Hydrostatic Drive System for Decanter Centrifuges

Hydraulic Motor ROTODIFF® and Hydraulic Pump Unit

A decanter centrifuge requires two independent drive systems. The bowl operates at a high rotational speed to create a high g-force. The scroll rotates inside the bowl with a low speed to the bowl (differential speed).

The scroll and bowl drive of the hydrostatic drive system operate independently from one another in terms of energy and control technology. Torque and differential speed can be controlled according to load and pressure relation. The drives can be directly and infinitely variably controlled, which allows ongoing adaptation to the separating tasks.

The pump unit supplies the oil to the hydraulic motor ROTODIFF which is directly attached to the bowl. The rotor drives the scroll independently from the bowl. The scroll drive system consists of the hydraulic motor ROTODIFF and a hydraulic pump unit as well as a control unit.

The bowl drive, on a semi hydraulic drive system, is controlled with a frequency-controlled electric motor which is provided by the centrifuge manufacturer.

The pump unit can also be expanded so that the bowl can be driven with a hydraulic motor. (full hydraulic drive).

VISCOTHERM develops and produces hydraulic drive systems for all kinds of applications. The drive systems are configured on the basis of the required torque (ROTODIFF) as well as the required differential rotational speed.

Setup of hydraulic drive system for scroll

The hydrostatic scroll drive system consists of the following components:

1. Pump Unit (stationary)
2. Control System
3. ROTODIFF (hydrostatic scroll drive motor) mounted on the centrifuge bowl, rotating unit
Setup of hydraulic drive system for bowl and scroll

The hydrostatic scroll drive system consists of the following components:

1 Pump Unit (stationary)
2 Control System
3 ROTODIFF (hydrostatic scroll drive motor) mounted on the centrifuge bowl, rotating unit
4 bowl drive
Advantages of the hydraulic drive system

A characteristic feature of all VISCOTHERM drive systems is the ability to adapt them optimally to an extremely wide range of operating conditions. This is based on the variable scroll rotation speed and bowl speed (option). These two parameters are some of the most important in decanter centrifuge technology.

Bowl speed variation strongly influences:

- Separation speed
- Sedimentation

Differential speed variation strongly influences:

- The solids throughput and therefore the solids production
- The solids retention time
- The solids loading in the decanter

These parameters have a direct influence on the quantity of solid material that can be separated, the dry matter content of the solid material and, as a result, the clarification performance of a decanter centrifuge.

Advantages of the hydraulic drive motor ROTODIFF®

ROTODIFF® versus Gear Box -> Movie
<table>
<thead>
<tr>
<th>Gear 57 Nm/kg (third-party producer)</th>
<th>Viscotherm ROTODIFF 129 Nm/kg</th>
<th>Viscotherm ROTODIFF 140 Nm/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque: approx. 26250 Nm</td>
<td>Torque: 25200 Nm</td>
<td>Torque: 25424 Nm</td>
</tr>
<tr>
<td>Weight: approx. 400 kg</td>
<td>Weight: ca. 195 kg</td>
<td>Weight: approx. 170 kg</td>
</tr>
<tr>
<td>&gt; 57 Nm/kg</td>
<td>&gt; 129 Nm/kg</td>
<td>&gt; 140 Nm/kg</td>
</tr>
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</table>

**Working Principal of a Solid bowl centrifuge hydraulic drive system**

The hydraulic oil pressure is directly proportional to the torque of the ROTODIFF worm drive motor. This in turn is directly proportional to the quantity of the solid material deposited in the bowl. This relationship makes it possible to achieve a closed control loop that enables the scroll differential rotation speed to be controlled depending on the deposited solid material.

As a result, the scroll rotation speed is automatically increased in proportion to the increase in scroll torque. The solid relationships in the bowl thus remain constant. That results in a constant maximum solid matter dryness with maximum output capacity. As a result, the centrifuge capacity can be optimally utilised, without blocking.
Technology with potential

Outstanding weight / torque ratio
The ROTODIFF hydraulic drive weighs on average only 50% as much as a gear unit with the same rated torque.

Overload-protected
A series of protection functions and a safety pressure valve protect all mechanical components of the drive against overload. High torque capacity.

**Long service life / simplicity and robustness**
Automatic heat dissipation via the oil conditioning system. No overheating problems such as gear units are prone to.

**Behaviour of the drive in special operation; 100% torque capacity in any operating mode**
Moving clear at standstill / scroll direction of rotation reversal possible.

**Outstanding controllability and operating safety**
The hydraulic system pressure is proportional to the torque, as a result of which the pressure can be used directly as an open-loop control parameter and it functions as a closed-loop control parameter. Automatic mode.