Gearless Conveyor Drive for medium power
**Gearless Conveyor Drives**

Technological leadership in conveyor drives

**Conveyor Classification**

- **High power**: Highest - capacity overland or inclined conveyors
- **Medium power**: Low - to high - capacity conveyors

**High power gearless**

- Synchronous motor for the highest torque requirements
- Easy - to - maintain embedding and alignment solution
- In co-operation with TAKRAF

**Medium power gearless**

- Special PM motor for mining environment
- Most compact to fit in many installations
- Highest possible energy efficiency
GCD for medium power
Pre-manufactured drive skid

**Skid mounted drive**
- 4 solutions cover the most embedding scenarios
- Brakes and couplings aligned with conveyor requirements
- Easy and accurate alignment of motor and brakes

**MCCP - PM drives control**
- Drives load sharing and monitoring
- PM motor operation
- Motor cooler control
- SIL2 rated brake control

**Optimized drive**
- Aligned dimensioning of motor, VSD and cooler
- Energy efficiency designed to conveyor needs
- Most energy efficient

**Reinforced motor cooler**
- Robust against shock, vibration and dust
- Highly reliable
- Most energy efficient
Savings in OPEX

- Monetary effects:
  - Power consumption
  - Production
  - Maintenance
  - Gearbox replacement / overhaul after 15 years
  - Failure / repair
  - Inventory management
  - Footprint / space requirements

- Sustainability aspects
  - Energy efficiency, power consumption
  - Carbon emission / Carbon footprint of product
  - Circularity / longevity
  - Environmental pollution (noise, oil)
  - Less hands-on activities (safety)

End user values
GCD for medium power

Why to choose GCD for medium power?

- Most compact direct drive
- SIL2 brake control
- Advanced concept for mechanical alignment
- Robust components for mining environment
- Embedding solutions for all cases
- Lowest operation cost
Low-speed gearless conveyor drives

Improve reliability... ...while simultaneously bring sustainable benefits to local communities and beyond.

No gearbox
Replaced with Permanent Magnet Motor technology

Reduced maintenance and risk of failure

Preserve the use of resources

Reduced energy consumption by an estimated 6–10%

Reduced risk of oil pollution, fire and accidents

+10 years lifetime vs a geared drive

Reduced noise pollution from more than 90dB(A) to 85dB(A)

Reduced CO₂ footprint by 6–10%
Low-speed gearless conveyor drives

Benefits

OUR SOLUTION
No gearbox
Replaced with Permanent Magnet Torque Motor

FEATURES
- Fewer components, lightweight and compact
- 30 years lifetime vs 15-17 years for gearbox
- No oil needed (several 100 liter per gearbox)
- GCD efficiency characteristics fit to typical conveyor operation
- Motor turning at low speed vs. 1,000rpm with drives containing gearboxes
- Produce the same torque/power with 20-25% less motor current
- No oil, reduced maintenance, less hands-on activities

...while simultaneously bringing sustainable benefits to local communities and beyond

Preserve the use of resources
Reduced noise pollution from more than 90dB(A) to 85dB(A) (A-weighted decibels)
Reduced energy consumption by an estimated 6-10%
Reduced CO₂ footprint by 6-10%
Reduced risk of fire, oil pollution and accidents

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Reference Project
Chuquicamata subterranea – Codelco, Chile

- 60 MW total power installed
- Max. 20 MW total at one gearless conveyor
- 100 partial deliveries, >3.500 tons
- >1.300 packing lots total footprint similar to a soccer field >4.200m²

- 12 x 5 MW 3KV gearless motors
- 10 x 0,5 MW VFD motors
- 4 x 5 MW double drives ACS6000
- 1 x 1 MW single drive ACS6000
- 10 x LV drive ACS800
- 8 x LV Switchgears (64 columns)
- 4 x AIS MV Switchgears (43 columns)
- 52 x Dry Transformers
- 8 x 800xA System Servers and Workstations
- 5 x AC800M redundant Process Controllers
- ~7.000 Total I/Os (Physical and Virtuals)
- 600 x Lighting fixtures
- 80 km MV, LV and control cables
- 52 x Dry Transformers

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Replacing diesel-trucks by conveyors - Chuquicamata

Customer Codelco (Chile) saves ~ 340,000 t CO2 p.a. in comparison to the Mining Truck fleet.
“This solution is a long-term solution; it has to guarantee the correct operation of this infrastructure for more than 50 years. It is not a project that takes place every day. This is a world-class project.”

Carlos Gonzáles Arrojo, TAKRAF Construction Manager [2019]
“Despite many years of experience in the construction of conveyor systems this is the first time for us to carry out a project with this new drive technology in particular. This means not conventional drive pulleys with gears and motors but 5 MW motors directly coupled to a drive pulley and in addition implemented in the conveyor system partly with four, five MW motors, in total 20 MW, but a conveyor system is of course a special challenge.”

Georg Paulick, ABB AG, Head of Commissioning [2019]
Reference project

2x 48kNm shaft mounted drive at Bilina Mine
Reference project
Pilot project at LEAG/ Germany

“The interest of LEAG in this pilot project mainly lies in the expectations related to higher efficiency, lower wear and hence less expenses for repairs and maintenance, … Since commissioning has taken place [in July 2017], the drive has been running smoothly.”

Peter Scholze
Head of Services
Open Pit Mines, LEAG
## Lifecycle Cost LEAG – Pilot, running since July 2017

Without production loss, motor and gearbox-cost only

<table>
<thead>
<tr>
<th></th>
<th>Geared</th>
<th>gearless</th>
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<tbody>
<tr>
<td>Gearbox</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>24%</td>
<td>120%</td>
</tr>
<tr>
<td>Cooler</td>
<td></td>
<td>7%</td>
</tr>
<tr>
<td>Noise cancellation</td>
<td>35%</td>
<td></td>
</tr>
<tr>
<td><strong>Total investment</strong></td>
<td>100%*</td>
<td>127%</td>
</tr>
<tr>
<td>Maintenance, overhaul</td>
<td>+6%p.a.</td>
<td>+1%p.a.</td>
</tr>
<tr>
<td>Energie</td>
<td>+2%p.a.</td>
<td>0%p.a.</td>
</tr>
<tr>
<td>Production loss</td>
<td>n.a. because of comprehensive gearbox service and monitoring by LEAG service team</td>
<td></td>
</tr>
<tr>
<td>Lifecycle Cost after 4 years</td>
<td>132%</td>
<td>131%</td>
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The costs are balanced after 4 years. Beyond, there are savings.