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Circular Blending System for Coal

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Rundlager-Mischsystem für Kohle
Systèmes circulaires de mélange du charbon
Sistemas circulares de mezcla para carbón
石炭用円形混合システム
煤的环形混合系统
أنظمة التوليف الدائرية الخاصة بالفحم

1. Introduction

PHB Weserhütte (PWH) have built and recently commissioned two circular stockpile systems which are used to stack, homogenise and reclaim raw coal for Gerwerkschaft Sophia Jacoba in Hückelhoven, Germany. The total system is the first circular stockpile blending plant of its kind in the world and became fully operational only in June 1980.

The PWH circular stockpiling system with its careful material reclaiming properties was chosen after an in-depth study of all characteristics of known systems such as rectangular storage areas with different stacking systems and various methods of reclaiming working on the principles of drum or bucket wheel reclaimers.

The circular stockpile blending system has many advantages such as low investment cost, reduced maintenance and operation cost, a high homogenising effect, continuous formation and reclaiming of the annular stockpile. However, it was the careful treatment of the highgrade, brittle anthracite that was the deciding factor for the placing of the order with PWH.

The design of the circular system was based on a required stacking capacity of 1,600 m³/h and a reclaiming capacity of 1,100 m³/h. The system works in accordance with the continuous principle of stacking and blending. In this case, careful handling of the raw coal is essential, and PWH developed a special technique to master this problem.

An electronic system maintains the stacker boom at a very low level above the stockpile crest as the coal is being stacked. The reclaimer bridge is equipped with a new carrying cell system, the blades of which are shaped to take up the material sliding down the slope carefully and to convey it to the central bunker with no lifting or friction occurring in the operation. Clearly, this new design offers most careful grain protection if compared with all other known reclaiming systems (Fig. 1).

Fig. 1: General view of the circular stockpile system: Gewerkschaft Sophia Jacoba, Hückelhoven, Germany

2. High Homogenisation Effect by the PEHA Chevcon System

Stockpiling can be achieved either by the cone layer system, the Chevron system or the Chevcon system, the latter of which has been applied for the first time in any circular blending plant. Basically, it combines the Chevron and Cone Shell methods. The material is stacked by means of a belt stacker capable of reversing its slewing motion. With each forward and reverse travel movement, the preselected angle of slewing is changed in accordance with the travelling distance in proportion to the volume stacked. The number of layers of the stockpile depends on the slewing speed of the stacker. Simultaneously with the slewing motion, there is also a luffing movement of the boom. Thus, while the stacker travels along the pile, the boom luffs between the lowest and highest positions and vice-versa. While the preselected slewing angle changes continuously, there is a constant forward development of the full stockpile cross-section. The lower the selected angle of the pile to be formed, the longer each individual layer. This means that the reclaimer has to keep track of many layers placed in greater intervals resulting in an amplified long-term homogenising effect. The constant forward development of the complete stockpile eliminates the end cone formation and thus any possible transfer area from an *old* to a *new* sector of the stockpile which is typical and becomes inevitable with Chevron stacking systems of the circular blending plant type.

3. System Function

The coal arrives from several areas of the mine and passes through the preliminary rock separation where big lumps are separated before it is conveyed on two belt systems to a circular storage area. The raw material conveyor discharges the coal on the feed belt over a rotary chute in the centre of the area for stacking in accordance with the preselected stacking system.

The stacking height is controlled electronically as a function of the preselected stacking angle. Both the luffing and slewing speeds are variable. Reclaiming of the annular stockpile is obtained by a triangular rope clearer, the angle of inclination of which can be adjusted to suit the sliding characteristics of the coal. A hydraulic cylinder moves the slope clearer parallel to the longitudinal axis of the reclaimer bridge

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in a shuttle movement approximately 4m long, while thin layers of the coal are cut over the entire cross-section of the stockpile. Thus, the stockpile front surface is caused to slide down in a uniform and continuous way, toward the carrying cell conveying means.

The carrying cells (Fig. 2), the bottoms of which form a closed strand, are filled

Fig. 2: View showing the carrying cells for the careful handling of coal

from the stockpile side by the continuous advance of the reclaimer bridge. The coal moves slowly and without turbulence into the cells and, with abrasion kept to a minimum, it is carried towards the central reclaiming bunker. A vibrating dosage feeder discharges the coal onto the raw coal conveyor leading to the washing plant.

The chain speed of the reclaim conveyor is infinitely variable by means of a D.C. drive unit. According to the desired rate of reclaim, optimum filling of the cells can be accomplished. The drive is designed for a maximum chain speed of 0.6 m/s.

All functions of the system are electronically controlled within preselected variable programmes. As a result of the commissioning of this first store, process conditions have been improved considerably between the mine and the washery. The surge effect created by the circular store have made the washery more independent of the mine. Fluctuations in the mine output or a capacity decrease or failures in the washery no longer affect each other considerably. A constant feed of homogenised coal results in optimum working conditions for the washery and in a sizeably increased output making it possible to reduce the required washing time. At this early stage in the operation of the plant, it can be said that the investment made in the PWH circular stockpile system will be cost-effective within a period of only a few years, due to substantial improvements in the quality of the product, less breakdown periods, and above all, larger washing capacities.

4. Technical Data

Material Handled:

Anthracite Raw Coal, Size 0 to 120 mm
Humidity: 6% H_2O

Homogenisation Effect
of the System: 6:1

System details:

Diameter — 90 m
Slope clearing angle/angle
of slope — 38°
Stockpile height — 15.8 m
Storage capacity — 49,000 m^3 per store
Stacking capacity — 1,650 t/h per store
Reclaiming capacity — 1,100 t/h
per store