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EAST EUROPE

TRANSLATIONS ON EASTERN EUROPE

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 7/79)

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CZECHOSLOVAKIA

MECHANIZED MOBILE COAL MINE SUPPORT SYSTEMS DISCUSSED

Prague TECHNICKY TYDENNIK in Czech 6 Feb 79 p 6

[Article by Eng Jan Ostrihon: "Modern Mining Technology"]

[Text] Deep mining of black coal is important primarily because it fully covers the domestic consumption of coking coal and its export. Its further development is limited because of mining difficulties encountered due to worsening geological conditions especially at depths of about 1,000 meters, saddle seam strata in the OKR (Ostrava-Karvina Coal Basin) and the necessity to exploit to the fullest coal deposits in narrow seams 0.4 to 1 meter thick which represent approximately a third of our coal deposits. Therefore, the required mining volume can be fulfilled only by introducing advanced deep coal mining techniques and technologies and by meeting the planned labor productivity increase.

Spurred by the international scientific-technical cooperation of CEMA countries, innovation of mechanized mining began as early as the end of the sixties by the introduction of the more efficient types of Soviet KS 1 KG mining combines and of mechanical supports, primarily of the shield system. In the beginning of the seventies CEMA member states adopted a uniform scientific-technical policy in introducing advanced mining techniques for deep coal mining which took into account special characteristics of each country. The addition of this technical policy was due primarily to the development of mechanized support systems permitting the concentration of mining in one stope.

The Main Chain Link

The Czech coal mining engineering industry, represented by the concern enterprise Ostroj Opava, also contributed importantly to the development of the mining systems primarily with the successful types of DVP 6 and DVP 7 mechanized mobile supports of the second generation, the TH 500 and TH 600 scraper conveyors, KSV 6 and KSV 101 mining combines for narrow seams and belt conveyors of the TP 400 C and TP 630 A series.

Since 1967, when large-scale production of individual SHZ-type hydraulic props began at Ostroj (annual volume about 50,000 pieces) and mobile supports began to be introduced, a qualitatively new stage of mechanized deep coal mining was reached. In the beginning of the Sixth Five-Year Plan the volume of mining from faces worked with mobile supports already amounted to half the overall volume with daily quantities of mined coal amounting to 482 tons from one stope and to 10.6 tons of coal per shift. The rest of the face was then equipped with individual hydraulic props, predominantly of domestic production. These stopes yielded more than a third of the coal mined with an output of 7.3 tons per shift and an average daily output of 372 tons per stope. Mobile supports reduced the amount of labor required, improved the efficiency of mining and coal transport equipment and in addition markedly improved the safety and hygienic conditions in the mines.

Mobile supports became the principal link in the process of comprehensive mechanization of mine shafts; their introduction was rather complicated. In the beginning of the sixties the first generation DVP 14 and DVP 2 test support series, designed for medium thick seams, were produced in our country, five DVP 3 mining support systems for narrow seams and DVP 5 supports designed for the exacting conditions of mining mighty coal seams. Compared to imports of mobile supports from the USSR, the FRG and Austria, the Czechoslovak first generation supports were not widely used, due primarily to poor production preparation for this qualitative advance in mechanizing work in coal mining shafts. However, the high costs of imports in foreign currency (the cost of a system per stope was at least Kcs 50 million) induced users and producers to change radically not only the development but mainly the production of mobile supports.

Second and Third Generation Mobile Supports

In the beginning of the seventies the management of the Ostroj enterprise created conditions for the production of mobile supports of the second generation; new advanced technological production procedures were introduced such as dynamic roller and ball burnishings, electrovibration welding of stainless materials and bronzes, welding with preheating in a protective atmosphere, etc. At the same time production was solidly based on the use of standardized hydraulic elements, specifically of switches, safety valves and spigots, and the basic sizes of hydraulic props and cylinders were chosen so as to permit using standard pipe semiproducts and seals for the widest possible production assortment. No less important was also the introduction of new intensive testing methods of mobile supports directly under production conditions.

At the present time 35 stopes in our deep mines are equipped with DVP 6 and DVP 7 supports which, among all types of supports used in deep mines in all CEMA countries, were highly rated. They proved advantageous in operation primarily because of their height, adequate working space for manipulation, long useful life, high reliability in operation and the requirement of only half the number of shifts for transportation and installation compared to other support types.

Since 1976, developmental work in the field of mobile supports focused mainly on saddle seam stopes of variable thickness, irregular bedding and heavy ceilings. To test mining technology, a mobile prop assembly had to be imported in the first stage. Simultaneously, intensive development of domestic mobile prop types is being pursued, especially of type DVP 8 A which can still be classified as a second generation prop, together with the development of the third generation DVP 9 mobile support for mining seams up to 4.5 meters thick.

Other third generation supports are type DVP 10 for mining medium thick flat seams and type DVP 11 for narrow flat seams. These supports will already use improved hydraulic cycle elements which will simplify and accelerate their control. But their main advantage will be their versatility for use in stopes with both a stowing area and a squeeze and for working seams from 0.6 to 5 meters thick. The support types under development will be tested from 1979 till 1982 in compliance with the state plan for technical development.

A Starting Point of Cooperation

However, the comprehensive mechanization of mining thin seams still causes serious problems. As in the case of saddle seams, one mining assembly was imported in 1977 to test the new technology. But the prospective requirement of supports will be covered by the DVP 11 type with the 3 MKS mobile support which is being developed by Czechoslovak-Soviet cooperation as part of the KTSC plow system. This system was tested in the Yubileynaya mine in a seam of average thickness of 0.78 meters where in 1977 the average daily output was 1,019 tons. Further tests will be carried out at the Staric Mine in the OKR. Individual SHT 70/30 hydraulic bitelescopic props developed at Ostroj will have to be used until the start of large-scale production of the above assemblies. In a stope of the Ostrava mine equipped with these props, the collective of Hero of Socialist Work Lumir Sakmar achieved a record output in mining a 51-cm-thick, 125-meter-long seam of coal. In 31 work days, 11,328 tons of coal were mined with an average output of 6.5 tons per shift [as published].

The problem of comprehensive mechanization of medium thick flat seams was practically solved by the introduction of domestic mobile supports, stope conveyors, combines and stowing machines produced at Ostroj or by the innovation of this equipment which is in preparation in that enterprise. The partial shortfall of efficient domestic combines will be covered by imports from the Soviet Union (types KS1KG; K52; 1GS68) and from the Polish People's Republic (types KWB3RDU and RDS).

Hitherto unresolved remains the conversion to 1000 V in the stope required by the higher electromotor output of the mining equipment. The currently used 500 V limits the installed electromotor output to 100 to 120 kW. By using voltage of 1000 V this limit increases to 250 to 300 kW. The problem is also being tackled at Ostroj in cooperation with

Polish manufacturers and Czechoslovak producers of electrical equipment. Belt conveyor production is also expected to be modernized. Outmoded types of belt conveyors are expected to be replaced by new ones which have a long useful life, are more reliable, and have a 2 x 30 or 2 x 55 kW electromotor output. A new series with belt widths of 800, 1,000 and 1,200 millimeters and 2 x 75 or 3 x 75 kW electromotor output is under development.

The above trends in the introduction of advanced mining machinery, together with other organizational measures increasing worker initiative exhibited by the movement of socialist work brigades and brigades of comprehensive rationalization, will help meet the more exacting demands in supplying the national economy with coal in compliance with the tasks assigned by the 15th CPCZ Congress.

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CZECHOSLOVAKIA

MECHANIZED PLANT TRANSPORT, INDUSTRIAL ROBOTS DISCUSSED

Prague TECHNICKY TYDENNIK in Czech 20 Feb 79 p 6

[Article by Eng Ivo Bernard, Research Institute of Machine-Building Technology and Economics, Prague: "Automating Handling Between Operations"]

[Text] Not long ago, primary attention in machine building was directed toward the production processes themselves. It was only in large-series and mass production that transportation between operations was arranged. In one-off, small-series and medium-series production, which account for the bulk of machine building, it was manual handling between operations, with only the most minor mechanization equipment, which prevailed and for the most part still prevails, not only here but abroad.

In many cases, the automation of individual workplaces has now been rather successfully implemented. The current concern is design and implementation of higher forms, particularly the organization of integrated structures which will lead to the creation of whole integrated transport and handling systems. These efforts have led to the development of many systems, most important among which are:

--combined supply and transport systems; and

--industrial robots.

These two types of systems are quite distinct in design, application and operating principles. A common feature is their use of computers to control work cycles, with considerable flexibility and rapid adaptability of equipment for a rather broad range of elements in one or several types of industrial groups.

Combined Supply and Transportation Systems

These have many variants in practice. Their basic features are:

--the supply system makes available a predetermined supply of prepared workpieces and products for further processing (machining, assembly and so on);

--the transport system provides connection between the production system, the supply section and a higher-level transport system (intrafacility transport and the like);

--an interconnecting system makes possible interchange of workpieces between the transport and supply systems and between the supply department and individual workplaces;

--organization of individual workplaces within the scope of a transport system;

--transportation and storage of workpieces in units of one or, exceptionally, two interrelated sizes or independently by the use of special or universal hangers, by a suitable transport line and so on;

--transportation of equipment (in some cases) to production sections by the supply and transport systems.

The most widely-used handling systems are described below:

Inductively-controlled electric carts (primarily in intrafacility transport) are also useful in interoperation transport, both for delivery of workpieces between individual workplaces and in particular in the assembly process. The carts are driven by a cable laid in the floor, and their movements are controlled by frequency signals emitted by the drive cable according to programmed control instructions. The length of the circuit is practically unlimited. The carts may be diverted at switches and can move both forward and backward. They can be stopped at a specified point with an accuracy of about ± 5 cm. An advantage of this system is that there is no interference with handling by other transport facilities. Good use can be made of the work rhythm, and work assignments can be divided up and regrouped as needed (so-called "service on demand") regardless of whether it is group-type work or process line work.

Suspended tracks, with conventional or electronic control, can generally be assembled in various configurations using building-block components, with the possibility of branching them and when necessary of changing the number of vehicles and varying the carrying capacity within wide limits for an extensive variety of products.

Another system is that of gravity (descending) transport lines using either roller lines along which the workpieces move to individual workplaces by their own weight, or as rails along which special dollies with guide rollers move by pravity (UNIROLL system).

Another important supply and transport system for small-series production, especially of box-shaped or flat parts, is a tiered stock bin with a stower. These are designed as one-, two- or three-tiered structures served by one or two stowers moving on wheels, or by a straddling stower rolling on a track on the middle range of the stock bin.

These sytems and many others have their individual merits and shortcomings which influence their use (size of series, type, dimensions and weight of workpieces, nature of production process and so on). In any case, however, they meet the needs of interoperation supply of workpieces and delivery to individual workplaces and between individual operations. Computer equipment is generally used to control them.

Industrial Robots

Industrial robots are applicable in industrial automation and to a certain extent in interoperation handling in small-series discrete production. Even though practical experience has led to a certain cooling of the initial enthusiasm for their use, their development and further application is continuing, and robots will unquestionably be an indispensible means of automating handling both between and during operations.

For economic reasons, they show their advantages in workplaces with conditions unfavorable to health, where they perform physically demanding tasks, and where labor productivity can be radically increased by their use. In most cases they operate more slowly than humans, but they are nonetheless efficient.

A wide variety of industrial robots with a broad range of carrying capacities (from several decagrams to several hundred kilograms) is being developed, especially in Japan, the United States, England, Sweden and West Germany. The development and improvement of industrial robots is also accelerating in socialist countries. Their development is particularly advanced in the Soviet Union, and good results have been attained in Bulgaria and Poland. Most advanced in this country is the development of the QJN 020 robot (by the Research Institute of Machine Building Technology and Economics and the Research Institute of Forming Machinery). The first models in an experimental series are destined for gear-box gear production lines. An experimental series of the PR 10P robot (developed by the Research Institute of the Metalworking Industry, Presov) and a prototype of the PR 04P robot (developed by the Research Institute of Machine-Building Technology and Economics, Prague) are in production.

The unprecedented development of electronics, computers, control systems and numerically-controlled machine tools is creating the conditions for automation of interoperation transport and handling. Different variants of systems with entirely new types of equipment do not compete with but rather complement each other. In many cases, comprehensive automation of a production section can be realized by its systematic interconnection. Precise delimitation of activities and of coordination between units has not yet been completely solved, and answering this question is a current task of research and production.

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