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THE DYNAMICS OF VESSELS OF VERTICAL TRANSPORT OF UNDERGROUND MINES

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ABSTRACT. For vertical transport in underground mines in The Czech Republic there are stiff mining regulations. These regulations, inter alia, determine limiting margins of safe operation in term of dynamics of a transport vessel subsystem – the pit equipment.

ДИНАМИКА НА СЪДОВЕТЕ ПРИ ВЕРТИКАЛЕН ТРАНСПОРТ В ПОДЗЕМНИТЕ РУДНИЦИ

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РЕЗЮМЕ. Съществуват твърди законови правила по отношение на вертикалния транспорт в подземните рудници в Република Чехия. Тези правила определят ограничения, гарантиращи безопасната работа на транспортната подсистема, съставена от оборудване в рудниците.

1.Introduction

Former mining regulation about ride on the rope NOJ No 5001/1945 set only recommendation for vertical transport. It was necessary to respect the recommendation at operation of a winding cage while people were transported and at raw material and mineral transportation (mining). In dependence on comments from operators and supervisor of state mining executive the NOJ was supplemented. Later on, the mining regulation 1/1949 set down rules for transport and mining in consideration of implementation of skips and containers.

2.Parameters of the 4K4016

A sharp expansion of this transport equipment began after transfer of production from ŠKODA Plzeň to ČKD PRAHA in 1965. Formerly used winding engines with asynchronous drive (to 1MW) were replaced by DC drive with a control unit WardLeo (outputs to 2x1.75MW). A development of DC drive with thyristors (to 2x3.85 MW) followed.

2.1 The development of transport vessels and equipment

a) winding cages - 4 decks (72 person)
- 6 wagons of coal by 1500 kg
- 4 wagons of aggregate by 2000 kg
- driving speed 10 ms^{-1}
- winding speed 16 ms^{-1}

b) skips
- payload 16-20 t
- winding speed 16 – 18 ms^{-1}

3.OKD Directive No 40 + CBU (Czech Mining Office Board) Decree in Prague No 12/1982

These regulations in Article 58 determine conditions for dynamics of vessels at fixed line for speed $v \geq 10ms^{-1}$. Measurement of horizontal acceleration at x axis (abreast to a guide) and at y axis (abeam to a guide) is ordered as optimal and fastest. Values of results are mentioned in table 1.

4.Subsequent development

The innovation of transport vessels is under way. It includes winding cages, containers and skips and thereby dead weights are decreasing at expense of a payload. Concretely skips carry the payload from 28 to 35t by speed between 14-16 ms^{-1}. New mining regulation - see No 415/2003Sb.

Conclusion: In Czech deep mines there are carried out comprehensive audits of mining equipment every 2 years. The protocol about dynamics of subsystem is one of the essential documents. For information, there is mined from depth between 960m to 1121m at OKD, a.s. and in uranium mines from depth 1200m.

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