

Improved Resource Efficiency Through Dynamic Loading Control

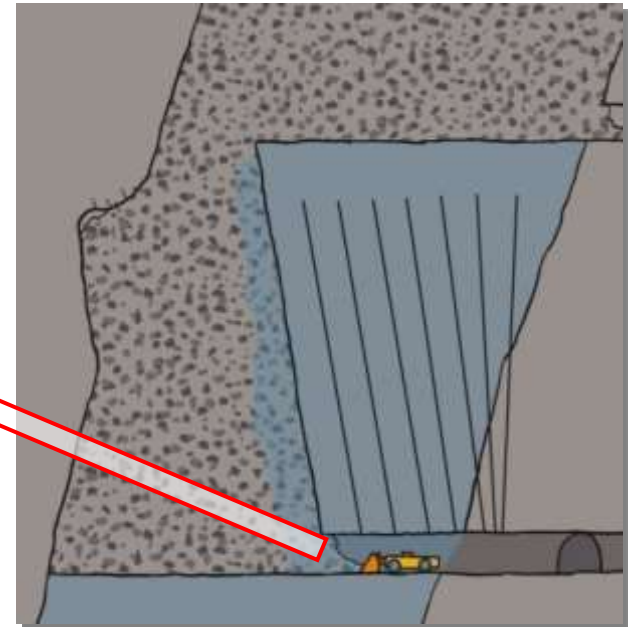
Project team (LTU);

Håkan Schunnesson, project leader

Anna Gustafson, senior researcher

Gurmeet Shekhar, PhD student, (Presenter)

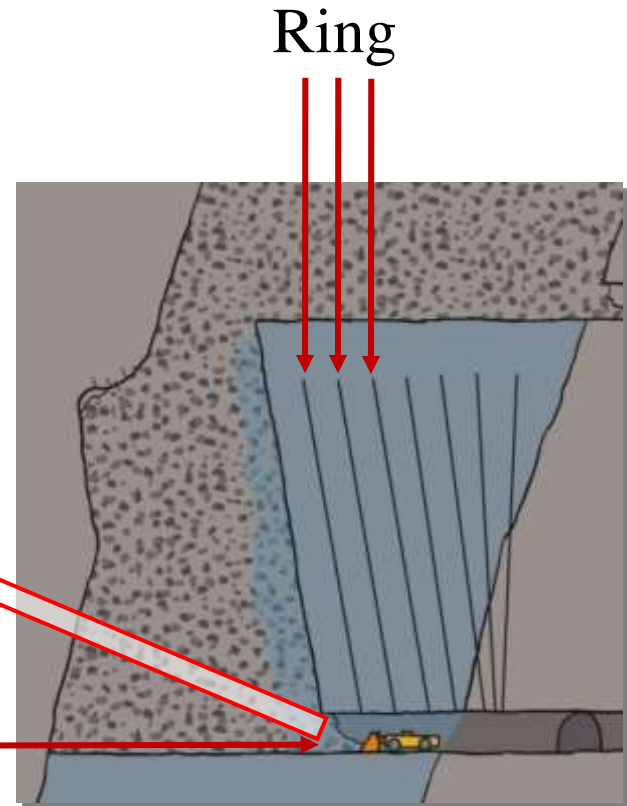




Courtesy of LKAB



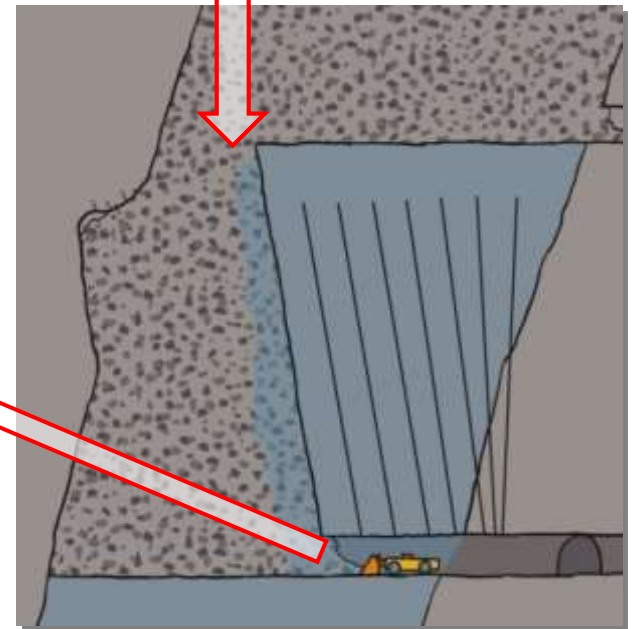
Draw point



Courtesy of LKAB



Continuous mixing
of ore and waste

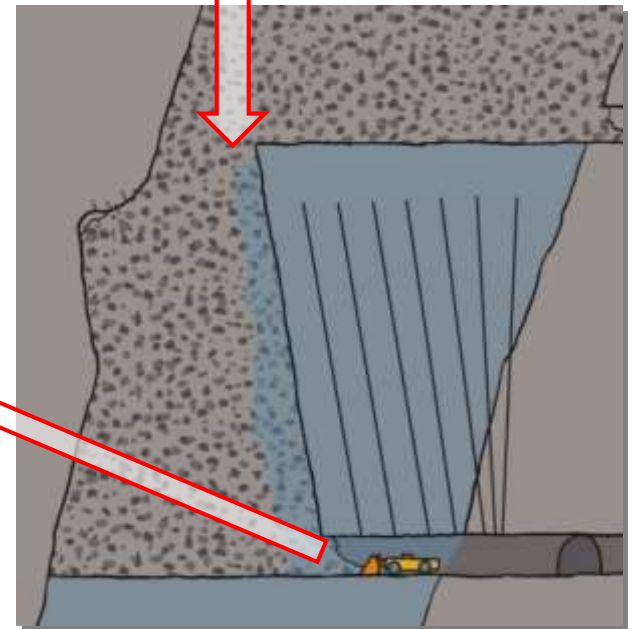


Courtesy of LKAB



Flow of material
from a restricted
opening

Continuous mixing
of ore and waste



Courtesy of LKAB

**Draw control
regulates
loading process**

**Draw control
regulates
loading process**



```
graph LR; A[Draw control regulates loading process] --> B[Amount of material to be loaded]
```

Amount of
material to be
loaded

**Draw control
regulates
loading process**

```
graph LR; A[Draw control regulates loading process] --> B[Amount of material to be loaded]; A --> C[When to stop loading];
```

Amount of
material to be
loaded

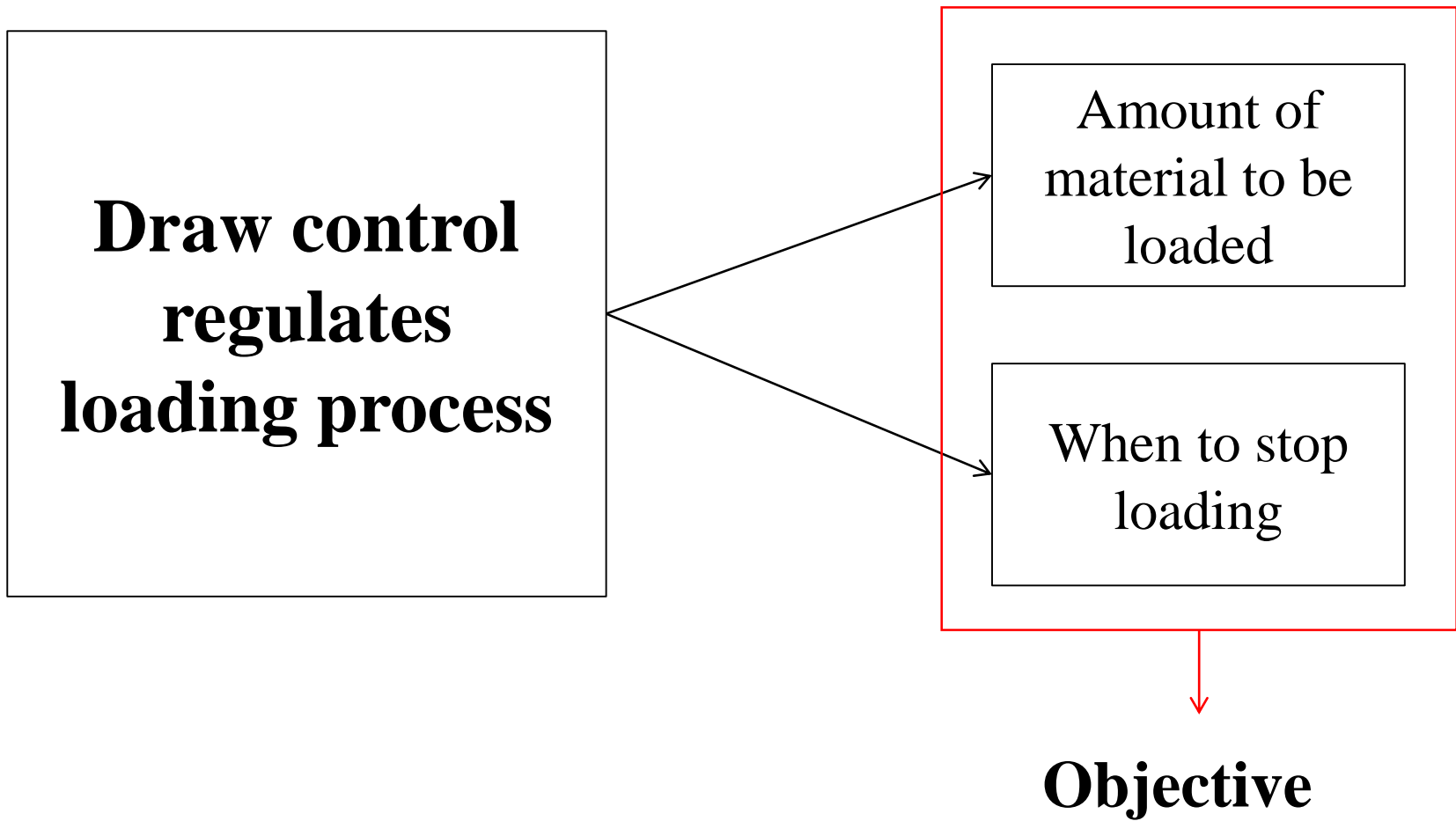
When to stop
loading

**Draw control
regulates
loading process**

Amount of
material to be
loaded

When to stop
loading

Objective



Purpose: Increase ore recovery
Reduce dilution and mining costs

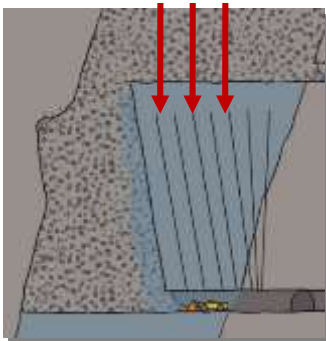
Project overview

Performance indicators

Project overview

Performance indicators

Number of rings mined



Courtesy of LKAB

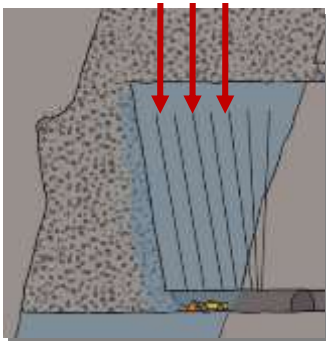
Project overview

Performance indicators

Number of rings mined



- Mining costs
- Mining footprint and sinking rate of the mine



Courtesy of LKAB

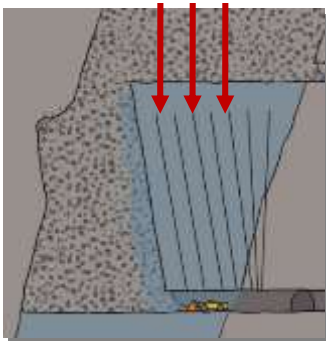
Project overview

Minimize

Performance indicators

Number of rings mined

- Mining costs
- Mining footprint and sinking rate of the mine



Courtesy of LKAB

Project overview

Minimize

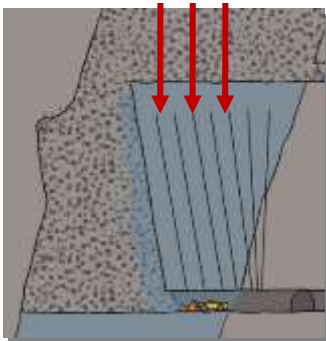
Performance indicators

Number of rings mined

Ore percentage



- Mining costs
- Mining footprint and sinking rate of the mine



Courtesy of LKAB



Project overview

Minimize

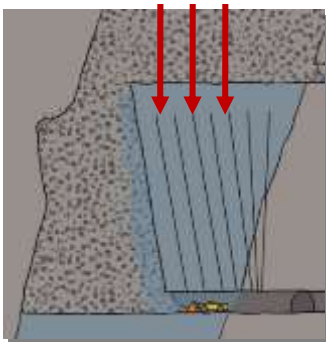
Performance indicators

Number of rings mined

Ore percentage

- Mining costs
- Mining footprint and sinking rate of the mine

- Ore recovery
- Profitability



Courtesy of LKAB

Project overview

Minimize

Performance indicators

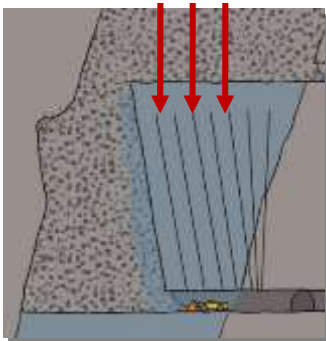
Maximize

Number of rings mined

Ore percentage

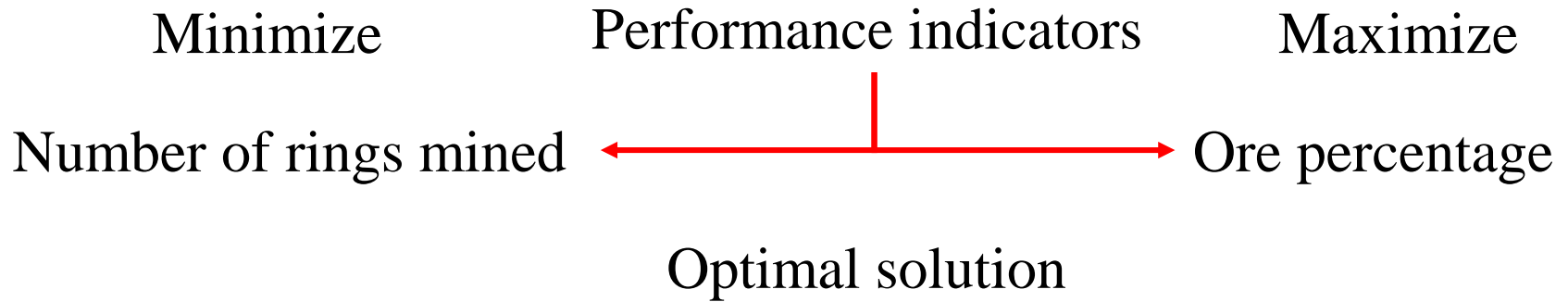
- Mining costs
- Mining footprint and sinking rate of the mine

- Ore recovery
- Profitability

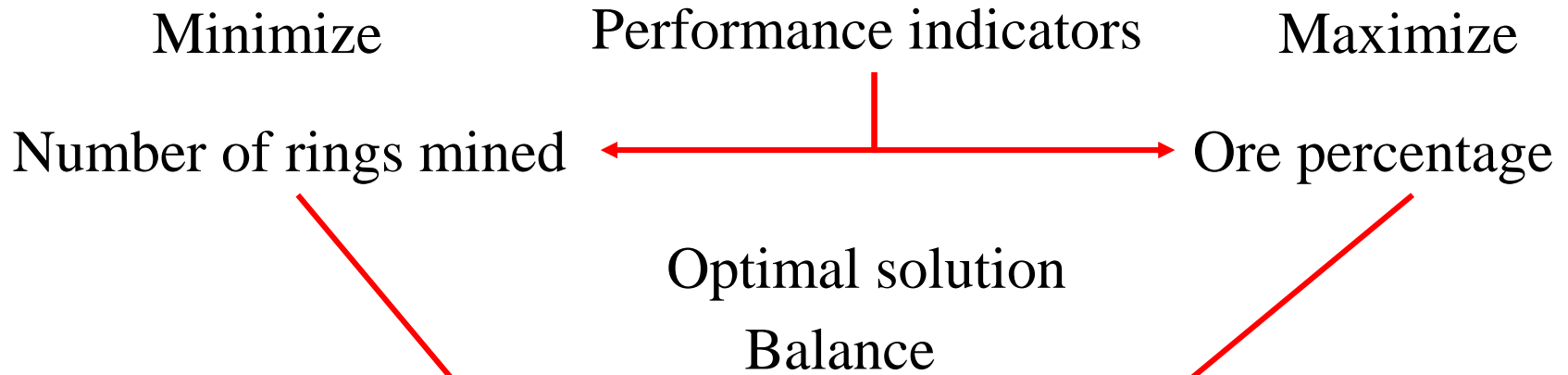


Courtesy of LKAB

Project overview



Project overview



Project overview

Optimal solution

Holistic approach

Project overview

Optimal solution

Holistic approach



Macro Level

Probability models to identify optimal draw control strategies

Project overview

Optimal solution

Holistic approach

Macro Level

Micro Level

Probability models to identify optimal draw control strategies

Online economic model to assess mine performance in real time and take necessary actions

Project overview

Future work:

- Model modification and verifications
- Mine test

Tack