Mining Conveyor Control Program - MCCP
for ACS600, -800, -880, -1000, -2000, -6000
Integration of Mining Conveyor Control Program MCCP

Control architecture
Mining Conveyor Control Program - MCCP

Load share software for up to 6 drives

ACS600
ACS800
ACS880
ACS1000
ACS2000
ACS6000

Conveyor drives load share, control and monitoring
ABB LV and MV drives
Geared or gearless
Conveyor drive station

Mechatronic system

- Rotatoric/translatoric mechanical system
- Thooth flank and gap offset in gears
- Mass – damper system (belt)
- Natural frequencies of transmission elements
Conveyor drive station

Mechatronic system
Mining Conveyor Control Program - MCCP

Superior drive control and load share

Mech. Torque M4
Mech. Torque M2
Mech. Torque M1
Motor Torque M4

Uphill Conveyor (9% incl.)

Requirement: Less than 15% torque overshoot at start up.
Master Follower
Standard Control Concept

- Master creates correct reference for own motor and passes this signal to all followers
- Follower reference created by master can be wrong for follower
- Simple Master Follower can create oscillations
- M/F concept can increase mechanical wear
MCCP Control Concept
Motion Master – references to all followers

- Motion Master processes feedback from all followers
- Each follower receives the correct torque reference
- Dynamic control, perfect load share without oscillations
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Block diagram

PLC Control Unit

Process Controller

Motion Interface

Drives I/O

Motor Control Program

SPEED CONTROL/LOAD SHARE

MCCP

RMIO-12 or AMC-34

DRIVES 1 … 4

SPEED CONTROL

TORQUE CONTROL

DTC CORE

DDCS

Monitoring

Torque Ref A 25.01

Fault/Alarm Words

Actual Values

Motor Control Program

Motor

Inverter

Communication

Status Words

Fault/Alarm Words

Actual Values

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Software features - Start/Stop sequence

Safe Start/Stop sequencing

Reliable and safe brake control
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Software features - Emergency Run Mode

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### P42.05 MACW2 Motion Auxiliary Control Word 2

<table>
<thead>
<tr>
<th>Bit</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>B0</td>
<td>TOGGLE</td>
</tr>
<tr>
<td>B1</td>
<td>RELEASE FOLLOWER 1</td>
</tr>
<tr>
<td>B2</td>
<td>RELEASE FOLLOWER 2</td>
</tr>
<tr>
<td>B3</td>
<td>RELEASE FOLLOWER 3</td>
</tr>
<tr>
<td>B4</td>
<td>RELEASE FOLLOWER 4</td>
</tr>
<tr>
<td>B5</td>
<td>RELEASE FOLLOWER 5</td>
</tr>
<tr>
<td>B6</td>
<td>RELEASE FOLLOWER 6</td>
</tr>
<tr>
<td>B7</td>
<td>Reserved</td>
</tr>
<tr>
<td>B8</td>
<td>Torque Diff Mon OFF</td>
</tr>
<tr>
<td>B9</td>
<td>Speed Diff Mon OFF</td>
</tr>
<tr>
<td>B10</td>
<td>SELECT LIM 2</td>
</tr>
<tr>
<td>B11</td>
<td>EMERGENCY OPERATION</td>
</tr>
<tr>
<td>B12</td>
<td>Reserved</td>
</tr>
<tr>
<td>B13</td>
<td>LIMIT 1 REQUEST</td>
</tr>
<tr>
<td>B14</td>
<td>LIMIT 2 REQUEST</td>
</tr>
<tr>
<td>B15</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

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The overriding controller must send these bits to the Master Drive and the Follower Drives, in order to signalise which followers are operational. Without these signals, the follower drives can not start.

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March 26, 2019
Slide 11
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Software features - Fault stop

- Safety functions E-Stop/ Fast Stop
- Several fault stop levels
- Flying reduced run option
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Software features - Monitoring

- Automatic torque and speed limitation
- Motion and Drive monitoring
- Example Overspeed monitoring
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Commissioning and maintenance with standard tool

- Easy signal monitoring, fault tracing and adjusting
- No programming work in control loop to change settings
- Parameter files: Save, compare, parameter lock
- Software backup and restore
On Site Tuning is time wasting
OFF – Site Tuning with Simulation
Identify control issues
Determine basic controller settings
Advantages

- High dynamic, perfect load share without oscillations
- Monitoring and protection of the motion
- Open to every control system

- Reduced engineering for software programming
- Easy commissioning and drive tuning with standard tools
- Contains many features for conveyor control
- Software code is the same in all projects, worldwide proved
- Service-friendly; trained personnel worldwide

- **Save and consistent firmware**
Mining Conveyor Control Program - MCCP

Manuals and Training

eLearning (introduction)
- [http://www.abb.com/abbuniversity](http://www.abb.com/abbuniversity)
- browse to „course locator“

Instructor led training
- Detailed and „hands on“ training
Reference
Conveyor line, Collahuasi mine, Chile

Key facts
- Length 13 km
- Hardrock
- ACS6000 MV Drives
- Uphill / downhill
- 10,000 t/hour
- >4500 m.a.s.l.
Reference

Tianjin Coke – Overland Conveyor

Key facts

Length 7.6 km