



HAZARDS IN POLISH MINING INDUSTRY

TYPES OF NATURAL HAZARDS OCCURING IN POLISH MINING



UNDERGROUND MINING

- rock burst hazard,
- fire hazard,
- roof fall hazard,
- methane hazard,
- coal-dust explosion hazard,
- outburst of gas and rocks hazards,
- water hazard,
- climatic hazard.

SURFACE MINING

- water hazard,
- landslide and rock fall hazard,
- seismic hazard.

BOREHOLE MINING

- blowout hazard,
- hydrogen sulphide hazard.

TECHNICAL HAZARDS



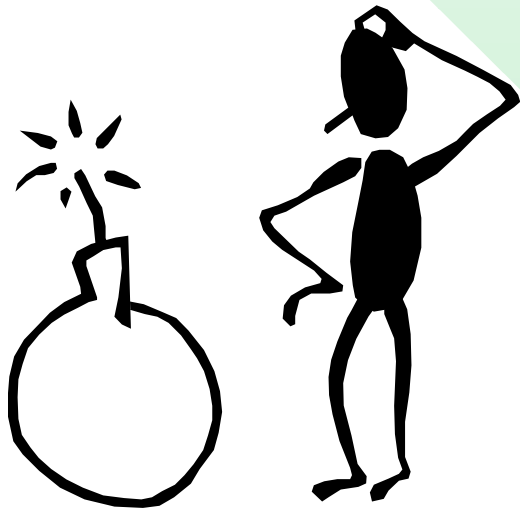
- ✓ occur in every mine,
- ✓ result from the use of machines and equipment and include:

- mechanical hazards,
- electrical hazards,
- thermal hazards,
- noise hazards,
- mechanical vibration hazards,
- radiation hazards.



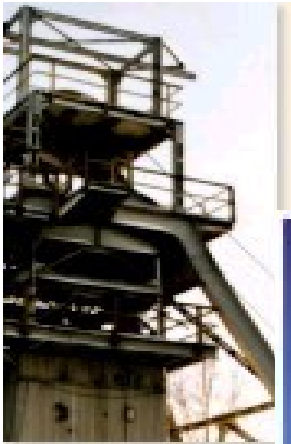


HAZARDS ASSOCIATED WITH THE USE OF EXPLOSIVES





HAZARDS IN UNDERGROUND HARD COAL AND COPPER ORE MINING



FACTORS THAT HAVE IMPACT ON WORK SAFETY AND ACCIDENTS RATE IN **HARD COAL MINES**:



- ✓ employment: ca. **123 000** workers in **33** mines, output: **100 M. t**;
- ✓ location of the mines within one region of Upper Silesia;
- ✓ long period of exploitation - 100 years or more;
- ✓ bedded deposits;
- ✓ natural hazards and tectonic deformations;
- ✓ mining operations carried out at increasingly large depth;
- ✓ use of “sublevel” model of deposit opening.

FACTORS THAT HAVE IMPACT ON WORK SAFETY AND ACCIDENTS RATE IN **COPPER ORE MINES:**



- ✓ employment: ca. **11 500** workers in **3** mines, output: **32 M. t**;
- ✓ exploitation of deposit 1 - 17 m thick at a depth of ca. 600 to ca. 1200 m;
- ✓ high rock burst and roof caving hazard;
- ✓ climatic hazard.

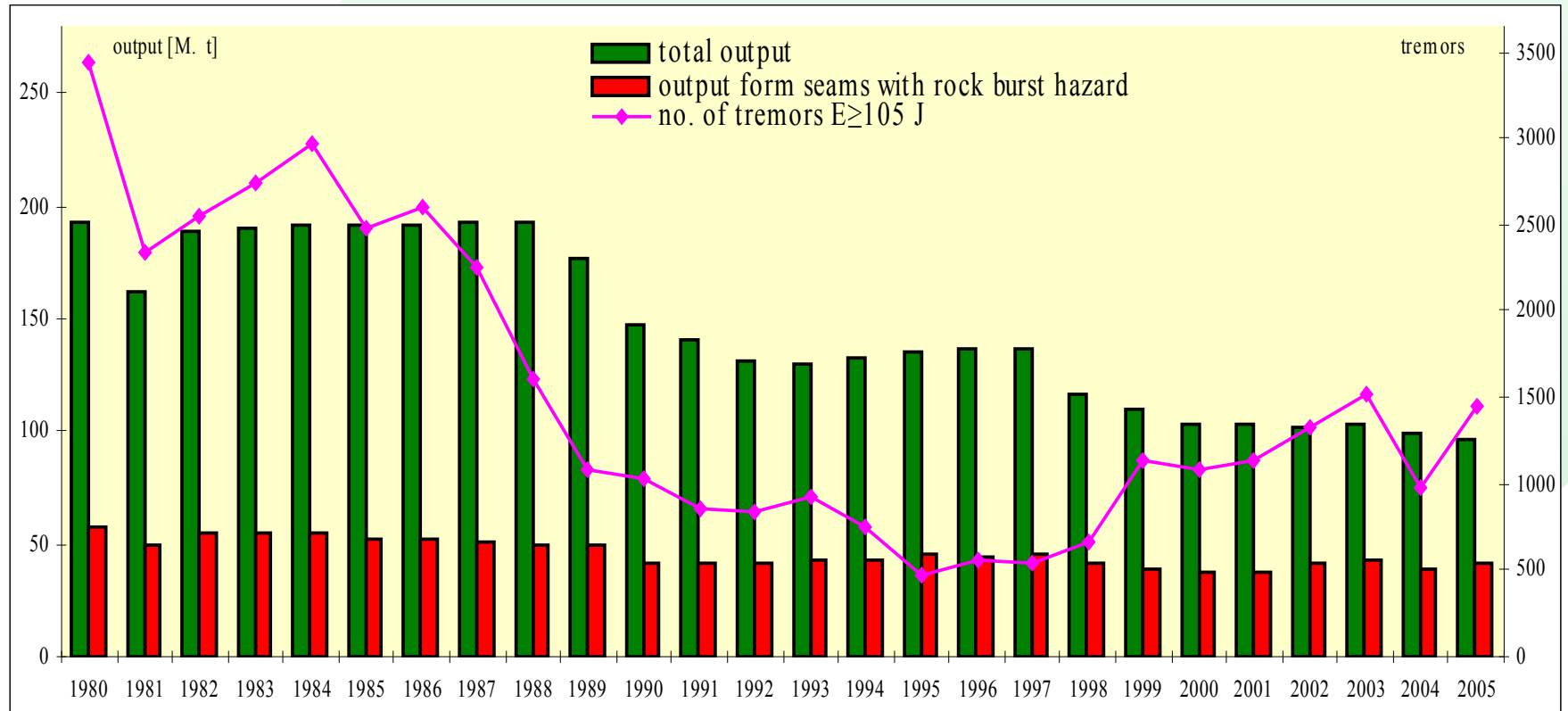
ROCK BURST HAZARD

Output, tremors of high energy, rock bursts and accidents in hard coal mining plants



YEAR	OUTPUT (M T)	OUTPUT FROM SEAMS LIABLE TO ROCK BURSTS %	TREMORS $E \geq 1 \times 10^5 \text{ J}$ $\Sigma E \text{ [GJ]}$	NUMBER OF ROCK BURSTS	FATAL ACCIDENTS AS A RESULT OF ROCK BURSTS
1985	191,1	27,1	14,04	16	9
1986	191,3	27,0	9,66	27	22
1987	192,7	26,4	6,33	11	7
1988	192,7	25,7	2,05	13	3
1989	177,7	27,9	2,44	16	7
1990	147,4	28,6	2,09	16	6
1991	140,1	29,9	1,25	9	7
1992	131,3	31,8	6,00	10	9
1993	130,2	32,7	12,60	16	11
1994	132,7	32,4	1,49	12	4
1995	135,3	33,6	1,94	7	7
1996	136,2	32,5	1,07	2	3
1997	137,1	37,7	0,87	2	-
1998	115,9	36,2	0,68	5	2
1999	110,4	35,7	1,59	2	-
2000	102,5	36,3	2,12	2	-
2001	102,6	36,5	1,85	4	2
2002	102,1	40,9	1,96	4	3
2003	100,5	42,1	2,82	4	2
2004	99,5	39,4	1,30	3	-
2005	97,1	42,9		3	1

TREMORS OF HIGH ENERGY AND OUTPUT IN HARD COAL MINING PLANTS

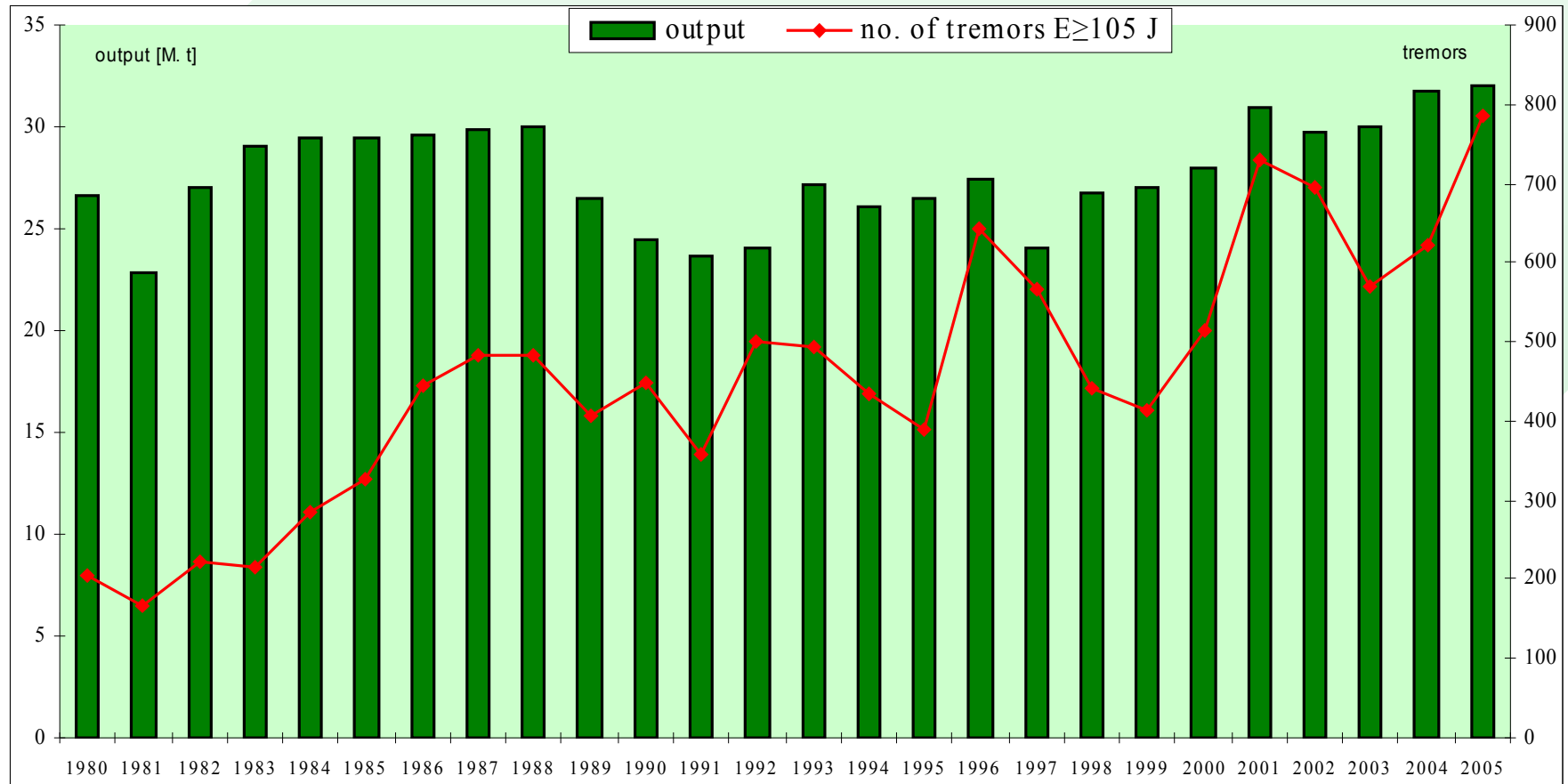


OUTPUT, ROCK BURSTS AND ACCIDENTS IN COPPER ORE PLANTS



YEAR	OUTPUT (M T)	NUMBER OF ROCK BURSTS	FATAL ACCIDENTS AS A RESULT OF ROCK BURSTS
1985	29,4	2	1
1986	29,6	4	-
1987	29,8	5	7
1988	30,0	1	1
1989	26,5	4	3
1990	24,4	2	2
1991	23,7	2	2
1992	24,1	-	-
1993	27,1	4	1
1994	26,1	2	5
1995	26,5	4	2
1996	27,4	4	3
1997	24,0	-	-
1998	26,8	2	3
1999	27,0	3	2
2000	28,0	4	2
2001	30,9	5	-
2002	29,7	8	3
2003	30,0	9	5
2004	31,8	8	1
2005	32,0	3	1

TREMORS OF HIGH ENERGY AND OUTPUT IN COPPER ORE PLANTS



BASIC WAYS OF FIGHTING ROCK BURST HAZARDS:



- proper mining operations project (order of extraction of seams and longwalls in seams, direction of face driving),
- monitoring and hazard assessment (seismic and seismic-acoustic surveillance, geophysical tests),
- selection of prevention methods (with application of blasting operations, water infusion into seams, spraying of support).

CAVING HAZARD



HARD COAL PLANTS - longwall methods

This hazard occurs most frequently in dog headings:

- on crossings with longwalls,
- in places where the workings were closed; during withdrawing of standing support

COPPER ORE MINES - chamber and long pillar mining

This hazard is connected with deterioration of mining and geological conditions.

PREVENTIVE MEASURES:

- good design of support,
- good carrying out operations according to requirements.

FIRE HAZARD



From 1995 to 2004 there were:

- **80 fires**, of which **62** in hard coal plants and **18** in copper ore mines (mainly machine fires)
- **44 fires** resulting from spontaneous ignition of coal, of which **30** in longwalls and **14** in dog headings.

Preventive measures:

- » more frequent application of precise firedamp determination method (C_2H_4 , C_3H_6 , C_2H_2 , H) for the assessment of the temperature and mass of heated coal,
- » setting of an optimal face advance and the maximal time of its liquidation,
- » setting of a detailed scope of prevention works (sealing of gobs, inertisation of air in gobs etc.).

METHANE HAZARD



- ➔ Methane release has been detected in the most existing hard coal mines.
- ➔ **Ca. 60%** of total coal output is extracted from methane bearing seams.
- ➔ Cases of methane ignition in recent years were caused by:
 - endogenous fire in gobs,
 - working by cutter machine rocks prone to sparking,
 - starting fire by workers.

COAL-DUST EXPLOSION HAZARD



- is faced in all hard coal mines;
- last accident related to this hazard occurred in 2002 and was caused by improper blasting; it resulted in 10 fatal and 2 serious accidents;
- in the past such incidents were infrequent, they happened mainly due to breach of regulations.