

MINexcellence2022

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Operational Excellence in Mining

UNCRUSHABLE ELEMENTS DETECTION WITH COMPUTER VISION

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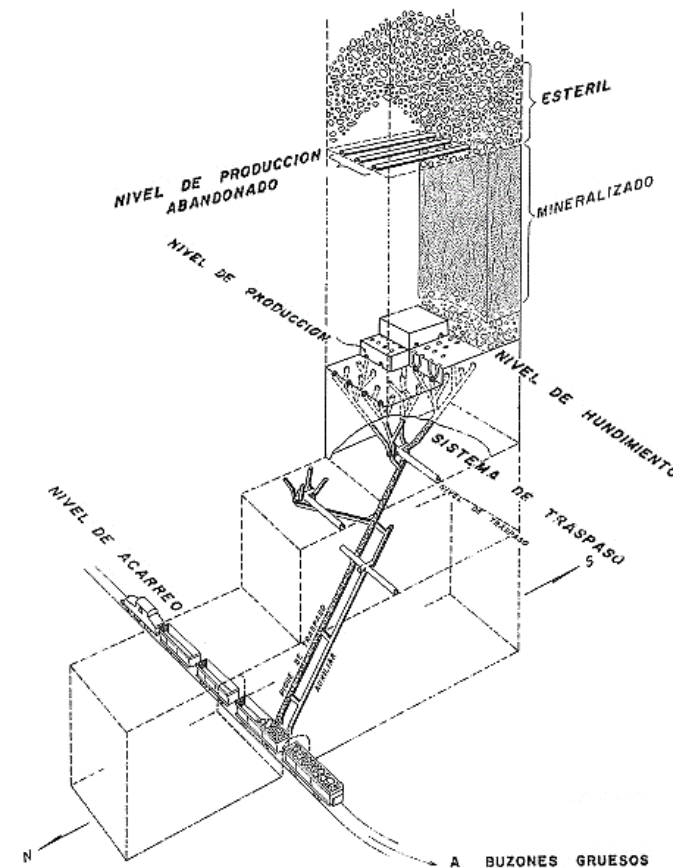


GECAMIN



The uncrushable elements problem

- Due to the **"Panel Caving"** extraction method used in the underground mine of **"El Teniente"**, there is a problem with the presence of remaining construction elements, like fortification and infrastructure of higher levels already abandoned.
- Despite the efforts to prevent these **elements reaching the crusher**, it is common for this to occur, **generating losses due to stoppages and bottlenecks**, in addition to exposing workers to risks associated to get the crusher working back.



Fuente: Francisco Camus Infanta, Alfredo Enrione Llaumet

Element Types

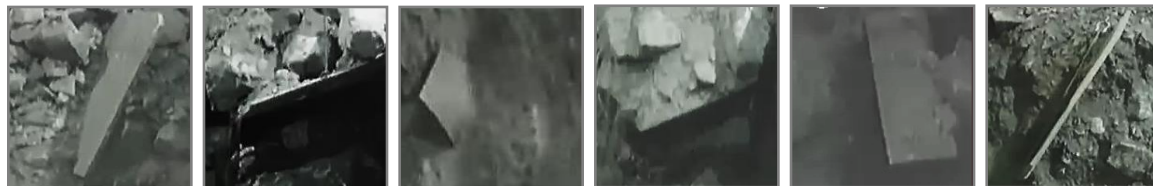
Metal mesh



Fortification Bolts



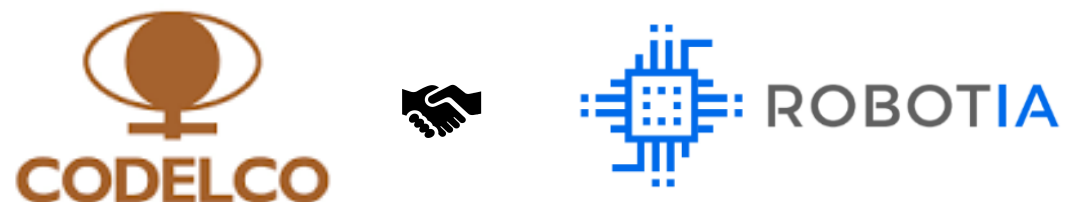
Metal Sheet



Metal Beam

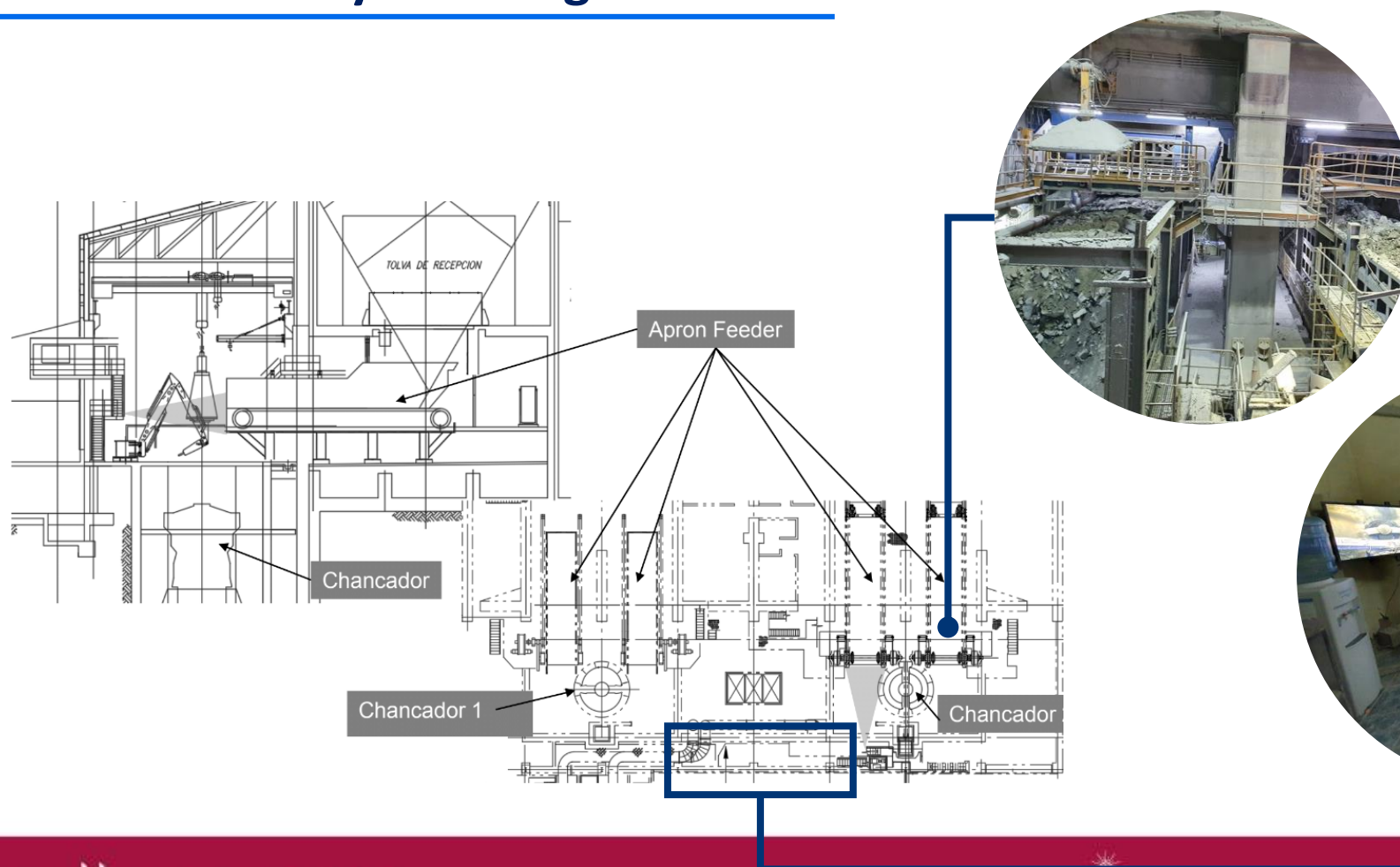


Collaboration agreement



Due to the magnitude of the production losses generated by this problem, and the capacity of the **Robotia** company to develop **Computer Vision** solutions. **Codelco** and **Robotia** decided to work together in the implementation of the software "**Visua Minería**" in the primary crushing plant of "El Teniente"

El Teniente: Primary Crushing Plant

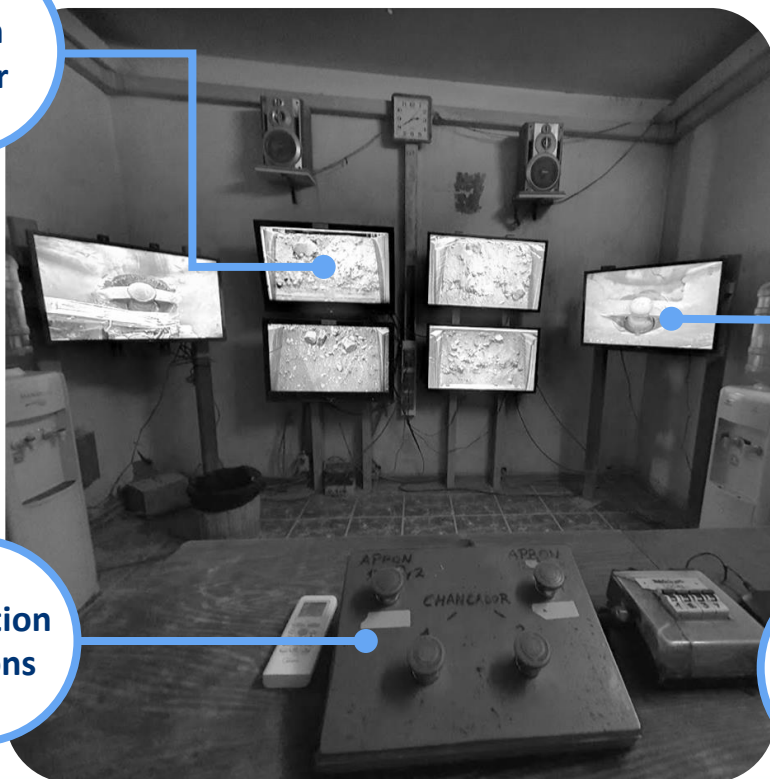


Operator View (ALERTS)

Apron Feeder

Detection buttons

Crusher 02

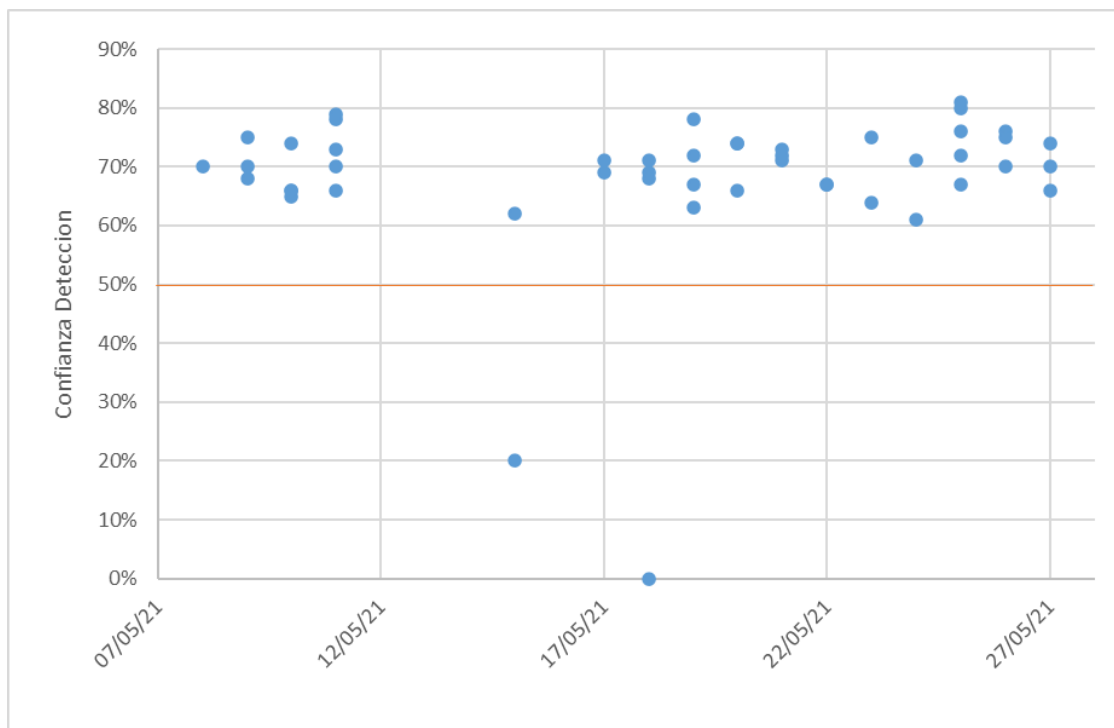


On screen detections



Results

SYSTEM EVALUATION - MAY 2021

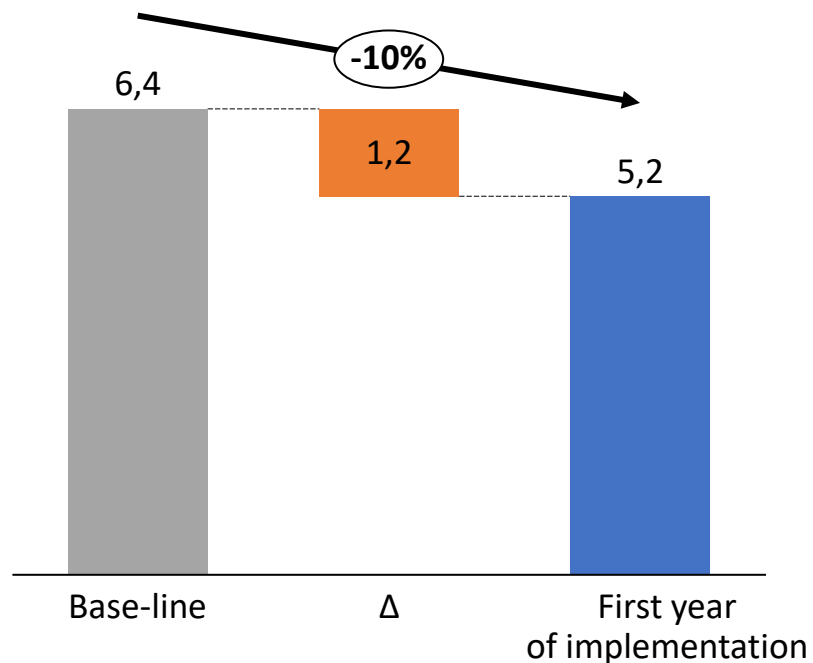


Metrics:

- **96% RECALL**
- **4 TYPES:** Metal Beam, metal sheet, metal mesh, fortification bolt.

Results

AVERAGE STOPPAGES DURATION [Hours]



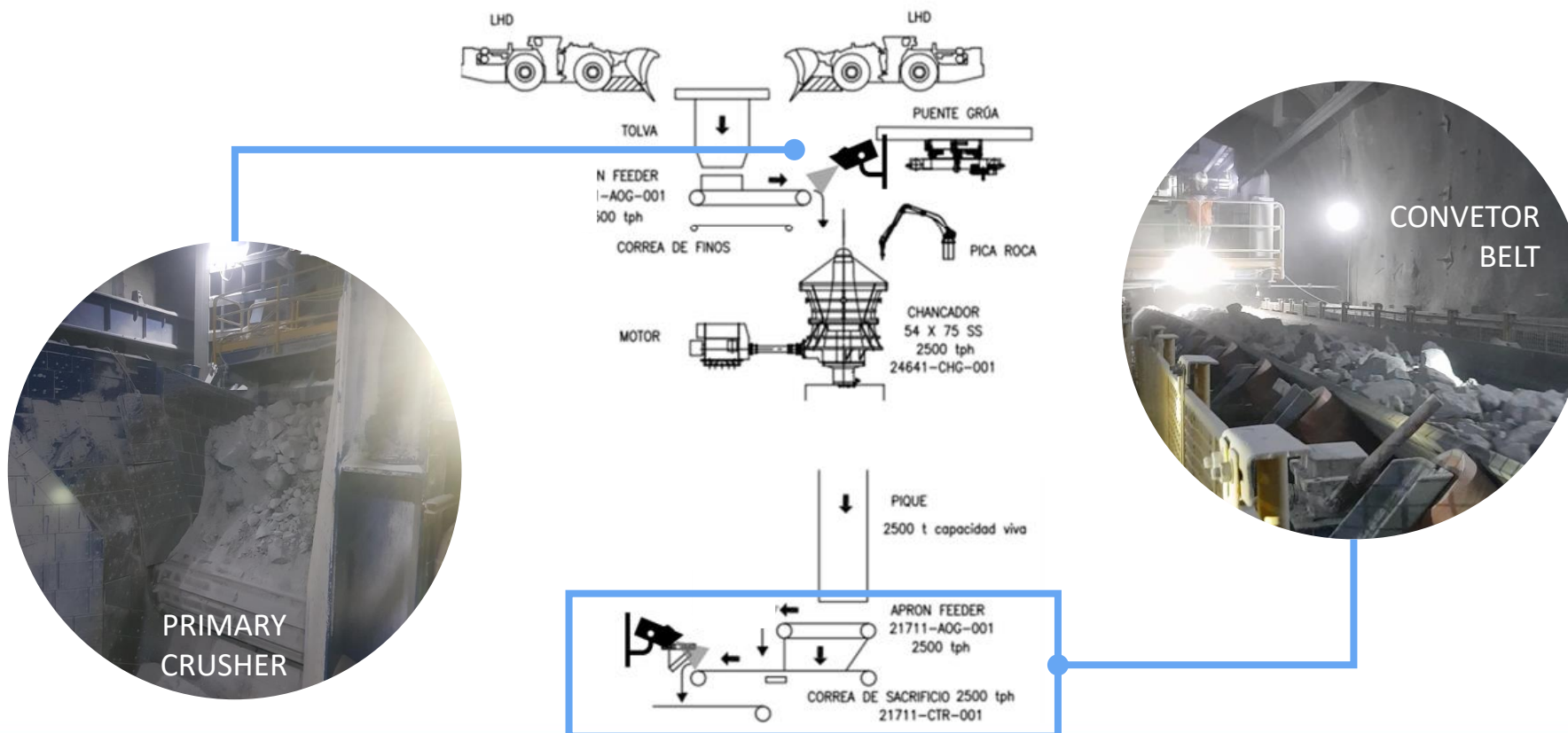
Contribution of Technology:

- 10% reduction in average stoppage duration
- The number of stoppage per year is reduced by 5%
- The number of hours of detention for stoppage is reduced by 36%

EXPANSION TO CODELCO NORTH AREA

Chuquicamata Mine

Process Line 1/2/3



Chuquicamata Mine

Alimentación Chancador 1

 08/06/2022 18:34:42

 10/06/2022 19:53:21



Chuquicamata Mine

Feeder in Crusher N°2

04/07/2022 03:19:16

04/07/2022 17:49:37



Chuquicamata Mine

Feeder in Crusher N°3 and Conveyor Belt

 20/06/2022 07:16:21

 15/06/2022 06:15:02



El Salvador Mine

Discharge Platform



Cámara IP
11



Cámara IP
12



Cámara IP
21

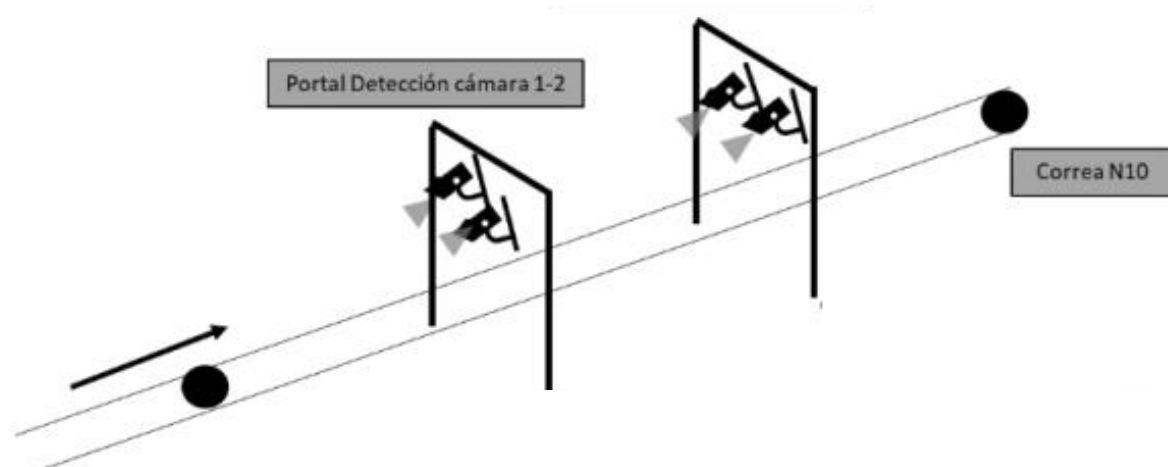


Cámara IP
22



El Salvador Mine

Conveyor belt N° 10

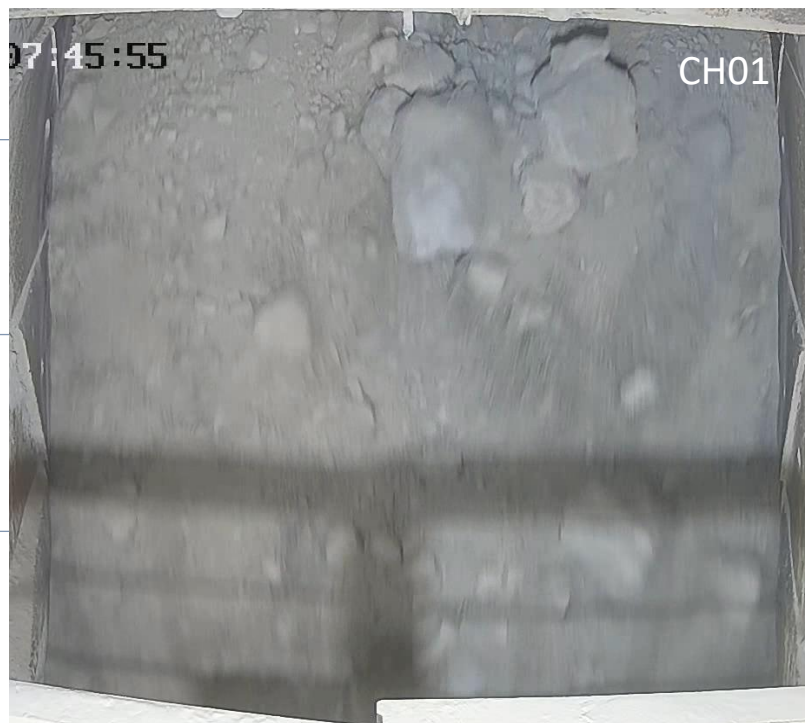


El Salvador Mine

Feeder in Crusher N°1 and N°2

 CH01

 CH02



El Salvador Mine

Conveyor belt N° 10

 Cam 01

 Cam 02



MEASUREMENT OF ACCUMULATION AREA ON ELECTROMAGNET

Radomiro Tomic Mine

Accumulation of elements
in electromagnet:

 ELECTROMAGNET - OXIDE
SECTOR



THANKS

