

# Nya roller och arbetssätt i morgondagens gruva

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# From “rock sense” to intelligent mining

**An ongoing transformation from hard difficult underground work close to the rock to automation and remote control from surface.**

1980s: Automated trains, remote control underground.

2005: A high-tech remote operation centre on the 7th floor of the office building (on the mine site). A clean and pleasant work environment with a beautiful panoramic view of the city.

2013: An even more high tech remote operation centre in a new building.

**Today:** digitalization, intelligent automatic systems, smart machines, intelligent sensors, mobile IT-tools, positioning, wearable sensors, visualisation, internet of things, Industry 4.0, robots, drones ...

*... and innovation, flexibility, sustainability, responsibility, trust, commitment, a social licence to operate ...*



# New types of work environment

## **New and better work environment, more worker safety.**

- In the remote operation center.
- But also underground. Reduction of manual work, better ventilation, electric vehicles, communication, evacuation, positioning, zero entry zones, drones, mobile robots, etc.

## **But also new work environmental problems?**

- More solitary work (working together with an autonomous machine)?
- Detailed control and monitoring of the individual.
- Ethical and privacy dilemmas.
- Risk of a form of psychosocial stress that until today has not been a problem in the mining context.

## **New possibilities to recruit more women mining underground workers.**



# Mining work in a new context

## Move into a “white-collar environment”.

- Longer distance to the mining face and to maintenance workers and to other underground workers.
- Move from solitary work underground to teams of miners working together in the same room.

**Greater freedom for both the organisation and the individual to decide how and where the work is done.**



# New forms of work organisation

**A lean, effective, innovative and learning organisation – a decentralised organisation with a focus on the core processes and innovation.**

- Multi-teams, job-rotation, learning and flexibility.
- Trust, responsibility and sustainability.
- How to combine this with long geographical distances, the use of contractors and fly-in-fly-out?

**Also higher demands for gender equality and diversity (as part of the work towards sustainable and attractive workplaces).**

- More women at mine site (today 20-25%) – also as mining workers (today 16%).
- More men on parental leave.



# New professional roles, new types of work tasks

## Computerised, remote control, high-tech, abstract work tasks.

- Miners become operators – as in an ordinary process industry.
- Supervisory and coordinating tasks – similar to service/white-collar work.
- Advanced technology, intelligent and automated decision systems for global communication, information and learning.

## More interacting and remote cooperation.

- Miners are included in multi-functional teams with mining engineers, analysts, production, logistics and maintenance planners, etc.
- Distance and global / cross-border co-operation and development within the enterprise or between enterprises, globalization.



# From “grounded” skills to “sky” qualifications

## **New skills and qualification demands.**

- A transformation from the craftsmanlike qualifications – autonomy, manual skills and sensitivity to material (“rock-sense”)
- Into more abstract qualifications – new technical/theoretical knowledge necessary to handle the new advanced machines – and communication skills, holistic understanding, knowledge of the whole mining process.
- Upskilling, deskilling or reskilling?

## **New and more things are important today.**

- Both technical and social skills.

## **But still need of direct and practical competence of “reading the rock”?**

- Mainly in relation to safety.
- How to handle this on remote?



# Need for new types of mining workers

**There is a different type of persons and competences that the company will recruit in the future.**

- And a need for change of the existing staff ...?
- The proportion of unskilled labour in the companies will decrease. There will be fewer employees (but higher educated/skilled and higher paid)? Or the new

**Need for a new type of workplace culture?**

**Workplace cultures and mine worker identities are adapting to the newest technologies and organisational concepts.**

- New things are important today, as compared to yesterday.
- People working in mines are simply adapting to them.



A workplace culture lagging behind development?

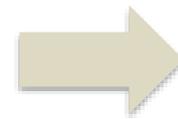
# Changes are happening, but not smooth and not without resistance ...



**The changes are challenging to the old type of mining work and mining identity.**

**The old workplace culture can (initially) be conservative and be lagging behind development.**

- Following old symbols rather than the new technology, new organisational model and/or new work tasks.
- Resistance and restoring responses, at least initially – towards new technology, new work methods and other changes.
- Somewhat paradoxical responses ...



Changes are happening, but not smooth and not without resistance ...

# A workplace culture lagging behind?

## **Encouraging nonchalant attitudes towards risks.**

- A workplace culture founded on risk-taking, competitiveness and “macho-masculinity”.
- Emphasizing the concept of a hazardous mine and the hard and tough mining work
- Higher wages and more safety

## **Glorifying “the culture heritage”, the old times.**

- The mine worker identity and culture is to a great extent constructed around the secrets of the mine, the mystery of the rock and old tales about mining.
- The Swedish mining labour union – a proud symbol for labour union fights.

## **Tendencies of a hesitant attitude towards technological development.**

- Seeing the new technology as a threat to the “uniqueness” of mining work, “real mining work is at the mining face”.
- Feminising of new technology (automation, robots)?
- Today – resistance towards wearable sensors and IT-tools that facilitate the positioning of people?

## **Active resistance towards more women at the workplace.**

- “The gender equality has gone to far”, “It is enough many women now” ...

## **Male workers avoiding anything that in some way might be related to ‘femininity’ or ‘unmanliness’.**

- “We are real miners – no women”.
- “The seventh heaven”, “Velour workers”.

## **Trying to preserve the old “macho-masculinity” rooted in the old type of mining work and identity.**

- The more different kinds of people that work in the mine the harder it becomes to maintain the old mining work.

Mining work of the future is under negotiation

## But also – windows for change

**It is not only a question of defending and restoring the old mining culture and concept of work, the old mine worker identity and macho-masculinity.**

- There are many different tendencies, resulting in conflicting emotions and behaviours.
- Despite, or perhaps because of, the contradictory nature of these emotions and behaviours they open to change and form ‘cracks’ in the traditional male workplace culture.

**Tendencies of a hesitant attitude towards technological development – but being proud of the new technology!**

**Nonchalant attitudes towards safety – but acting for safety!**

**Active resistance towards more women at the workplace – but being positive to gender equality!**

**Glorifying the old times – but striving for future!**

# The mining work of the future

**The mine work need to move on from the old “blue-collar worker roles” and take a position in a high-tech (or even white-collar worker) environment.**

- The old type of macho-behaviour and the male mine workers workplace culture is progressively becoming obsolete.
- New ways of defining mining work, qualifications, competences and of constructing identities and gender need to be found.
- The workplace culture, the mine worker identity and what “real mine work” are gradually changing.

## **But perhaps to slow?**

- The workplace culture change might need some help to develop faster – and in the right direction.



# Sociotechnical challenges for the mining work of the future

## → How to create sustainable and attractive mining workplaces?

- Changing the old “macho-culture” is one important part in creating safe and flexible workplaces – and attractive, sustainable and productive mining workplaces.

## → How to design safe and yet flexible work environment in a digital context?

- Design of both technology and work organisation that develop good work conditions and enables empowerment, collaboration, learning, innovation and development for all mining workers – and the implementation of new technology.

