

## Technological Innovations

### Establishment of our Organisational Structure and Incentives to Technological Innovations

In 2006, building on our existing coal and power technology branch centres, we established the Shenhua Technology Centre, thereby expanding our science and technology team. Preparation for the Shenhua Transportation Technology Centre is underway. The "Shenhua Post-doctorate Work Station" was approved by the Ministry of Personnel of the State in May 2006, and the recruitment of post-doctorate personnel and preparation for their admission has been progressing smoothly.

During our rapid development in 2006, the Company attained a number of important technological achievements with improvements to its technological indicators:

- We received 24 "China Enterprise Innovation New Records", the third highest number of awards nationwide, of which 14 were for the coal segment, eight were for the power segment and two were for the ports segment, accounting for half of the new records for the coal industry;
- We received three first class provincial technological advancement prizes, and five second and third class prizes;
- At the inaugural China Comprehensive Industrial Technology Innovation Awards, we were awarded the highest honour – "China Industrial Award";
- We applied for a total of 44 patents and were granted 38 patents, of which 24 were for the coal segment, two for the railways segment and 12 for the power segment. Three of these were invention patents. The Company applied for and was granted the largest number of patents within the coal industry.

### Key Technological Projects Domestic development of technology for hydraulic supports

The Company successfully developed 5.5m hydraulic supports through collaborations with domestic manufacturers and introducing strategic partners, thereby contributing to the progress in the domestic development of hydraulic supports technology. By placing emphasis on technology advancements, the Company not only resolved technological difficulties such as the welding of high-strength plates, but also applied advanced technologies such as automatic welding by robots, to manufacturing of hydraulic supports, thereby greatly enhancing the technological standards of domestic hydraulic supports. In 2006, 18 sets of hydraulic supports were developed through the Company's collaboration with domestic manufacturers, reducing costs by approximately RMB2.4 billion while the quality of the hydraulic supports remained comparable to imported equipment. At present, all our hydraulic supports from 2.4m to 6.3m have been made domestically, and efforts are being made to develop hydraulic supports under 2.4m which are suitable for the mining of thinner coal seams.



Domestically produced high mining height supports at the Shendong Mines



Air-cooling facility of Jinjie Energy

### Panel Extension Technology

In 2006, panel extension technology was successfully applied in 15 panels in Shendong Mines, and the working length of panels has been extended from 240m, to 300m to 400m, thereby reducing the roadway developments, lifting the coal resources recovery ratio by 4 percentage point, increasing coal production by 4.26 million tonnes and increasing direct economic benefits by RMB1 billion. The technology will gradually be applied in other mines of the Company.

### Comprehensive dust treatment technology in preparation plants

In 2006, the Company developed the dust treatment technology for the preparation plants. The technology reduces the dust density in the Zhunge'er preparation plant to less than 20mg/m<sup>3</sup>, essentially eliminating the safety hazard caused by dust.

### Enhancement of the quality of coal

In 2006, we continued our technological research on high-efficiency and safe combustion of Shenhua coal technology and on the special features of Shenhua coal slurry, which led to the development of a slurry technique for Shenhua coal and resulted in the development of an additive for coal slurry of Shenhua coal, thereby saving the slurry production cost. At present, the technique has been applied in the newly constructed coal slurry plants in Guangdong, Fujian and Liaoning Provinces, where over 10 million tonnes of Shenhua coal will be used in the production of coal slurry. It is expected to generate increased economic benefits of nearly RMB500 million. Technology for the high-efficiency and safe combustion of Shenhua coal has led to the development of slag prevention technology for 600 MW generation unit, enabling the exclusive use of Shenhua coal in 600 MW generation unit, which is expected to expand the market for Shenhua coal, and ensure the safety and stability of boilers in coal combustion.

### Water-saving power generation technology

To address the shortage in fresh water available for the construction of power plants in coastal regions and the northwestern regions, China Shenhua has made an active effort in 2006 in the research and development of sea water desalting technology, of technology for direct air-cooling system operation in extreme low-temperature areas and of sea water cooling tower technology. In 2006, the largest sea water desalting facility in China has been successfully operating at Huanghua Power with a daily production volume of 20,000 tonnes of fresh water. This represents the first “negative consumption” of fresh water resource in China – not only will it directly consume small amounts of fresh water, but also it will supply fresh water to the adjacent areas.

The 600 MW air-cooling generation units at Jinjie Energy was successfully put into operation in 2006, marking the successful operation of large-scale air-cooling generation units technology by China Shenhua. This addressed the key technological difficulty of constructing mine mouth power plants in the northwest regions where the altitude is high and supply of Shenhua coal is plentiful but there is shortage of water, thereby optimizing the deployment of power source.

Construction of Ninghai Power II has commenced. This power plant will employ sea water-cooling tower technology for the first time in China, marking the Company’s continued leading position in that technological aspect and providing the technical assurance for Shenhua to develop its power operations in the coastal regions of China.



Desalting facility of Huanghua Power

### Plasma ignition technology for the power plants boilers

Having adopted the plasma ignition technology for power plants boilers, in 2006, the Company successfully applied it to 600 MW generation units. This has simplified the automatic startup formula of the units and increased the speed of ignition and safety of boilers. It has also led to ignition fuel savings and reduced operation costs. As a result, in 2006, the Company saved its fuel requirement by 48,400 tonnes, which contributed directly to an economic benefit of RMB185 million.

### Vibration control technology for the roads and bridges of Shuohuang Railway

Shuohuang Railway has many large bridges, some of which suffered from serious transverse vibrations. In 2006, the Company made substantial efforts on a study on a vibration control technology for the bridges of Shuohuang Railway. After a series of comprehensive tests and reinforcement works, the technology was successfully applied to the bridge across Xiaotang River, and has been extended to the remaining 18 bridges along Shuohuang Railway. The application of the technology has allowed us to eliminate the risks to the bridges and vehicles caused by vibrations and ensure the safety of transportation, and has increased the transportation capacity of the railway by about 5%, or more than 5 million tonnes.

### Silting treatment for the sailing channels of Huanghua Port and dredging technology

In 2006, the Company made a breakthrough in silting treatment for the sailing channels of Huanghua Port and dredging technology". We applied the technology to the expansion of Huanghua Port and the related dredging works, thus ensuring that the depth along the sailing channels was maintained at not less than 13 meters. This has successfully addressed the problem of silting by fine silt and sand along the sailing channels of ports and increased our seaborne coal volume by 10 million tonnes a year, bringing economic benefits of about RMB480 million a year.