

# Improved resource efficiency through dynamic loading control

Professor Håkan Schunnesson



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Med stöd från:



STRATEGISKA  
INNOVATIONS-  
PROGRAM

Improved resource efficiency through dynamic loading control, is a joint project between Luleå University of Technology, LKAB, ABB, Boliden Mineral AB and Agio System och Kompetens AB

The project have two test sites/case studies;  
LKAB's Kiirunavaara and Malmberget mine

Project team (LTU);

- Håkan Schunnesson, project leader
- Anna Gustafson, senior researcher
- Gurmeet Shekar, PhD student



## Project aim:

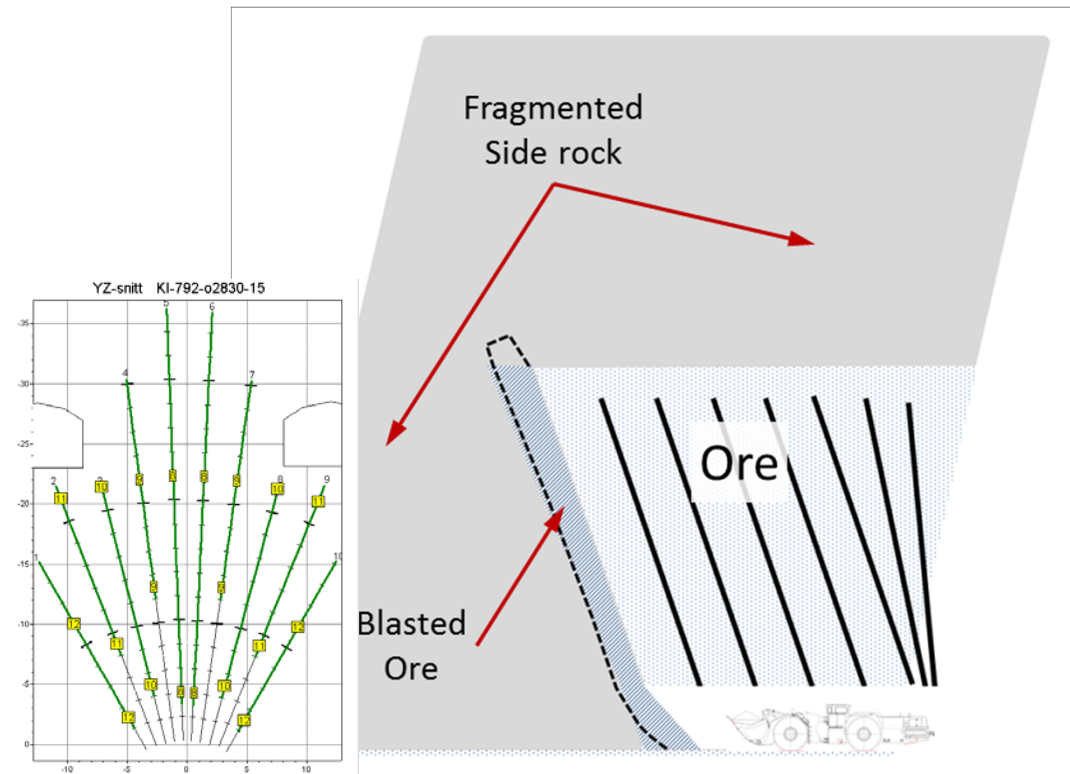
- Build detailed knowledge on the loading process in SLC
- Develop improved methods for draw-point control
- Improve resource efficiency
- Increase production and/or grades

***Is this possible?***

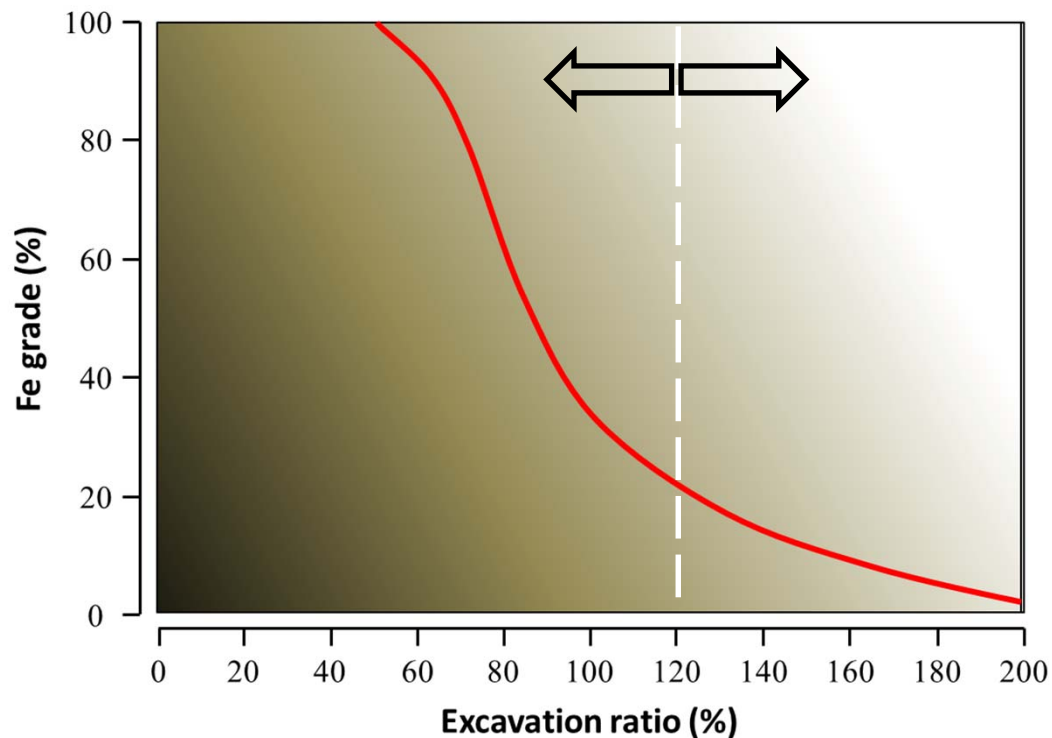
# Sub-Level Caving (SLC)

Sublevel caving is one of the most efficient and cost-effective mining methods. Furthermore, the mining process and the lay-out of the mining area favour high mechanization and automation.

The drawbacks of the method are low ore recovery, high waste rock dilution, low flexibility for changes, and low selectivity and control of the ore extraction process.



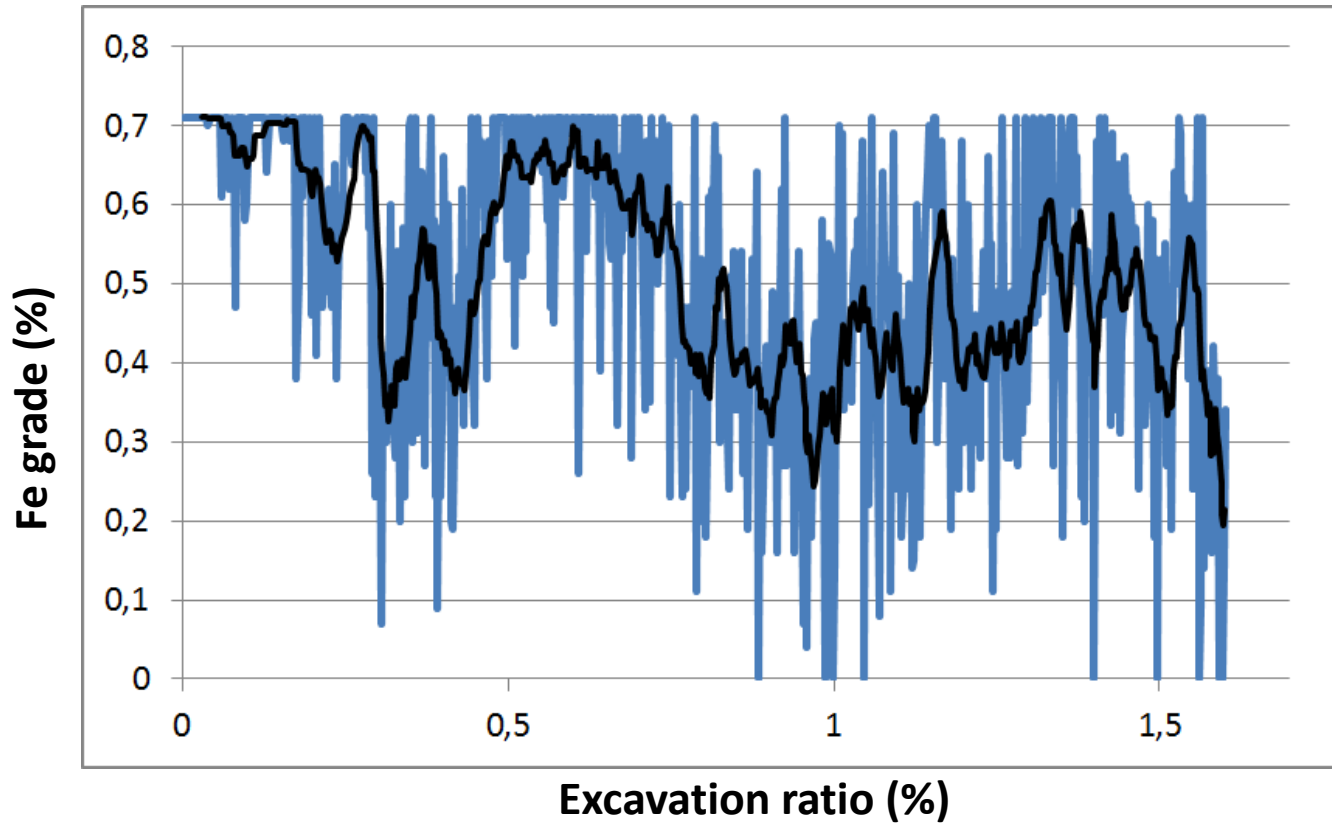
# Draw Control Strategies



Ref: After Bull, G. and Page, C. 2000

- Fixed Loading criteria assisted with cut-off grade
- REBOP (*Rapid Emulator Based On PFC*) – **Gravity flow principles**
- PCSLC (Based on Template Mixing by T Diering 2007 a modified PCBC Gemcom Approach) – Condition specific **Mixing Algorithm**
- Dilution entry method (Bull and Page, 2000 ) – Empirical Model
- Draw Bin Methodology (Allman 2002 at AMC consultants) – Empirical Model and **Marker Trials**
- Newcrest Dilution Model and SLC optimizer (NSO) – Marker Trials & Mixing Model
- NON Dilution Draw Method in SLC mines – Dilution Cover Theory

# Initial results

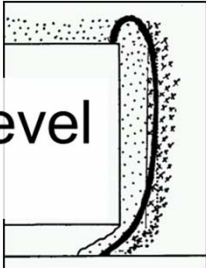


## Initial results show that the present draw control gives:

- High variation in final extraction ratios
- Systematic issues with either under loading or overloading at draw point.
- This has sometimes caused poor recovery and increased dilution
- Current draw control strategy have potential to be made more sensitivity to key impact factors

**Need for improved draw control**

# The importance of Draw Control Strategies

Level	Issues
Strategic level (Management)	Annual production Customer satisfaction Quality
Tactical level (Planning/Mine control)	Production scheduling Excavation rate Fe-content
Production level (Operator) 	<b>Continue loading?</b> <b>Stop loading?</b>



# Improved resource efficiency through dynamic loading control:

- Literature review and Base line mapping reports is under preparation
- Two abstracts accepted for MassMin 2016
- More results, shortly on [www.drawcontrol.se](http://www.drawcontrol.se)

**Thank you**