SOLVING MINING'S TOUGHEST CHALLENGES THROUGH WORLD-CLASS PRODUCTS & DIRECT SERVICE℠

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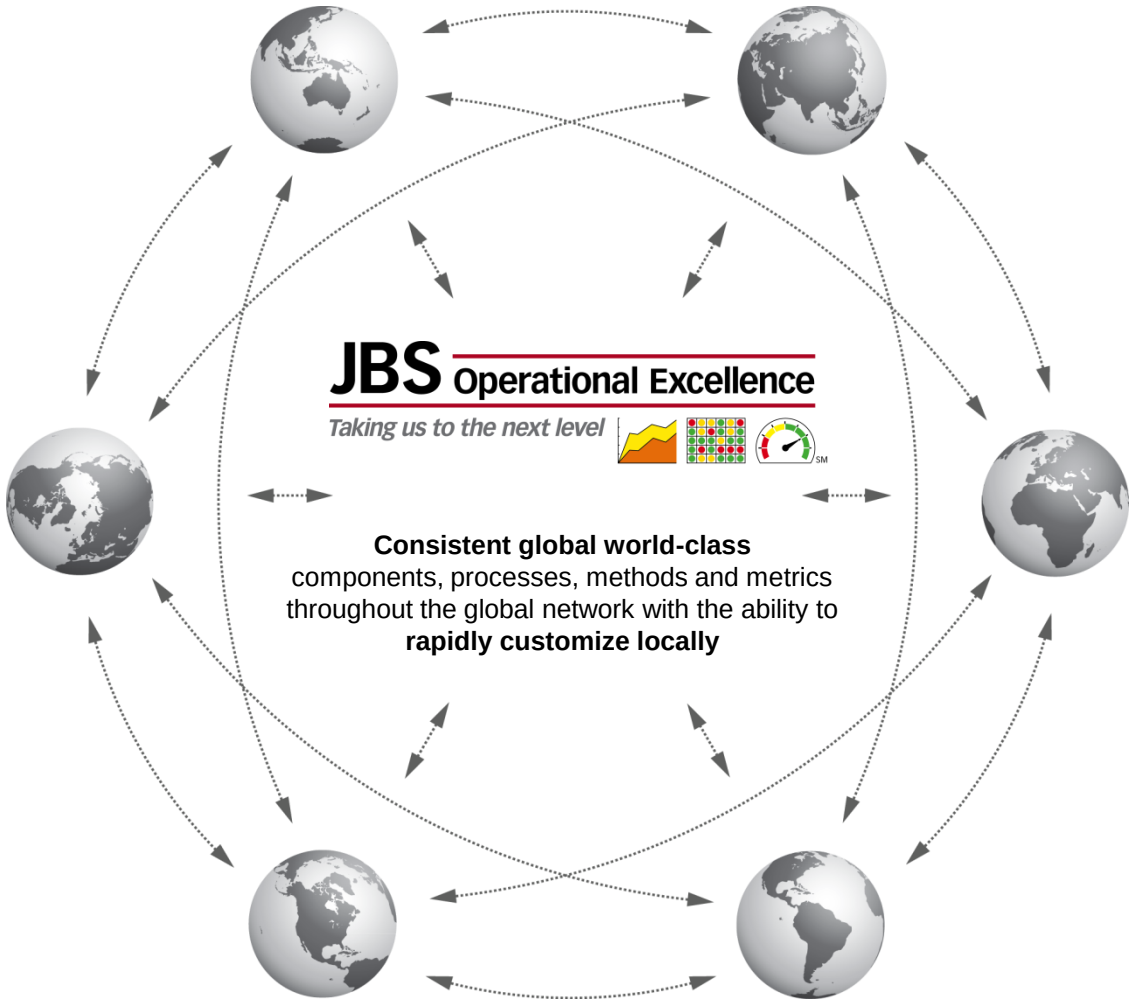
Every customer is a reference℠

# Joy Global – Conveyors

Jean-Paul Pélissou
Global Tunnelling Product Manager
April 2016

# Direct Service Leader

## Every Customer is a Reference



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# SOLVING TUNNELLING'S TOUGHEST MATERIAL HANDLING CHALLENGES

THROUGH WORLD-CLASS PRODUCTS & DIRECT SERVICE

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Every customer is a reference℠

## Tunnelling Reference Presentation
## Projects from 2000 - 2015

Jean-Paul Pélissou
Global Tunnelling Manager / Global Conveyors

# Conveying - Underground

**Norway**

Longwall conveyor 2,200 m long

2 x trunk conveyors each 2,250 m long

2 x tunnel conveyors 2,365 m & 3,228 m long

All handling 2,000 TPH

1,400 mm belt width running at 3 m/sec



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# Spie Batignolles TPCI, Vinci construction JV Metro, Line B Tunnel - Rennes


| | |
|---|---|
| Project | Spie Metro Tunnel |
| Location | Rennes |
| Tunnel Diameter | 9.6 |
| Mining Method | TBM |
| Conveyor Width (mm) | 1000 |
| No. Conveyor flights | 1 |
| Conveyor Length (M) | 8500 |
| Tonnage (MTPH) | 700 |
| Quantity of curves | 7 |
| Minimum curve radii | 300 |
| Installed power (kW) | 1 x 160kW Head drive, 4 off 160kW tripper drives, 110kW tail drive |
| Mineral Transported | Flint / Clay & Aggregate 200mm |
| Conveyor Type | Booster & Stacker |
| Installation completed | 2014 |



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# Dragados/Sisk JV Crossrail C305 - London

| Project | Dragados/Sisk JV Crossrail C305 Tunnels |
|---|---|
| Location | London |
| Tunnel Diameter | 30.4 (Shaft) |
| Mining Method | TBM |
| Conveyor Width (mm) | 1500 |
| No. Conveyor flights | 1 |
| Conveyor Length (M) | +45 |
| Tonnage (MTPH) | 1300 |

| | |
|---|---|
| Quantity of curves | N/A |
| Minimum curve radii | N/A |
| Installed power (kW) | 2 x 160kW Head |
| Mineral Transported | Flint / Clay & Aggregate 300mm |
| Conveyor Type | Single pull |
| Installation completed | 2012 |

# Bouygues TP Tunnel CVR Miami USA

| | |
|---|---|
| Project | Bouygues Tunnel CVR |
| Location | Miami USA |
| Tunnel Diameter | 11.3 |
| Mining Method | TBM |
| Conveyor Width (mm) | 1200 |
| No. Conveyor flights | 1 |
| Conveyor Length (M) | 1606 |
| Tonnage (MTPH) | 1200 |
| Quantity of curves | 3 |
| Minimum curve radii | 317 |
| Installed power (kW) | 2 x 160kW Head |
| Mineral Transported | Mix hard rock / Soft ground 250mm |
| Conveyor Type | Single pull |
| Installation completed | 2011 |



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# Conveying - Tunnelling Applications

**Guadarrama, Spain**

Two conveyors: 15 km & 13.4 km

1,500 TPH, 900 mm belt width

2 x 160 kW head drives

**Metro Line, Barcelona**

8,390 m long, 1,500 TPH, 10.9 m dia tunnel

6 curves, 9 boosters, 800 kW installed base



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# CAPABILITY IN TUNNELLING

- Conveyor System Design
- Tunnelling Environment
- TBM Conveyor Interface
- Conveyor Structure Installation
- Conveyor Tension and Storage
- Booster Drive Technology
- Vertical Conveying Technology
- Control and Safety Systems
- Conveyor Maintenance



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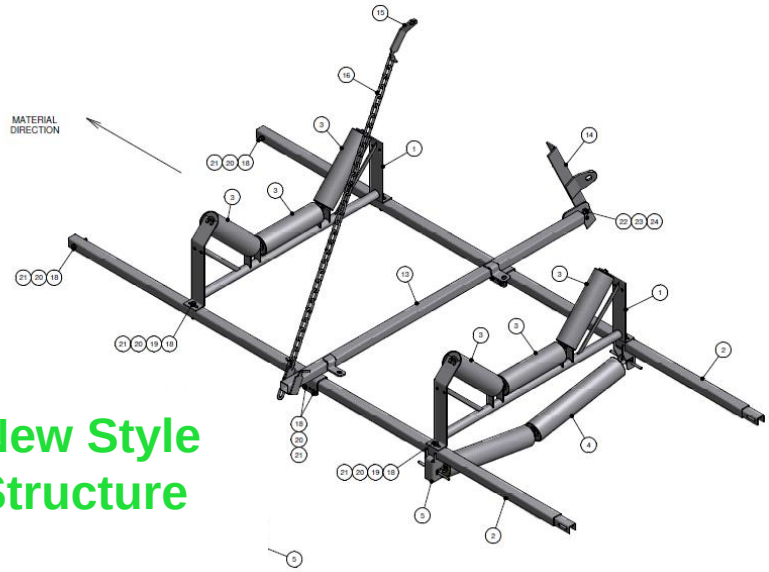
# Tunnelling Sector

## Success Factors:

- **Cost out structure – 17% saving & improved design**
- **Reduction in loop costs from re-design**




**New Style Structure**

- **Greater understanding of clients needs**
- **Client "buy-in" with procured items (buying belting direct from JG partner)**
- **Reduction in complexity of fabricated steel on gantry conveyors (6m modular designed gantries)**
- **Review and re-design of short surface conveyors <200m**

**Old Style Structure**


- **Structure above highlights savings**:
  1. Reduced stringer size
  2. Removed & re-designed return roller mounting
  3. Amended idler frame to reduce labour content
  4. Improved wall mount to also provide horizontal bracing
  5. Stringer connections adjusted to allow for quick installation



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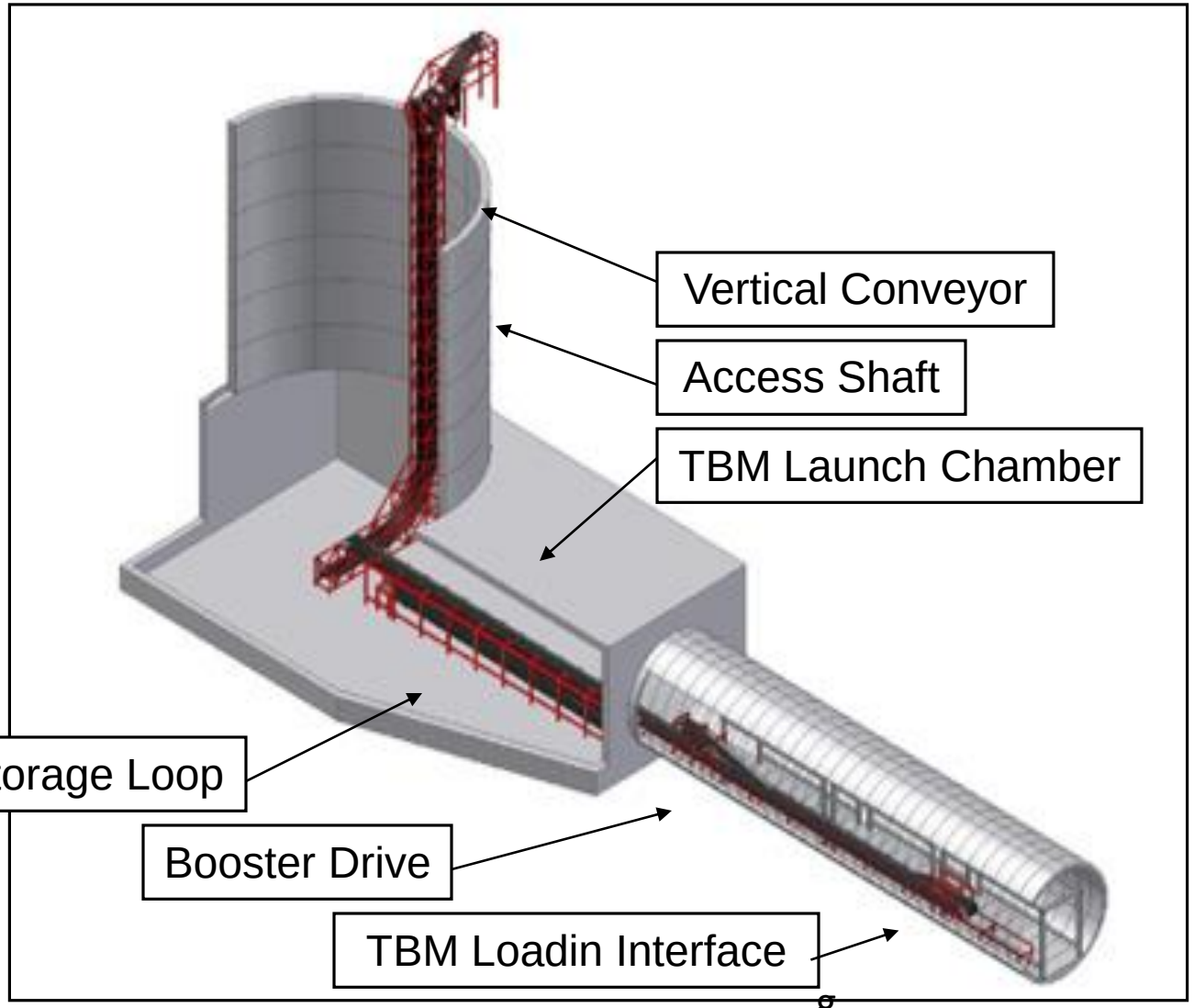
# TUNNELLING ENVIRONMENT

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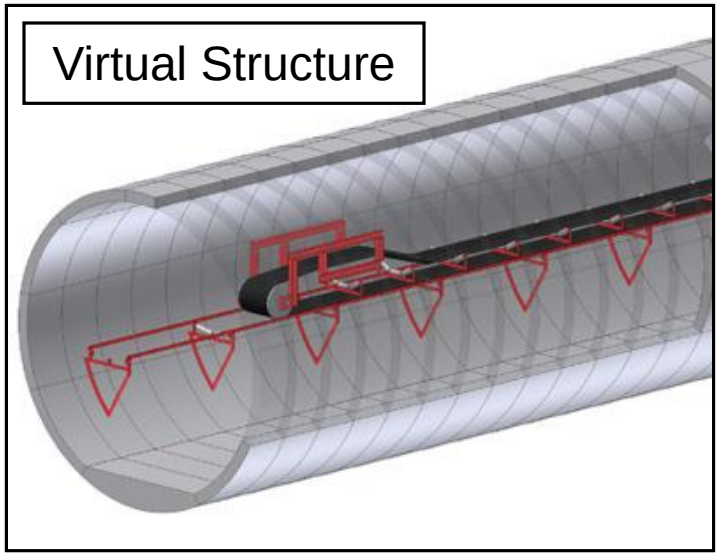
# TBM Conveyor Interface

Wall Mounted

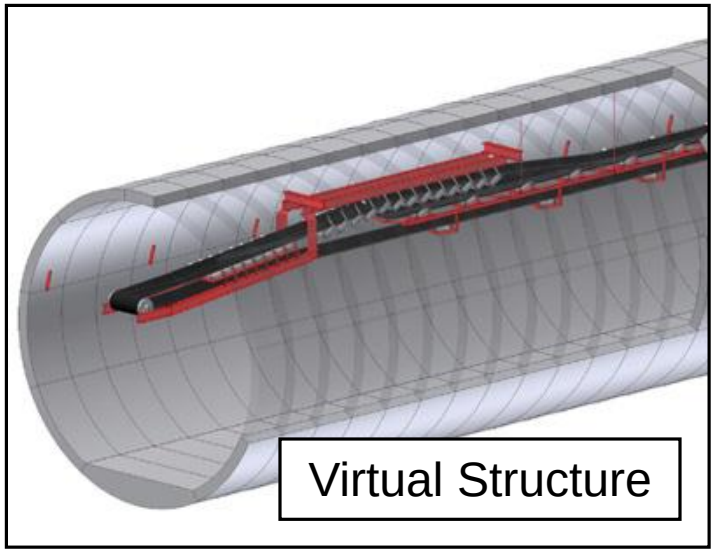
- Attached using custom steel brackets
- Structure installed in separate locations before and after TBM loading interface
- Generally located in lower quadrants

# TBM Conveyor Interface

Chain Slung

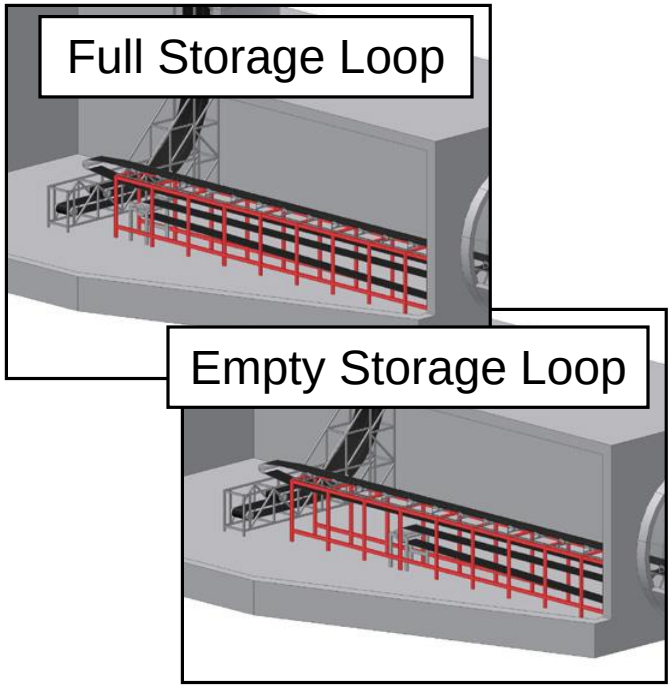
- Suspended using chain and turnbuckle assemblies
- Installed after TBM loading interface
- Generally located in upper quadrants

# Belt Tension and Storage

- Correctly applied tension prevents operational problems
- High capacity storage loop allows continuous TBM operation

Belt Replenishment



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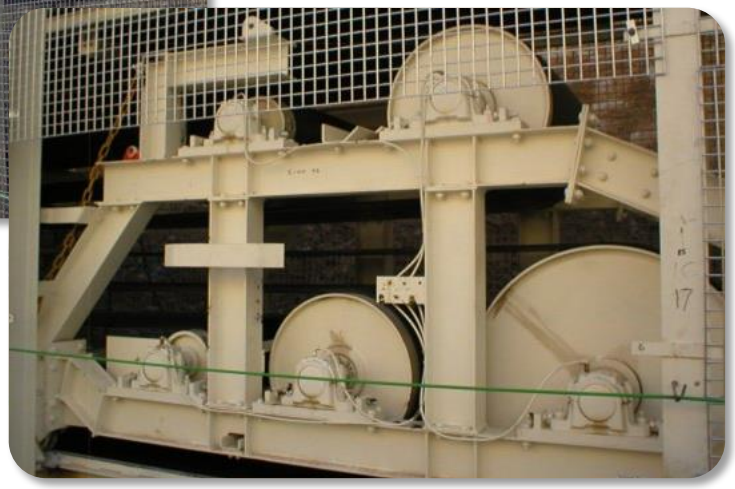
# Belt Storage

Hi-speed quick response tensioning systems

- Hydraulic
- Electric
- Gravity

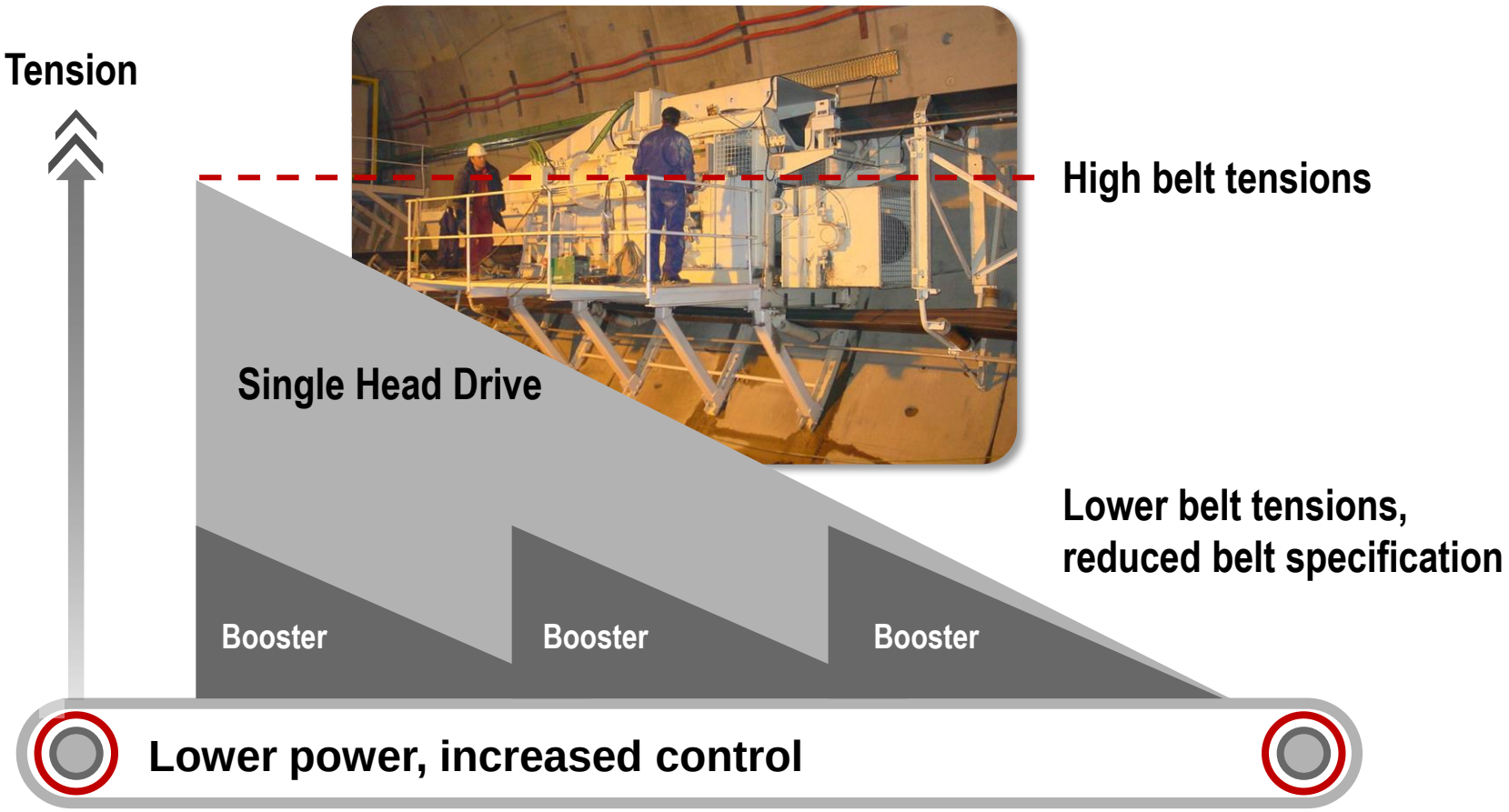


Up to 16 laps that stores 700 m

0-0.2 m/s carriage speed

Up to 65 KN running tension

# Booster Technology



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# Booster Drive Technology

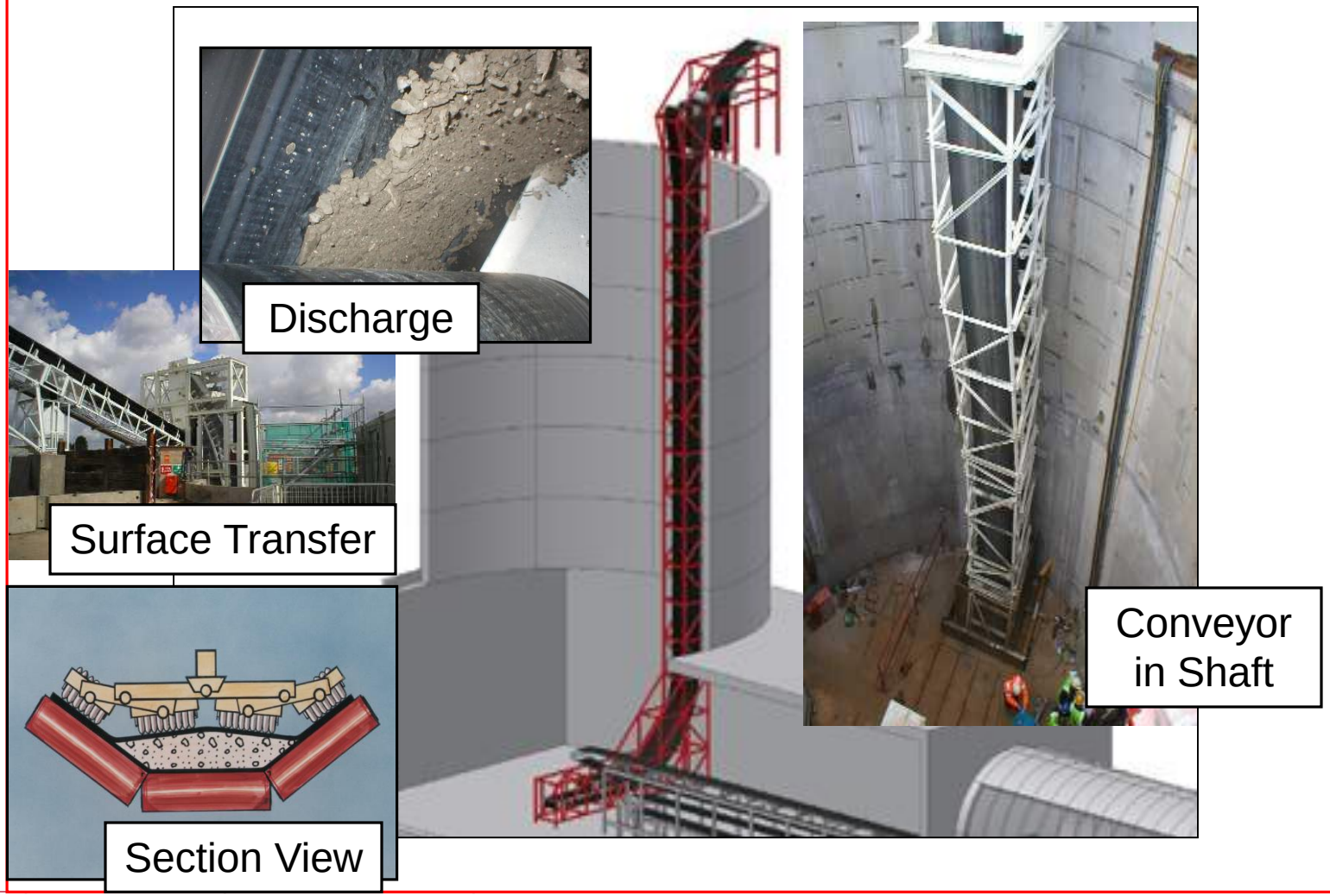
- Reduces overall belt tensions
- Allows belt to negotiate tight curves
- Intelligent belt tension control

Booster Testing

Installed Booster Drive

# Vertical Conveying Technology

- Integrates with other conveyor systems



# HIGH ANGLE CONVEYOR - HAC®


Heathrow Airport Project

**Continuous Operation** of conveyors and the High Angle Conveyor allows the tunnel excavation process to be a reliable and continuous means of muck and spoil removal.

**Productivity** is increased with the use of High Angle Conveying. The continuous handling of higher tonnages of muck and spoil are visible, real time benefits.


London Crossrail Project


London Crossrail Project


London Crossrail Project

**Complete Conveyor Equipment** can be provided for muck and spoil removal associated with tunneling projects. This equipment is specifically engineered to smoothly handle the transport of materials from tunnel excavation to the surface and beyond.



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# HIGH ANGLE CONVEYOR

# HIGH ANGLE CONVEYOR - HAC®

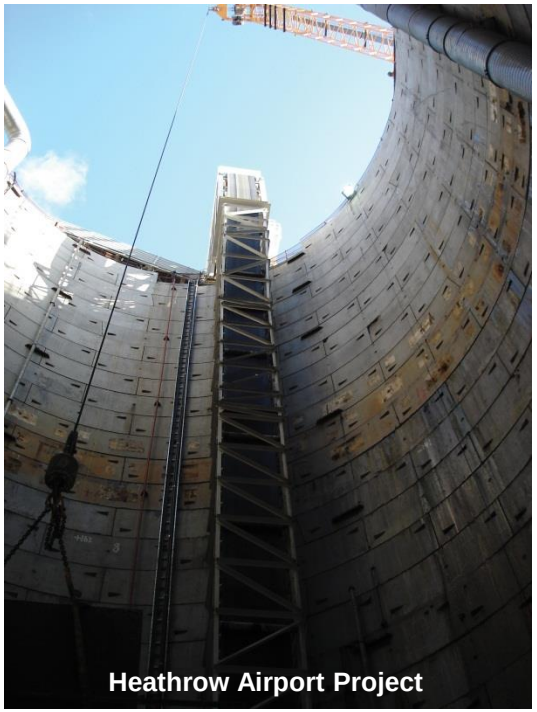
HIGH ANGLE CONVEYING – TUNNEL SPOIL REMOVAL

# HIGH ANGLE CONVEYOR - HAC®

**Cleaning of Belts can often be challenging and even impractical for the use of Skip Hoist, Bucket Elevators or Pocket Belt systems.**

**Sticky material cannot completely discharge.**


London Crossrail Project


Heathrow Airport Project


Heathrow Airport Project


Heathrow Airport Project

**Smooth Surface Belts used on the HAC® allow continuous cleaning by belt scrapers, cleaners and plows.**

**This is especially important in handling wet and sticky material.**



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# HIGH ANGLE CONVEYOR - HAC®

## TROUBLE SHOOTING

# ▪T5 Heathrow 2009

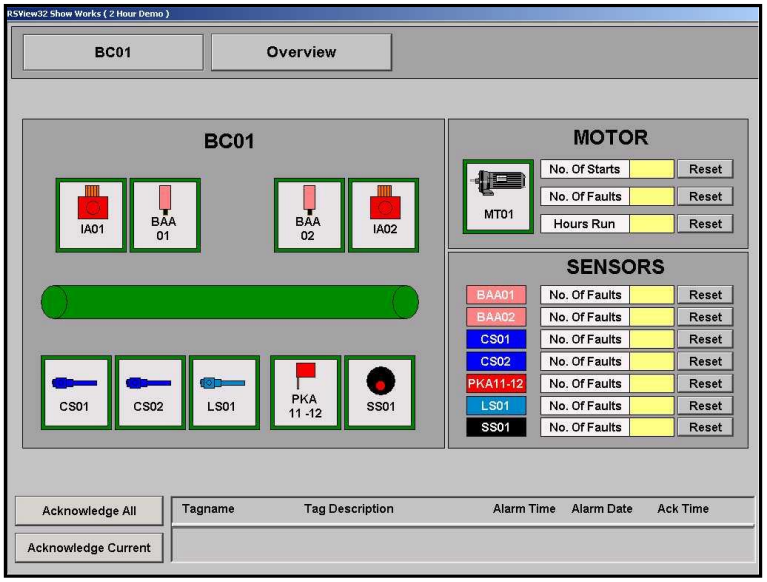
▪T5 Heathrow 2009

# Curved Tunnel Structure

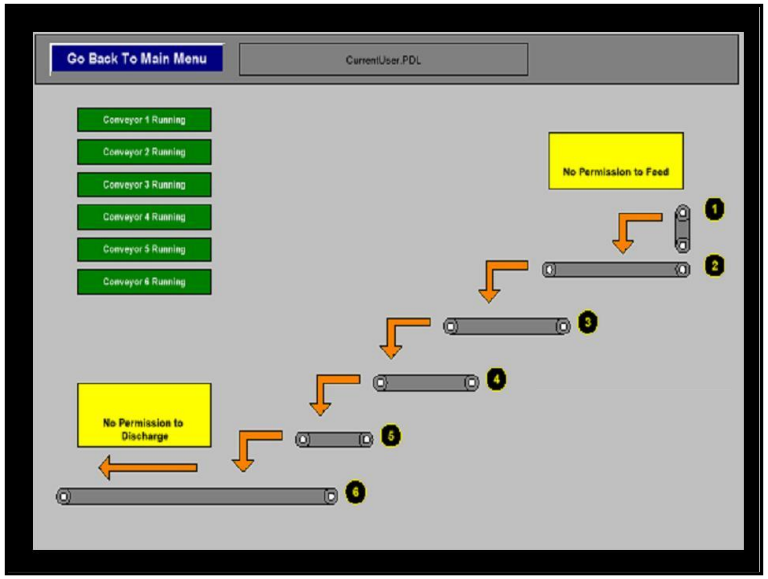
# Control and Safety Systems

- Control and monitor conveyor operation
- Notification of maintenance requirements
- Warning of emergency conditions

Monitoring Display




System Overview



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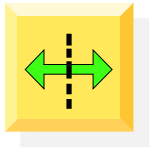
# Conveyor Maintenance

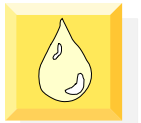


Belt Alignment — Idlers, Pulleys, Belt, Material Loading

Housekeeping — Maintenance Access, Transfer Design

Lubrication — Improves Operation, Effects Operation Life

Safety — Relevant Standards, Trained Personnel



# JBS Operation Excellence

## Taking it to the Next Level


JBS Operational Excellence

*Taking us to the next level*



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