



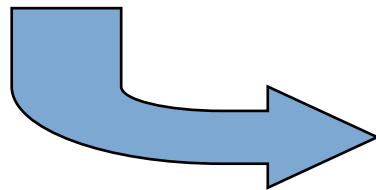
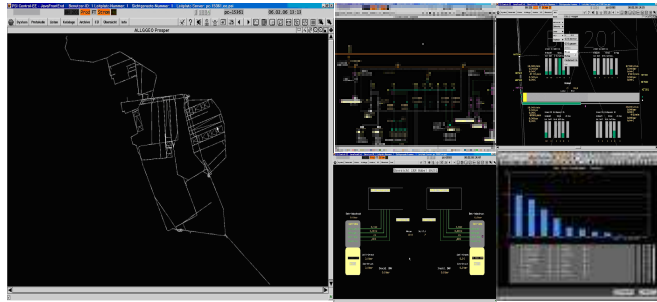
PSI Production GmbH



PSImining

**World first fully integrated
Central Control System
for mining operations**

PSImining – multiple mines centrally controlled



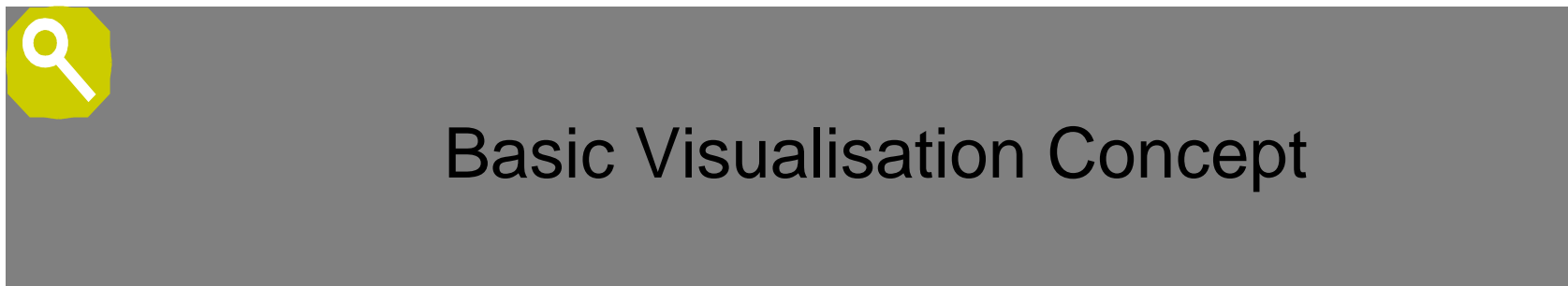
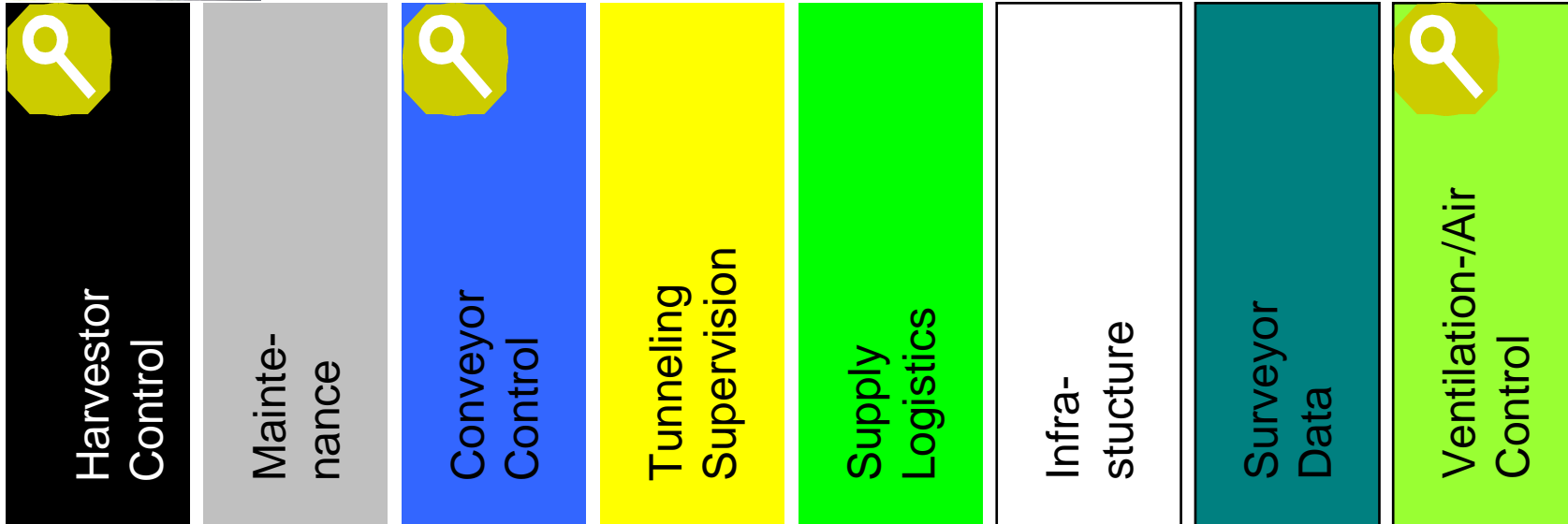
Worldwide first integrated process control project for mining operations!



PSImining – Core Modules

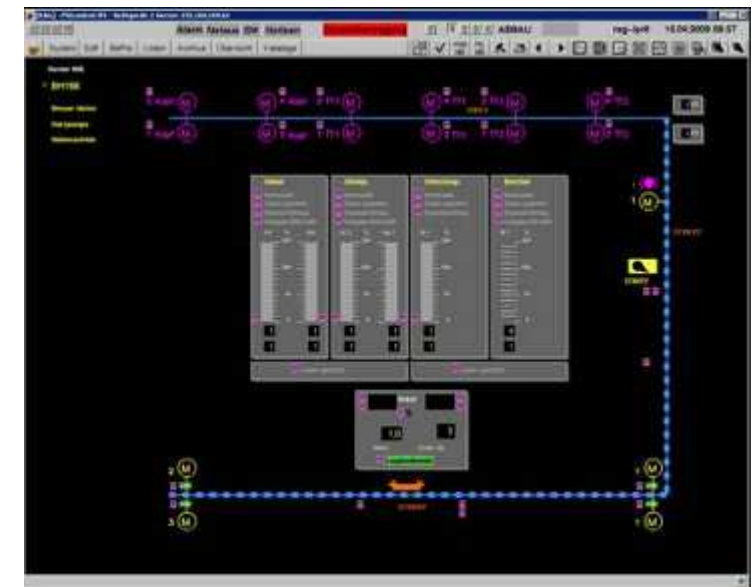
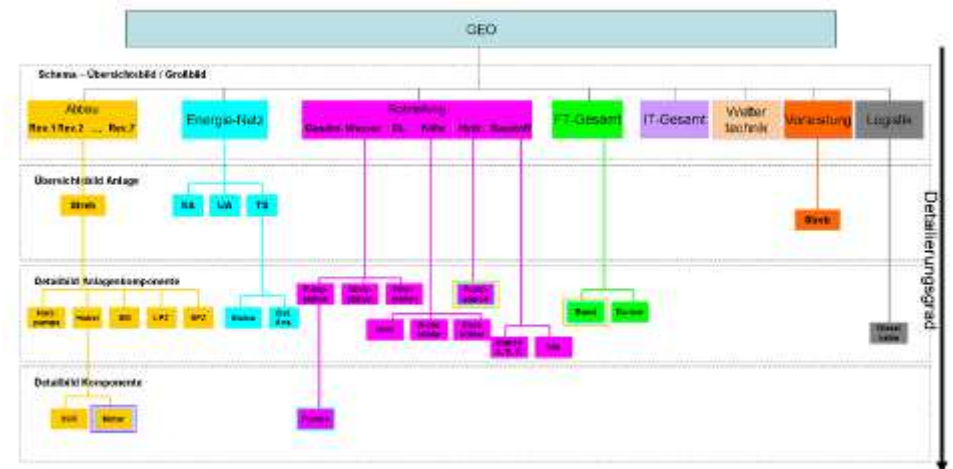


= Details on following slides



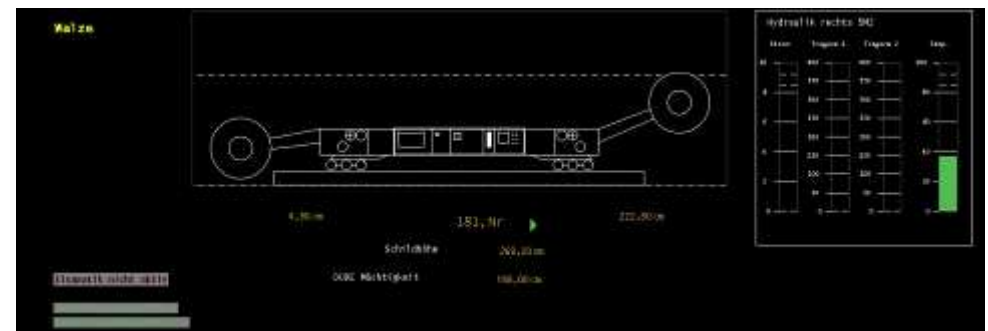
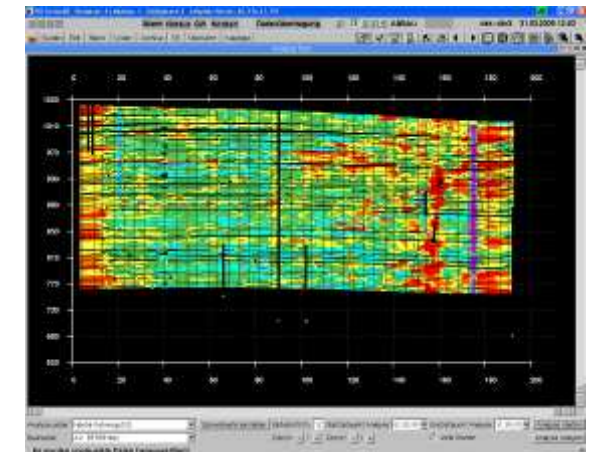
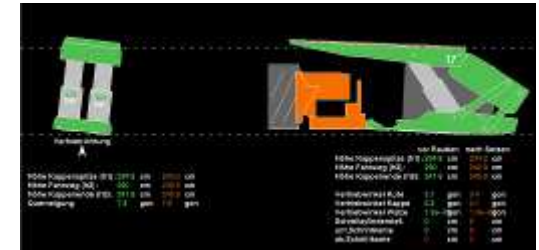
Basic Visualisation Concept

- **Common visualisation basis for entire Mining-Automation project**
 - few pictures
 - only four picture-layers from overview to detail
 - project wide unique picture-objects
- **Project wide standardized zooming- and decluttering-techniques**
- **Common data base and data model for all sub projects**
- **Consistent and uniform**
 - user interface
 - guidance of operators
 - reports, alarm lists, curves, etc.
- **Reduction of maintenance efforts (SCADA system)**



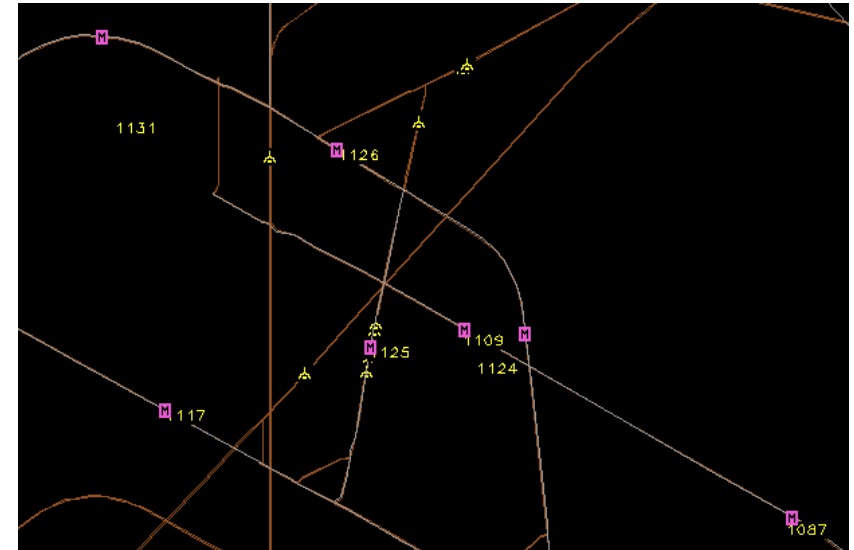
Harvesting Control (winning process)

- **Data acquisition of all process data (harvester, shields)**
- **Integration of the data of**
 - harvester (shearer, plough)
 - shields
 - surveyor (geology)
- **Automatic closed-loop-control of cutter or plough (online, continuous)**
- **Post mortem analysis of mining process data**
 - improve precision of surveyor data
 - identify geological faults
 - hight of cut
- **Direction control of harvester for optimal cut in coal layer**



Ventilation Control

- **Main task: CH₄-supervision**
 - precise relation to location
 - automatic import of measuring devices incl. geographic data
- **Improve safety of mine works**
- **Identify local CH₄-concentrations**
 - caused by vehicles
 - caused by excavation
- **Adapt speed of harvester according CH₄-values (avoid stand still)**



Improvements

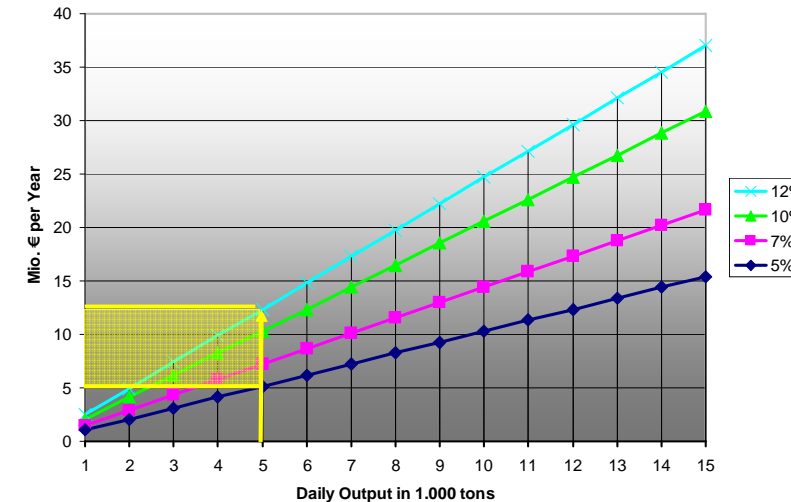
Benefit of Central Control System

Module Harvesting *)

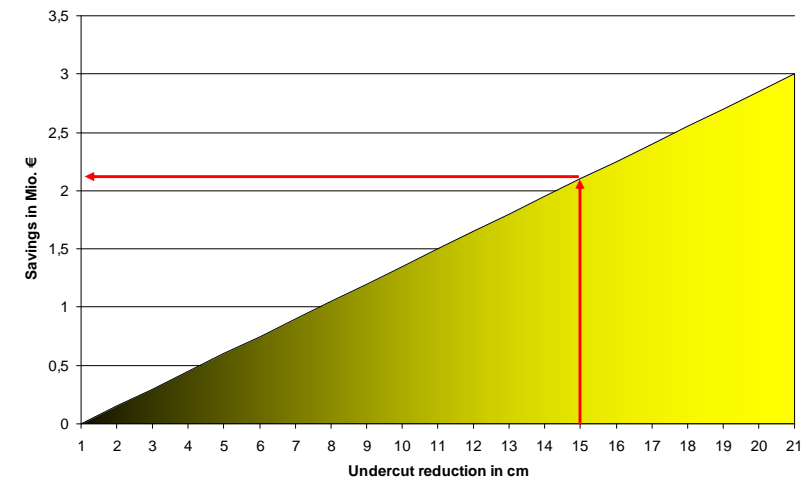
- Attacking-the-face improvement by undercut reduction:**
 Coal face length of 300 m and longwall of 1000 m length, 5.000 tons/day, supposed undercut reduction of 5%, 7%, 10% and 12%
 - ➔ additional output 5 to 12,5 Mio. € p. a.
- Dirt reduction by avoiding cutting the dirt:**
 Coal face length of 300 m with 2000 m length of longwall and supposed reduction of cutting the bottom by 15 cm
 - ➔ profit improvement 2.2 Mio. € p. a.

*) N.B.: The figures are calculated with a price for thermal coal of 80,- \$/ton = 57,- €/ton (Aug. 2009)

Contribution of undercut reduction



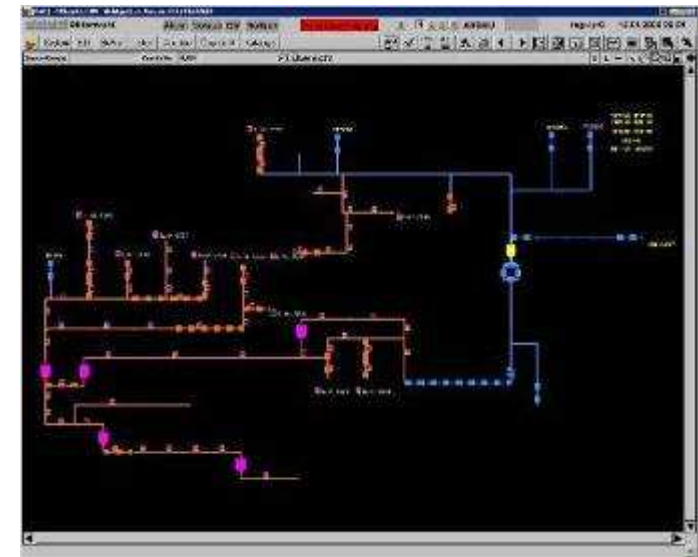
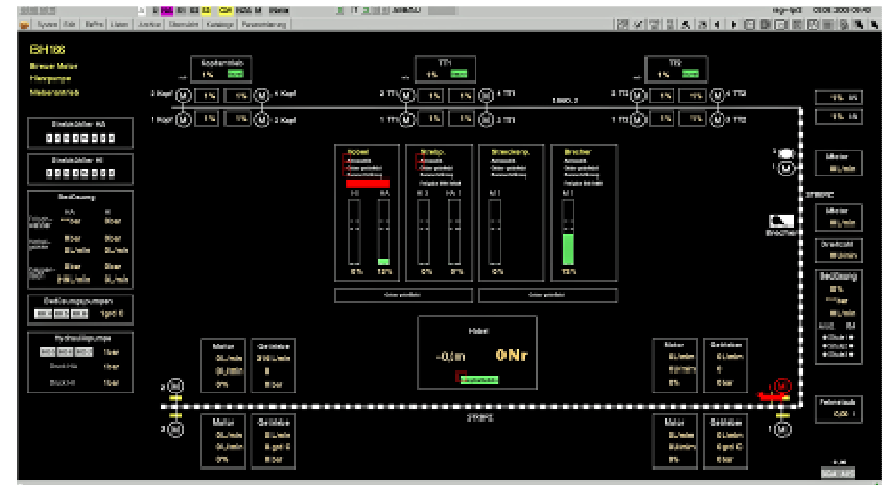
Dirt reduction by reducing undercut



Benefit of Central Control System

Module Conveyor Control

- Production improvement by increasing operation time of conveyors and better availability for the excavation locations
 - Optimal conveyor loads
 - Reduction of stand stills by event supervision/correlation
Stand stills of all main conveyors in one year in a typical coal mine (Europe) about 125.000 min.
Assumption: 5.000 t operation, sales price of 57 €/ton and estimated operation improvement of 10%
- ➔ **estimated profit improvement:
2.5 Mio € p. a.**



Strong partnership combining
Operations Expertise
with excellence in
Central Control Centres

RAG Mining Solutions and PSI Production = extraordinary combination of expertise

RAG Mining Solutions GmbH

● 3 main activities

- Used equipment
- Support for mining operations
- Consultancy and engineering

● In depth know-how from the experienced operator of mines

- > 10 patents with mining operations know-how
- more patents to come

● PSI Production and RAG Mining Solutions closed exclusive partnership!

Company Management



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Conclusions

- **Integrated supervision and control of entire coal mines can be realized with today Information Technology**
- **Supervision and control of several coal mines can be realized with one control center**
- **High potential for cost improvement**
- **Reduction of stand-still times**
- **Improvement of safety for underground people**
- **Real-Time feedback of important production parameters (KPIs)**

Mining operations and technology center



Thank you for your attention and "Glückauf"

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