

BIECON INDUSTRIAL ENGINEERING



About BIECON

Who are we?

- Started in July 2005 formerly Business Engineering in Anglogold Ashanti.
- Dedicated personnel with skills and expertise in Industrial and Systems Engineering.



PRODUCTS & SERVICES

- **Simulation modeling**
- Work study
- Feasibility studies
- Logistic studies
- Operations research and optimization
- Systems & Process design and improvement
- Business models
- Production scheduling and control systems design Solutions implementation assistance



LIST OF CLIENTS

- Anglo Gold Ashanti
- Harmony
- Goldfields
- Great Basin Gold
- Barrick
- Lonmin
- Impala platinum
- Anglo Platinum
- Anglo Health services
- Rand Uranium
- RSV
- TWP
- Kopano
- Deloitte
- Shaft Sinkers
- Murray and Roberts



PROJECTS

Ore processing



Transport systems



Underground mining



Open pit mining



Personnel Transport



Shaft Scheduling



Ore transfer systems



Shaft transport



Access Development

Water Reticulation



Ore extraction

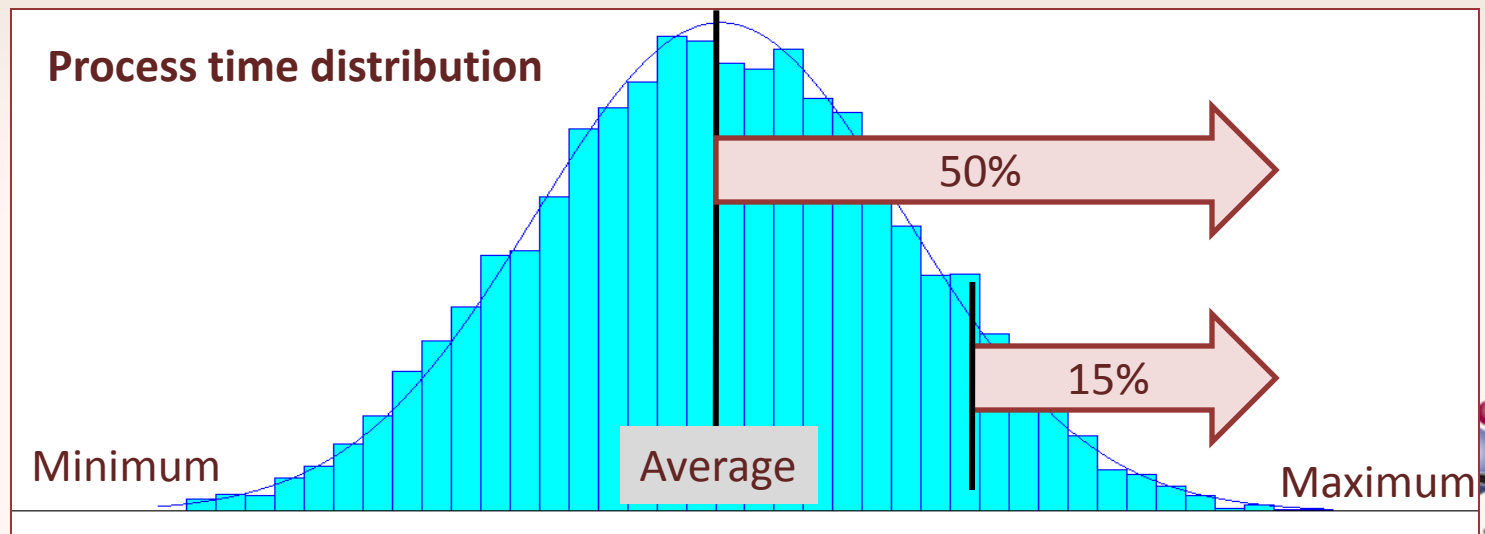


SIMULATION MODELING

- **Biecon** specializes in the simulation of processes. World acclaimed Arena Simulation software by Rockwell is used.
- **Simulation** entails the building of an abstract computer model to simulate the behavior of any system, process, future situation or scenario. It is used to predict the impact of business strategy decisions before implementation.

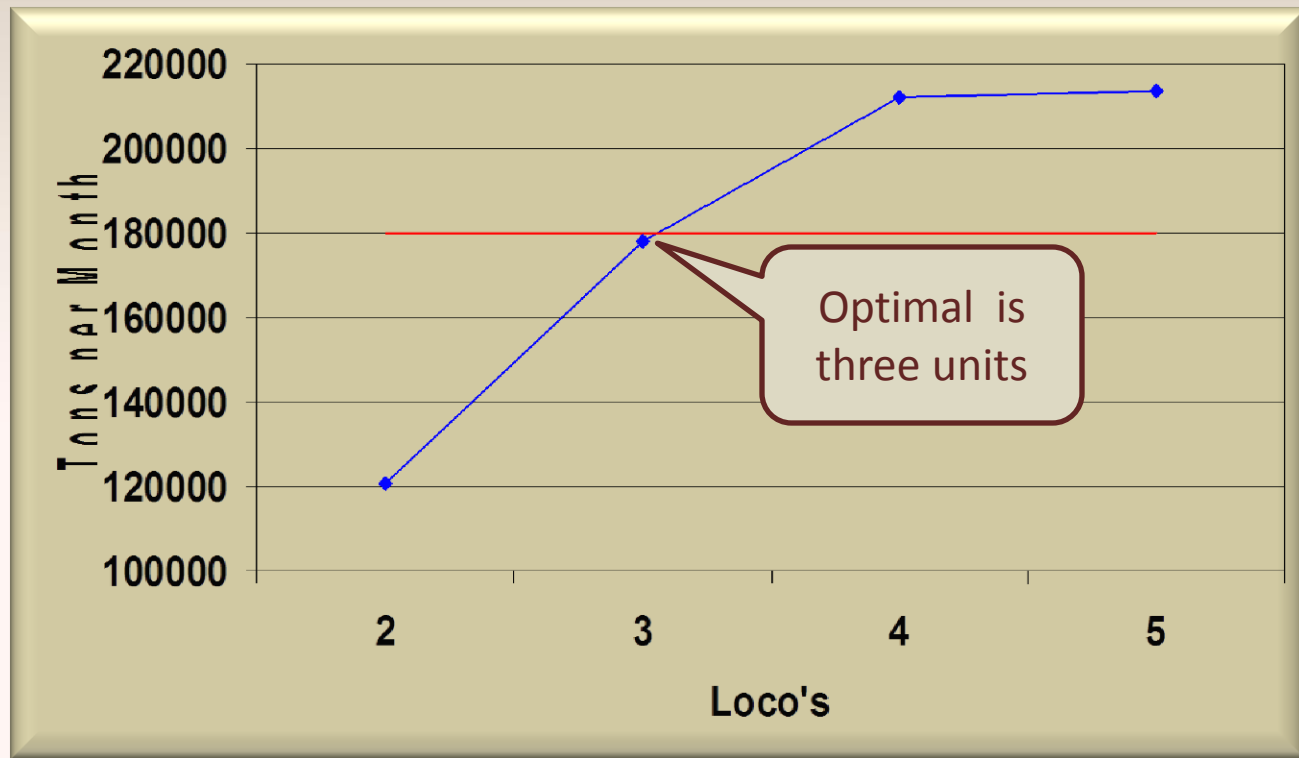
WHY SIMULATION ?

- It is common practice to base calculations on *averages*.
- Not a true representation of reality.
- On *average* the process will always finish in time, but in reality will miss the target 50% of the time.



WHY SIMULATION?

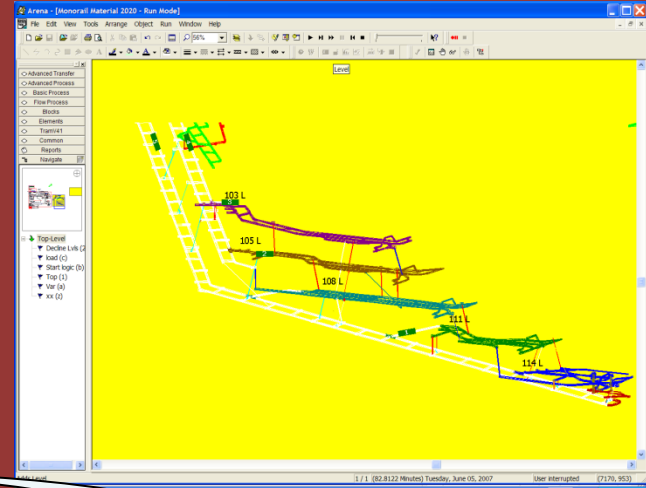
- The effect of *congestion* can only be determined through simulation.
- Increase in transport units does not necessarily mean an increase in throughput.



SIMULATION PROCESS

- Consultation
 - Determine objective
- Time study

■ Simulation model



- Analyze data
- Optimise system

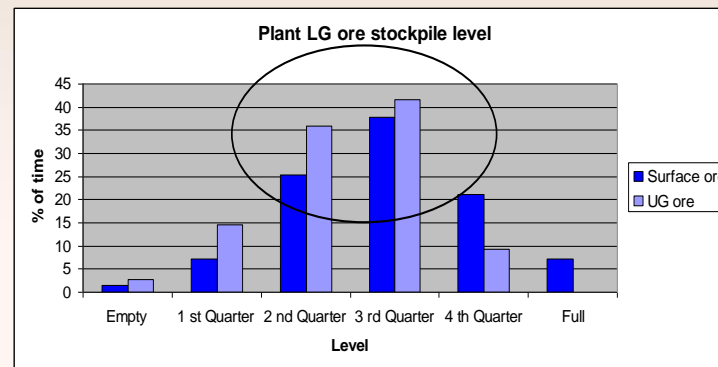
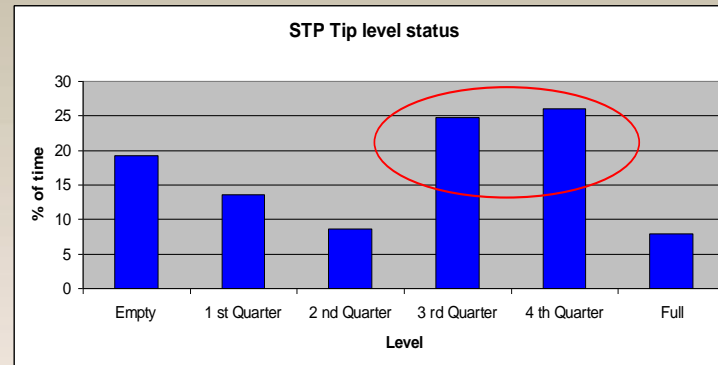
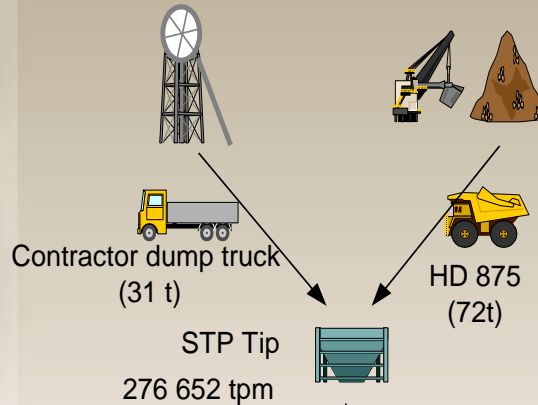
- Simulation runs
- Different scenarios/

SURFACE ORE HANDLING

LG Underground ore
200 000 tpm

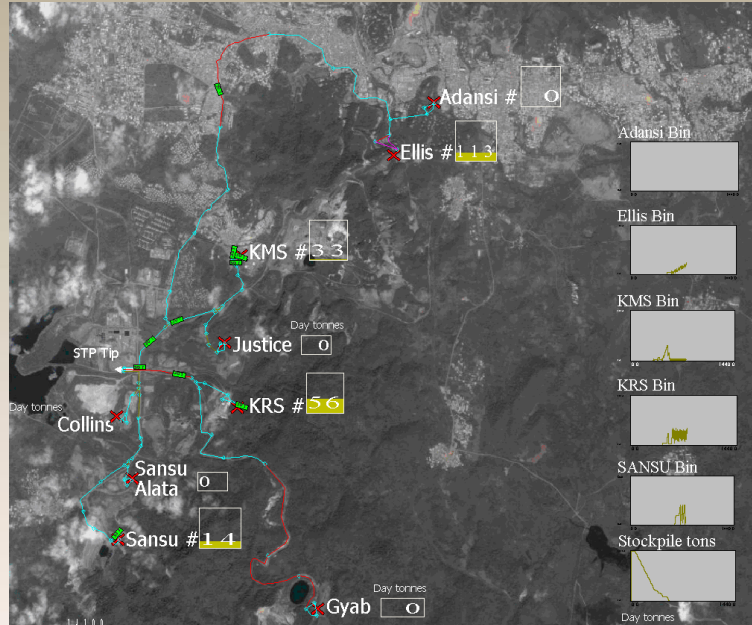
LG Surface Stockpiles
90 000 tpm

- 4 Vertical shafts
- 5 Stockpiles
- 1 Tip

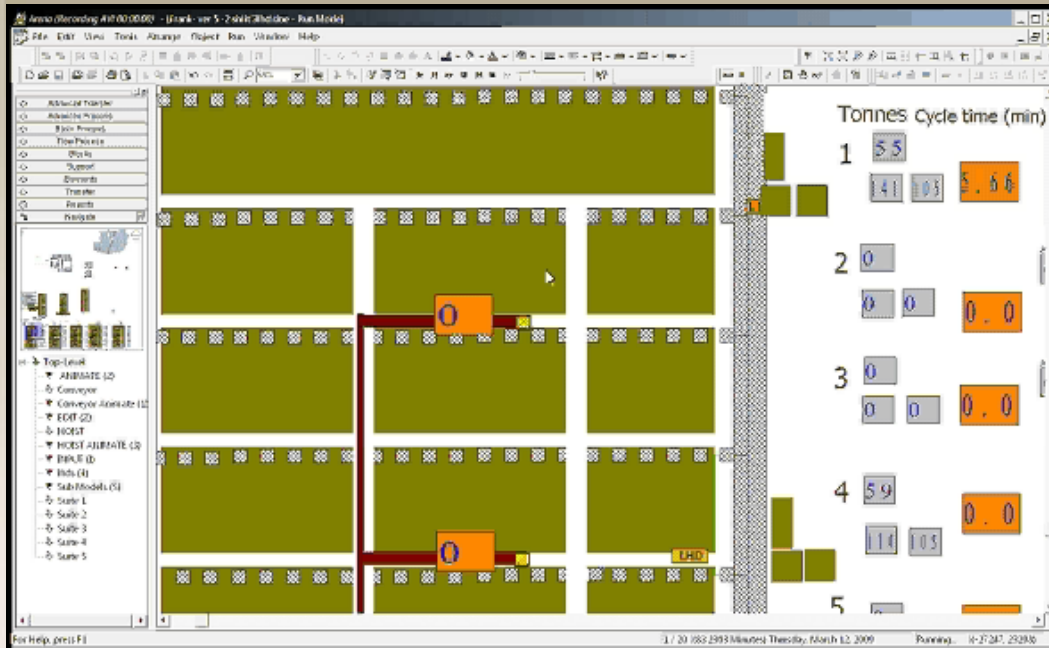


- Determine tip and crusher capacity
- Determine optimal truck fleet

SURFACE ORE HANDLING



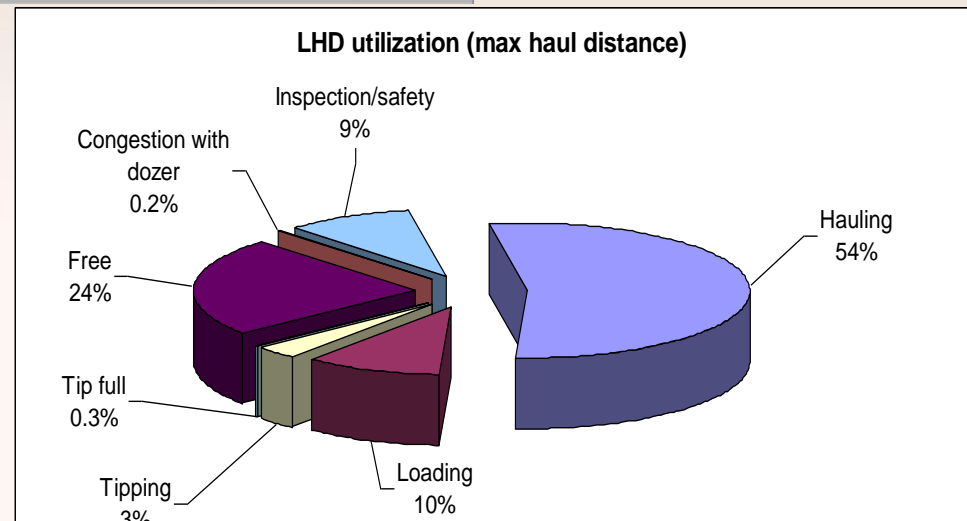
MECHANIZED SIMULATION MODEL



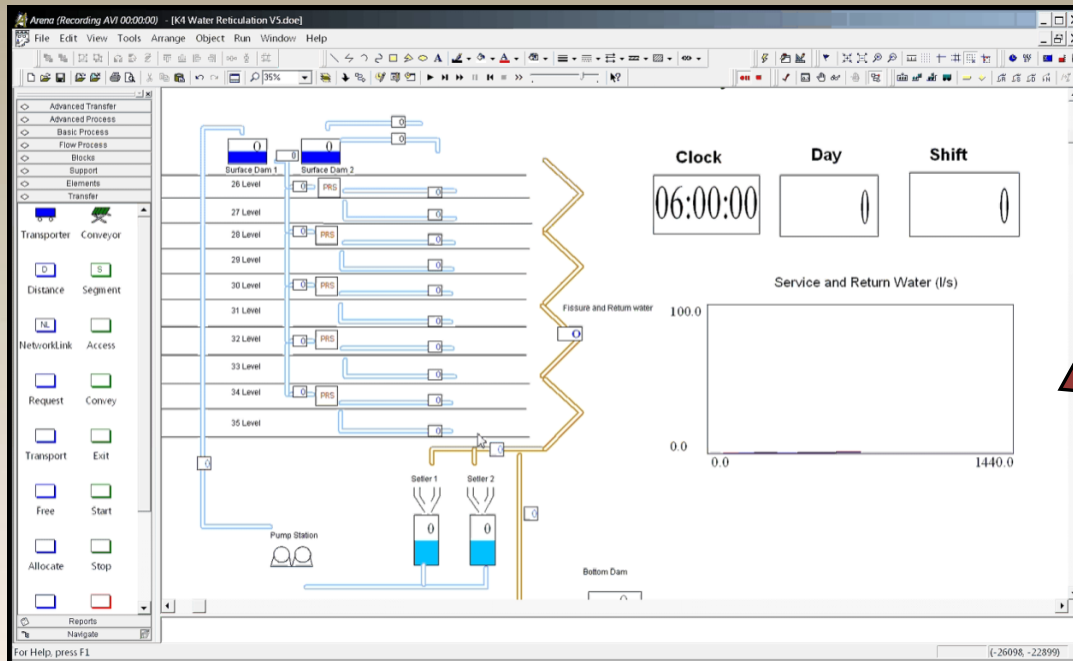
Mechanized ore cleaning
Simulation model

Results obtained

- Cleaning time
- Equipment utilization
- Interaction with other equipment
- Optimal fleet required
- Standby units required



WATER RETICULATION MODEL

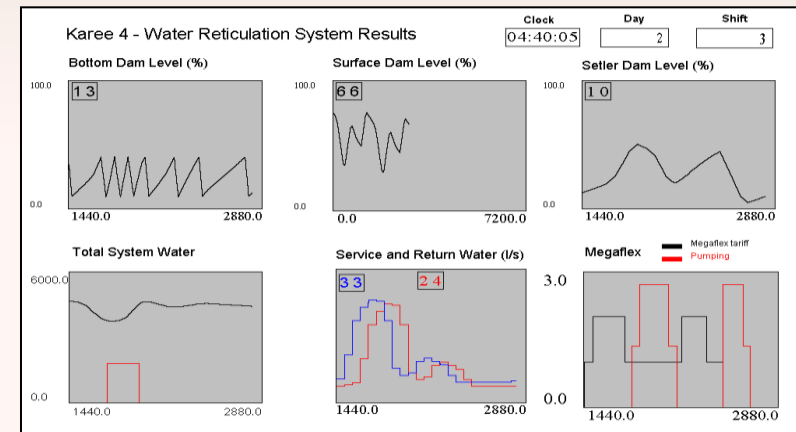


Simulation Model

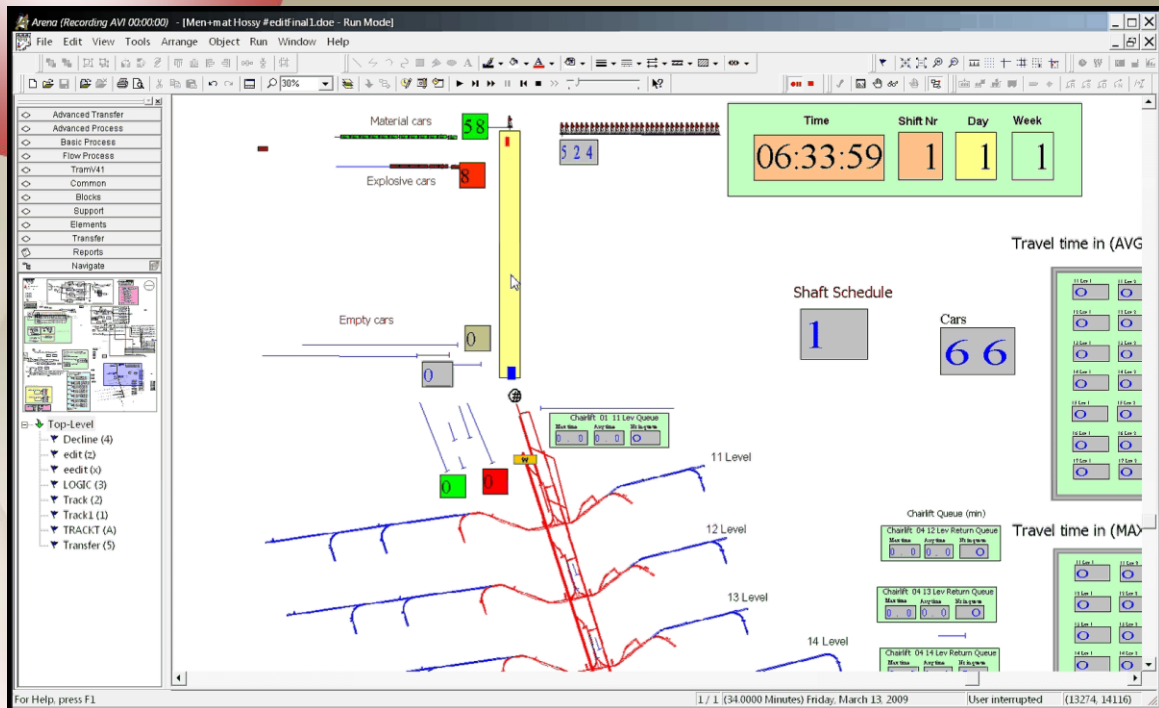
- 10 levels
- 2 settlers
- 2 main pump columns

Results obtained

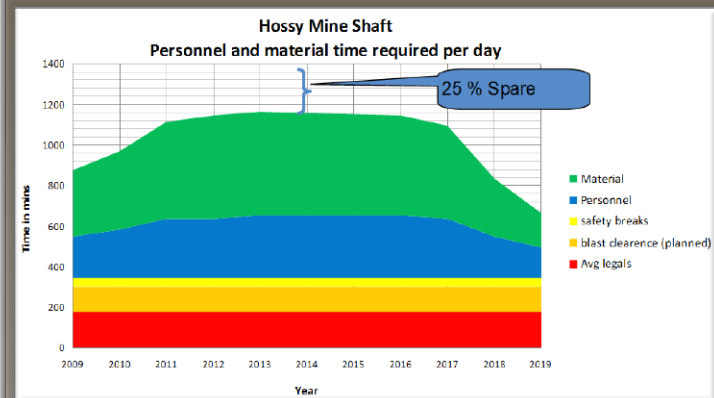
- Dam sizes
- Pump sizes
- Needed settler capacity
- Top up water required
- Mega flex compliant
- Flood risk



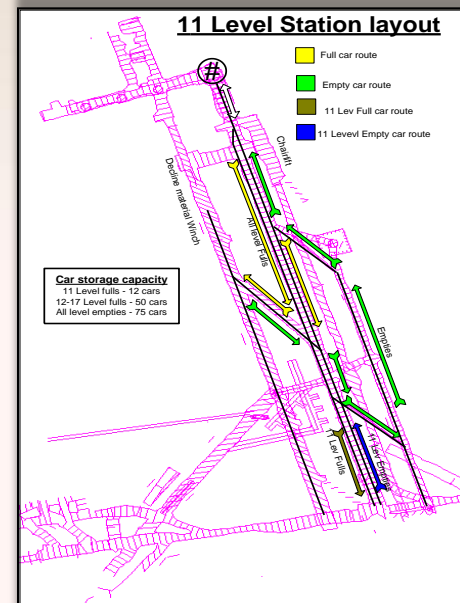
PERSONNEL AND MATERIAL



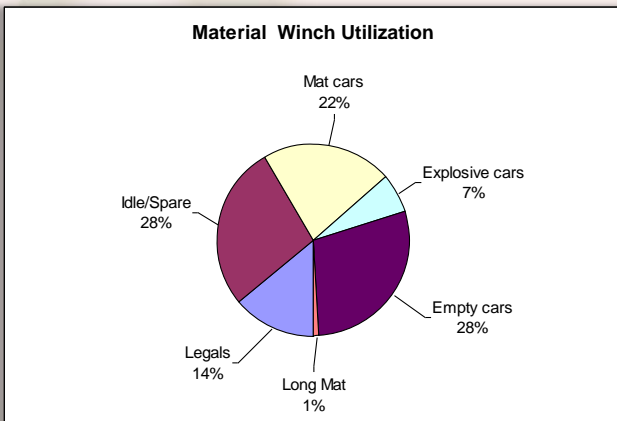
Vertical shaft utilization



Traffic flow on main station



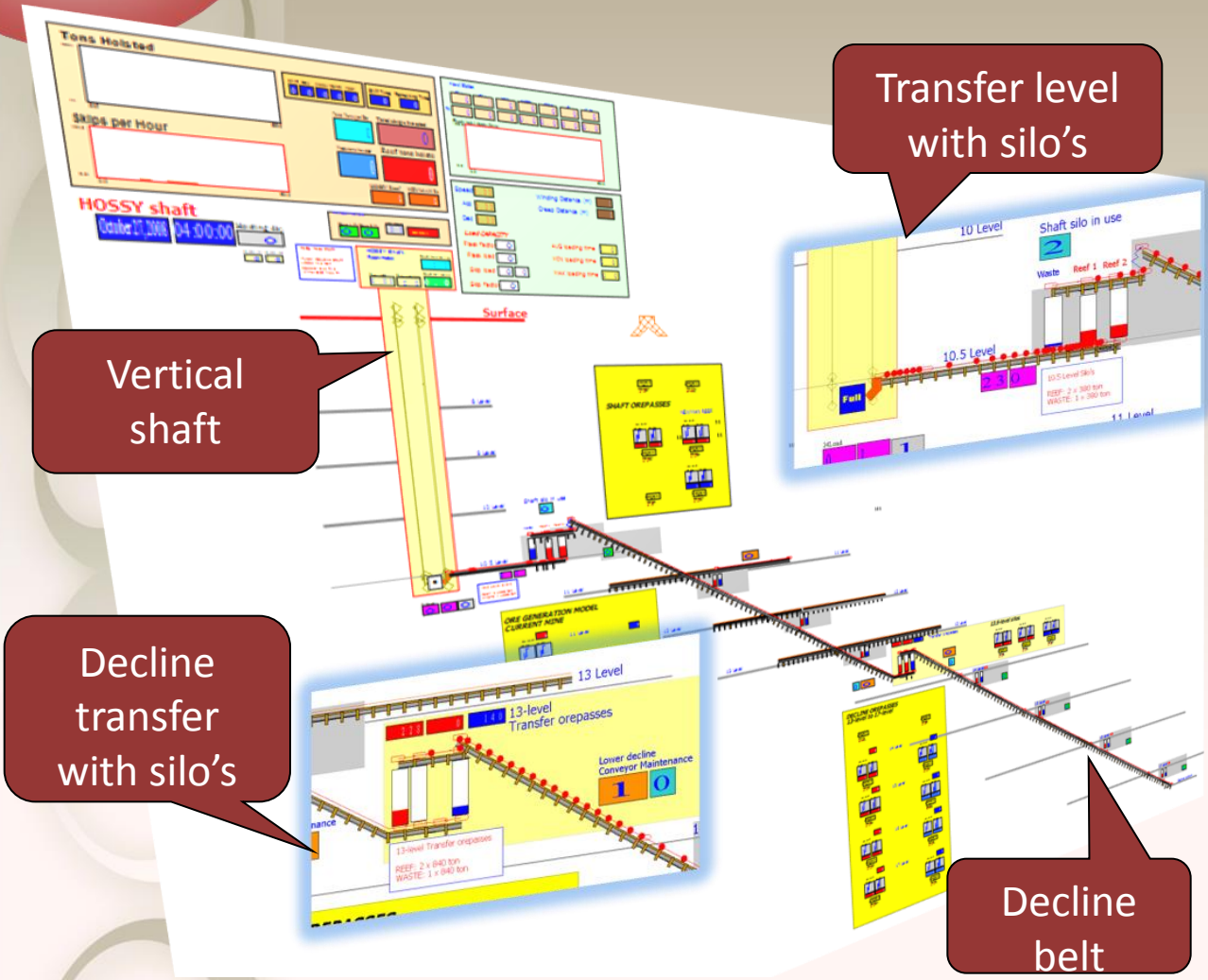
Material decline winch utilization



Additional results

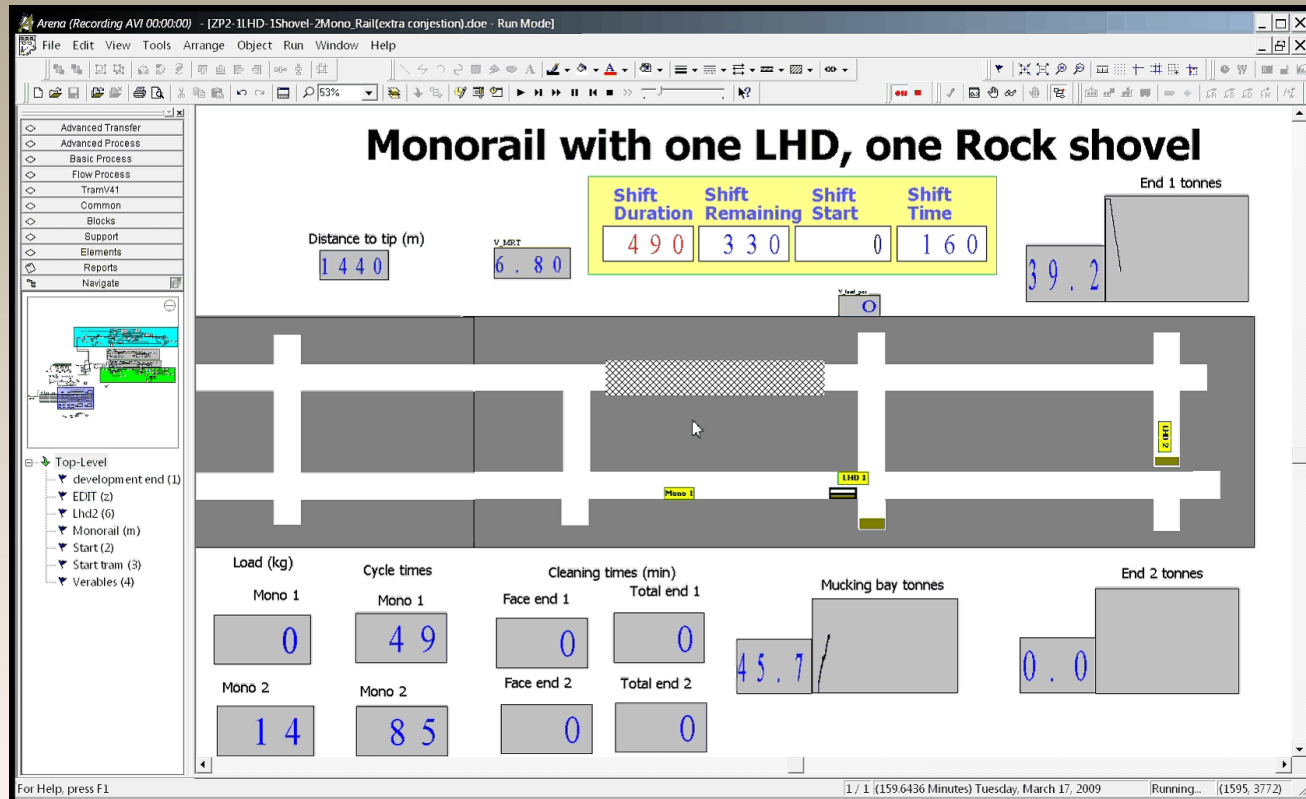
- Personnel travel time
- Available face time
- Queuing at chairlift
- Needed chairlift capacity
- Shaft schedule
- Nr material cars
- Nr explosion cars

ROCK FLOW MODEL



- Results obtained
- Shaft hoisting capacity
 - Conveyor capacity
 - Needed silo transfer storage
 - Needed on level ore pass storage
 - On level tramming fleet
 - On level tramming scheduling

DEVELOPMENT END



Results obtained:


- Monorail cycle times
- Dev end cleaning time
- Mucking bay cleaning time

Two barrel decline development

- Utilize monorail, originally purchased for material transport, for rock transport in decline development
- Compare to articulated dump truck

WHAT WE OFFER YOU.

- Prevent unnecessary capital caused by fatal design flaws or over design.
- Reduce risk by eliminating bottlenecks before implementation.
- The ability to test and compare different mining strategies and equipment at the fraction of the cost.
- Increase earnings with optimal equipment utilization and scheduling.
- Added value of our diverse mining experience.



**Allow us to make
a difference in your world!**