



SME 2012: Ulf Richter, Global Portfolio Manager – Belt Conveyor Systems

# Large Belt Conveyors

# BU Minerals Conveyors

## We provide ...

### Electrical equipment for

- Uphill
- Downhill
- Horizontal
  
- Overland
- Stockpile
- Machine conveyors

**... SINCE 1960!**

**so far >300 conveyors, all climates, >720km**

# New trends in conveyor design

## Hardrock mining



<b>Capacity</b>	<b>up to 20.000 tph</b>
<b>Particle Size</b>	<b>up to 450 ... 600 mm</b>
<b>Belt width</b>	<b>2.200 mm</b>
<b>Belt Speed</b>	<b>7.0 ... 7.2 m/sec</b>
<b>Maximum Drive Size for standard conveyor drives (c/w bevel hecial gear box)</b>	<b>3.500 kW</b>
<b>Drive Size for gearless drives</b>	<b>&gt; 3.500 kW with up to 8.000kW</b>
<b>Maximum Belt Quality</b>	<b>St 10.000</b>

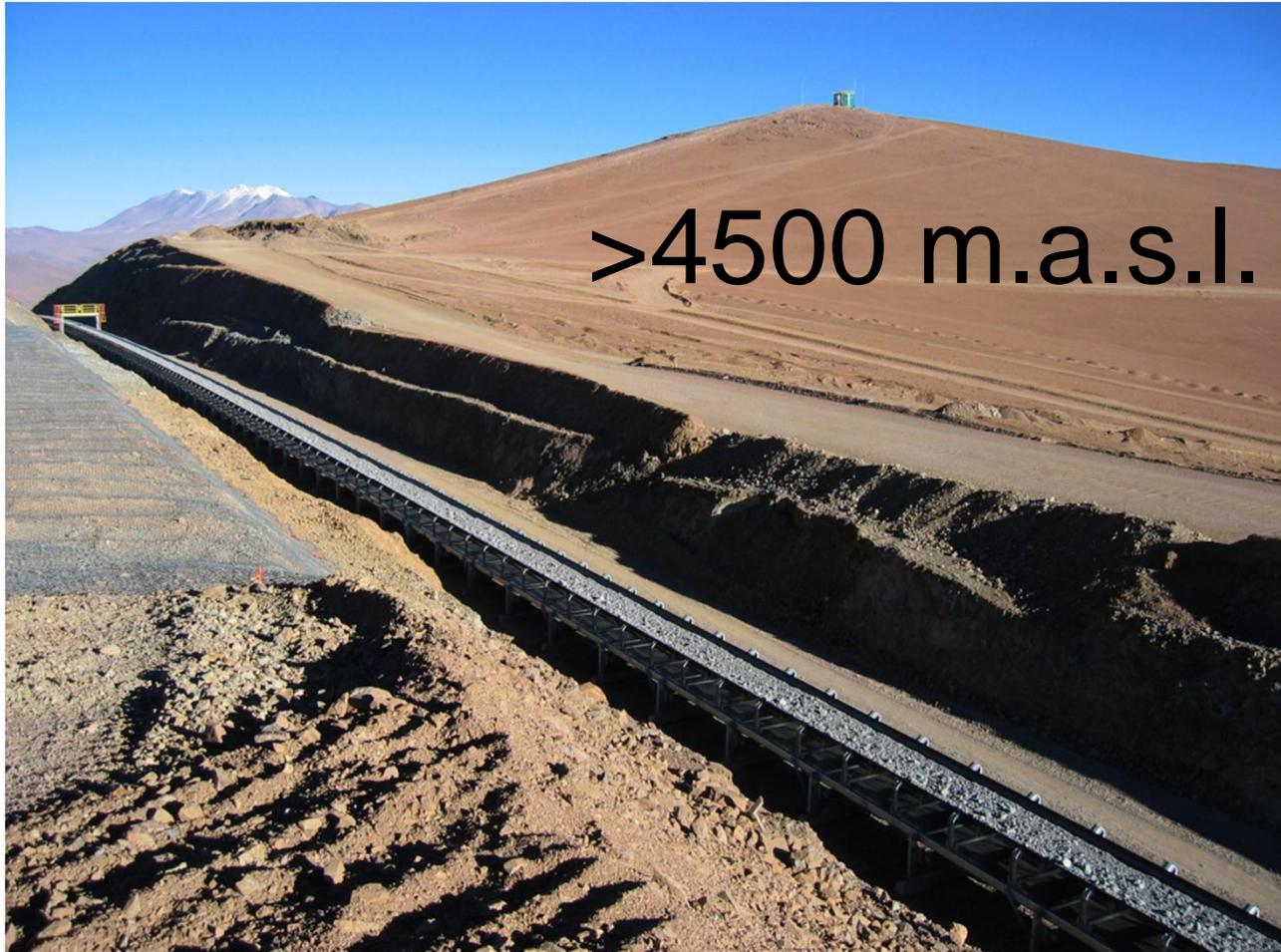
# BU Minerals Conveyors Portfolio



- Engineered Solutions for
  - Drive
  - Control & Automation
  - Erection & Commissioning
  - Services
- R&D

# Some References

## Collahuasi/Chile



- Hardrock
- ACS6000 MV Drives
- Uphill / downhill
- 10.000tph

# Some References

## Coal Conveyor Welzow South/ Germany

- 98% availability (total)

- 9 main flights (>9km in total)

- 8.300tph

- ABB LV drives

- Automatic belt speed adjust

- Advanced conveyor control



# Some References

## Tianjin Coke – Overland Conveyor (7.6km)

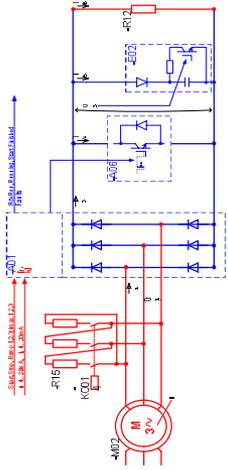


# Drive Solutions

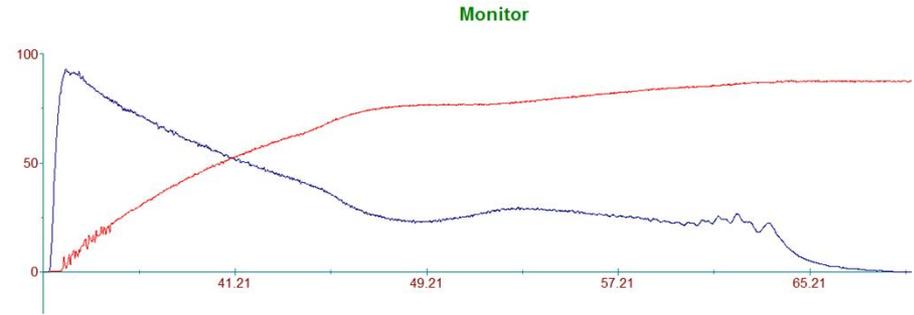
- Resistor Starters (binary, electronic)
- Variable Speed Drives
  - Drives Load Share Software (MCCP)
  - Simulation
  - Mining Drive and Motor
  - Gearless Conveyor Drive (**GCD**)

# Drive Solutions

## Electronic Compact Resistor Starter (ECOSS)



Overburden Bridge F60/ Germany



Strain gauge torque measurement

- One contactor/ resistor only
- Controlled, smooth starting torque
- Fieldbus integration in DCS
- Commissioning by Drive Window

# Drive Solutions

## Variable Speed Drives

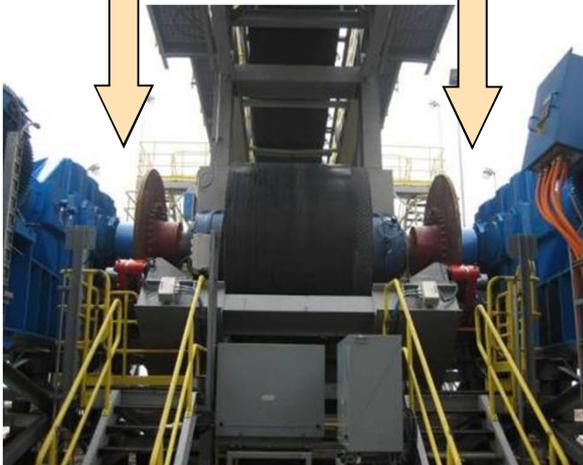
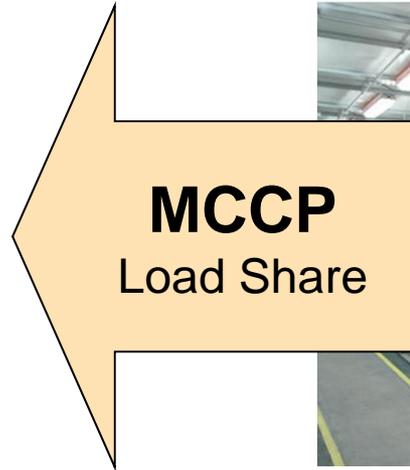
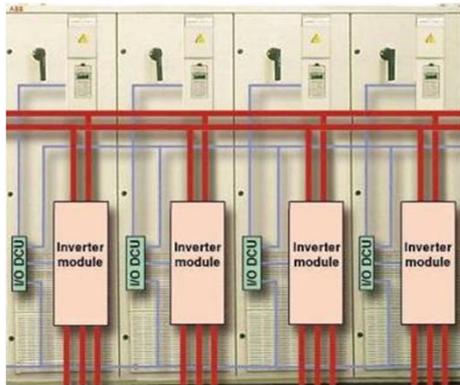


- Softly controlled start/ stop
  - Decrease or **increase** speed
  - Saving in energy
  - Equalize load on flight
  - Eliminate slip
  - Reduction of audible noise, dust emission, spillage
- 
- Overall higher flexibility of conveyor system

# Drive Solutions

## MCCP – Mining Conveyor Control Program

- ACS800
- ACS1000
- ACS2000
- ACS6000

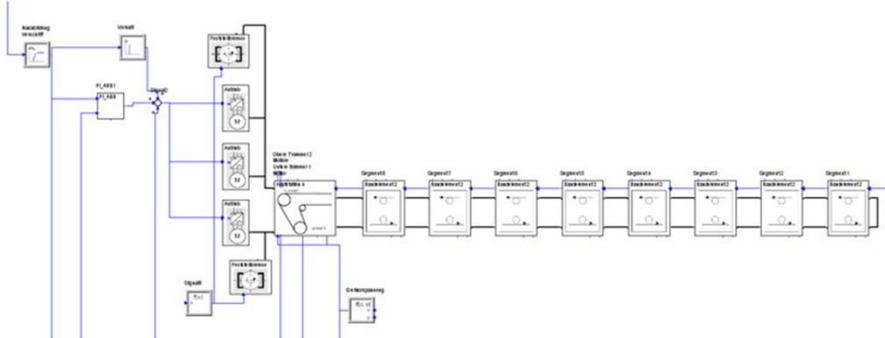
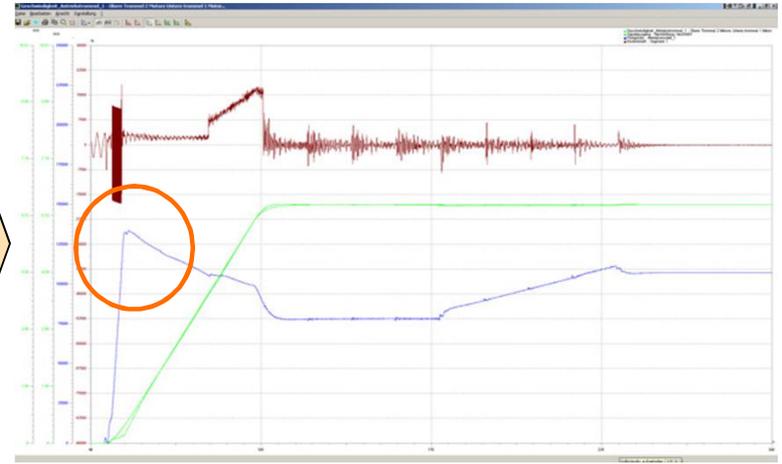


- Conveyor drives soft starting, load share and monitoring
- ABB LV and MV drives
- Geared or gearless
- Proofed conveyor drive control

# Drive Solutions Conveyor Simulation Model



OFF Site  
Tuning



- On Site Tuning is time wasting
- OFF – Site Tuning with Simulation
- Identify control issues
- Determine basic controller settings

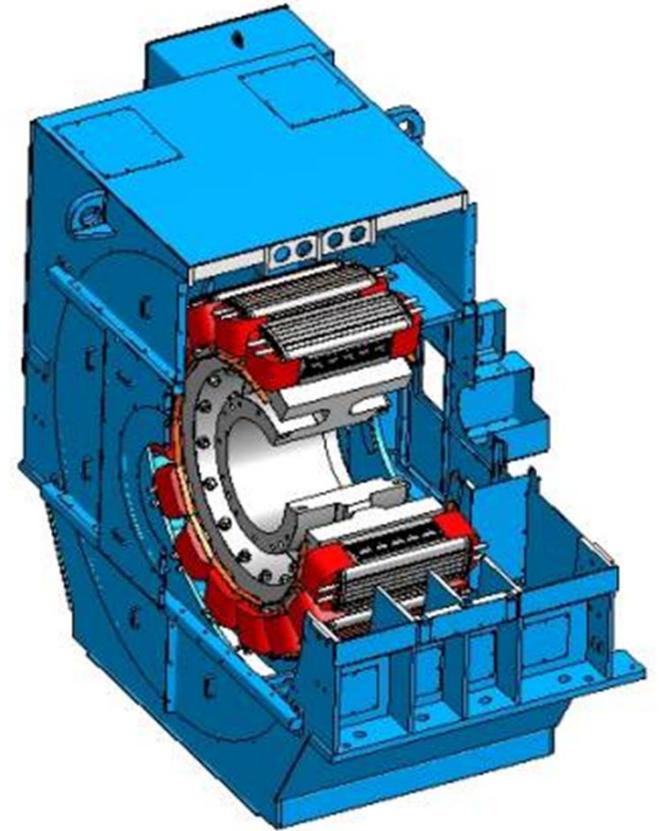
# Gearless Conveyor Drive (GCD) Development in Partnership



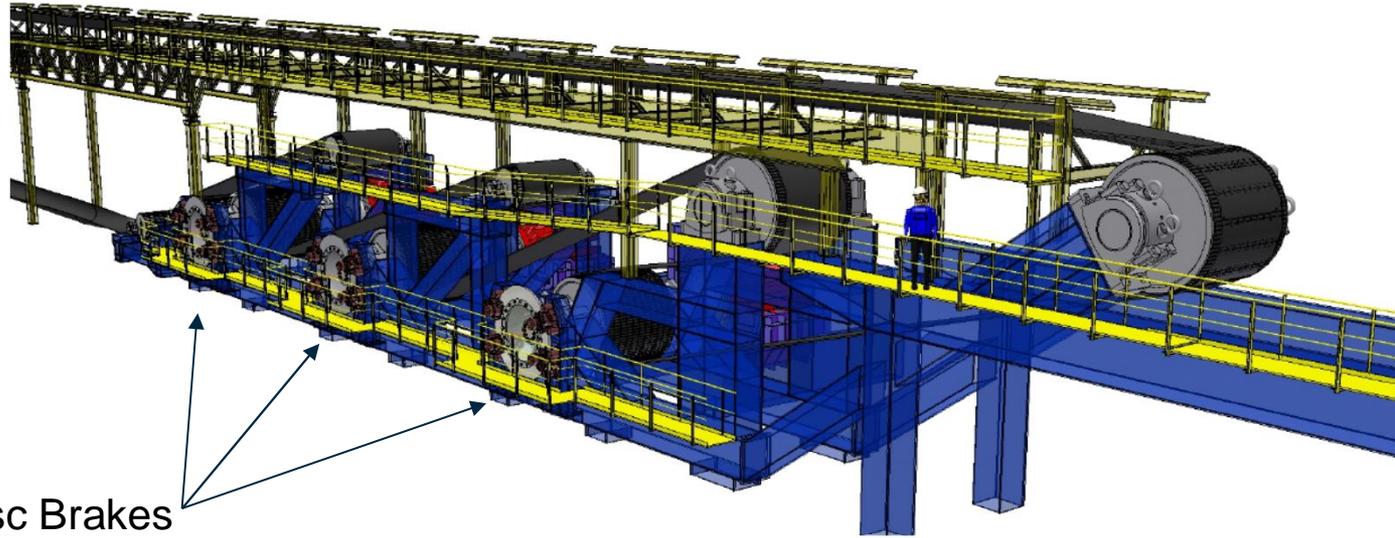
# Low speed & bearing-less solution ABB Motor and Frequency Converter



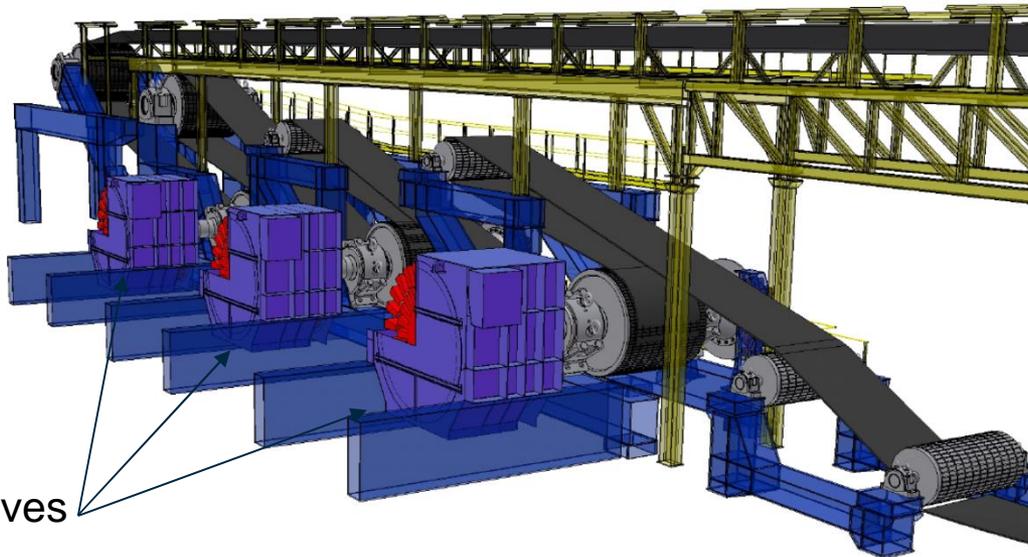
- Synchronous Motor
- Power range 2.5 ... 7 MW
- Motor pole number 8, 12, 16
- Motor speed 45 ... 100 rpm
- Shaft heights 800 – 2500 mm
- Air gap 10 – 14 mm
- Standardized and well approved synchronous motor used in many demanding applications
- Voltage Source Inverter



# Head Drive Station Three Drive Pulleys with Gearless Drives



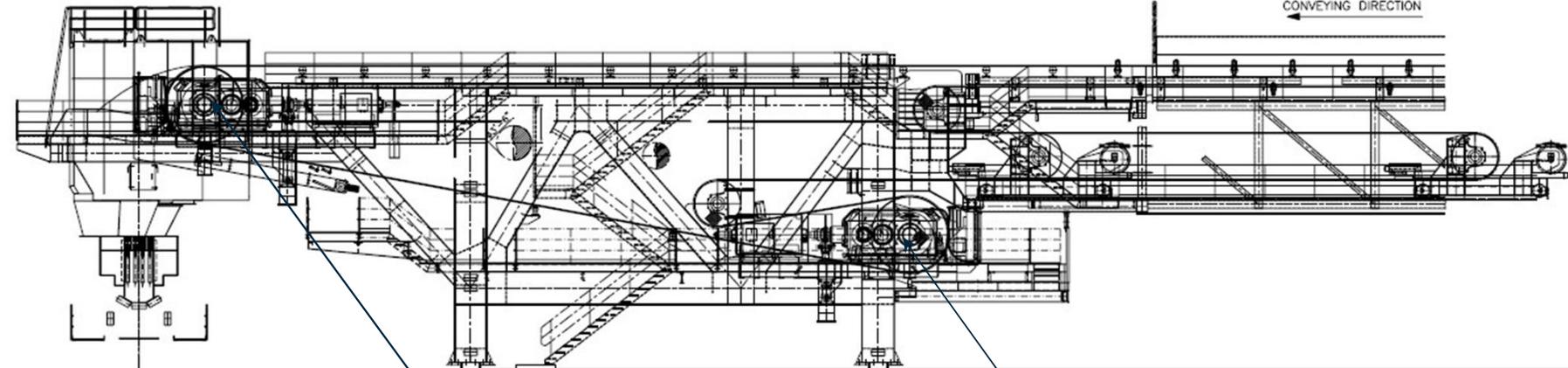
Disc Brakes



Gearless Drives

General arrangement of head drive station with gearless drives on one side and disc brakes on the opposite side

# Conveyor installations with potential use of GCD Henderson Mine (USA) - PC-2 Conveyor

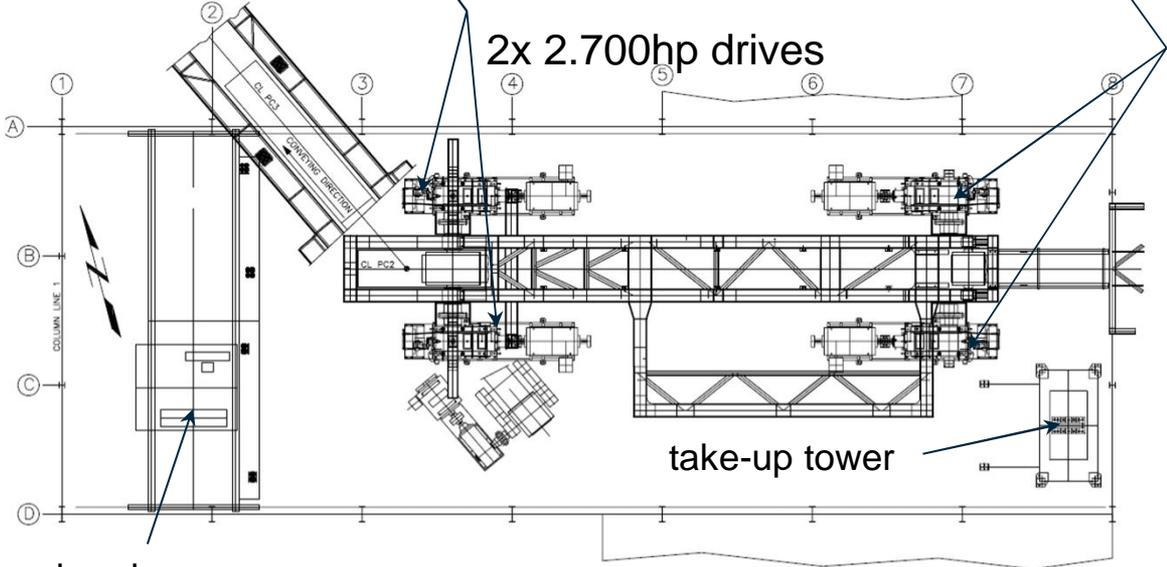


primary drive pulley with

2x 2.700hp drives

secondary drive pulley with

2x 2.700hp



overhead crane

PLAN VIEW

take-up tower

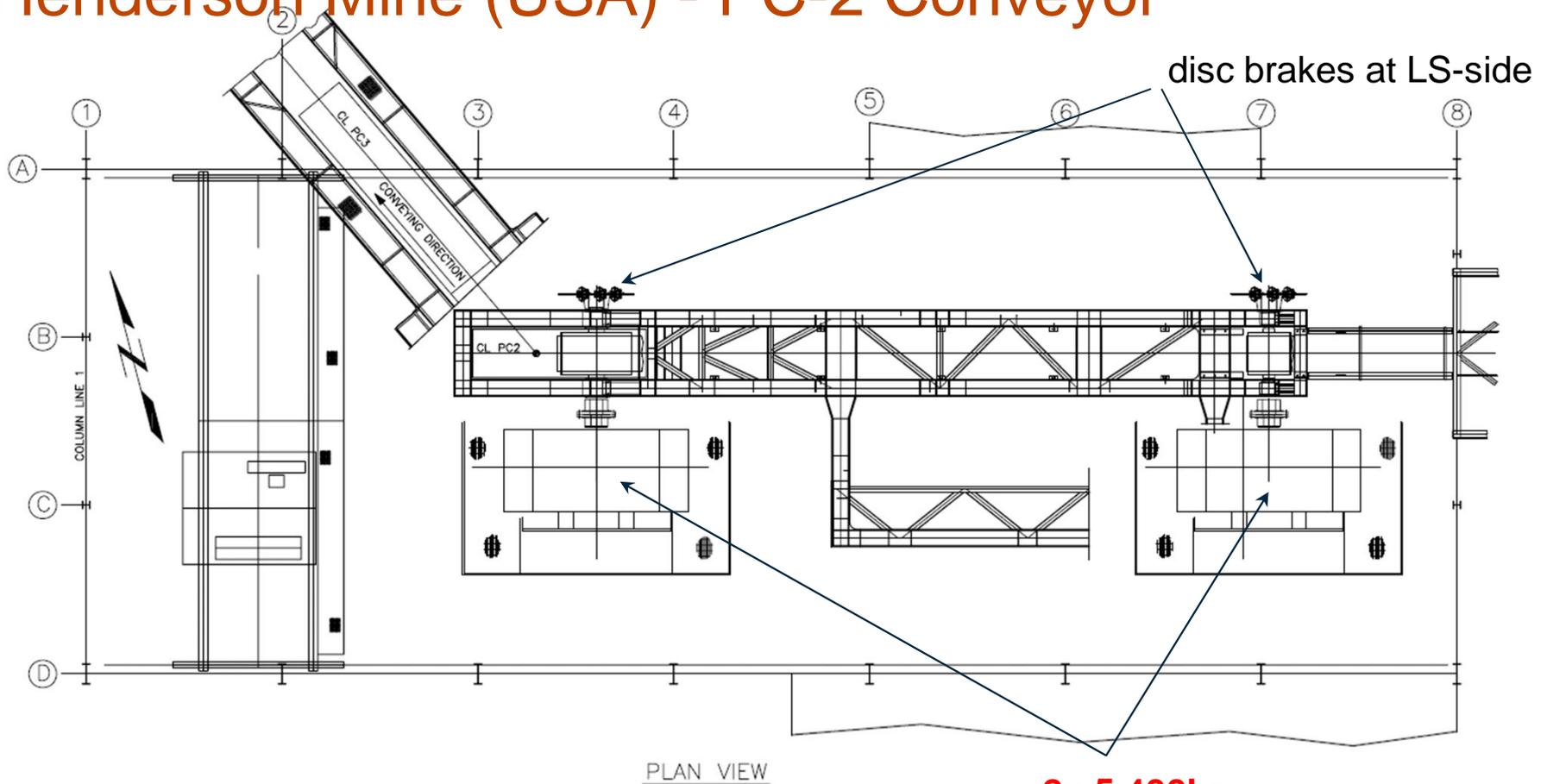
HENDERSON PC-2

head drive station with

**4x 2.700 hp drive units**



# Conveyor installations with potential use of GCD Henderson Mine (USA) - PC-2 Conveyor

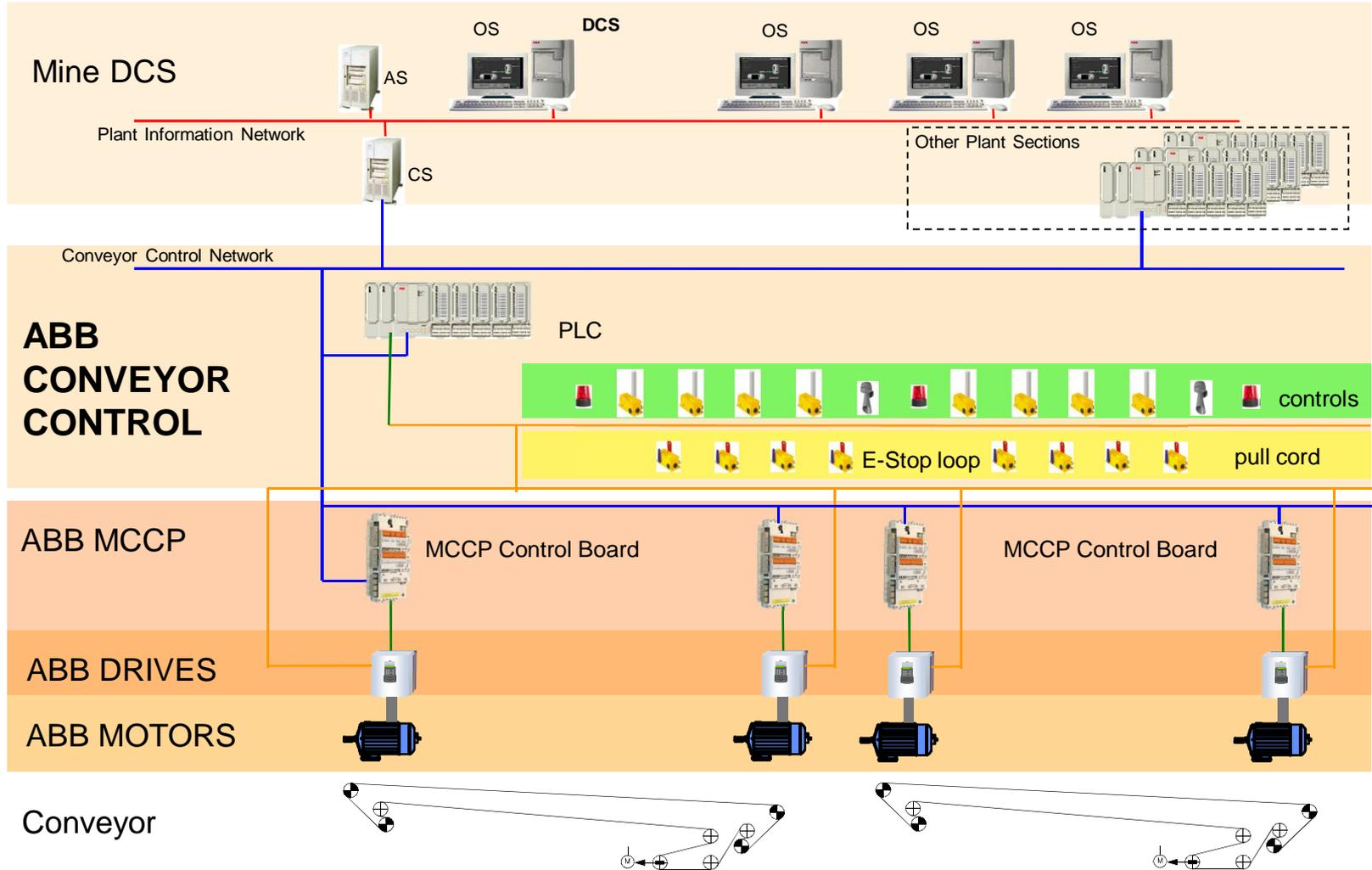


HENDERSON PC-2

head drive station with **2x 5.400hp** gearless drives

**2x 5.400hp**  
gearless drive

# Control and Automation Architecture



# BU Minerals Conveyors Control and Automation

- Control Hardware Infrastructure
- Control Software & Libraries
- Material Tracking
- Belt Speed Adjust
- Conveyor Scan

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# Control and automation

## Belt speed adjust

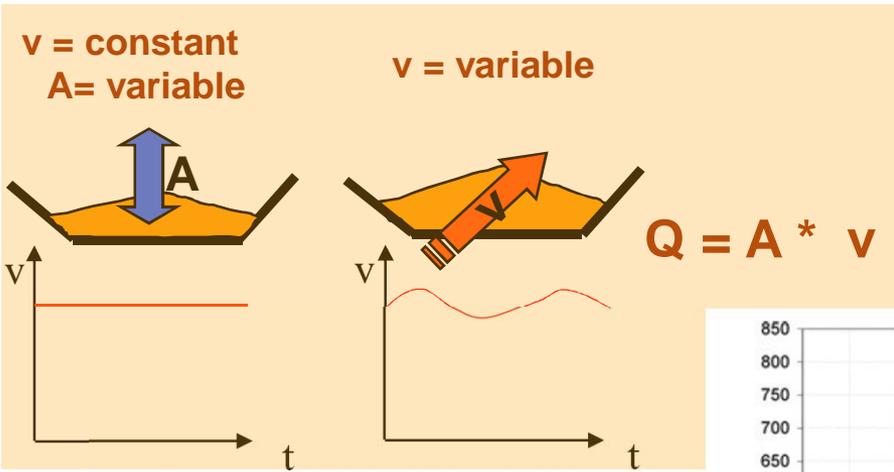


Typical case:

- Low conveying volume on conveyor
- Reduce speed!

# Control and automation

## Belt speed adjust

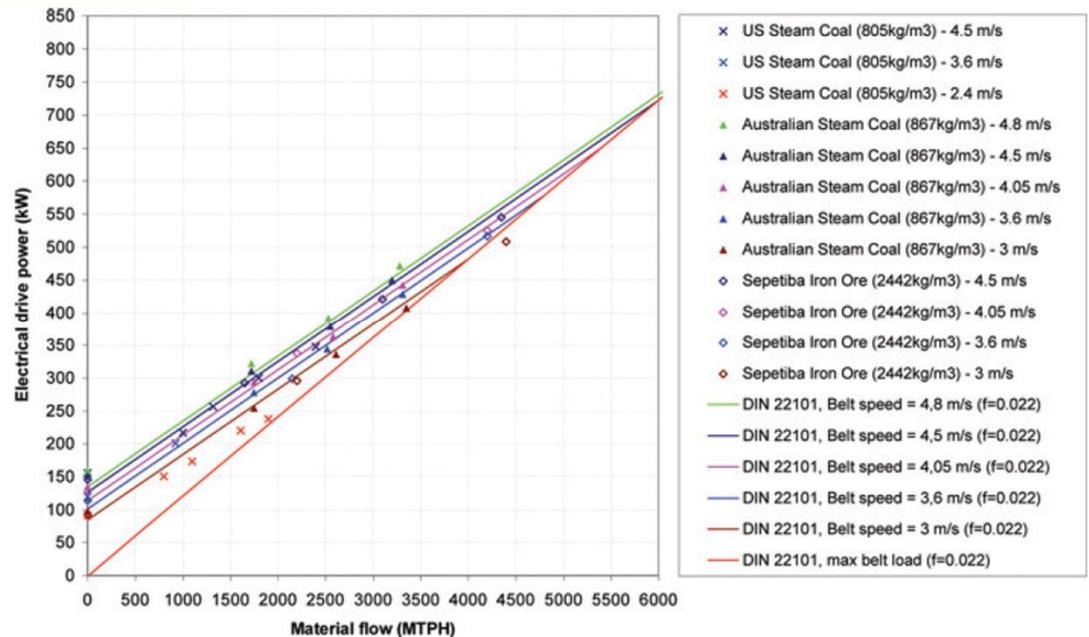


- Adapt speed to actual conveying capacity
- Save energy

### A Methodology to Predict Power Savings of Troughed Belt Conveyors by Speed Control

J. HILTERMANN<sup>1</sup>, G. LODEWIJKS<sup>1</sup>, D. L. SCHOTT<sup>1</sup>,  
J. C. RIJSENBRIJ<sup>1</sup>, J. A. J. M. DEKKERS<sup>2</sup>,  
AND Y. PANG<sup>2</sup>

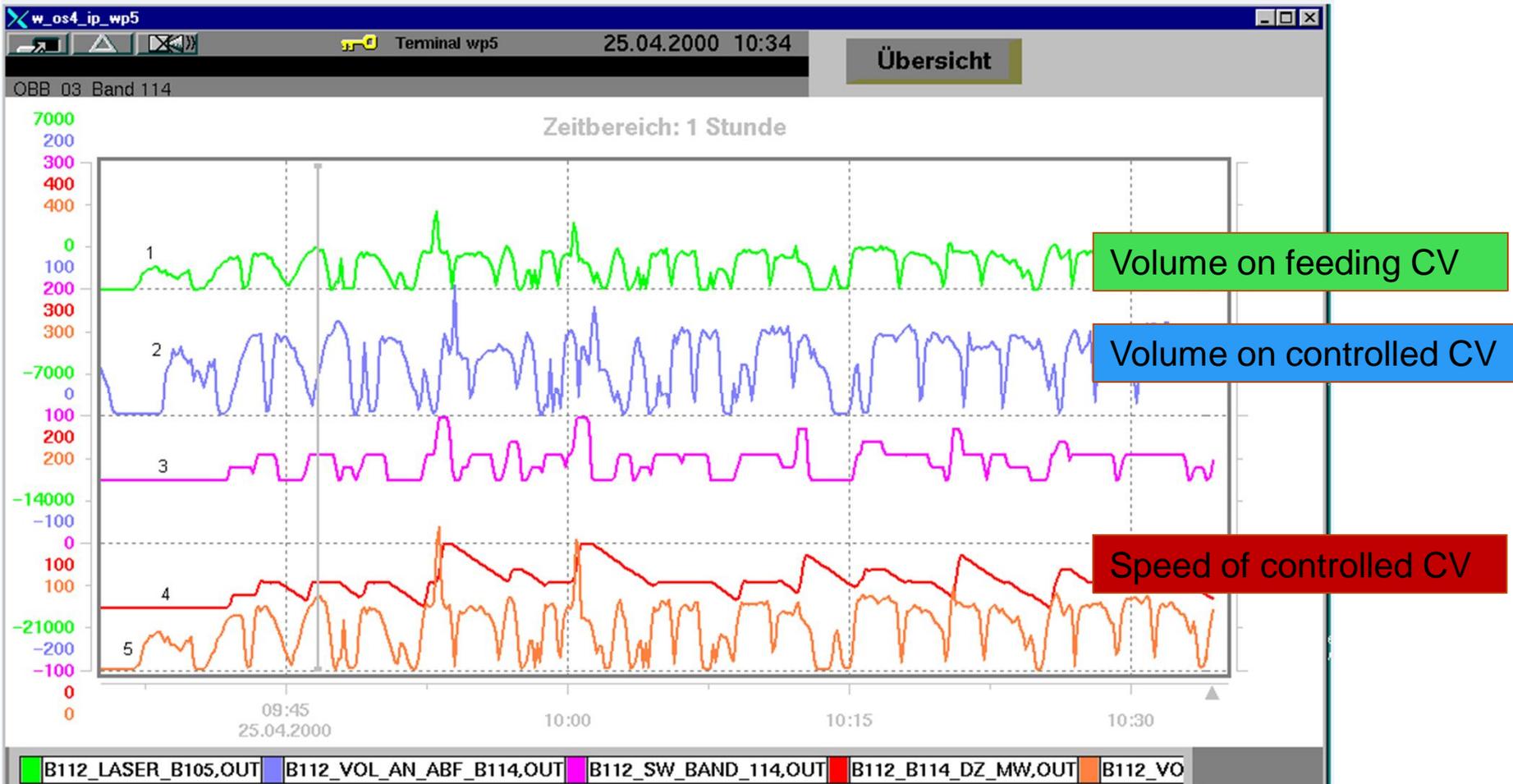
<sup>1</sup>Department of Marine and Transport Technology,  
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# Control and automation

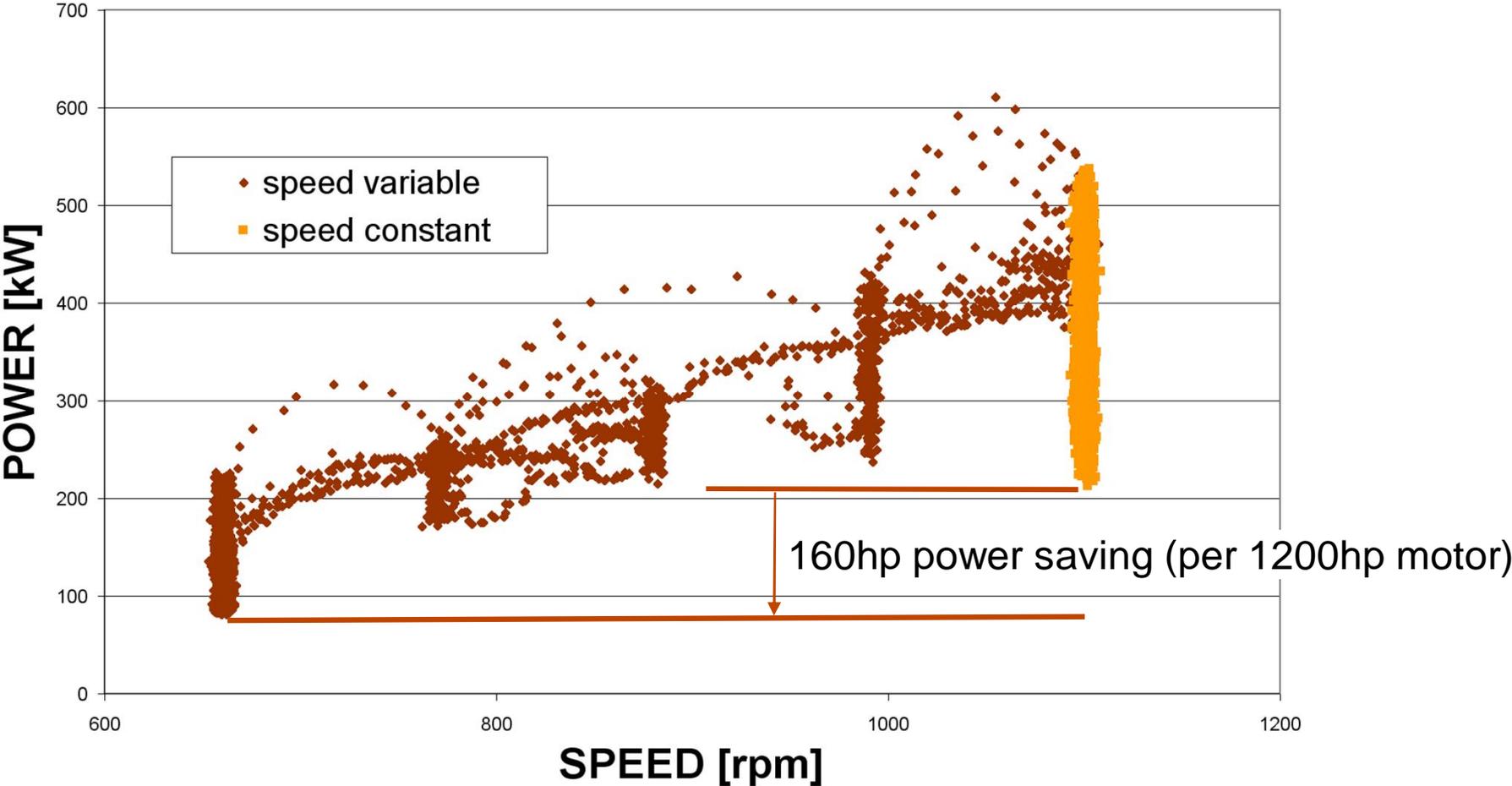
## Belt speed adjust – ABB Solution

Nominal capacity = 8.300tph; 1 hour time frame



# Control and automation

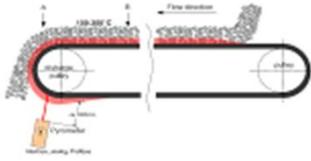
## Belt speed adjust – ABB solution X–Y chart



# BU Minerals Conveyors Conveyor Scan



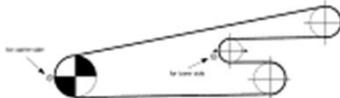
Misalignment &  
Longitudinal  
Crack



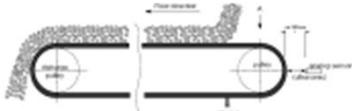
Temperature



Speed and Slip

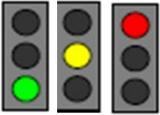


Belt Damage



Belt Thickness

**ASSET  
MONITORING**



Early Alarms



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for a better world™

