



Strategic Mine Planning

**Flexible mine planning to meet
changes in the business
environment**

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MINE PLANNING

The process to get the right material out of the mine at the right time to obtain the lowest possible cost per unit of final commodity product in order to fulfil the business targets of the company

With the right material we mean the optimised quantity and quality of the mined product

Strategic mine planning is the process where the mine planning process is integrated and aligned with the strategic objectives of the company which involves continuous adjustments to changes in the business environment.

BUSINESS STRATEGY EXAMPLE: NPV VERSUS RECOVERY

Different recovery strategies:

- Maximum NPV versus “Custodians of the Earth” (highest recovery at specific required financial return)
- Historical USSR philosophy (maximum resource recovery at any costs) versus optimization on NPV

By varying the input parameters in a flexible mine planning system the desired **balance between financial and physical returns** can be achieved.

CHANGE IN APPROACH TO MINE PLANNING

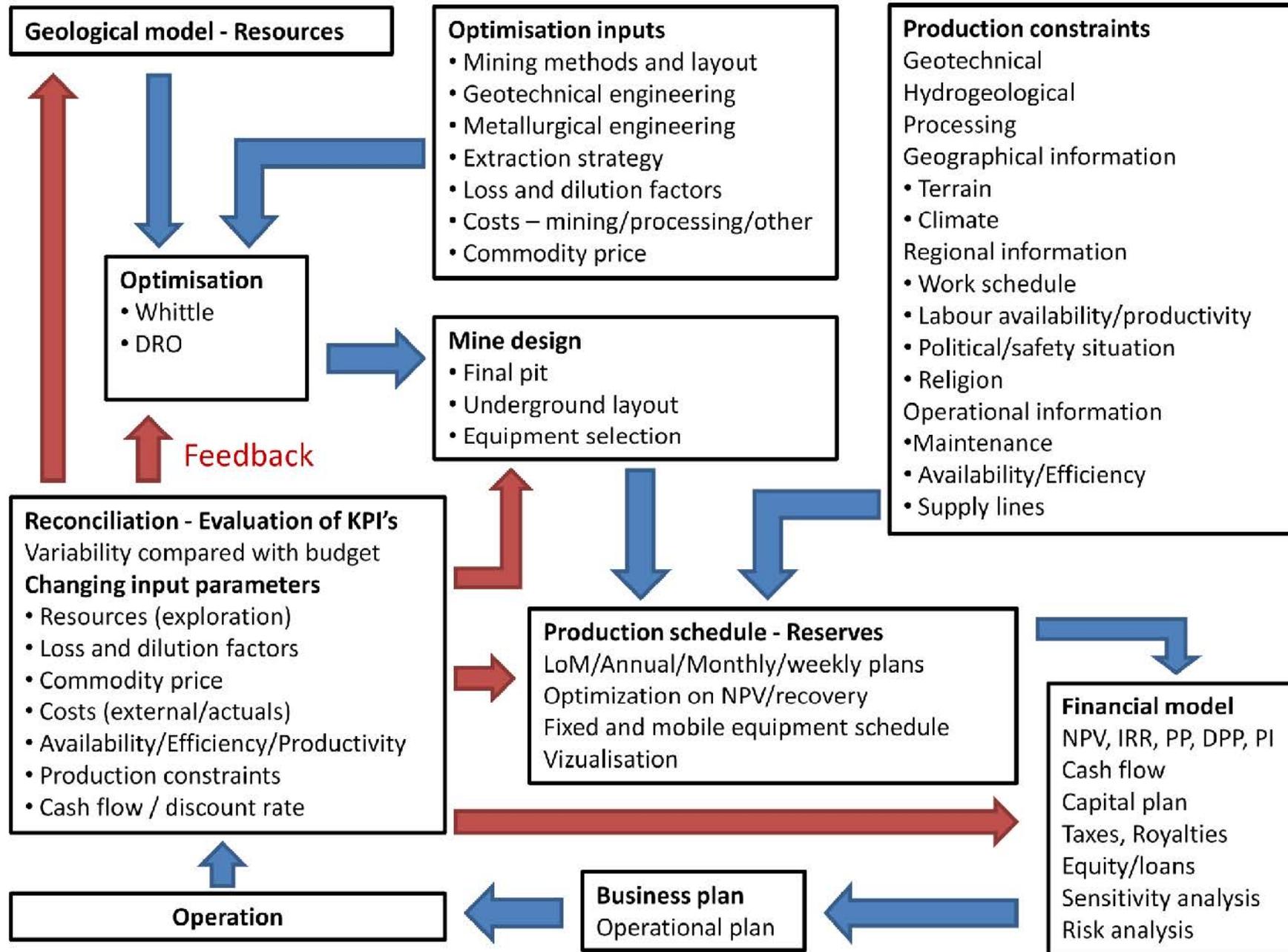
Companies need to **adapt to the business environment**

This requires **cyclical, continuous feedback planning** where Reserves and mine schedule are being re-evaluated regularly pending various input parameters

Computerized mine planning systems are a necessity for this approach

To fully implement this concept in Russia, certain regulations would require amending. Until these changes **cyclical evaluation should be implemented during the technical studies.**

CYCLICAL MINE PLANNING



MINE PLANNING HORIZONS

Short term operational

- Monthly/weekly/daily plans - Line management

Tactical

- Annual, Five yearly plans - Mine Managerial

Strategic

- Corporate plan - Company management
- Life of Mine design and plan - Institutes

SRK has observed disconnects at Russian operations between the corporate plan prepared in Moscow, the life of mine plan prepared by the institutes and the annual plan prepared on site.

A fully integrated mine planning system can link the various horizons together and increase communication and efficiency

FLEXIBLE MINE PLANNING SYSTEM

Demands

- Optimise the quantity and quality of the mined product
- Utilize all available resources as efficiently as possible
- Show the big picture and detail where required
- Implement business strategy
- Accommodate change in input parameters at any time
- Allow effective feedback to workforce and management
- Allow scenario analysis
- Chosen on basis of the technical level of available personnel

Results

- Adaptation to business environment
- Effective decision making
- Lowest cost of final commodity product
- Confidence in the operation
- Reduce risk for all stakeholders

ACCOMMODATE CHANGE

Expected changes

- Resources
- Commodity price
- Costs
- Cash flow
- Project detail level

Results

- Changes in resource utilization, production levels and quality, timing of development and other capital investments

Requirements

- Computerized geological models
- Possibility of “what-if scenarios” and risk evaluations

CUT-OFF GRADE VERSUS ECONOMICAL BLOCK ANALYSIS

Problem

Cut-off grade is often used on underground metal mines to determine economic limits and is based on mine-wide average parameters

- General cut-off grade not valid as many parameters vary by location
- Does not show which areas deliver the greatest value or which areas are not economic to mine

Solution

Split the deposit in blocks and calculate economics for each block

- Caveat: for Russian projects, the cut-off grade can only be changed by lodging a revised TEO Konditsii

RECONCILIATION – FEEDBACK

- The benefits of reconciliation and optimisation will be covered in more detail in the next speech
- Feedback into planning systems is required for physicals, financials (external and actuals achieved)
- The standard monthly reports should be replaced by a continuous feedback and reporting system which can show results and trends over any period to enable appropriate management decisions and actions

Some practical comments

- No dedicated systems exist at this moment which allow easy feedback of actual parameters into the planning process
- Company specific systems have to be set up
- Systems based on spreadsheets are too freeform and introduce errors, databases are preferred

DESIGN AND SCHEDULING TOOLS - GENERAL

- Non-mining specific - Lower costs versus lower mining specific functionality

Design

- Pencil, pen and paper
- AutoCad and alternatives

Scheduling

- Spreadsheets
- Project planning software (MS project, Primavera)

DESIGN AND SCHEDULING TOOLS – MINING SPECIFIC

Design and schedule

- Gemcom/Surpac and MineSched
- Datamine and Mine24D
- Maptek - Vulcan and Chronos

Other design software

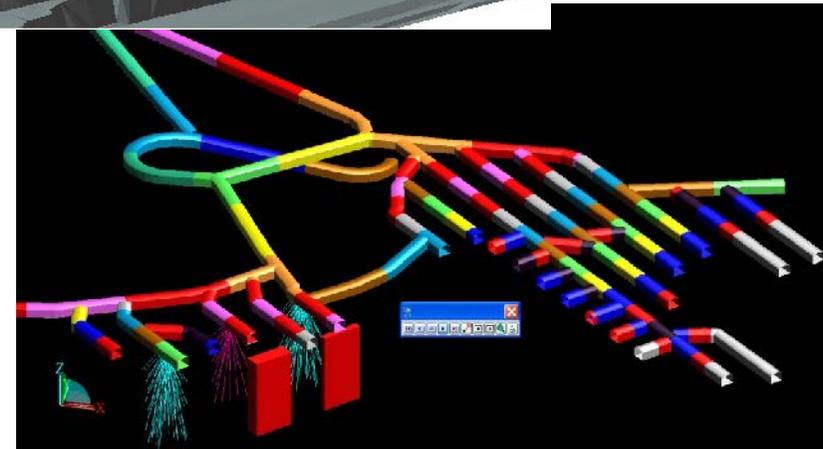
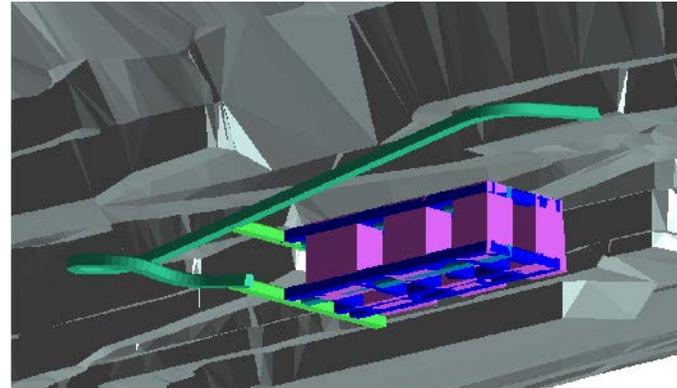
- Mintec - MineSight
- GMSI - mineCAD
- Promine

Russian programs: Digimine, Geomix

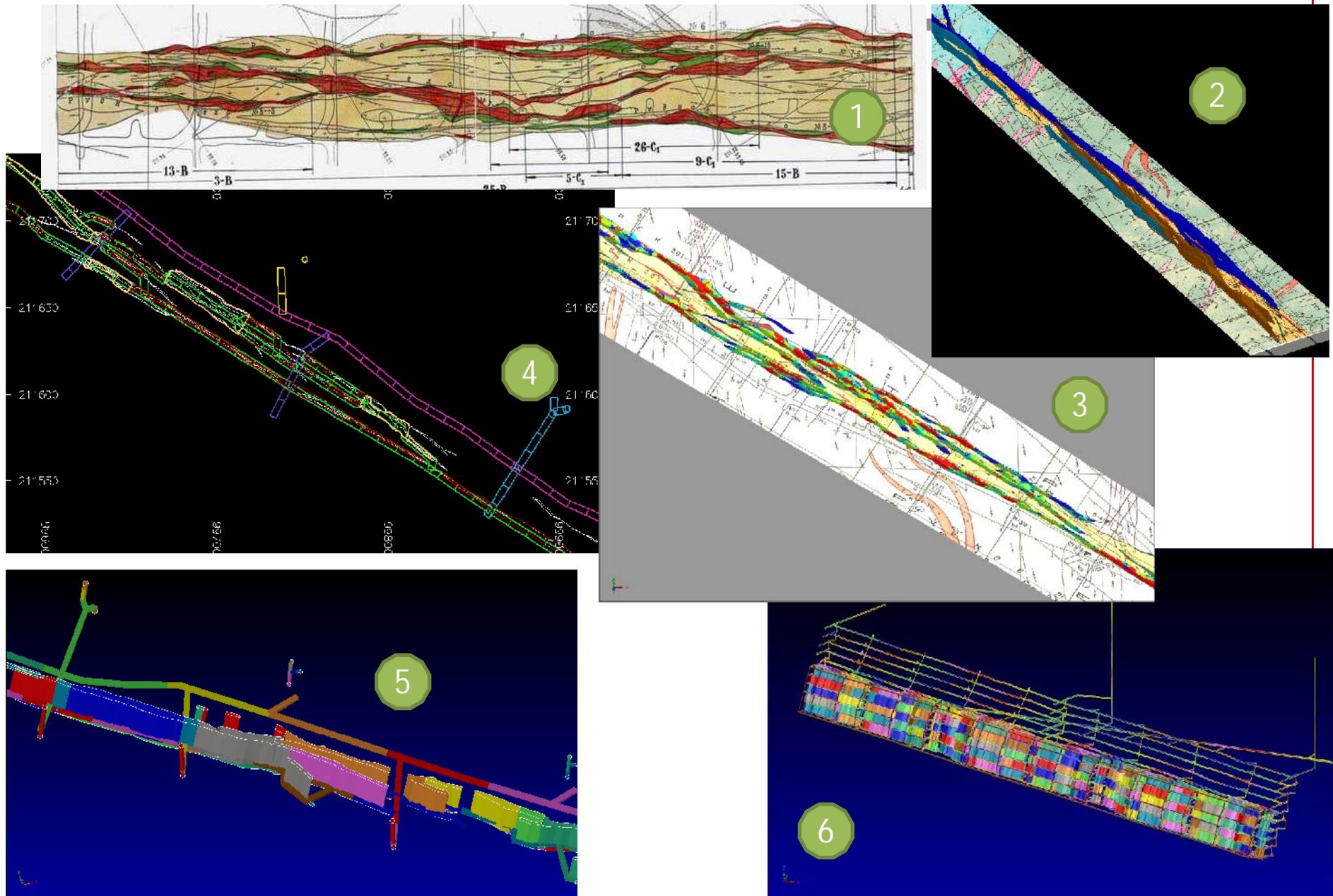
Stratiform deposits: Minex

Generic scheduling programs: Minemax - iGantt, Runge – XPAC

Information processing: Xemplex



EXAMPLE OF PRODUCTION LEVEL EVALUATION IN MINE24D



IMPLEMENTATION

Evaluation on basis of:

- Overall mine planning strategy
- Costs
- Ease of implementation
- Technical level available personnel
- Complexity of the orebody and mine

Resistance to be overcome by estimating benefits in advance and effective change management as discussed in the previous presentation

CONCLUDING REMARKS

- Benefits for companies can be great, provided a company wide implementation program is conducted and systems are co-selected and designed by people who have to work with them
- Variety of commercial mine planning programs available
- Choice of supplier should be part of a company wide mine planning strategy
- Feedback systems to be developed specifically for the company
- Changes are required to Russian regulations with regards to Balanced Reserves and cut-off grade to allow implementation of flexible mine planning strategies

Final slide

Thank you for your attention!

Any questions?