Expert of Solid-Liquid Separation Solutions

www.csci.com.cn
Shanghai Centrifuge Institute Co., Ltd., established in 1958, located on the beautiful Huangpu River bank, is a subsidiary of Shanghai Electric Group Co., Ltd. SCI was engaged in the research and manufacturing of ultra-high-speed centrifuges for national defense science in the early days, and now SCI is a high-tech enterprise which developed the most horizontal decanter centrifuge products with the fullest specifications in China. With years of rich experience and expertise in the field of separation, SCI is providing reliable process solutions and the best separation technologies for customers in the industries such as urban sewage, industrial wastewater, ecological desilting, bio-pharmacy, chemical industry and food processing, etc.

1958
SCI was established in Shanghai, known as Shanghai 651 Research Institute at that time.

1965
SCI first put forward the theory of isotope separation by centrifuge in China and provided uranium separation test machine for National Defense Science and Technology Commission, which realized the product innovation in the centrifuge development.

1983
Premier Li Peng came to SCI, listened to the detailed situation of scientific research and visited the working environment and research facilities.

1995
SCI signed a cooperation agreement with the internationally renowned decanter centrifuge company German Humboldt and co-developed the horizontal decanter centrifuges with single machine processing capacity 10~150 m³/h exported in bulk to Germany, amounted to more than 100 sets.

1997
SCI developed the first generation decanter centrifuge mobile unit in China.

2004
SCI succeeded in designing the domestic largest LW900 horizontal decanter centrifuges and putting into use in China.

2007
SCI entered a rapid phase of development with the capital injection of Shanghai Electric Group Co., Ltd.

2008
SCI developed the second generation decanter centrifuge mobile unit in China.

2012
SCI developed the largest LW1100 horizontal decanter centrifuges in China and our steps are to be continued.
Solid liquid separation horizontal decanter centrifuge (Decanter Centrifuge for short), one of key machines for solid liquid separation, separates suspension liquid for two or three (multiple) phase materials in different specific weights by centrifugal settling principle, especially clarifies liquids containing suspended solid.

Such centrifuge applies to solid liquid separation of suspension liquids with solid phase particle equivalent diameter ≥ 3μm, weight concentration ratio ≤10%, volume concentration ratio ≤70% or solid liquid density difference ≥0.05g/cm³.

SCI has different series of decanter centrifuges with bowl diameter from 200~1100mm. The machine can be also sorted by bowl type, such as thickening, dewatering, classifying, clarifying etc., to be fit for different separations.

**High Dryness Solid Bowl Decanter Specifications**

<table>
<thead>
<tr>
<th>Model</th>
<th>Max Capacity ★ (m³/h)</th>
<th>Max Solid Discharge Capacity ★★ (m³/h)</th>
<th>Motor (kW)</th>
<th>Weight ★★ (kg)</th>
<th>Dimensions ★★ (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LW220</td>
<td>5</td>
<td>0.4</td>
<td>&lt; 17</td>
<td>760</td>
<td>1600×1100×850</td>
</tr>
<tr>
<td>LW300</td>
<td>15</td>
<td>0.8</td>
<td>&lt; 23</td>
<td>1500</td>
<td>2470×1230×850</td>
</tr>
<tr>
<td>LW350</td>
<td>20</td>
<td>1.2</td>
<td>&lt; 30</td>
<td>2000</td>
<td>2790×1300×880</td>
</tr>
<tr>
<td>LW400</td>
<td>30</td>
<td>2.0</td>
<td>&lt; 38</td>
<td>2600</td>
<td>2950×1400×850</td>
</tr>
<tr>
<td>LW450</td>
<td>45</td>
<td>2.5</td>
<td>&lt; 48</td>
<td>3200</td>
<td>3300×1500×920</td>
</tr>
<tr>
<td>LW530</td>
<td>80</td>
<td>5.0</td>
<td>&lt; 66</td>
<td>5200</td>
<td>3730×1600×1100</td>
</tr>
<tr>
<td>LW580</td>
<td>90</td>
<td>8.0</td>
<td>&lt; 97</td>
<td>7000</td>
<td>4000×1400×1600</td>
</tr>
<tr>
<td>LW650</td>
<td>100</td>
<td>13.0</td>
<td>&lt; 120</td>
<td>8500</td>
<td>4300×1900×1350</td>
</tr>
<tr>
<td>LW760</td>
<td>150</td>
<td>21.0</td>
<td>&lt; 165</td>
<td>15000</td>
<td>5000×2500×1500</td>
</tr>
<tr>
<td>LW900</td>
<td>240</td>
<td>35.0</td>
<td>&lt; 220</td>
<td>20000</td>
<td>6500×2700×1500</td>
</tr>
<tr>
<td>LW1100</td>
<td>400</td>
<td>64.0</td>
<td>&lt; 300</td>
<td>25000</td>
<td>7000×3000×1700</td>
</tr>
</tbody>
</table>

Notes:
- ★ The actual processing capacity depends on the particle size and the specific application
- ★★ Parameters of the hydraulic-driven centrifuge

**Enterprise Strength**

- Large-scale high-speed dynamic balancer (rotor maximum mass 10,000kg)
- Professional and technical personnel (80% of the staff with college degree)
- Second-generation decanter centrifuge mobile unit.
- Special purpose machine tools for large centrifuge processing (maximum swing diameter 1,600mm)
Working Principle of High Dryness Decanter

- **Working Procedure**
  High dryness decanter can use limited space to fit together different stages of separation.

- **Mixing and Accelerating Stage**
  Sludge and chemical mixes in the specially designed feed chamber and accelerates together. This prepares the sludge for best separation.

- **Clarifying Stage**
  The flocculants sediments inside the bowl under centrifugal force, the clear liquid flows out of the weir at the end of the bowl.

- **Pressing Stage**
  Conveyor pushes the solid toward the discharge end. The sludge is further pressed by centrifugal force and the water comes out of the small holes of the sludge.

- **Double-direction Pressing Stage**
  In the conical part of the bowl wall, the sludge is pressed by specially designed double direction pressing effect. The specially designed conveyor produces axial pressing force and water comes out of the tiny holes of the sludge.

- **Control the Staying Time of Solid**
  In order to achieve best dewatering effect when flow rate or character of sludge changes, the solid content inside the bowl should be continuously controlled. This is controlled by the drive system of the conveyor. The drive system of the conveyor can measure real-time the solid content inside the bowl and adjust automatically, solid discharge torque automatically compensated.

Key elements

- **Rotary drum design**
  - 12°-20° big cone angle
  - 8°-12° small cone angle

- **Screw drive**
  - Planetary gear
  - Polishing

- **Screw design**
  - Variable pitch
  - Wear protection by hard surface

- **Hydraulic drive**
  - Wear protection by hard alloy sheet or ceramic plate

- **Drive Combine Example**
  - AC Motor + Frequency Converter
  - AC Motor + Hydraulic Coupling
  - AC Motor + Hydraulic Coupling with individual hydraulic pump
  - AC Motor Frequency Converter
  - AC Motor Frequency Converter with Individual hydraulic pump

- **Screw conveyor**
  - Reasonably designed screw conveyor adopting the combination below
  - Different screw pitches
  - Single or multiple head
  - Variable pitch
  - Different cone angles

- **Rotary drum and screw materials**
  - AISI304, AISI316 and duplex stainless steel.

- **Generation of differential speed**
  In order to generate differential speed between screw and rotary drum, several types of gear box, planetary gear, cycloidal gear and hydraulic drive may be used.

- **Screw with carbaloys protection layer**
  Wear protection by replaceable exquisite ceramic
Wear-resisting Design

SCI typical wear-resisting design

SCI offers a various wear protection components:

- Sintered Tungsten Carbide plates
- Ceramic
- Tungsten Carbide coating with thermal spraying
- Polyurethane

Sludge Dewatering Complete System

Our decanter can be used to thicken the sludge, dewater the sludge or thicken-dewater the sludge.

The whole sludge dewatering system has five parts:

1. Sludge Feeding System
2. Polymer Adding System
3. Dewatering System
4. Sludge Conveying System
5. Automatic Control System
Sludge Dewatering Complete System

Sludge Feeding System
Made up of sludge cutting pump, sludge feeding pump, electromagnetic flowmeter, electric valve, hand valve, pipe, turbidity meter, ultrasonic level meter and centrate turbidity meter.

Polymer Adding System
Polymer Adding System is automatic mechanical equipment that can make up polymer solution from PAM powder. By batch throwing the powder, the polymer can reach full mature and achieve its effect. Polymer Adding System can carry out remote control. Therefore, it is safe, convenient, reliable and applicable for various purposes. It is especially fit for municipal domestic sewage treatment, industrial wastewater treatment and other industries that needs dosing chemical solution. The design of this dosing system can also be altered to fit for the requirement. This makes it able to fit for special needs from customers.

Technical Parameter

<table>
<thead>
<tr>
<th>Models</th>
<th>Preparation Concentration (‰)</th>
<th>Preparation Capacity (m³/h)</th>
<th>Motor (kW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PY3-1000</td>
<td>1 - 3</td>
<td>1.0</td>
<td>2.0</td>
</tr>
<tr>
<td>PY3-2000</td>
<td>1 - 3</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>PY3-3000</td>
<td>1 - 3</td>
<td>3.5</td>
<td>2.0</td>
</tr>
<tr>
<td>PY3-4000</td>
<td>1 - 3</td>
<td>5.0</td>
<td>3.0</td>
</tr>
<tr>
<td>PY3-5000</td>
<td>1 - 3</td>
<td>6.0</td>
<td>3.0</td>
</tr>
<tr>
<td>PY3-10000</td>
<td>1 - 3</td>
<td>12.0</td>
<td>5.0</td>
</tr>
</tbody>
</table>

Notes: The number of dosing points is decided upon requirements from customer.
Sludge Dewatering Complete System

Sludge Conveying System
Screw conveyors are widely used in city sewage treatment and industries and convey solid with a rotating strong steel screw. LSS series are designed as shaftless structure, which is fit for transporting solid that is dry, humid, sticky, in powder or rough form. LSS can effectively prevent blockage or entangling. Such design makes the solid conveyor easy to transport solid with different particle dimensions.

Main Specifications

<table>
<thead>
<tr>
<th>No.</th>
<th>Type</th>
<th>Flow Rate (m³/h)</th>
<th>Motor Power (kW)</th>
<th>Main Dimension (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Horizontal</td>
<td>declining</td>
</tr>
<tr>
<td>1</td>
<td>LSS200</td>
<td>1.2</td>
<td>1.1</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>LSS260</td>
<td>2.8</td>
<td>1.5</td>
<td>2.2</td>
</tr>
<tr>
<td>3</td>
<td>LSS120</td>
<td>6.3</td>
<td>2.2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>LSS300</td>
<td>9</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>LSS420</td>
<td>14</td>
<td>4</td>
<td>5.5</td>
</tr>
<tr>
<td>6</td>
<td>LSS500</td>
<td>17</td>
<td>5.5</td>
<td>7.5</td>
</tr>
</tbody>
</table>

No. 1. Values of above mentioned specifications: Horizontal $\beta=0^\circ$, $L=5m$. Declining $\beta=25^\circ$, $L=5m$. These are values for reference.
2. $\beta$ stands for mounting angle, $L$ stands for length of the screw conveyor.
3. Thickness of screw is 18 ~ 30mm. Thickness of polyamino lining is 10 mm.
4. These specifications may vary to be fit for different kind of materials.

Automatic Control System

SCI has three types of automatic control systems:
1. Simple Control System
2. PLC Control System
3. PC Computer + PLC Control System

SCI automatic control systems have the following features:

Seven Analog Signals
1. Main Bearing Temperatures
2. Main Drive Load
3. Flow Rate of Input Product
4. Flow Rate of Polymer
5. Drum Speed
6. Differential Speed
7. Remote Transmission

Nine Digital Signals
1. System Alarm (Main)
2. System Mode (Auto/Manual)
3. Lubrication System Status
4. Main Motor Run/Time/Status
5. Conveyor Motor Run/Time/Status
6. Hydraulic Motor Run/Time/Status
7. Polyamino System Run/Time/Status
8. Feed Pump Run/Time/Status
9. Trouble Monitoring &Alarming
**Application fields of decanter centrifuge**

**Environmental protection:**
- Municipal waste water treatment
- Industrial waste water treatment
- Water plant sludge treatment
- Desilting and dredging

**Food and beverage industry:**
- Juice separation
- Tea and coffee separation
- Beer separation
- Soybean milk separation

**Oil and Fat Processing:**
- Separation and Recovery of Fat and Protein
- Rendering applications
- Biodiesel applications

**Micro powder:**
- Photovoltaic industry
- Silicon carbide

**Pharmaceutical Industry:**
- Liquid clarification
- Liquid-liquid separation
- Classification of solid mixture

**Metallurgical Industry:**
- Ore washing water of mining field
- Acid pickling of steel works
- Grinding circulation fluid

**Drilling and Tunneling Industry:**
- Tunnel shield slurry treatment
- Mine slurry treatment
- River sludge dewatering
- Oil field drilling slurry dewatering
- Construction piling slurry dewatering

**Chemical industry:**
- Chemical raw material clarification
- Chemical raw material classification

**Starch Industry:**
- Corn starch
- Wheat starch
- Starch extraction
- Potato starch and protein
- Ethanol production

**Three-phase separation:**
- Palm oil
- Olive oil
- Fish oil and waste oil
SCI supplied horizontal decanter centrifuge to deal with alkali (the main solid is CaCO3&CaO&CaSO4). The main residue for soda ash enterprises using Ammonia-soda process is lime sludge. The most soda ash factories in north China discharge them to the sea directly or stockpiling landfill. The throughput for single horizontal decanter centrifuge is 70m³/h, consistency is 8-15%. After dewatering, the solid content of solid cake gets to 50%. Solid discharge recover gets to 98%, the SS in clean liquid is less then 110mg/L.

SCI had supplied 3 sets of LW 650, 3 sets of LW760 and 9 sets of LW 530, total 15 sets vinasse dewatering decanter centrifuges to one Ethanol fuel company. The application of the vinasse dewatering centrifuges not only meets the vinasse dewatering production requirement, but also reduces the cost of waste water treatment on post-procedure and enhance the social and economic benefits.
SCI had supplied 6 sets of LW650 dewatering decanter centrifuges totally since 2008 on one project of Alunite ore renovation in China.

The practical usage report was belows,

- Loading capacity: 50 m³ per hour
- Loading solid content is 12%
- Discharging solid cake is 68%
- Discharging dry mud is 6 tons per hour

SCI had supplied one set of LW350 sludge dewatering complete system to one petrochemical company in order to solve the problem of treatment for the oil sludge. After the practical usage, the equipment could assist to solve the problem of treatment for the oil sludge effectively.
SCI had supplied 5 sets of LW530 and 1 set of LW900 dewatering decanter centrifuges in the Tai Lake for the large-scale desilting and dredging in Jiangsu Province, China, the dewatering system not only saved the circle of the stacking, but also saved a lot of investments and improved the dredging efficiency.

SCI had supplied 4 sets of LW530 dewatering decanter centrifuges specialized in seaweed extractor, in the whole running period, with the stable characteristics, the separation parameters was reaching the technical requirement as followings;

1. Processing capacity: 20-50 m$^3$/h (feeding consistency: 0.5%-3%)
2. Dewatering solid cake content: ≥20%
3. The maximum rotation speed of the bowl: 2700r/min
4. Separation factor: 2160g
SCI had supplied one set of LW650 New Type dewatering decanter centrifuge specialized in coal sludge dewatering, with the coal sludge output up to 15 ton per hour, the loading water content is 50-70%, the solid cake water content is 30-35% after dewatering.

SCI had supplied the decanter centrifuges in the Mortar recovery in photovoltaic industry in China. Mortar Online Recovery System is a system which removes the silicon powder and the fine silicon carbide particles those lose the cutting power from old cutting mortar; then adds the new silicon carbide, new cutting fluid, make them becomes to be stable density cutting mortar in order to recycle. The main features are as following points:

1, 1156x156 silicon chip consumes new silicon carbide 20~40g/chip
2, 50% cutting fluids recycle and reuse
3, Stable process of cutting mortar and yield
4, Low cost of mortar recycling; output: 12000L/DAY; installed capacity: 75KW/SET
5, No need of acid, alkali, water; no discharge of sewage
6, Clean product environment without micro powder, no smell.
7, Automatic operation; less human-operation.
SCI had supplied 16 sets of LW530 new high dryness dewatering decanter centrifuges for sludge dewatering with the maximum separation factor reaching 3500g. The rotating parts adopted high-quality duplex stainless steel and were manufactured with advanced centrifugal casting process for the perfect processing performance of our equipments. The designed absolute sludge capacity reached to 370 tons per day.

SCI had supplied 3 sets of LW450 dewatering decanter centrifuges for the thermal power plant sludge treatment, the processing parameters are belows;

1. Average processing capacity: 35 m³/h;
2. Average sludge solid content: 1.1%;
3. Dewatering cake solid content: 22%;
4. Average solid phase recovery rate: 95%
SCI had supplied over twenty sets of LW530 tannery sludge dewatering complete system to one Chinese Tannery Industry Area.

SCI had supplied over hundred sets of LW530 municipal sewage dewatering complete system to many Chinese water factories, sewage treatment plants, waste water treatment plants etc.
Horizontal Screw Centrifuge and 3-phase Decanter Centrifuge

Horizontal screw filtering centrifuge of SCI

Horizontal Screw Filtering Centrifuge applies the principle of filtration for suspension separation, and is used for solid-liquid separation or centrifugal dewatering of suspension with solid-phase particles 0.1~9mm and concentration range of 10~75%. The centrifuge may have washing function. The horizontal screw filtering centrifuge of SCI has the features such as continuous operation, automatic discharge, high solid-phase dewatering rate, compact structure, high separation efficiency, easy operation and maintenance and small footprint, etc. It can greatly reduce the cost of material drying, even save the drying process. Therefore, it is widely used for solid-liquid separation and dewatering of suspension in chemical, food, chemical fiber, salt and alkali manufacturing industry.

SCI horizontal screw filtering centrifuge series

<table>
<thead>
<tr>
<th>Model</th>
<th>Diameter of the bowl end (mm)</th>
<th>Maximum speed (r/min)</th>
<th>Main motor (kW)</th>
<th>weight (kg)</th>
<th>dimensions (L×W×H)(mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWL350</td>
<td>350</td>
<td>3000</td>
<td>7.5~11</td>
<td>1000</td>
<td>1000×1200×950</td>
</tr>
<tr>
<td>LWL450</td>
<td>450</td>
<td>2300</td>
<td>15~22</td>
<td>2500</td>
<td>1150×1500×1150</td>
</tr>
<tr>
<td>LWL560</td>
<td>560</td>
<td>2000</td>
<td>22~30</td>
<td>3000</td>
<td>1350×1800×1300</td>
</tr>
</tbody>
</table>

High-speed Tubular Centrifuge

SCI high-speed tubular centrifuge is a kind of small tubular separator with high separation factor used in schools, laboratories, research institutes, biological products, chemical industry, beverage, pharmacy etc., which divides into GQ76,GQ105,GQ105G,GQ142,GQ200. It is mainly used for separation of suspension with small solids hard to separate. SCI high-speed tubular centrifuge is suitable for solid-liquid separation with low concentration, small particles, high viscosity and small proportion difference of two mediums. The material of all touched-parts inside machine is 316L stainless steel.

Main technical parameters:

<table>
<thead>
<tr>
<th>Model</th>
<th>Separation Force</th>
<th>Working Bowl Volume(L)</th>
<th>Max Flow(Water) (m³/h)</th>
<th>Motor (kW)</th>
<th>Weight(empty) (kg)</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GQ76</td>
<td>17000</td>
<td>2</td>
<td>0.2</td>
<td>1.5</td>
<td>180</td>
<td>750×380×1180</td>
</tr>
<tr>
<td>GQ105</td>
<td>15000</td>
<td>6</td>
<td>1.2</td>
<td>3</td>
<td>550</td>
<td>800×450×1620</td>
</tr>
<tr>
<td>GQ105G</td>
<td>15000</td>
<td>6</td>
<td>1.2</td>
<td>3</td>
<td>750</td>
<td>780×460×1640</td>
</tr>
<tr>
<td>GQ142G</td>
<td>15600</td>
<td>10</td>
<td>1.5</td>
<td>3</td>
<td>900</td>
<td>910×620×1770</td>
</tr>
<tr>
<td>GQ200</td>
<td>15000</td>
<td>20</td>
<td>2</td>
<td>5.5</td>
<td>1000</td>
<td>900×600×1700</td>
</tr>
</tbody>
</table>
SCI could provide the service as below:
- Repairing
- Rebuilding
- Overhauling
- Refurbishing
- Reconditioning

SCI always takes the first-class customer service as the conduct of the company, in order to make customers get more efficient and attentive service, SCI has long been focusing on customers to build the four levels customer service systems.