

NOCODUST – REDUCTION OF RISKS ARISING FROM EXPOSURE OF WORKERS TO HIGH DUST LEVELS IN COAL MINES

1. Organisations involved

Centrum Mechanizacji Gornictwa (Mining Mechanisation Centre) KOMAG

2. Description of the case

2.1. Introduction

The problem of worker exposure to high dust levels is present in many industries, especially mining. It affects all underground workers and all coal and rock transportation systems above ground. The risk caused by dust has two elements. On one hand, the dust collects in the lungs, which causes pneumoconiosis. On the other hand, coal dust poses an explosive risk when combined with air. This action aimed to tackle both elements of the risk — to reduce lung diseases caused by dust and to eliminate risks of coal dust explosion.

The project was conducted by KOMAG Mining Mechanisation Centre. KOMAG is involved in research and development activity leading to new, competitive technologies and technical solutions in mechanical systems and environmental engineering. The project arose from close cooperation between users of dust control equipment in coal mines, manufacturers of old-type dust collecting units and designers from KOMAG. Experience gained by these three groups was shared and applied in the project.

2.2. Aims

The main aims of the project were:

- to develop new dust-collecting units to reduce the exposure of workers to high dust levels and eliminate the risks of coal dust explosion;
- to increase awareness among coal mine workers of the risks of exposure to dust;
- to provide information to staff about proper exploitation of new dust collecting units at the roadhead;
- to improve the new dust collecting units using feedback from staff who work in roadheads, supervisors in coal mines and the manufacturers of dust collecting units.

2.3. What was done, and how?

The broad aim was to increase the workers' awareness of the risks of exposure to dust. This goal was achieved in two ways: first by designing new dust collecting units, and second by conducting an information campaign in coal mines.

Figure 1.
The LDCU-630 Labyrinth Dust Collecting Unit



Figure 2.
The DRU-400 Dust Removing Unit



CASE STUDIES

The new dust collecting units were designed for maximum reliability and efficiency. All parts driven by electric engines were placed away from the flow duct. The path of polluted gases was made complex to use inertia forces instead of additional power from electric drives. Two new units were designed: the LDCU (Labyrinth Dust Collecting Unit) and DRU (Dust Removing Unit). They are proved to have a 99 % level of effectiveness. Both devices have been tested in KOMAG laboratories and certified by KOMAG for work in explosive atmospheres (underground).

At the start of the project, an information campaign was conducted in coal mines. Designers of dust collection units visited sites where these devices are installed and talked to the staff at the roadhead. Workers were able to explain to them any problems they had when using these devices. Training sessions and information meetings were also conducted at the KOMAG Centre. The new solutions were also presented at KOMAG meetings to which representatives from coal mines were invited.

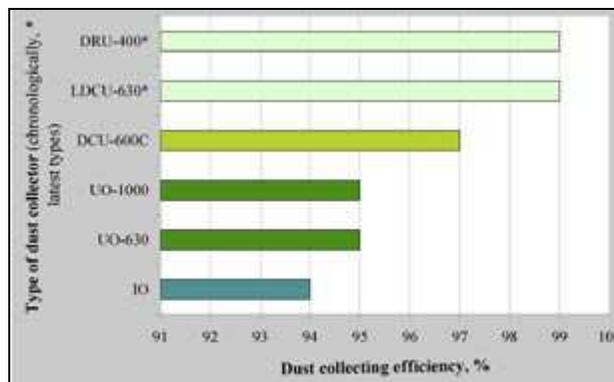
Involving mine workers, supervisors and the manufacturers of dust collecting units allowed a broad exchange of opinions and information and helped solve many practical problems. Finances for the project came from two sources: statutory funds of KOMAG and NOT (Naczelna Organizacja Techniczna — Polish Federation of Engineering Associations).

The project lasted from 2004 to 2006.

2.4. What was achieved?

The main result of the project was the development of an improved dust collecting unit for coal mines. The new units are currently being installed to replace old dust collectors and are receiving very good feedback from users. The efficiency of the new units compared with other dust collectors is shown in Table 1.

Table 1. The efficiency of the new dust collectors compared with other dust collectors



The new units are very reliable because of their simplified structure, which prevents faults and damage from occurring. Older dust collecting units were powered by electric motors. Dust collection units in coal mines use water to remove dust from the air because it neutralises the explosive properties of coal dust. However, water tended to penetrate to the motors, causing damage and breakdown. Removing the motors therefore removed one of the most common causes of faults. Another valuable result of the project was a greater awareness of the risks of dust exposure. Dust in coal mines poses two hazards: it may cause an explosion, and it can bring about lung disease. Dust collecting units help to eliminate those risks. The information campaign had two goals: to maintain a high operating efficiency of dust collecting units and to raise awareness of the influence of dust on human health. The awareness of dust's explosive properties was relatively high, while awareness of its negative effect on health was very low. The project helped both workers and supervisors to realise that the negative influence on human health does not end with coughing when the dust is inhaled but has more serious long-term effects.

CASE STUDIES

The project had no negative side effects. The only difficulty was in raising sufficient funds to start production of the new dust collecting units.

Problems faced

Lack of motivation in the main target group, especially among workers, was one of the most significant problems encountered. At the beginning of the project many of them said they believed there was nothing more to achieve in the field of dust fighting in coal mines. It was therefore very important to get across to the representatives of the project target group that levels of dust protection could in fact be improved. Therefore the project was not limited to the design of new dust collecting devices, but it also aimed to achieve higher awareness by launching a broad information campaign among relevant staff representatives at coal mines.

Another challenge was to design units that could be used in all mines. The local conditions in each coal mine are unique. Therefore it was very important to draw up a set of basic guidelines to ensure that units are usable whatever the conditions in a particular mine.

Another problem related to the failure on the part of workers operating those units to comply with technical recommendations in the operating manual. This failure meant that the units did not operate correctly. It is very important to assemble a unit in strict accordance with the manual. Any inconsistency may cause the unit to fail — the unit may expel polluted air without removing the dust, or water may leak from it. It was observed that workers who experienced those problems tended not to look for a solution (proper assembly and strict conformity to the manual) but just accepted the ‘fact’ that the unit was not working properly. The manuals for the new units therefore stressed that any observed fault must be corrected immediately.

2.5. Success factors

The main success factors of the project were:

- introduction of new dust collecting units (labyrinth dust collecting units — LDCU — and dust removing unit — DRU) that would ensure high reliability and high effectiveness. These units are now being installed in coal mines and the feedback from users is good.
- Increased awareness among mine workers of:
 - risks from exposure to dust;
 - the importance of proper assembly and operation of the new dust collecting units for safety.

The long-term results of the project will be monitored by studying the number of cases of lung disease among miners.

- The exchange of opinions and knowledge between all the parties involved in the project — designers, members of the certifying body, makers of the units, and workers and supervisors in coal mines. There is consensus that the new units are effectively reducing the risks from exposure to high levels of dust in mine roadheads.

2.6. Further information

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2.7. Transferability

The results of the project may be quite easily transferred to other industries where workers are exposed to dust. Dust collecting units designed in the project are not confined to use in coal mines. They have a simple structure and are relatively cheap, so they should have widespread application in many workplaces with high levels of dust.

3. References, resources:

- <http://osha.europa.eu/en/publications/reports/TEWE09001ENC>