Conveyor Asset Management

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The world has changed …….

Covid-19 has forever changed the way we work and travel.

- There are now fewer people onsite

- Increased costs and difficulty in having specialists travel to site.

- We have adapted:
    - Zoom, Teams
    - Navisworks
    - Augmented Realty

- Will everyone travel again? ….. Vaccine Hesitancy

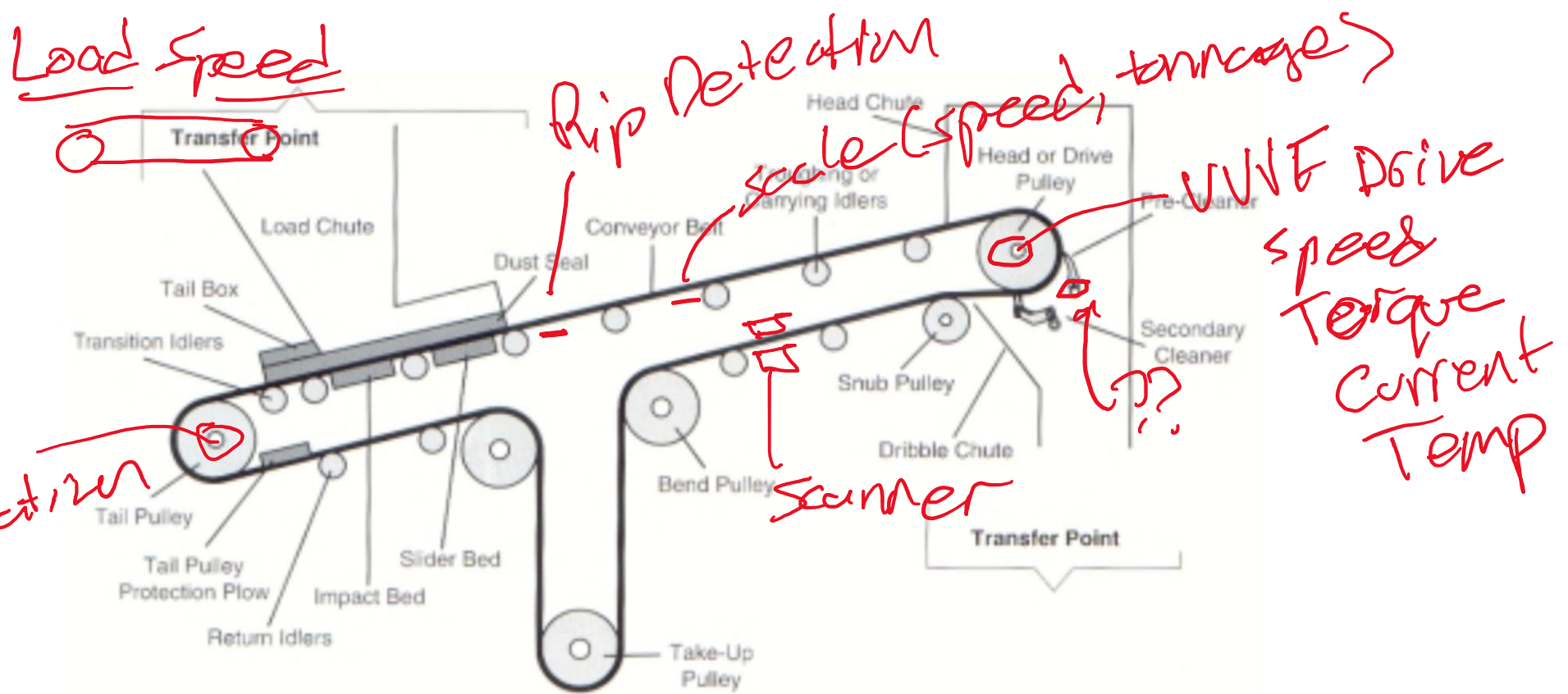# The world has changed ….

- Navisworks for 3D Interactive job planning
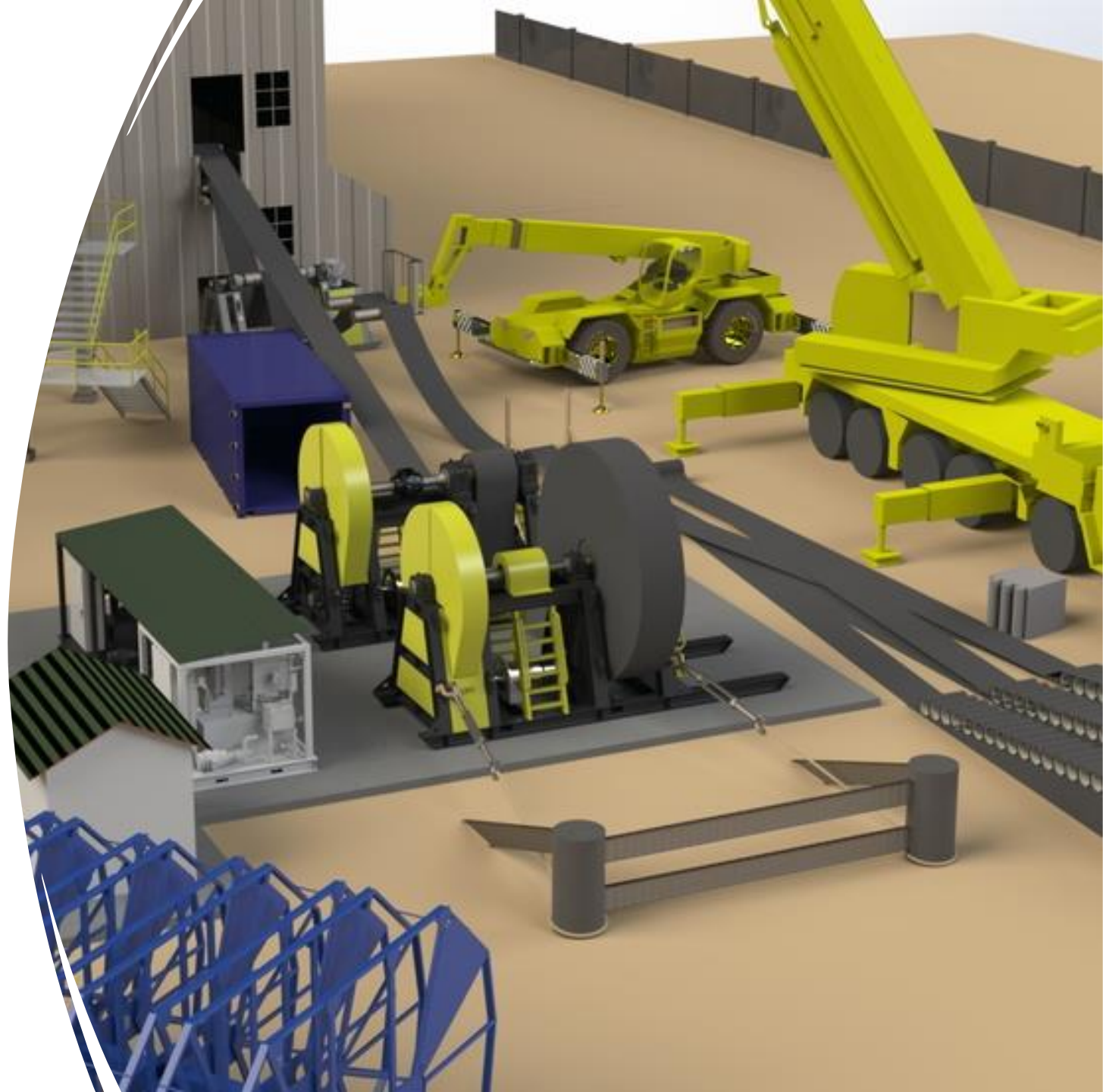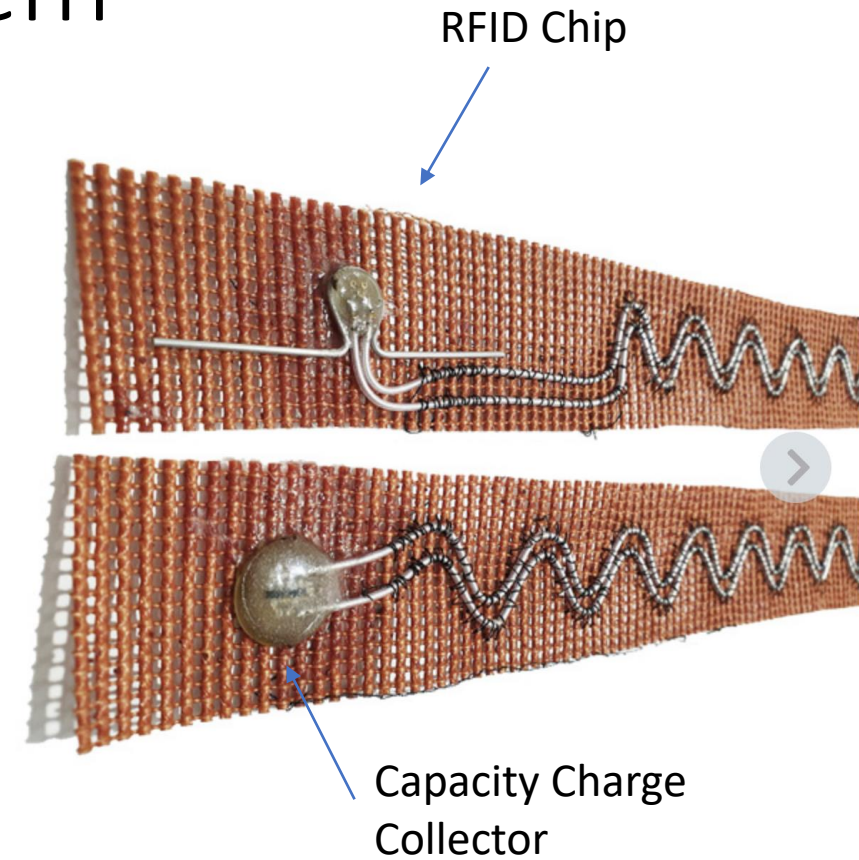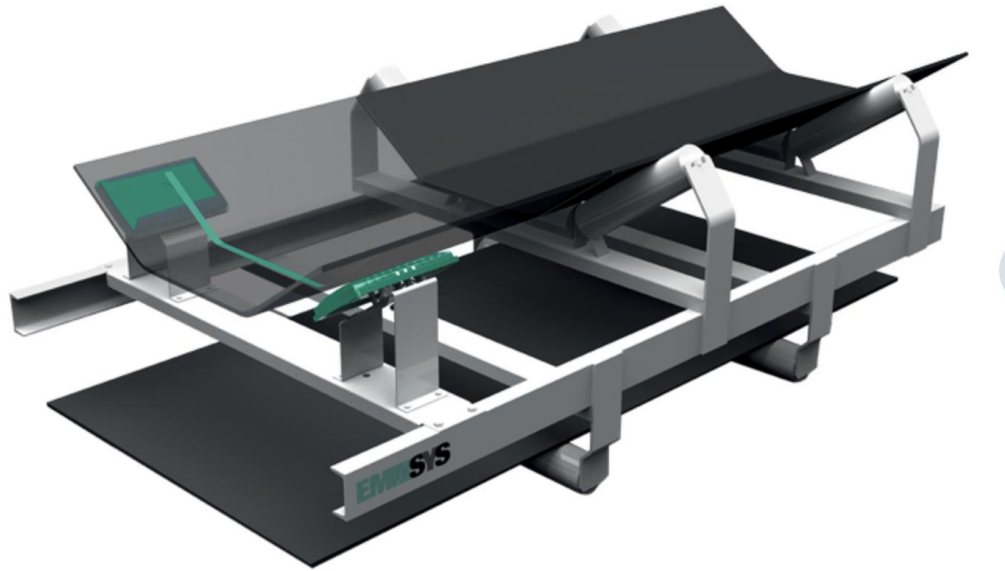
The world has changed ....

Presentation Outline

- Sensors, detectors, NDT – Some old and Some new
- Machine Learning and AI with all this data

Available Data

Emsys - Rip Detection System

RFID Chip

Capacity Charge Collector

With the capacitive charge collector we are able to collect temperature data in the RFID chip and pass it off at the next reader. Enabling the collection of data along the conveyor in the belt.

Flexco Elevate

## Operational Savings Case Studies Arising From Conveyor Asset Monitoring

- R. Grevenstuk and B. DeVries; Flexco, Grand Rapids, MI

*Patent# 10,836,585

X-Ray – Static or Continuous

- Complicated to move between countries
- Regulations differ in each country
- Negative impact on splice schedule
- Good for quality feedback and keeping the supervisor engaged
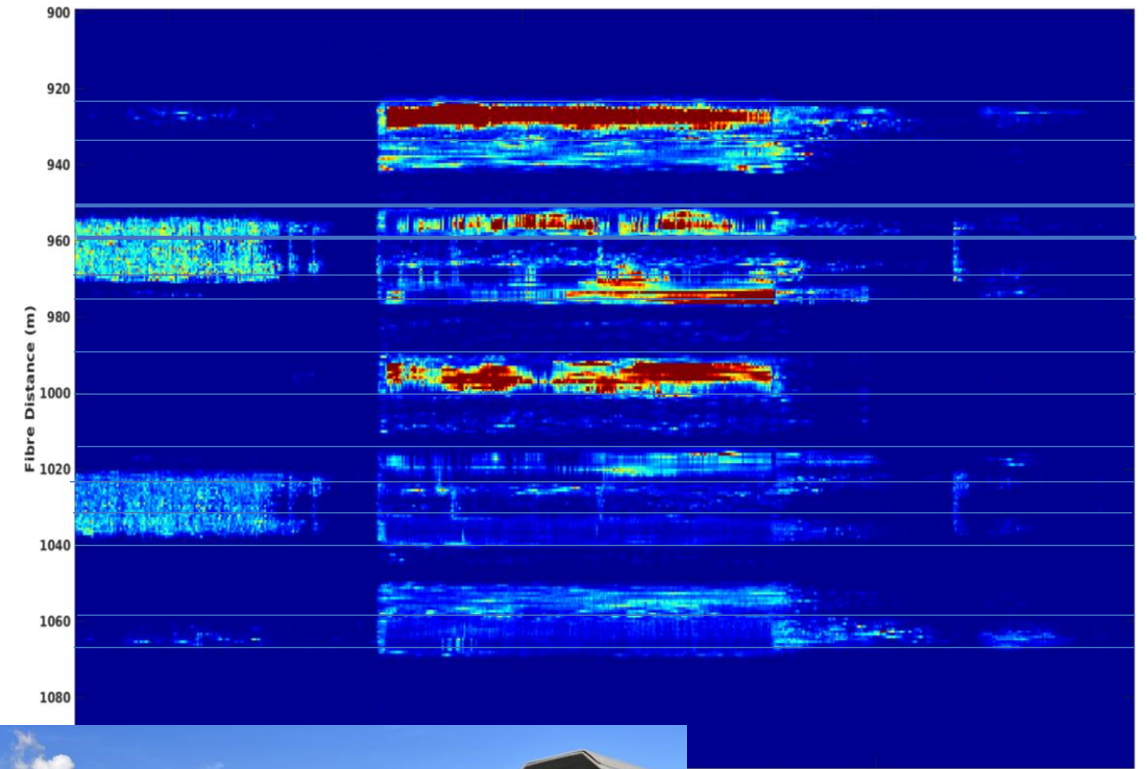- Lot's of data – what value?
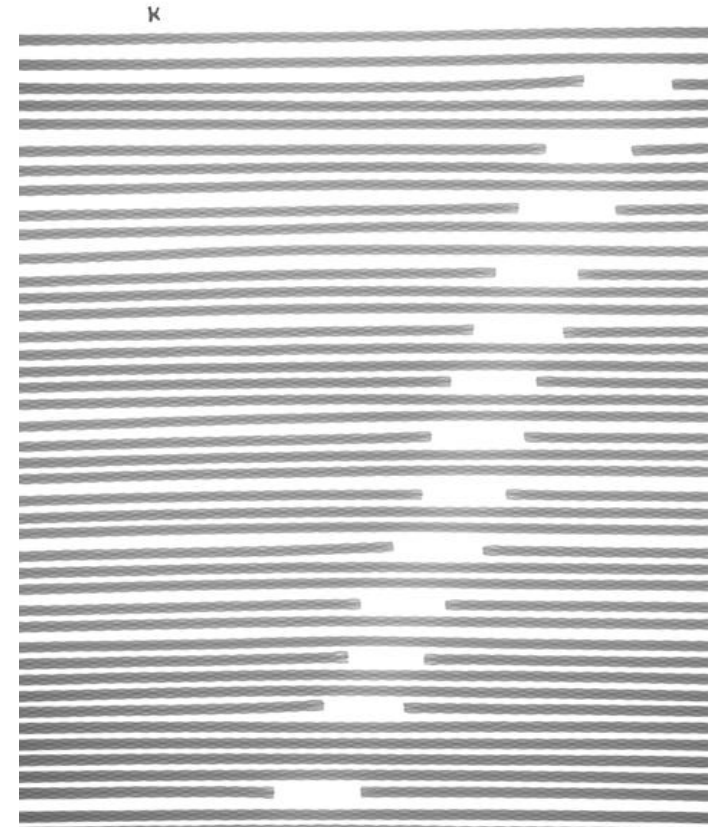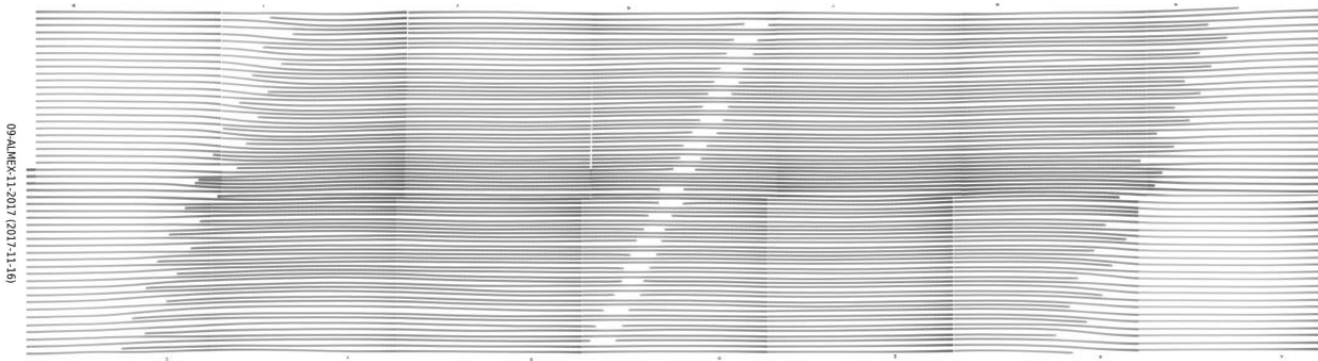
Fiber Optic Sensing

Using standard Single optical fibre:

- Pulses of light are sent

- Backscattered light is received

The backscatter is interrogated for:

- Changes in characteristics

- Caused by acoustic energy

Fiber Optic Sensing

- Fiber Bragg Grating (FBG)
  - Relatively cheap (~~~$5,000)
  - A limited amount of reading points
- Distributed Temperature Sensor (DTS)
  - More expensive (~~~$30,000)
  - Continuous reading along length.
  - Used for fire detecting
  - Not sure sensitive enough to detect a single hot idler bearing
- Distributed Acoustic Sensor (DAS)
  - A lot more expensive (~~~$150,000)
  - Continuous reading along length
  - Can be daisy chained between conveyors to leverage system costs

DAS – Typical Applications

- Pipeline Monitoring
- Perimeter and Tunnel Security
- Seismic Activity Detection
- Seismic Data Acquisition
- Conveyor Belt Monitoring

What is different about Conveyor Belt Monitoring is there are so many external excitations associated with the conveyor – structure, idlers, belt, material impacts, vehicles, etc
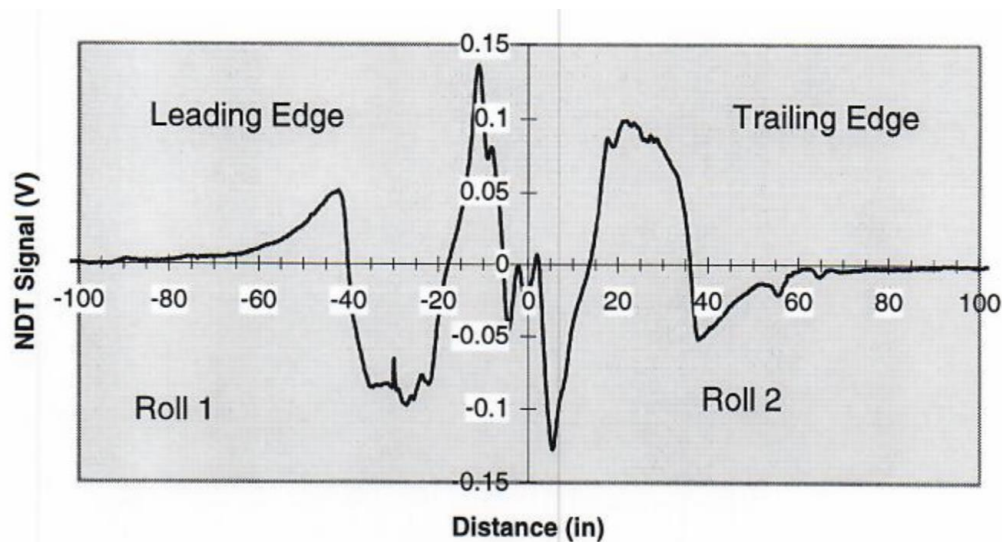
Magnetic Belt Scanning

Machine Learning – Magnetic Belt Scanning

Using convolutional neural network (CNN) to recognize data events.
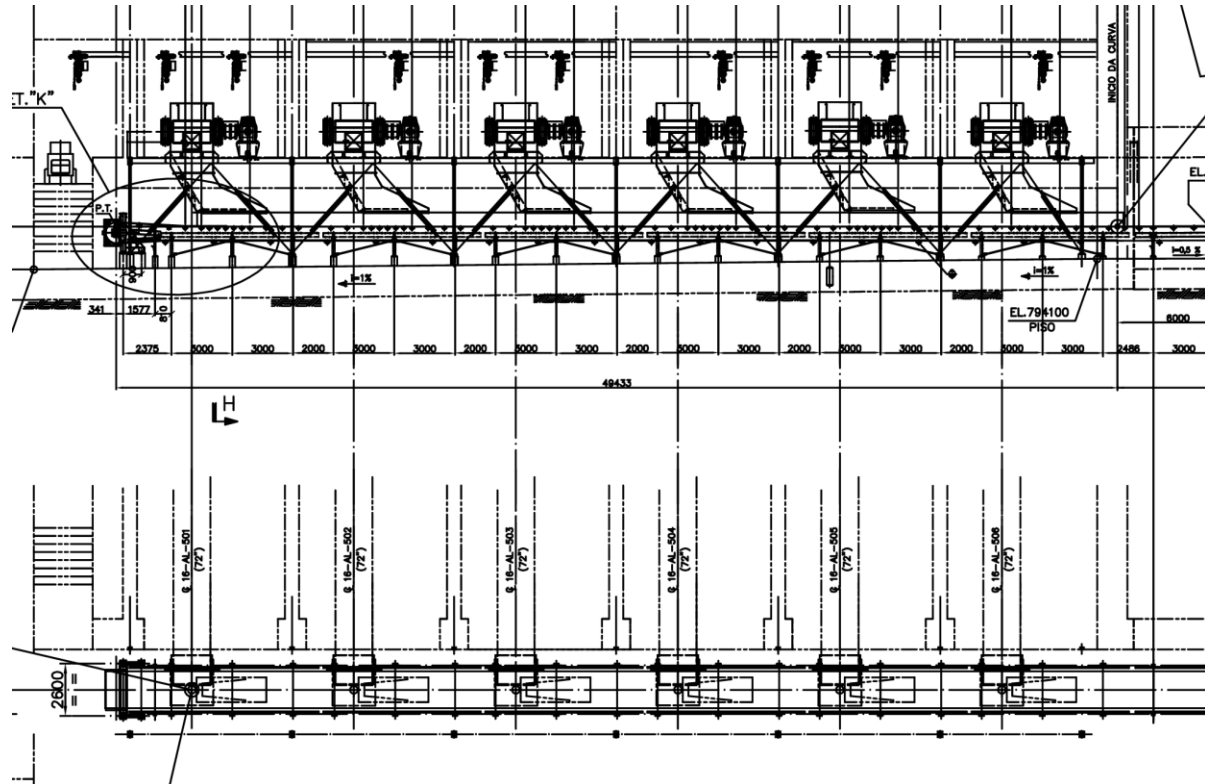

- Flower
- Columbine

- Splice
- Stage 2 Splice

Machine Learning – Conveyor Data

- How does the belt tension (total drive torque) change with loads from different feed points?

Machine Learning – Conveyor Data

- Conveyor loaded by 6 feeders under a stock pile.

- Months of data is available from the mines PI Process Book

- Data available is the speed of each feeder (VVVF drive), belt tonnage and speed (from scale), drive torque (VVVF drives)

- Target data is the total drive torque

Voith – Belt Genius

Practical Experience with BeltGenius

- M. Ziegler; Belt Conveyor Systems, J.M. Voith SE & Co. KG, Nörvenich, North Rhine-Westphalia, Germany
- This afternoon – 3:35