

1A2. Coal Production Technology

Technology Overview

Coal occurs in slightly or steeply dipped beds, or in the form of discontinuous lenses underground. The depth, number and thickness of coal seams vary by region. Coal mine development requires consideration of these geological conditions and the state of ground surfaces. Specifically, the quality of coal, the depth, thickness and dip of coal seams, the presence of faults and folds, and the properties of coal-bearing strata substantially affect the productivity and the resource collection rate. The mining method to be used may also vary due to these conditions. Underground mining requires the drilling of shafts down to an underground coal seam to extract coal. The shafts may also be used to transport equipment and workers, for ventilation and drainage, or for prospecting for coal. As mining develops, the digging area becomes deeper, raising the issues of maintaining the mining space, gas emissions, and water

seepage due to higher ground pressure. The mining machinery is required to have maneuverability to respond to variations in natural conditions. Utilizing larger-scale mining machinery to increase the extraction capacity of the equipment is limited by space constraints.

For mining coal deposits near the ground surface, open-cut mining is used to strip the overburden and extract the coal. When coal deposits are steeply dipped or composed of several coal seams, open-cut mining is used for extraction. In this mining method, the overburden is piled in a place where it will not interfere with the mining work, and a pit is formed in the ground surface during mining. Horizontal or slightly dipped coal deposits are mined by the strip mining (side casting) method, in which the overburden is temporarily piled just beside the mining site and returned to the original site after the coal has been extracted.

1. Background

Coal-producing countries in the Asia-Pacific region are faced with coal mining challenges, such as mining under deeper and more complex geological conditions. To cope with these challenges, while improving safety and productivity, new technical measures are required. NEDO and JCOAL have, therefore, carried out domestic and international research and development on coal production based on technologies introduced and developed in Japan to improve mine safety and

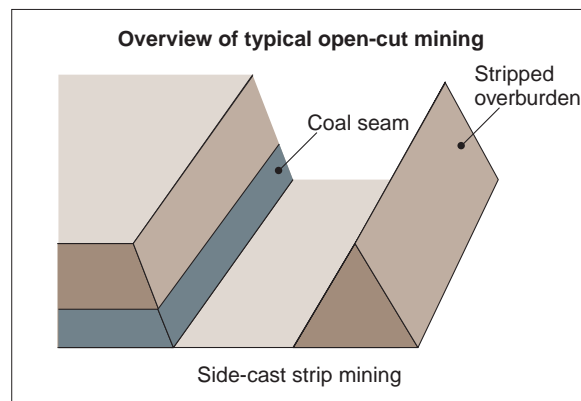
productivity while addressing the challenges faced by coal-producing countries. These efforts have led to the establishment of stable coal production systems and improved production capability, thus contributing to a stable supply of coal for Japan. Japan has also extended assistance to coal-producing developing countries for the sound development of local coal industries through joint research with local organizations, aimed at improving coal production technology.

2. Technologies to be developed

To address the challenges faced by coal-producing countries in the Asia-Pacific region, such as mining under complex geological conditions while ensuring safety, improved productivity, and a stable coal supply, novel technical measures are required.

(1) Open-cut mining

- Draglines
- Power shovels and dump trucks
- Overview of open-cast mining
- Side-cast O/C



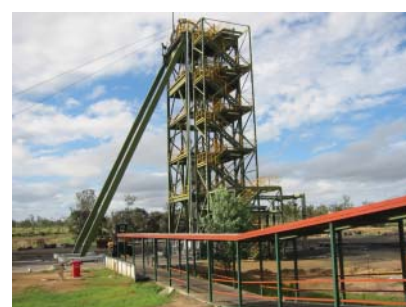
Draglines



Power shovels & dump trucks

(2) Underground mining

- Longwall mining
- High-power coal mining machines
- Highwall mining (auger mining)



Underground mining (headframe)

Development of a high-power coal mining machine

In order to achieve higher production efficiency in mining hard and thick coal seams, a new high-power multi-motor coal mining machine was demonstrated at a mine in Australia.



Longwall mining (SD Mining) drum shearer and shield support



High-power coal mining machine (following control function)



Highwall mining (steep incline auger mining system)

Development of a high-power excavator

To improve the efficiency of hard-rock tunnel boring, a high-power rock excavator equipped with rock bolts has been developed.



Drifting road header MRH-S220

Development of high-speed manned cars

In underground coal mining, as drifting progresses to include deeper working faces, measures are needed to ensure the necessary working time in the faces. To increase the efficiency of transportation and shorten the transportation time, high-speed manned cars with a maximum speed of 50 km/hr have been developed.



High-speed manned cars (former Taiheiyo coal mine)



High-speed manned cars (former Ikeshima coal mine)