The I²Mine – Project
The contribution of intelligent deep mining to sustainable development

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Acknowledgement

I²Mine
Innovative Technologies and Concepts for the Intelligent Deep Mine of the Future

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I²Mine – basic project data

- 27 partners from 10 European countries
- 25.4 M€ budget
- 16.0 M€ EU contribution
- 2,300 person-months (191.7 person-years)
- Funded by the EC from the NMP programme of FP7
The $I^2$Mine consortium
Did you know?

Mining is one of the oldest industries on Earth. With the exception of agriculture, mining is the only method of obtaining the raw materials we need to maintain our way of life.
Nearly all sectors, such as construction, chemicals, automotive, aerospace, machinery and equipment sectors which provide a total value added of € 1 324 billion and employment for some 30 million people, depend on access to raw materials.
The I²Mine Vision

Low/Zero Impact Mine + Invisible Mine = Future Intelligent Deep Mine
Social licence to operate

Reduce impacts of deep mining

Reduce import dependency for mineral raw materials

Exploit the known and predicted European minerals deposits
Objectives

- Development of innovative methods, technologies, machines and equipment for mining in greater depths
- Autonomous, highly selective mineral extraction processes and machinery
- New sensor technologies
- Needs for a completely different mine layout
- Innovative concepts for mass flow management and transportation
- Improved rock mechanics and ground control
- New near-to-face processing methods including backfill
- Health and safety issues and work environment
Mine wide information and control systems, logistic and mass flow management

An advanced mine wide mining production control platform

- With this platform, the objective is to increase productivity with 20% with the same equipment fleet and reduce energy consumption by 10%.

A technological logistic system based on information and control systems logistic and mass flow through the whole production process

- Expected cost savings: 25% - 40% per gravity principle based underground mechanism

A mine wide ground control monitoring and detection sensing system

- Safety high impact
Novel mining and underground processing methods

To develop new advanced, intelligent and safe underground mining concepts and technologies to utilize deep strategic mineral resources for a competitive EU industry

To reduce environmental damages like subsidence, urban congestion, noise and pollution and to transfer structures below ground level, to make them invisible

To transform the underground related industries into highly technological and competitive industries
Rock mechanics and ground control

- Generate new knowledge of physical phenomena associated with stress/strain processes
- Decrease the risk for human injuries by reducing uncontrolled rock falls through significant improvements in ground control strategies
- Develop integrated monitoring and numerical modelling tools for detection and prediction of in situ stress fields and seismic activities
- Develop a general planning procedure for safe deep underground mining
- Develop and test a robotic spraying system for concrete liners with integrated thickness measuring device
- Develop a mine wide ground control and rock bolt sensing information system
- Develop a new method for predicting, monitoring and controlling subsidence
Innovative machinery for deep underground mine

RWTH, Caterpillar

Caterpillar

RWTH, Sandvik

Caterpillar, DMT

DMT, GeoData, Sandvik

Tomra
Innovative machinery for deep underground mine

- Cutting head
- Boundary layer and material detection
- Collision avoidance
- Machine guidance for precise positioning and cutting trajectory
- Integrated process optimisation on autonomous mining machinery
- Mineral sorter for an underground pre-processing of extracted material
Cutting head
Health and safety and environmental aspects in future deep mining

Develop health and safety design criteria and guidelines for new mining concepts

Studies and analyses of new production technologies will be made regarding job content, work organisation, physical risks etc.

Roadheader cutting simulator - develop and establish a trainings concept which enables a realistic training for the operators
Clean, safe and comfortable atmosphere and climate. Exhaust gases processing technology.

Green mining - list, classify and describe potential impacts that may be generated by deep mining activities on the environment as well as mitigation methods.

Develop integrated mine rescue concepts for deep mines.
Conclusions

Numerous and comprehensive challenges

International and interdisciplinary cooperation is necessary, both in the technical and socio-economical field

Need for new and modern vision based on socio-technical approach along the whole value chain

I²Mine marks the start of such cooperation

I²Mine will pave the way to sustainable deep mining in the future
For further information please visit: http://www.i2mine.eu

Thank you for your attention

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