



An overview of coal mining in Poland

by A.J.S Spearing*

Synopsis

This overview serves as an introduction to the succeeding paper in this issue, that entitled 'The design of backfill as a support for Polish coal mines' by Professor J. Palarski. As such, it briefly describes the coal-mining methods, production, and mining education in Poland.

It ends with a brief account of Professor Palarski's qualifications and experience in the fields of backfilling and hydrotransport.

Bibliography

- ANON. Coal news. *Mining Magazine*, Jul. 1994.
- PALARSKI, J. The experimental and practical results of applying backfill. *Innovations in mining backfill technology*. Hassani *et al.* (eds.). Rotterdam, Balkema, 1989.
- PALARSKI, J. Assessment of backfill materials and roof strata behaviour in deep coal mining. International Deep Mining Conference & Technical Challenges in Deep Mining, Johannesburg, South African Institute of Mining and Metallurgy, 1990.

* *Gold and Uranium Division, Anglo American Corporation of South Africa, Limited, P.O. Box 61587, Marshalltown, 2107 Transvaal.*

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Introduction

Poland is a major international coal producer and mined approximately 200 Mt of bituminous coal in 1989. This makes Poland the fourth-largest producer after the USA, China, and Russia. There are approximately 68 coal mines in Poland, some of which have reduced production or closed owing to the recent economic thrust into the free-market system. The principal mining method is longwalling, and three main systems are currently in operation:

- longwall mining with caving (goafing)
- longwall mining with hydraulic fill
- longwall mining with pneumatic fill.

Coals seams in Poland have typical thicknesses of 1,8 to 20,0 m, with dips from 5 degrees to near vertical. Pneumatic stowing was introduced in the 1920's, but over recent years there has been a planned shift towards hydraulically placed fill mainly because of cost considerations.

A breakdown of longwall mining in Poland (in 1989) is given in Table I. Production has now dropped to about 125 Mt of bituminous coal annually as a result of the re-organization of the industry in recent years.

The Polish Coal-mining Industry

Figure 1 shows the major coal-producing regions in Poland (bituminous and brown coal). It can be seen that the bituminous coal deposits are found in three major basins:

- Upper Silesian Basin
- Lower Silesian Basin
- Lublin Basin.

The Upper Silesian Basin is the most important in terms of output and reserves. The Basin typically consists of numerous near-parallel coal seams, and extensive coal mining has occurred, typically starting nearest to the surface and progressing deeper.

The Polish coal-mining industry is extensively mechanized and has made important contributions to mining particularly in the areas of

- backfilling
- mine seismology
- control of surface subsidence.

It is worth noting that the city of Katowice (population of about 400 000) has subsided by 6 to 12 m over the past 50 years owing to subsidence caused by mining. The city is heavily industrialized, and has numerous steelworks and power stations that have continued unhindered during the subsidence—a tribute to Polish mining expertise.

The coal deposits currently mined are at depths down to 1500 m below surface, and the main reasons for backfilling are to

- minimize surface subsidence
- reduce the hazard of spontaneous combustion
- dump waste material underground
- maximize extraction, particularly in wide coal seams that are mined in successive slices, as shown in Figure 2.

The filling method is shown in Figures 3 and 4, and changes as the dip of the coal seam increases.

Table I

Longwall mining in Poland

Fill type	Annual coal production Mt	No. of working faces	Fill types used	Annual fill placement x 10 ⁶ m ³
Hydraulic fill	33	270	Sand Waste Fly ash	25,0 3,5 1,0
Pneumatic fill	3	53	Slurry tailings Waste	1,1 2,5
Caving	156	559	-	-
Total	192	882	-	33,1

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Figure 1—Coal-mining regions in Poland

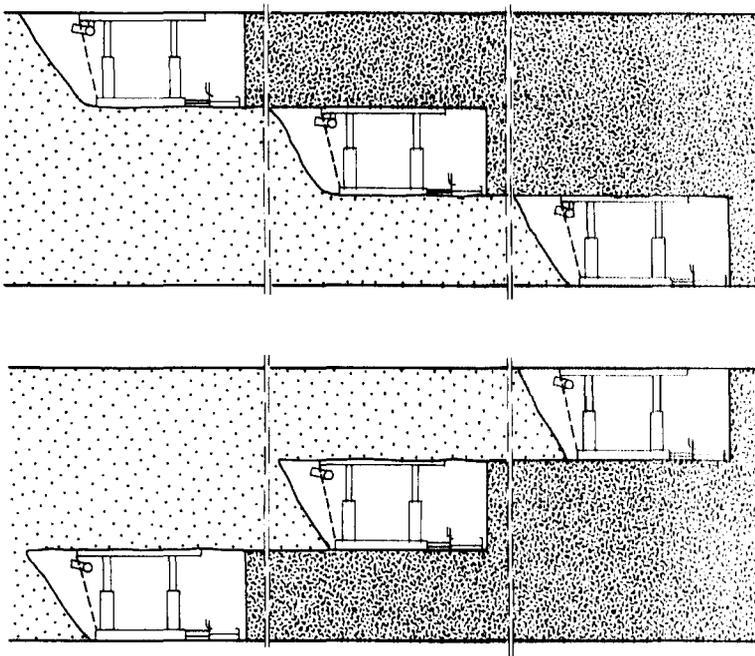


Figure 2—Longwall mining in thick coal seams

It is interesting to note that backfill cannot be legally placed where seismicity is expected, mainly because the cave seems to reduce the stresses acting on the longwall faces.

Endogenic underground fires (spontaneous combustion) in Polish coal mines used to be relatively frequent, accounting for over 75 per cent of all fires in the coal-mining industry. The following methods have been adopted to control this:

- ▶ total seam extraction
 - driving of gates without leaving pillars
 - application of extensive backfill
 - selection of fill material to avoid the use of flammable shales or waste coal, particularly when pneumatic stowing is used
- ▶ reduction of rock stresses and the avoidance of mining in underlying seams
 - minimization of non-production working on the seam itself
 - avoidance of working two parallel seams in close proximity at the same time
- ▶ maintenance of rapid extraction
 - installation of adequate seals
 - compaction of the goaf with fill.

Safety is important in Polish coal mines, and the results have been creditable. In 1983 there were 100 fatalities, and this was reduced to 52 in 1992. When normalized against coal production, the fatality rate was approximately equal to that in Germany (in 1992).

Productivity is still rising and currently stands at about 2,3 t per man shift. However, mines are still being closed or scaled down, because of the new free-market approach in Poland, as a result of poor profitability.

Polish Tertiary Education System for Mining

Poland produces not only coal but also the following minerals based on 1992 figures:

- ▶ 24 Mt of copper ore (yielding 287 kt of copper)
- ▶ 5 Mt of lead-zinc ore (yielding 76 kt of lead and 187 kt of zinc)
- ▶ 900 t of silver
- ▶ 5 Mt of sulphur
- ▶ 240 Mt of construction materials (aggregate and sand mainly).

Poland has two main mining engineering departments at

- ▶ the Technical University of Silesia (in Gliwice)
- ▶ the Academy of Mining and Metallurgy (in Krakow).

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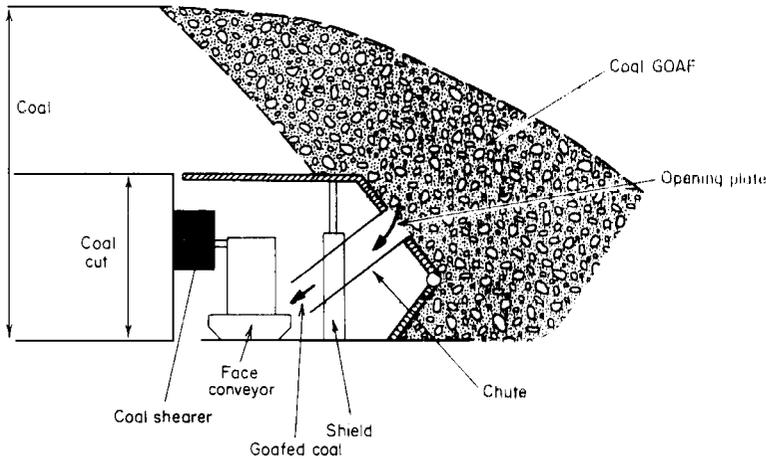


Figure 3—High-seam longwall extraction in shallow-dipping coal

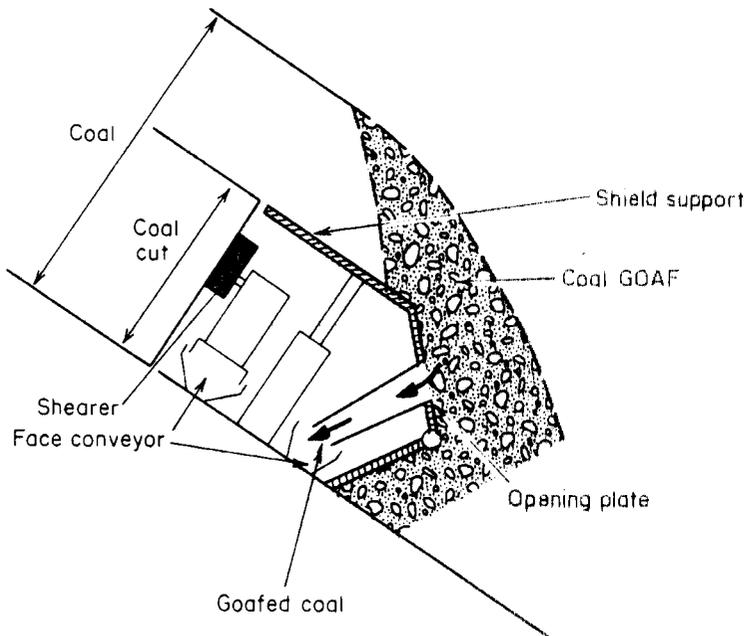


Figure 4—High-seam longwall extraction in steeply dipping coal

- safety in mines
- pollution monitoring and protection
- waste management
- geophysics
- industrial medicine
- social problems.

The GIG employs about 1000 people (500 specialists and scientists), and covers 80 per cent of its running costs by contract research.

The Design of Backfill as a Support for Polish Coal Mines

The paper that follows is by Professor J. Palarski, who is a world-recognized authority in the field of backfilling and hydrotransport. He completed his doctorate in 1973 at the Technical University of Silesia, and was appointed a full professor in 1987. In addition to this, he is a visiting professor at the Technical University of Aachen (Germany), a post that he has held since 1978.

Professor Palarski is associated with numerous committees and organizations, including being the President of the International Society of Mining Professors (in London), and serving as a member of the International Steering Committee in Mining with Backfill. He is the author of a Polish book on hydrotransport, and has published over 70 papers in refereed journals and at conferences.

The Gold and Uranium Division of Anglo American Corporation has employed Professor Palarski on three separate occasions to assist with backfilling in South African mines.

English is his fourth language (after Polish, Russian, and German) and, although his English style may not always be idiomatic, the technical content of the paper is good. ♦

SPEARING, A.J.S. Backfill visit report from Germany and Poland. Johannesburg, Anglo American Corporation, internal report, Oct. 1989.

SPEARING, A.J.S. Visit report to Poland. Johannesburg, Anglo American Corporation, internal report, Apr. 1993.

WOJNO, L. Personal communication, Jul. 1994.

These universities offer internationally recognized degrees.

In addition, the Central Mining Institute (GIG) in Katowice has the authority to issue technical doctorates. This Institute is unique in that it not only conducts research but also operates an experimental mine—Barbara Coal Mine—where practical testwork can be undertaken (since 1926). Other fields of research undertaken at the Institute include