hollow shafts, which rotate the scraper drum and centrifuge basket respectively.

All gears, shafts and bearings are extremely robust and capable of many years of trouble free operation.

The Scraper drum and Basket rotate in the same direction at different speeds resulting in optimum life of the Scraper Blades and Basket.

Drive Motor Position Options

Ideal For

• Dewatering of fine coal. nominally less than 6mm.
• Dewatering of reflux classifier product.
• Dewatering of coal spiral product, nominally less than 2mm and greater than 0.1mm in size.

Drive Motor Position Options

HFC1300 horizontal fine coal centrifuge

The Ludowici HFC1300 fine coal centrifuge is a horizontally configured, scrolled basket style centrifuge to optimize water removal in fine coal processing. With a small footprint, the HFC occupies a similar space to the FC1200 centrifuge, yet has twice the rated capacity. The HFC 1300 is the world’s largest capacity scrolled basket type centrifuge.

How it works

The differential speed of the scroll to the basket, combined with the basket angle, conveys material from the feed end of the basket to the product discharge.

The feed slurry is introduced via a feed chute to the distributor, which accelerates the feed up to the basket speed and evenly distributes onto the central main shaft. The rotational speed of the basket creates high G-forces, which forces surface water through the apertures of the basket while the solids are retained on the basket surface.

The dewatered fine coal is scraped off the basket surface by the scroll and is then discharged from the rear of the water housing.

The Ludowici HFC1300 fine coal centrifuge is a horizontally configured, scrolled basket style centrifuge to optimize water removal in fine coal processing. With a small footprint, the HFC occupies a similar space to the FC1200 centrifuge, yet has twice the rated capacity. The HFC 1300 is the world’s largest capacity scrolled basket type centrifuge.

HFC1300 Horizontal Fine Coal Centrifuge Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>Nominal capacity (tph)</th>
<th>Basket diameter (mm)</th>
<th>Basket angle</th>
<th>Basket aperture (mm)</th>
<th>Drive Motor (kW)</th>
<th>Lubrication Motor (kW)</th>
<th>Machine weight (kg)</th>
<th>Typical feed size range (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC-1200</td>
<td>50-80*</td>
<td>1200</td>
<td>20</td>
<td>0.250/0.375</td>
<td>55</td>
<td>1.1</td>
<td>5860</td>
<td>-6 + 0.1mm</td>
</tr>
</tbody>
</table>

* Depending on Particle size

Features and Benefits

Value, efficiency and support
• Low cake moisture.
• Low installation cost.
• High efficiency.
• Maximum solids recovery.
• Professional back up and site service support.

Advanced design features
• Higher unit capacity – designed to handle 100 dry tonnes per hour of reflux classifier/spiral product.
• Lower product moisture – capable of 350 G force, to producing the driest product.
• Feed chute is mounted on the door and swings away for fast maintenance access.
• Cyclo drive used to drive basket and scroll.

Drive Motor Position Options

Motor Position A

Motor Position B

Motor Position C

Motor Position D

In-line Motor Position

HFC1300 Horizontal Fine Coal Centrifuge (Front)
HFC1300 is the largest Fine Coal Scrolled Basket Centrifuge in the world

Horizontal Fine Coal Centrifuge combines leading-edge engineering with unique design.

Design Features
Higher unit capacity: The HFC1300 is designed to handle nominally 100 dry tonnes per hour of Reflux Classifier® or spiral product – roughly twice the capacity of the FC1200. Lower Product Moisture: The HFC1300 is capable of G forces up to 350Gs, to produce the driest possible product.

The HFC1300 has been designed so that the wet end is disassembled in order of component wear with the basket on the outside and then the distributor, scroll and carrier. The HFC1300 is a horizontal style machine, meaning reduced maintenance height requirements.

The door is hinged complete with the chute allowing for quick access to routine wearing components. Modular design allows for easy replacement of components in complete sub-assemblies.

Ease of Maintenance:
- Wet end is disassembled in order of component wear with the basket on the outside and then the distributor, scroll and carrier.
- Reduced maintenance height requirements due to the horizontal style.
- Modular design allows easy replacement of components in complete sub-assemblies.
- Easy access to all lubrication points.

Optional: A choice of drive motor and door handling change the footprint to best suit plant space requirements.

Externally mounted easily accessed drive motor and drive belts. Maintenance of wearing components via custom engineered lifting tools.

Vibration Dampening: The centrifuge frame is isolated from the plant structure through rubber mounts.

Small footprint: The HFC occupies a similar footprint to the FC1200.

The HFC1300 is of modular construction, the main components are:

- **Discharge Housing And Base Assembly**: The discharge housing and base assembly are the main body of the centrifuge. All sub-assemblies are fixed to the discharge housing.
- **Discharge Housing**: The discharge housing consists of two wear lined compartments – the effluent and product housings.
- **Abrasion Resistant Wear Linings**: To ensure long life of the discharge assembly, all internal assemblies of the discharge housing are lined with either trowelable Ludowici Wear Resist or Alumina tiles.

Drive Module Sub-Assembly
The Drive module consists of a Cyclodrive inside a protective casing.

- **Cyclodrive Speed Reducer**: A Cyclodrive is used to convert a single input from the drive motor into two constant and different speed outputs. This speed differential provides the conveyance mechanism of the cake. The Cyclodrive allows a higher G force, differential speed and mechanical reliability over more conventional gear-drive mechanisms.
- **Clutch**: Torque protection of the Cyclodrive is provided in the form of torque limiting clutch fixed to the rear shaft of the Cyclodrive. A limit switch is included to detect the clutch tripping.
- **Labyrinth Seal**: A grease labyrinth protects the reducer assembly from the ingress of moisture and fine solids from the wet end. A second grease labyrinth is included on the pulley for protection from the plant environment.

Lubrication System: is of modular design and is easily accessed, all components can be replaced separately. It incorporates a lubrication tank, pump and motor, a flow switch to prevent the centrifuge operating without lubrication, a magnetic oil filter and a strainer for contamination protection.

A rotary union allows pressure lubrication to the Cyclodrive in the event of a tripped clutch.

Drive Sub-Assembly
The drive assembly consists of a guarded set of pulleys and v-belts. The drive motor is mounted on an adjustable base to allow for adjustment and replacement of the belts and pulleys. A special hatch on the guard allows access to the clutch for quick and easy resetting.

Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>75 – 100 tph*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (dry tonnes nominal)</td>
<td>75 – 100 tph*</td>
</tr>
<tr>
<td>Drive motor</td>
<td>110 KW</td>
</tr>
<tr>
<td>Lubrication motor</td>
<td>0.75 KW</td>
</tr>
<tr>
<td>Length</td>
<td>2,875 mm</td>
</tr>
<tr>
<td>Width</td>
<td>2,256 mm</td>
</tr>
<tr>
<td>Height</td>
<td>2,089 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>6,280 kg</td>
</tr>
</tbody>
</table>

* Depending on Particle size
Reflux Classifier®

The Ludowici Reflux Classifier® (RC) units are state of the art fine particle technology (gravity based separation) and offer significant advantages in capacity, adaptability and efficiency. The Reflux Classifier® incorporates the new ‘laminae high shear rate’ mechanism - the latest in fine particle gravity based separation technology. This, along with advancements in channel spacing and width mean that Reflux Classifier® are more efficient and more compact than competing fine coal and mineral processing equipment.

How it works
A Reflux Classifier® separates small particles based on a difference in density or particle size. The feed distributor delivers the slurry into the Reflux Classifier® mixing chamber. The slurry inside the Reflux Classifier® then undergoes a sorting process due to the force of gravity and the up flow of fluidisation water.

At the bottom of the mixing chamber, a higher density bed of settling solids is formed. The high density bed is kept in suspension by jets of incoming fluidisation water at the base of the chamber. The coarse and fine low density particles that may be trapped in the dense fluidised bed tend to be sorted upward due to the turbulent motion created by the fluidisation water injected from below. The high density particles sink to the bottom of the fluidised bed due to gravity and migrate to the central underflow valve.

The density of the middle section of the mixing chamber is measured and used to determine when to allow high density solids to be discharged from the bottom of the Reflux Classifier® Fluidisation Chamber via a central underflow valves.

The low density particles are held in the slurry suspension and migrate to the lamella section of the Reflux Classifier®. The lamella channels enhance the settling rate of any misplaced fine high density solids, which slide down the plates and slowly re-circulate back into the feed zone of the mixing chamber. This forms a slightly higher density zone under the lamella plates. The low density and small particles tend to overflow from the Reflux Classifier® Lamellas in their first pass, whereas the slightly denser and larger particles will require the autogenous process density within the vessel to rise to enable them to be displaced to overflow. The overflow from the Reflux Classifier® contains most of the process water, the low density solids and any misplaced slimes in the feed.

The FLSmidth Ludowici service promise - all products are supported by expert staff to ensure they are custom designed, manufactured and installed to your needs. FLSmidth Ludowici also offer spares backup services and contracted maintenance schedules to maintain the highest operational efficiency of your products.

Unit capacity
Ludowici has commercial units from RC850 up the RC3000 unit. Actual unit capacities are related to the type and size of feed material.

Typical capacities for a RC treating –1.0 mm +0.250 mm coal are:

<table>
<thead>
<tr>
<th>Unit</th>
<th>RC850</th>
<th>RC1400</th>
<th>RC1850</th>
<th>RC2000 (RC2020)</th>
<th>RC2350</th>
<th>RC3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Capacity (tonnes/hour)</td>
<td>20</td>
<td>50</td>
<td>75</td>
<td>90</td>
<td>130</td>
<td>200</td>
</tr>
</tbody>
</table>

Typical capacities for a RC treating –0.5 mm +0.125 mm iron ore are:

<table>
<thead>
<tr>
<th>Unit</th>
<th>RC850</th>
<th>RC1400</th>
<th>RC1850</th>
<th>RC2000 (RC2020)</th>
<th>RC2350</th>
<th>RC3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Capacity (tonnes/hour)</td>
<td>25</td>
<td>55</td>
<td>80</td>
<td>100</td>
<td>140</td>
<td>225</td>
</tr>
</tbody>
</table>