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RECENT BASIC CONSTRUCTION AND TECHNICAL  
REVOLUTION IN CHINESE COAL MINING

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At the invitation of the Japan-China Trade Promotion Association, a Chinese coal delegation will soon come to Japan. Items in which this delegation is interested are (1) mining techniques and machinery, (2) technical exchange concerning coal mine construction, vertical shaft construction, and waterproof construction, and (3) coal-dressing technology and equipment, and centered on these, the plan is said to be to inspect Japan's coal mines and mining machinery plants. Therefore, on this occasion in this paper, let us explore new trends in such things as China's most recent coal-mining construction, technology, and equipment.

Recent Basic Construction

Basic construction of coal mines in China has steadily advanced, and each year new pits are completed and put into production, and from the end of last year into this year, news of the beginning of coal production at new pits has been reported several times. If those are listed, they are as follows.

Kirin Province Tunghua Mining Affairs Bureau New Pit - All production processes at this pit are mechanized from coal mining to carrying away, and it can produce 450,000 tons of coal per year (New China News Agency Changchun dispatch, 7 January 1966).

Shansi Province Yangchuan Peitoutsui Ssuchih Coal Mine New Pit - The annual production capacity of this pit is 450,000 tons, and production processes are all mechanized from coal mining to transportation. Also, a coal-dressing plant is attached to the pit (New China News Agency Taiyuan dispatch, 27 December 1965).

**Shansi Province Fenkao Coal Field Shuiyu Pit** - This is a modern large-sized pit with an annual production capacity of 900,000 tons of basic coal. It was designed by China itself and the mechanized equipment is completely domestically produced. The workers who built this large-sized pit carried out the principle throughout the entire construction process of firmly combining revolutionary enthusiasm with a scientific attitude, and greatly breaking through the framework of foreign dogma and convention, they conducted technical revolution and scientific experimentation, aiming for first-rate quality. Strict inspection has proved that the quality of drift work at this pit as well as transportation facilities, machine and electrical equipment, ventilation and drainage facilities, and construction installation works all reached specified standards (New China News Agency Taiyuan dispatch, 11 February 1966).

**Anhui Province Huaipai Mining District Huanghouyao Pit** - This is a pit of quite high mechanization with an annual production of 600,000 tons of basic coal and it was designed and put into operation by the Huatung Coal Industry Company Basic Construction Company. All machine equipment of the pit was manufactured by related plants in China (New China News Agency Hofei dispatch, 17 January 1966).

**Szechwan Province Several Tens of Small-Sized Coal Mine Constructions** - New Construction of 57 small coal mines and technical reconstruction of 29 is being advanced in Szechwan Province at present. When these are completely in operation, an annual production of more than 3,300,000 tons of coal will be possible, which is approximately half of the annual amount of coal produced at present in the Szechwan district coal mines. Most of these small coal mines are distributed in the central part of Szechwan which has little fuel as well as along rail lines of comparatively convenient transport and on both banks of rivers. These districts are Szechwan Province's food and economic products producing areas and are districts in which handicrafts, small chemical fertilizer plants, small sugar refineries, and other plants processing secondary agricultural products are relatively concentrated. Heretofore, these districts have depended on large and medium-sized mines and other coal-mining regions for all of their coal supply. When these small coal mines are completed, this situation will gradually change and it will become possible to obtain the coal supply locally.

#### Recent Technical Revolutions

As seen above, in China's coal mines, even now new pits are being put into production one after the other, and it presents a remarkable contrast to Japan and Western countries where they are being closed one after the other with coal as a declining industry, and technical innovations are steadily being advanced even in old coal mines which are being exploited. Below, let us consider recent principal coal-mine technical innovations.

### Fouhsin Haichou Open-Pit Coal Mine Coal-Washing Plant Heavy Fluid Coal-Dressing Method

This is said to be a coal-dressing method greatly superior to former human coal-dressing methods, and the operation process is to first mix together iron filings and water and make a suspension of a certain specific gravity, and putting this in the ore separator, from that passes coal mixed with butter. The specific gravity of the suspension is between the specific gravity of coal and butter, and when the coal passes through the ore separator, it floats up, and after it is screened and dehydrated it is put in coal cars. When the butter passes through the ore separator it naturally settles, and after it has been dehydrated with the dehydration screen, it is discarded in the butter cars.

This coal-dressing method is exceptionally superior to human dressing methods. In the case of previous human coal-dressing, workers stand on both sides of the conveyor belt and sort out the butter, and one person must sort out from 10 to 13 tons in one shift, work intensity being great, and also, since the lumps of coal strike against each other on the belt, coal dust rises in the room, which is also bad for the health of workers. After adopting the heavy fluid coal-dressing method, human coal dressing was completely taken over by machine, and moreover, efficiency of coal dressing greatly increased from the time of manual labor and butter content of the carefully selected coal approaches zero, and also the coal content of the butter is lowered from the former 12 parts per thousand to 3 parts per thousand.

This heavy fluid coal dressing method which was adopted by the Haichou Open-Pit Coal Mine was successfully experimented upon with assistance of the Peking Mining College.

### Fushun Coal Mine Hydraulic Hoisting System

At the Fushun Coal Mine, which is China's largest coal mine, a new hydraulic hoisting system has been introduced which is believed to be quite important for deep-strata coal mining. Compared with the winch multi-stage hoisting system which was heretofore adopted by the same mine, the new hoisting system can reduce personnel by 50 percent, can greatly reduce labor intensity of workers, and can transport 100 tons of coal to the surface per hour from a pit 600 meters below the ground. This new hoisting system is comprised of such things as a main pump, suction pipes, coal removal pipes, and tank-type coaling machines, and utilizing water pressure, lumps of coal up to 120 millimeters in diameter can be carried up to the surface from a pit bottom of a depth of 600 meters. This also performs the work of a coal-dressing machine, and when the coal is brought out from the pit, the lumps of coal are automatically separated from the butter, the large lumps of coal coming up first, and next are brought up medium and small lumps of coal, and finally, the butter and coal mud are also brought to the surface.

This hydraulic hoisting system was successfully researched and experimented with jointly by the Fushun Mining Affairs Bureau and the

Tangshan Coal Scientific Research Institute as well as related manufacturing departments. Also, technicians and workers of the Fushun Coal Mine created a flexible coal conveyor which can be operated by means of water power, and this slack coal conveyor can pull up close to the coal face and is said to be able to carry twice as much as ordinary conveyors, and this equipment is also seen as a powerful link in raising the efficiency of the hydraulic hoisting system.

Rope-Mounted-Type Belt Conveyor Manufactured at  
Huainan and Heavy Model Flexible Scraper Conveyor Manu-  
factured at Chiangchiakou

In coal transportation equipment, new belt conveyors have been manufactured and are being used in various coal mines. One of those is the rope-mounted-type belt conveyor manufactured by the Huainan Mining Machinery Plant in cooperation with the Peking Mining College and the Coal Scientific Research Institute Shanghai Coal Mine Machinery Research Institute. The structure of this conveyor is simple, and the steel rope may be hung on the shaft supports to support the conveyor belt wheels, and installation and moving are both convenient, adjustments can be quickly made, and maintenance care does not require much labor. Having been experimentally used on the ground at the Huainan Coal Mine as well as in shafts of the Kailuan Coal Mine, efficiency of this new conveyor has been demonstrated to be good. The belt used in this is 800 millimeters wide and can carry 350 tons of coal 300 meters in one hour, and it is said to remarkably increase transport capability as compared with conveyors presently widely used near coal faces in shafts of China's coal mines.

Another new-model conveyor is the heavy-model flexible scraper conveyor which is a new product of the Chiangchiakou Coal Mining Machinery Plant. The greater part of those used previously in China at coal mine faces were inflexible scraper conveyors, and these had defects such as that the amount of transported coal was small, and they were easily damaged and troublesome to move. This new flexible conveyor was used at the coal face of the Kailuan Coal Mine Fanlochuang pit in the fall of last year, and Chief Engineer Yin Chi-chang of the Fanlochuang pit said, "The coal-carrying capacity of this new-model conveyor is great, it is strong and durable, troubles are few, and the quality of design and construction are quite high." The Changchiakou Coal Mine Machinery Plant has already entered into quantity production of this conveyor.

Tatung Coal Mine Convenient Cutter-Loader

The Tatung Coal Mine is the most highly mechanized coal mine in China. Last year, 261 items of technical innovation proposed by workers and technicians of the mine were put into use, all of them being related to reduction of physical labor, and one of those, the convenient cutter-loader which was put into use last year and was devised by workers, has been proved to be very effective in all pits of the Tatung Coal Mine.

This cutter-loader advances at the rate of 120 to 180 meters per hour. At the Meiyukou coal pit which is the most highly mechanized pit at the Tatung Coal Mine, only a few workers do manual labor at the coal face. They are only assigned to the cutter-loader, and the cutter-loader automatically mines the coal and loads the coal on the conveyor belt, and from there the coal is carried out by coal car to the surface. Thus, the entire work at the Meiyukou pit, excepting the work of timbering, is mechanized, and at the entire Tatung Coal Mine, 80 percent of coal mining operations are mechanized.

#### Pingtingshan Coal Mine Signal Surveillance Board and Small-Sized Mixer for Use Within the Mine

At the Honan Province Pingtingshan No. 4 Mine, a signal surveillance board is used. The appearance of this important technical innovation from the point of view of coal mine production supervision has greatly raised the level of superintendence operations at the Pingtingshan No. 4 Mine. This signal surveillance board was successfully manufactured by eight graduates of the Peking Mining College specializing in mining machinery and electricity when they did practical work at the Pingtingshan No. 4 Mine together with workers.

Mine command personnel of the Pingtingshan Coal Mine have heretofore, for the purpose of understanding and controlling the production situation, depended completely on telephone communication with such things as cave rooms in the mine, workshops, coal mining districts, and coal faces, and the command personnel were extremely busy with telephone calls, records, and replies. At the same time, in order to grasp the overall production situation it was necessary to depend on many diagrams. However now, with use of the signal surveillance board, command personnel can understand and grasp the facilities operation situation and the general production situation both inside and outside the mine by means of the indications of signal lights, electric clocks, and electric bells, and using portable telephones, they can at all times control transportation within and without the mine and can make command operations more timely and correct, and make production more safe.

At the Pingtingshan Coal Mine, also in shaft construction, a small-sized convenient tool - a mixer for use inside the mine - is used, and is regarded highly by the coal industry. This is a mechanization of mortar mixing which had heretofore depended completely on physical labor, and as the result of more than three months of on-the-spot experimentation, its efficiency is considered to be good. Formerly, 10 to 15 minutes were required for two persons to mix one bag of cement, but this machine is operated by one person and can mix it in three to four minutes. Labor intensity of workers is greatly reduced, the quality of mortar increases, and loss of cement is lessened.

This mortar mixer for use inside the mine was successfully trial-manufactured by workers and technicians together with strong support of the mine leadership and with guidance of instructors at the time 1965 graduates of the Peking Mining College specializing in coal mine construction did their graduation projects. The coal-mining industry

attaches much importance to the completion of the mortar mixer for use inside mines, and it has already begun to be disseminated to other coal mines.

#### New-Model Air Compressor for Coal Mine Use Manufactured in Shenyang

Manufacture by the Shenyang Air Compressor Plant of a new-model air compressor used in coal mines will also be noted. This compressor was produced for the first time in China and was designed and manufactured on the basis of requirements of the Chinese coal industry and conditions of use in the mines. Previously, compressors used in Chinese coal mines were voluminous and were therefore generally placed outside outside the mine, but the structure of this new-model air compressor is small and well-made and very convenient in installation, operation, and movement. When compressed air is sent by it, the pipe which was previously 1,000 to 2,000 meters can be shortened to about 100 meters. For the purpose of conforming to special requirements of production within the mines, this compressor has various kinds of automatic control and safety equipment and it automatically stops when water or oil are lacking or when the temperature of the machine rises above a prescribed amount.

#### Automatic Equipment for Preventing Electric Leakage Accidents in Mines -- High-Voltage Electric Leakage Relay

When high-voltage cables inside a coal mine leak electricity, explosion accidents of gas or coal dust occur, and the high-voltage electric leakage relay which is automatic equipment which can effectively prevent these accidents has been manufactured at the Acheng Relay Plant in Heilungkiang Province. This is a protective relay using a semiconductor technique, and having been experimentally used inside the Anhwei Province Huainan Coal Mine, it has been demonstrated that its effectiveness is good. In the experimentation process in this mine, five high-voltage cable electric leakages occurred, and the automatic equipment very responsively cut off the power source and prevented an accident in the mine. Thus, many of the coal mine workers danced for joy and said that since the state manufactured such wonderful new equipment, work in the mine had become safer.

Insulated monitors had previously been used in Chinese coal mines in control of high-voltage electric leakage. With this equipment, when electric leakage occurred in any line alarms were simultaneously sounded, and when at that time it was tried to eliminate the difficulty, they would inspect cables one by one or turn on the oil switches one by one and had to seek the trouble point by the method of complete power stoppage. However, when the newly-made high-voltage electric leakage relay is used, wherever the electric leakage occurs, the power source of that place is immediately controlled and other cables work as before. In the process of designing and trial-manufacturing this high-voltage electric leakage relay, the Acheng Relay Plant gained the cooperation of the Shenyang

Coal Mine Design Institute, the Hefei Industrial University, as well as coal mines of Hokang, Fushun, and Huainan.

#### High-Multiplying Air Machine Foam Fire-Extinguishing Method

In the field of preventing disastrous accidents in coal mines, the successful test of a high-multiplying air machine foam fire-extinguishing method at the end of more than six years of endeavor at the no. 2 laboratory of the Fushun Coal Research Institute will be noted. Large fires are apt to break out in coal mines, and when these cannot be put out, generally the method has been used of sealing off the fire area, but when this high-multiplying air machine foam fire-extinguishing method is used, fire-fighting personnel can conduct fire-fighting from a safe position several tens of meters to 100 meters away from the fire location, and under certain conditions the speed of putting out the fire is fast, the power is great, and effectiveness good. Research of this new technique of fire-fighting was begun in 1958, the first step of the research being to select a foam material of good efficiency. At the end of three to four years of endeavor, more than 20 kinds of foam raw materials were gathered from the entire country, and from these, foam materials of low price, good efficiency, and high water content were selected and mixed. The researchers continuously endeavored, and made a revolving-leaf-type foam nozzle and a plumb-shape string firing net. When this foam ejector is used, the amount of foam produced in one minute reaches more than 100 cubic meters.

In 1964, the Pingtingshan Mining Affairs Bureau rescue group, in practice within the mine, conducted tests of foam ejection and mock fire extinguishing, and as a result it was proved that the high-multiplying foam has great effectiveness in mine timber fires, coal wall fires, oil fires in rooms within the mine, and single-shaft fires. Its strong point is said to be that its force is great, and within 20 to 30 minutes the force of the fire is restrained and the source of the fire extinguished, and fire-fighting personnel can promptly enter the fire area and put out the embers. This fire-extinguishing technique has already been used by rescue groups of mining affairs bureaus in such places as Pingtingshan, Fouhsin, and Fushun, and it is said that the principal present defect of this fire-fighting technique is that the set equipment is quite heavy.

#### All-Country Rock Dust Elimination Meeting

Above have been given technical innovations of the Chinese coal industry reported last year and this year, and some of the things in which emphasis has probably been placed in these technical innovations are prevention of coal mine disasters, lessening of the labor of workers, and preservation of health. It is noted in this regard that recently an all-country meeting was held at Wuhan concerning measures to reduce rock dust in mines. This meeting was held under the sponsorship of the Chinese Metal Association, and 120 representatives including workers, specialists, scholars, scientists, and engineers from 22 provinces and

cities of the entire country participated, and subjects were taken up such as vertical shaft ventilating equipment and its automation, purification and filtration of air, rock dust measuring equipment, and other measures for protecting the health of coal mine workers.

As was brought out in this meeting, at present in China in the fields of mechanization and automation of ventilation as well as equipment for preventing rock dust, improvements are being conducted in the various kinds of drills attached to hydrogen bomb explosion ventilating equipment and moist and dry-type dust suction equipment. Also, the filter membrane rock dust measuring technique which is the world's latest technique has been adopted. In addition, it is said that the most advanced photoelectric-type as well as electrostatic-type rock dust measuring equipment is at present being tested, and that research into electrical rock dust elimination techniques is also being advanced.

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