

## USING OF THE SCIENCE AND TECHNOLOGY DEVELOPMENT FOR THE WINDING SHAFT IN UNDERGROUND MINES IN CZECH REPUBLIC

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**ABSTRACT:** Underground mining of minerals and the consecutive vertical transport are on high level in Czech republic. The up-to-date pieces of knowledge of the science and research for technical innovations including the operation use are utilized.

### ПРИЛОЖЕНИЕ НА НАУЧНО И ТЕХНОЛОГИЧНО РАЗВИТИЕ ПРИ ИЗВОЗНИ ШАХТИ НА ПОДЗЕМНИ МИННИ ИЗРАБОТКИ В ЧЕШКАТА РЕПУБЛИКА

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**РЕЗЮМЕ:** Подземният добив на полезни изкопаеми и последващо вертикално транспортиране са на високо равнище в Република Чехия. Използвани са успешно съвременни научно-изследователски познания и техническите нововъведения в практиката.

### Introduction

The main mining equipments in the Czech republic deliver the raw materials (coal, uranium) from the depth of 800 (OKD, a.s.) till 1400 m (Uran, s.p.). It is realised by the hoisting machines of the producer ŠKODA

Plzeň (until 1965), subsequently ČKD Praha (till 1998) and now INCO Engineering. It is described as the mining equipment of the double drum type 2B6018, 2B6121 or the Koepe disc type (1K7008, 4K4016, or 4K5016) – see Table 1.1 and 1.2.

### Parameters:

Table 1.1 and 1.2

Mine	Locality	Ø of pit [m]	hoisting equipment	mining depth [m]	hoisting machine	drive	power [kW]	parameters of extraction		Ø of rope	
								Q [t]	v [m/s]	mining [mm]	balance [mm]
PASKOV	STARČ	neutral St.I 7,5	KP	558	4K2010	A	250	3,8	5,5	4x22,4	2x155x27
		neutral St.I 7,5	KK	710	2B6121	T	3500	10	16	63	
		ventilation St.II 7,5	SS	634	4K4016	W-L	2x1800	21	14	4x40	2x155x27
		neutral St.II 7,5	KK	755	2B6021	W-L	3600	11,25	16	56	
		neutral St.II 7,5	KK	920	2B6121	T	3000	11,25	16	60	
		neutral St.III 7,5	KK	744	2B6021	W-L	3600	7,5	16	56	
ČSM	SEVER	neutral Sever	KK	903	2B6118	W-L	2000	7,5	14	56	-
		neutral Sever	KK	1079	2B6021	W-L	2800	7,5	14	56	-
		Ventilation Sever 7,5	SS	955	4K4016	W-L	2x1800	20,0	14	4x40	2x45
		Ventilation Sever 7,5	SS	955	4K4016	W-L	2x1800	20,0	14	4x40	3x45
		Ventilation Sever 7,5	HDZ	903	1B1200	A	100	-	2	16	
		neutral Jih 7,5	KK	954	2B3116	W-L	2000	7,5	14	56	
JH	Jih 7,5	neutral Jih 7,5	KK	908	2K3212	W-L	1100	7,5	10	2x37,5	2x37,5
		ventilation Jih 7,5	HDZ	908	1B1200	A	90	-	2	16	

Footnotes:

Mining equipment according to transportation vessels: K-K cage – cage; K-P cage – counterweight; S-S skip – skip; S-P skip – counterweight; S-K skip – cage; K cage; HDZ emergency transport equipment; Drive: W-L Ward – Leonard; A – asynchronous; T- tyristor type of mining machine: 1B – one drum; 2B – double drum; 1K – one rope Koepe; 4K – four ropes Koepe. Parameters of mining: v – mining rate; Q – usable load of mining; H – mining depth of pit; Ø – diameter of pit

Table 1.2

Mine	Locality	Ø of pit [m]	hoisting equipmen t	těžní hloubka [m]	hoisting machine	drive	power [kW]	parameters of extraction		Ø of rope	
								Q [t]	v [m/s]	mining [mm]	balance [mm]
LAZY	STARČIČ	neutral č.2 6,2	KK	822	1K6008	W-L	2470	7,2	10	56	2x37,5
			KK	822	2B6020	W-L	2800	6,0	16	50	
		neutral č.5 5,5	KK	641	2B4016	A	1000	4,0	10	37,5	
			SS	658	4K5016	T	3750	23,0	18	4x45	3x53
		ventilation č.6 7,5	SP	658	4K5016	T	3300	23,0	18	4x45	3x47,5
			HDZ	642	1B1200	A	100	-	2	17	
	DUKLA	neutral č.2 7,5	KK	730	1K7009	W-L	3300	11,25	12	60	2x45
			KK	950	2B6017	W-L	3300	7,5	12	50	
		ventilation č.1 5,25	KK	950	1B2014	A	140	2,2	2	20,5	
		ventilation č.3 5,25	SS	729	4K5019	T	3300	25,0	12,4	4x50	3x53
HDZ	729		1B2014	T	295	-	3	20			
DARKOV	DARKOV	ventilation Mir4 7,5	SS	801	4K5016	T	2x3750	30,0	14	4x53	3x158x29
			SS	801	4K5016	T	2x3750	35,0	14	4x53	3x158x29
			HDZ	992	1B2014	T	295	-	3	17	
		neutra Mir5 7,5	KK	887	2B6124	T	3800	11,25	16	67	
			KK	887	2B6124	T	3800	11,25	16	67	
		neutr. Darkov 1 7,5	KK	878	2B6118	T	1330	3,75	10	50	
		neztr. Darkov 2 7,5	KK	738	1B1200	A	90	-	2	18	
		ventilation č.1 4,5	SS	563	2B6018	W-L	1400	10,5	10	50	144x26
	neutral č.2 5,5	KK	756		W-L	1400	5,9	12	50		
	ventilation č.3 4,5	KP	395	1K2000	A	160	-	3	26,5	70x17	

3.2 The dynamics of the subsystem is also applied by the science and research at the department of parts of machines of the Engineering Fakulty - see Fig. 1.

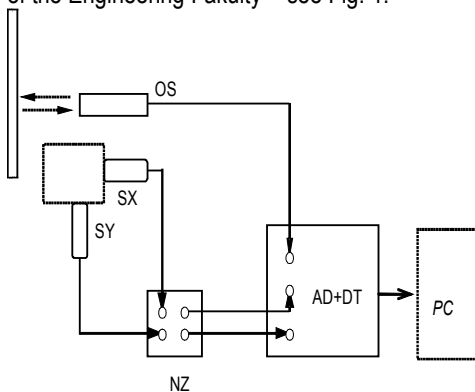


Fig.1  
 OS – optical device  
 SX – accelerometer in axis X  
 SY – accelerometer in axis Y  
 NZ – Feeding source of sensors and amplifiers  
 AD – analog – digital transducer  
 DT – data registration  
 PC – computer

The complex analysis of the subsystem is then the output which should meet the parameters in the Table 2.

Measurements are carried out separately with the empty transport vessels and with the highest allowed load, in both directions of transport. At the measuring procedure should the other equipment in the pit be stopped. Apart of accelerometer measurements the registration of the movement of transport vessel in the pit should be done with the accuracy at least  $\pm 0.5$  m. The result of experiments should be grafically evaluated separately for the frontal and side measurements with the presentation of localities with no satisfactory state. At the evaluation of the state we start from the position of the least positive result.

Table 2 – Accelerography measurements on transport vessels

- a) Measurements of horizontal acceleration in the front and side directions are carried out at the most allowed highest speed at the right way and at the mining procedure , as the speed is higher than 8 m/s.
- b) The values of horizontal acceleration for the evaluation of the state of directionality of the guiding of transport vessels:

Table 2

Value of front acceleration m/s	Value of side acceleration m/s	Evaluation of the state	Regulations
up to 3	up to 5	very good	not necessary
from 3 till 5	from 5 till 8	good	not necessary
from 5 till 8	from 8 till 10	not satisfactory	speed reduct.
Higher than 8	higher than 10	not acceptable	stop operation

## Conclusion

At the VSB – Technical University of Ostrava have been elaborated several outputs of science and research for the main mining equipments in the Czech Republic.

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