

Biggest-Ever Bucket Wheel Reclaimers in the Coal Terminal of Port Kembla

H. Kemper, Germany

Die größten Schaufelradlader im Kohlenhafen von Port Kembla
Les plus grands chargeurs à roue-pelle dans le port de charbonnage Port Kembla
Las mayores rotopalas cargadoras en el puerto de carbón de Port Kembla

ポート・ケンブラ石炭ターミナルの今までで最大のバケットホイールリクレーマ

肯伯拉港煤炭集散站所装设的世界最大型约轮回收机

أضخم وحدات الاستعادة بالدواليب ذات القواديس على الإطلاق محطة الفحم في بورت كيمبلا

Near Wollongong, N.S.W., 100 km south of Sydney, a new coal terminal is being built in Port Kembla. The initial capacity will be 15·10⁶ tonnes and the final capacity 25·10⁶ tonnes per year. The coal will be carried to the terminal by rail and truck and stockpiled by means of boom stackers.

In the initial phase of operation two bucket wheel reclaimers will feed coal from the stockpiles onto trunk conveyors leading to the ship loaders. The terminal will be commissioned in 1982. The bucket wheel reclaimers built by Krupp Industrie- und Stahlbau, Duisburg, West Germany, will be the biggest units ever built for reclaiming coal from storage.

The size of the units is determined by the need to make port turnaround as speedy as possible. The average rate of reclaiming will be 6000 t/h of coal weighing 0.75 to 0.9 t/m³ with peak rates of up to 10,000 m³/h. Maximum lump size will be 50 mm. The coal can be stockpiled to a height of 26 m.

These parameters determined the design dimensions of the two units. In order to be able to work along the whole width of the stockpile, the boom had to be designed for a length of 52 m.

The bucket wheel reclaimers will mainly operate by the slewing block digging method in which the unit's undercarriage remains stationary as the superstructure slews to cut a sickle-shaped swathe in the stockpile in the horizontal and vertical plane. When the wheel boom reaches its end position, the unit advances by a pre-selected distance and slewing proceeds in the opposite direction.

If, due to failure of the slewing motion or because of other reasons, slewing is not possible, coal can continue to be reclaimed, albeit at a reduced rate, by benching, irrespective of the position of the boom.

The units are designed for semi-automatic operation. Advancing, slewing and reclaiming rate are controlled automatically, but shifting from one level to another must be undertaken manually. The design provides for working at three levels and this determined the diameter of the bucket wheel which will be approx. 12 m. As the unit will have to reclaim wet and sticky coal, the wheel will be cell-less. After being picked up by the bucket, the coal moves up a ring

chute and is discharged into a chute projecting into the wheel. Each of the ten buckets, which are made of stainless steel to protect against the sticky coal, has a nominal cubic capacity of 2,700 liter. The bucket teeth are exchangeable. The power train consists of planetary gearing, a fluid coupling and a 360 kW wheel drive motor.

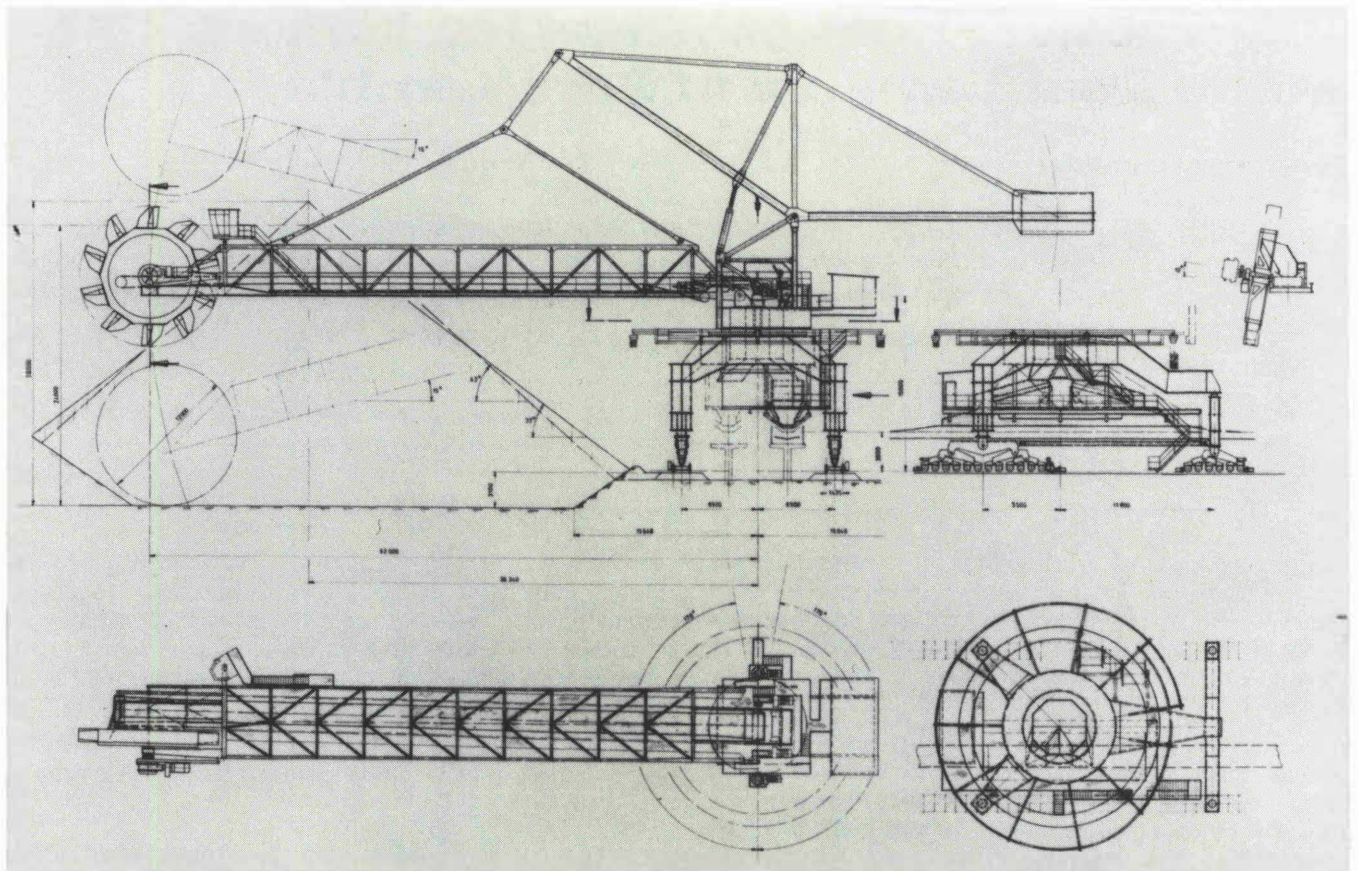
The boom is of lattice design and carries the 2200 mm wide belt conveyor with 35° troughed idlers. Belt speed is approx. 4.5 m/s.

The boom is raised and lowered by hydraulic cylinders at a speed of 7 m/min. The two slewing assemblies, consisting of planetary gears and DC motors, make for stepless slewing at a speed of between 9 and 36 m/min. A roller-bearing slewing ring with a diameter of approx. 6 m connects the undercarriage with the superstructure.

In the middle of the unit there is a surge bin which in the first phase will have two outlets and a volume of approx. 68 m³ and in the second phase four outlets and a volume of approx. 93 m³. The 19 m long discharge apron enables material to be withdrawn from the bin via two outlets, below each of which a vibrating feeder is arranged. In the second phase of operation a second trunk conveyor will extend beneath the bucket wheel reclaimer and along the storage yard and two further outlets, which are already provided for in the bin, will be equipped with vibrating feeders. The discharge apron chute can be raised by means of hydraulic cylinders. The discharge apron can be detached from the reclaimer so that for purposes of future expansion or extension the conveyor unit can be changed.

The undercarriage rests on three legs and has four trucks. The third leg rests on the middle of a cross beam spanning the conveyors. The travelling gear, with altogether 72 wheels of 500 mm diameter, makes for a relatively low wheel pressure of approx. 22 tonnes. The track gauge is 1,435 mm; the centre distance between the two tracks is 13 m. Four automatic rail clamps hold the unit when it is not in operation.

To minimize shifting of the centre of gravity within the slewing ring, a pantograph system has been provided for the counterweight boom which is supported on the slew platform and moved by means of hydraulic cylinders. Movable rigging connecting the counterweight boom to the bucket wheel boom transmits the movement of the counterweight boom to the bucket wheel boom. This ensures that there is relatively little movement of the counterweight. The height of the gantry was determined by the arrangement of the bin and



the vibrating feeders and the level of the conveyor which rests on stanchions for cleaning purposes.

Operation is automatic with freely programmable control. The reclaiming rate is controlled by the amount of coal in the bin. The coal level in the bin is measured ultrasonically.

The operator's cabin is arranged close to the bucket wheel and can be raised hydraulically to the required level by the operator. Adequate safety devices are provided to protect the unit from operator errors. These include an overload safety device featuring four pressure sensors on the hydraulic

cylinders. The sensor signals are evaluated electronically to shut down the unit under various overload conditions.

The steel structure for the units has been fabricated in Australia; the mechanical portion has been supplied from Germany. The size of the reclaimers meant that numerous studies were necessary on how to machine and transport the large components. The dimensions of the reclaimers set new standards for future coal terminals which are required not only in Australia but in many other countries in the present energy situation.