The Decanter

The efficient way to separate

TEMA Systems, Inc.

CHEMICAL & MINERAL PROCESS EQUIPMENT
7906 Redsky Drive, Cincinnati, Ohio 45240-1632, U.S.A.
Phone (513) 489-7811  Fax (513) 489-8817  www.tema.net
Our head office at the Raffelbergpark in Mülheim an der Ruhr

Our works premises in the industrial port in Mülheim an der Ruhr

Partial view of our workshop in Mülheim an der Ruhr
Of all the machines operating on the centrifugal principle, the decanter is the most versatile centrifuge with the largest overall market share worldwide. In the light of increasingly demanding requirements of the authorities in respect of reducing the waste content in effluent and the requirement of industry for maximum possible efficiency of production plant, the decanter is gaining further importance.

In the planning of new plants or extensions of existing production plants, these criteria are always of primary importance. Whilst generally the trend is towards standardization, SIEBTECHNIK attach importance to production equipment tailored to the product. This means that our specialists design and construct a suitable machine for and frequently in collaboration with the customer for his specific application.

In this way, it is possible to achieve optimum product-specific efficiency and to meet individual requirements. **We are your partners!**

Correct product-specific design of a decanter centrifuge involves a correspondingly wide range of options according to the application - gastight or open process - as well as the properties of the product.

At the same time, variable drives and special equipment options which affect production flow costwise are the state of the art with SIEBTECHNIK decanter centrifuges. Reliability under all operating conditions is the guiding principle with SIEBTECHNIK decanter centrifuges and an inviolable obligation to the environment.

To suit the numerous applications and meet the demands of the operator for efficiency of the machines, the machine must be precisely matched physically, as well as in its operating parameters, to the product to be processed. Here, we are assisted by existing operational experience or trials with test machines on site or in the SIEBTECHNIK laboratory.

Here as well, we are assisted by computer in extrapolation to operating conditions and optimum design of the operational machine with regard to geometry of screw and drum, operating speeds and the resultant physical conditions in comparison with the trial results. **Why not give us a try!**
Principle of operation

Even the finest solids can be separated in the decanter centrifuge if its sedimentation rate in the carrier liquid is sufficiently high. The sedimentation rate depends on the particle size, the particle shape, the density difference between solid and liquid, and the viscosity of the latter. In many cases, significant improvement is possible by conditioning, for example heating or addition of flocculants. Also important is the geometrical design and establishment of operating parameters.

Clarification of the liquid is effected in the case of solid bowl centrifuges primarily in the cylindrical section, dewatering of the solid matter taking place by means of filtration or compression of the solid cake in the conical section of the drum.

Design

SIEBTECHNIK decanter centrifuges operate on the contraflow principle. This means that the suspension to be separated is fed approximately in the centre of the drum, the sedimented solid matter is conveyed towards the smaller diameter by the screw rotating at a speed differential in relation to the drum, whilst the clarified liquid overflows at the opposite end of the drum.

The height of the liquid level in the drum and thus the ratio of clarifying to drying section of the drum can be infinitely varied. This permits optimum matching to the separation application involved.

The speed differential between screw and drum is effected by means of a CYCLO gear unit. Drive is effected in standard form by V-belt, the centrifuge being fitted, according to speed combination, with a single drive (fixed eccentric shaft) or dual drive (driven eccentric shaft).

Versatility

SIEBTECHNIK decanter centrifuges can be used for almost all separation processes:

- Pure separation processes (clarification and dewatering of solids)
- Compacting
- Three-phase separation
- Classifying
According to its structural layout, the TS Series is used in preference for gastight process systems, and the DZ Series for open plants.

The additional structural complexity of the TS Series justifies the additional price.

The geometrical and equipment options listed aside, add up to provide a range of decanters with an unusually wide scope of options.

**Basic types**
- TS Series (tunnel version)
- DZ Series (pedestal bearing version)

**Drum lengths**
- Diameter/length ratio
  - 1 : 1.5
  - 1 : 2
  - 1 : 3
  - 1 : 4

**Drum angle of inclination**
- 6°
- 8°
- 10°
- 12°
- 15°

**Drive options**
- Single drive
  (fixed eccentric shaft)
- Dual drive
  (driven eccentric shaft)
- Hydraulic drive
- Frequency converter drive

**Separation**
- Two-phase decanter
- Three-phase decanter

**Centrifuge effluent discharge**
- Free discharge
- Impeller
  (discharge under pressure)
- Continuous sump adjustment during operation
  (patent applied for)

**Solids discharge**
- Free discharge
- Discharge device (racetrack)
- Slurrying trough (patent applied for)

**Sealing systems**
- Open labyrinth seal
- Vapour-tight version
- Gastight version with chamber packing with PTFE rings
- Pressure tight version with mechanical seals
- Decanter in pressure vessel

**Special designs**
- Compressing decanter
- Washing decanter
- Screen decanter
- Overhung-mounted decanter
  (TS 140 F, TS 210 F, TS 250 F, TS 360 F)
This SIEBTECHNIK heavy duty decanter is used in preference for open process systems and is distinguished by its outstanding separation properties with maximum availability.

As with all SIEBTECHNIK centrifuges, the rugged CYCLO gear unit, as well as all the antifriction bearings are connected to a circulating oil lubrication system. All the components are generously dimensioned and will stand up to the most severe operating conditions.

This ensures maximum service life with minimum maintenance.

An overload protection system patented by SIEBTECHNIK which provides not only mechanical power disconnection, but also provides electrical signals for shutoff of product feed and drive, completes this Series and meets all safety requirements.

The housings are sealed as standard by a multi-chamber labyrinth system.

The DZ Series can also be supplied as a vapourtight and gastight unit. The product housings are two-part throughout and sealed with PTFE rings. The geometry of the rotating parts is specially matched to the separation application involved.

For repairs and maintenance, we recommend an assembly bench as a valuable addition to the centrifuge for care and safe handling of the high-quality rotating parts.
### Sizes available

<table>
<thead>
<tr>
<th>Type</th>
<th>DZ 1</th>
<th>DZ 2</th>
<th>DZ 3</th>
<th>DZ 4</th>
<th>DZ 5</th>
<th>DZ 6</th>
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<tr>
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<td>55 - 160</td>
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<td>1450</td>
<td>1500</td>
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<td>2160</td>
<td>2600</td>
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<td>9700</td>
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</table>

Subject to modification without notice.
Series TS decanters are used in preference for gastight process systems. The continuous, undivided housing (tunnel construction), the tried and tested sealing of the shaft exits of the smallest diameters, as well as the layout designed structurally for special operating conditions, provide this centrifuge Series with an unusually high standard of safety.

As with all SIEBTECHNIK centrifuges, the gear unit and all the bearings are connected to the circulating oil lubrication system, so that minimum maintenance can be assured with maximum service life. The geometry of the rotating parts is specially matched to the separation application involved.

The TS Series is also fitted as standard with the patent overload protection (see DZ Series) and thus fulfils the very highest safety requirements.

It goes without saying that all the options of the SIEBTECHNIK range are also applicable to this type of centrifuge.

For industry and the environment - SIEBTECHNIK centrifuges!
### Gastight Version up to 5000 mm WG process pressure
- PTFE rings, butt-joint version: Inerting with sealing gas and grease seals to prevent leakage to atmosphere. Minimum gap.
- PTFE rings, overlapping angle-cut version: Inerting with sealing gas, without additional grease seal, PTFE rings run pretensioned with constant contact, without gap.

### Pressure tight Version over 5000 mm WG process pressure
- Fitted with mechanical seals, complete with supply systems.
- In the case of extreme pressures and extreme temperatures with special safety requirement, installation of the decanter in a pressure vessel without shaft exit to atmosphere and thus without use of mechanical seal systems. The centrifuge is fitted with a fully hydraulic drive unit.

### Installation and removal of drum and screw, TS Series
The drum and screw of our TS Type decanter centrifuges are mounted in anti-friction bearings. The bearing end shields are fixed to the torsionally rigid product housing. After releasing several screws, the rotating parts can be moved horizontally out of the housing with the aid of the rails provided and swivelled vertically.

### Sizes available

<table>
<thead>
<tr>
<th>Type</th>
<th>210</th>
<th>300</th>
<th>360</th>
<th>420</th>
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<th>600</th>
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<tr>
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<td>10 - 22</td>
<td>18,5 - 30</td>
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<tr>
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<td>1900</td>
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<td>1750</td>
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<td>2580</td>
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<td>2800</td>
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<td>5800</td>
<td>7000</td>
<td>9800</td>
</tr>
</tbody>
</table>

Subjects to modification without notice.
The screen decanter is a combination of solid bowl decanter centrifuge and screen screw centrifuge with outstanding dewatering behaviour for granular products.

The charge suspension is first of all prethickened in the decanter section, and to a large extent dewatered on the conical section of the solid bowl. The liquid is clarified in the cylindrical section and spun off at the end. The prethickened solid matter is transferred by the conveyor screw into the cylindrical screen section and is there separated from the residual liquid adhering to it.

Particularly efficient washing can be carried out in the screen section by a special SIEBTECHNIK washing device. Mother liquor and washing liquid can, if required, be taken off separately.

By virtue of the minimal residual liquid, the ultra-fine particle loss is relatively low and can be minimized by recirculation of the centrifuge effluent.

SIEBTECHNIK small overhung-mounted decanters

This small decanter Series has been developed specially for laboratory and technical institutes. Where relatively small quantities of suspensions with high solids contents are involved, this decanter version is also outstandingly suitable for production.

The rotating parts connected to the drive unit on one side offer the advantages of ready accessibility and ease of cleaning.

A special feature with sizes TS 140 F and TS 210 F is their convertibility to screen screw centrifuges H 200 and H 250. For this purpose, only the product housing with feed pipe and rotating parts are changed. These sizes are specially suitable for laboratory use and as universal screw centrifuges.

This Series of centrifuges is also available in gastight form and with all drive options.

All the decanter sizes listed in the SIEBTECHNIK range are available with screen section. The larger SIEBTECHNIK screen decanters are available with externally replaceable screen inserts.

All the SIEBTECHNIK features and equipment options described are also applicable to these centrifuge types.
Circulating oil lubrication
All SIEBTECHNIK centrifuges are equipped as standard with an integrated circulating oil lubrication system. The CYCLO gear unit, the main bearings and the screw supplementary bearings are supplied continuously with fresh oil by a pump unit. This favourably affects temperatures, even at high speeds and prevents anti-friction bearing fouling. The return oil is passed back to the oil reservoir integrated in the base frame and filtered. Monitors are included in the supply. This ideal lubrication system ensures long service life of the gear unit and bearings with minimal maintenance.

Weir adjustment
At the cylindrical end of the drum, the clarified liquid is spun off across a weir. The height of the weir determines the pool depth and thus the residence time of the suspension and thus the dry beach length of the solid matter.

All SIEBTECHNIK decanters are fitted with an infinitely adjustable weir plate which ensures optimum adjustment and easy accessibility without involving expense for conversion.

Impeller
Alternatively, the clarified liquid can also be discharged under pressure by means of an impeller. Delivery heads in excess of 20 metres are quite possible. This additional device makes it possible to dispense with a feed pump downstream of the decanter.

Infinite sump adjustment during operation
A special feature is optimization of the pool depth in the decanter drum during operation for readjustment with constantly changing products or product conditions. Here, SIEBTECHNIK offer a multi-channel peeling device which is used during two and three-phase separation in open as well as in gastight process systems. Adjustment is effected during operation by means of adjusting spindle (patent applied for).

Solids discharge ring
Discharge of solid matter is effected in the standard version directly into solids housing. In the case of products which tend to cake, the decanter should preferably be fitted with a discharge device which passes the solid matter directly into the receiving screw. This discharge device consists of a ring positioned round the drum discharge section which is open tangentially in the bottom half about 45°. The solids fall into the ring and are conveyed and discharged by the scrapers attached to the drum. This directs the material into the solids chute.
Slurrying trough
In many production cycles, the solid matter must be re-slurried after centrifuging. A specially developed slurrying trough intercepts the solid matter at the drum discharge and permits direct slurrying in the centrifuge itself.
The solid matter is deposited in a surrounding "water bed" and discharged extremely finely distributed with the movement of the liquid. This device renders downstream special containers and agitators superfluous (patent applied for).

Three-phase separation
The three-phase version of the decanter provides not only the facility for separation of the solid matter from a liquid, but also simultaneous separation of two liquid phases with different specific gravities.

Accelerated by the high centrifugal forces, the heavy liquid is deposited on the drum wall, so that the lighter phase floats. Whilst the solid matter is discharged by the screw, the two liquid phases flow to the outlet openings at the cylindrical end of the drum and are discharged in separated form.

Equipping the centrifuge with a peeling device which is adjustable during operation permits fast, optimum fine adjustment of the separating line between the two liquids.

If density differences or proportions of the individual phases are changed, it is always possible here to achieve maximum possible separation effect and optimum purity of the liquid phases by means of the level height adjustment described.

Overload protection  (SIEBTECHNIK patent)
A special feature of all SIEBTECHNIK decanter centrifuges is the patent overrunning clutch for protection against overload. This clutch ensures completely friction-free mechanical power disconnection with maximum efficiency and simple resetting of the operating function without the need for assembly. At the same time, disengagement in the case of overload results in an electrical signal to shut off the product feed and the drive motor.

Solid matter washing
Excellent washing results can be achieved with many products by means of a special washing device in SIEBTECHNIK decanters. This special equipment option ensures optimum displacement effects of the mother liquor with variable washing zone adjustment.

Wear protection
For abrasive products, we offer a selection of wear protection options to suit a variety of applications:
- Screw armouring with tungsten carbide deposition welding employing a special process
- Screw thread armouring with carbide segments
- Powder armouring
- Stellite tipping
- Ceramic

Materials
We make all parts coming in contact with the material to be centrifuged, according to requirements, of stainless, austenitic steels, special bronzes, Hastelloy, nickel, titanium, etc.

CIP Cleaning (Cleaning in Place)
As standard, our decanting centrifuges are fitted with various cleaning nozzles and an additional inlet tube in the inlet pipe, so that the centrifuge is rendered self-cleaning by means of suitable connection without involving any major expense.

For special requirements, the decanter can be fitted with a CIP cleaning system. This includes special washing tubes, special nozzles and PTO drive.
In the standard version, an electric motor drives the drum directly via a pair of V-belt pulleys. The rugged cycloidal planetary gear unit provides the differential speed between screw and drum and at the same time acts as a torque converter. Either the natural gear unit transmission ratio determines the differential speed as a function of the principal speed by locking the gear unit drive shaft (single drive), or it is determined by a second belt drive arranged in parallel by drive of the gear unit input drive shaft from the same electric motor. Drum speed and differential speed can be altered by changing V-belt pulleys. A hydraulic starting clutch limits the starting current and at the same time acts as overload protection for the motor. The patent SIEBTECHNIK overload clutch prevents damage to the mechanical gear unit in the event of overload.

In the same way as the standard drive, an electric motor drives the drum directly by V-belt. The mechanical cycloidal gear unit is replaced by a hydraulic motor. A hydraulic pump unit supplies the oil for the hydraulic motor and is integrated in the base frame of the machine. This drive option permits not only infinitely variable manual adjustment of the speed to suit the product conditions, but also continuous analog regulation of the screw speed according to the load characteristics with different solid matter concentrations. This means that the differential speed increases continuously or suddenly with rising screw torque and conversely reduces with falling torque.

This SIEBTECHNIK drive control with integrated SPC is a state-of-the-art alternative to hydraulic drives and by means of two separate drives permits infinitely variable adjustment of drum speed and differential speed. A compact control cabinet houses two frequency converters which are cross-linked such that when the screw is leading, the energy flowing backward via the gear unit shaft is made available again to the main drive.

In addition to variable manual matching of drum speed and differential speed, this drive option also offers the facility for automatic analog speed adjustment to suit changing operating conditions. A serial interface is provided for PC connection which also permits computer-controlled regulation by means of product coding. This control can be integrated in any fully automated system.

Possible functions:

**Regulation functions**
- analog to the torque, automatic
- PC-programmed control

**Control functions**
- reduction or shutoff of product feed in the event of certain process conditions

**Possible emergency functions**
- torque limitation
- product feed shutoff
- drive shutoff

This SIEBTECHNIK drive ensures low noise, minimized wear and energy saving.
With both screen and settling centrifuges, centrifuge characteristic numbers and the residence time of the product are measures of the efficiency of a machine.