Recent developments in coal handling for terminals, stockyards and power plants

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As one of the world's leading suppliers of materials handling equipment, ThyssenKrupp Fördertechnik (TKF) has developed a complete range of products for bulk terminals, stockyards and coal-fired power plants. With more than 100 years' experience, TKF today supplies a complete range of products, including:

- Ship unloading and loading equipment such as:
  - Grab type ship unloaders of different designs;
  - Mechanical continuous type ship unloaders;
  - Shiploaders of different designs for bulk and break-bulk;
  - Combined shiploader/unloader; and
  - Pontoon-based floating transhipper.
- Stockyard equipment, such as:
  - Slew and bridge type bucket wheel machines of different designs;
  - Drum (barrel) type reclaimer;
  - Longitudinal and circular stockyard with stacker and scraper reclaimer;
  - Homogenisation/blending with stacker and bridge type scraper reclaimer, for circular and longitudinal stockyards; and
  - Combined portal scraper reclaimer with both stacking and reclaiming functions.
- Other material handling equipment include such items as:
  - Railway wagon tipplers;
  - Truck dumpers and unloading stations; and
  - Belt conveyors, curved conveyors and pipe conveyors.

TKF's new development of full-line material handling equipment has focused on being a global supplier with its own subsidiaries throughout the world, offering a full range of products and designs, multipurpose applications, suitability of machines for various different kinds of material with significantly different handling characteristics, and design suitable for upgrading to either fully automatic operation or unmanned remote controlled operation.

Recent technical achievements and contracts highlight TKF's development work for coal handling in terminals and stockyards.

Six wagon tipplers for the Port of Huanghua

In April 2002, the first three tipplers supplied by TKF to Huanghua Port in North China were taken over for commercial operation. From 2003 on, the three car dumpers have achieved an annual throughput of 40 million tons of coal, which has set a benchmark for high performance in China.

After commencement of commercial operation of the three tipplers in Phase I of the terminal, TKF won another order for further three tipplers. These are located parallel to the existing ones.

The new tipplers share the same basic design as the first three; however, there are several improvements in the hydraulic system, special mechanisms for the rotor and drives and in the

Figure 1. New car dumpers installed at Huanghua, China.

Figure 2. Coal handling system with continuous ship unloaders for coal-fired power plants.

environmental protection facilities. These measures will ensure high reliability and performance, so that the annual throughput of 80 million tons in total can be secured. The new tipplers were successfully installed in 2004 and the terminal operation was able to start at full load.

Coal handling system for modern power plants

Tanjung Bin Power Plant with 3x700 MW, located in the southern state of Johor, Malaysia, is one of the largest coal-fired power plants in Asia. The contract for the design, manufacture, supply, erection and commissioning of the coal handling system was awarded to TKF.

The coal handling system comprises the following major parts:

- Two continuous ship unloaders of chain bucket elevator type;
- Three combined bucket wheel stacker-reclaimers;
- Incoming conveyor system in two lines from the jetty to the coal stockyard;
- Coal conveyor system in two lines from the coal yard to the bunkers;
- Crusher and screens; and
- Overall electrical and control system for the automatic operation of the coal handling system.

The tailor-made equipment and machines in this coal handling system, supplied by TKF itself, will be the latest technology for bulk material handling, and will take into account the high performance, efficiency and availability requirements, as well as the high degree of automatic operation and environmental protection against dust and noise emissions, required in modern power plants.

Figure 3. Giant shiploaders at the port of Tianjin, China.

The construction will begin in mid-2005 and the first 700MW unit is scheduled to go online in 2006, with the remaining two units following by mid-2007.

Shiploaders for China's coal giants

Between 1999 and 2003 TKF received orders for and successfully supplied two shiploaders of 6,000 t/h each for ships up to 100,000 DWT for the port of Tianjin, one of China's major coal terminals. The success story for TKF continued early 2003 with the award of another order for two further shiploaders. These shiploaders are proven to be the largest ones in China.

Both of these machines are designed to load ships at a rated capacity of 6,000 tph (max. 6,800 tph.). The first machine is designed for ships up to 150,000 DWT and the second for up to 200,000 DWT. Each machine is equipped with a luffing boom, shuttle head, telescopic loading spout and trimming chute. These two giants went into commercial operation in September 2004.

Another milestone contract was awarded to TKF for the design, and supply of four shiploaders for coal by the port of Qinhuangdao, the world's largest coal terminal, underlining Chinese confidence in TKF. The shiploaders are designed for a peak capacity of 8,940 t/h and for ships up to Capesize; two of them are travelling type, with luffing and telescopic boom, and the other two with slewing and telescopic boom.

The fourth continuous ship unloader for Huayang Houshi power plant

Formosa Plastic Group is the Taiwanese owner of the Huayang Houshi power plant in Fujian Province, one of mainland China's giant power plants. This power plant purchased its first two continuous ship unloaders of 2200 t/h from TKF in 1997. In 2002, the contract for a third unloader was awarded to an Asian competitor. However, TKF's well-proven design, which is

Figure 4. Slewing shiploaders, similar to that for Qinhuangdao.

Figure 5. TKF's CSU at FPG's Huayang Houshi power plant.

Figure 6. Typical installation of CSU for power plants, similar to that at Shanwei and Huilai, China.

constantly being developed further and improved to ensure that it remains state-of-the-art technology, convinced the customer in August 2004 to place the contract for its fourth unloader once again with TKF. The fourth CSU will have a rated capacity of 2,300 t/h and high efficiency.

This success is the result of the relentless further development of proven design by TKF in modern CSUs. For several years CSU development work at TKF has been focused on the chain bucket elevator, with the following aspects:

- Reliable and effective digging by means of the patented flexible digging foot through the improved hydraulic control and chain guiding system;
- New design for the material transfer from elevator to boom conveyor to fit the elevator suitable for different material, which may be wet, sticky or may contain large tramp iron or stones. This is realised by a ring feeder for a forced and totally enclosed discharge of materials;
- Effective collision protection of the elevator with ship hatches. Such collisions are the main cause of lower through-the-ship efficiency. By adopting the so-called shape scanning of ship hatches, with mechanical limit switches on the elevator and purpose-made control software, the elevator can work much more safely and be controlled more easily, even under adverse weather conditions.

CSUs for coal-fired power plants in China

China's increasing energy demands have necessitated considerable expansion of power plant capacity and therefore in port facilities for the distribution of coal. This requires application of modern efficient material handling equipment, such as ship unloaders.

The expansion of power generating capacity in Guangdong Province means that port facilities have to be expanded for unloading coal from the ships. The operation has to take the following requirements into account:

- Increasingly strict environmental protection regulations;
- High performance unloading under different geometrical and meteorological conditions;
- High efficiency, resulting in demurrage savings as well as berthing and operation time; and
- Low maintenance and spare parts costs.

In August and October 2004, two new power plants to be built by Guangdong Yuedian (Group), Shanwei and Huilai power plant, opted in favour of TKF for the installation of modern CSUs for their coal terminals. For each power plant, TKF will supply two CSUs of chain bucket elevator type for a maximum capacity of 1,800 t/h to handle Capesize vessels. All four machines are due to start commercial operation in 2006.

The TKF type of CSU has become increasingly popular in recent years because of the continued further development of the chain bucket elevator as well as the automation of ship unloading procedures.

The decision of Guangdong Yuedian to choose TKF as the supplier for all of their important ship unloaders underlines the client's confidence in TKF's technology, ability to execute large-scale projects and first-class technical service. The decision was made after comparison of several competitors, on the evidence of TKF's:

- Worldwide and extensive experiences in the development of ship unloading technology both for grab type and continuous type;
- Excellent performance of ship unloaders already built;
- High availability and long service life without intensive repairs;
- Reliable technical services during construction, commissioning and operation period; and
- Good relationship with Chinese partners for manufacturing and erection.

Together with the achievement in the development of technology, the contract award of seven CSUs within one year has been a further milestone in TKF's development of CSU. At the same time it signifies the wide acceptance of modern ship unloading technology in China. TKF believes that, with the construction of these machines, a new era of CSUs ship unloaders has begun in Eastern and South-Eastern Asia.

As one of the leading suppliers for bulk material handling equipment and complete plants, TKF will continue its activities in the development of the port handling and stockyard technology, focusing mainly on automation of operation for high efficiency and cost-saving, equipment with multi-functions for flexible operation and high performance, and new design and product with regard to environmental protection and energy saving. With these measures TKF will retain its leading position in the global material handling equipment market.

ABOUT THE ORGANISATION

With more than 100 years of experience in the design and supply of solid bulk material handling equipment, **ThyssenKrupp Fördertechnik** today is a supplier of state-of-the-art technology. The supply programme includes: stackers, all types of reclaimers, combined stacker/reclaimers, shiploaders, ship unloaders (continuous and grab type), wagon/truck loading/unloading stations, conventional and pipe conveyors, gearboxes and drives, plow feeders, etc., as well as complete handling systems for the fertiliser and cement industries and for ports, as well as complete coal handling plants for power stations, including heavy load cranes, luffing-slewing cranes and cable cranes for the construction of concrete dams.

ENQUIRIES

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