

Reclaiming Equipment at the Port of Bristol

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Strachan & Henshaw Limited, Bristol, U.K., have completed the installation and commissioning of the three coal stockyard machines at the Royal Portbury Dock in the Port of Bristol. Strachan & Henshaw is a WEIR Group company.

The development of the Coal Import Terminal is a Joint Venture between the Port of Bristol and National Power, and the main contractor for the turnkey project is the Balfour Beatty/Birtley Engineering Joint Venture. Strachan & Henshaw were awarded the contract for the three stockyard machines in November 1991. The terminal is rated to handle up to 7 million t/a of coal and other commodities and includes two continuous ship unloaders, extensive conveyor systems and wagon loading plant in addition to the stockyard equipment.

The open stockyard has an area of approximately 25 hectares with a total coal capacity of 550,000 t. In order to minimise the environmental impact of this terminal, the stockpile heights have been limited to 10 m, and the area has been surrounded by earth bunds and fences 10 m high. Extensive dust suppression and dust collection systems have also been installed.

In an emergency the stockpile height can be increased to 15 m, in which case the total capacity would be up to 750,000 t.

The machines are designed to operate in wind speeds up to 20 m/sec (45 miles/h) and the design storm wind is 55 m/sec (123 miles/h).

Manual and automatic control modes are provided and fault annunciation messages are displayed in the operators cab-

ins and electric room. Closed circuit TVs are sited at strategic locations on each machine providing video signals to the central control via the control cable serial link. The central control also monitors machine position from data transmitted by on-board sensors, to avoid the possibility of collisions between the machines.

In each case the operator's cabin is sited on the boom and is air conditioned and equipped with automatic hydraulic leveling system.

Within the stockyard, three separate stockpiles are provided for. These are serviced by a stacker and a separate reclaimer travelling on adjacent runways at 15 m centres on a 40 m wide by 1.5 m high berm, and, separated by 94 m, a combined stacker reclaimer travelling on a separate berm, 15 m wide by 1.5 m high. The travelling distance of each machine is approximately 500 m. The stockyard conveyor for the reclaim machine is 1,400 mm wide and for the stacker and stacker reclaimer 1,800 mm wide, reversible in the latter case.

The layout of the stockyard and choice of machines provides the maximum flexibility of operation and ensures that ship unloading and train loading can take place simultaneously. In order to improve access around the machines and facilitate cleaning up, the stockyard conveyors are elevated about 3 m above the berm and the conveyor structure also incorporates trays for the support of the trailing cables and water supply hoses for the machines. This eliminates the possibility of damage to either by vehicles moving on the berms.

There are obvious benefits to be accrued from using common components between the different machines and this has been done as far as possible in this project. Common components include such items as bogies and travel drives, slew bearings and drives, conveyor com-

ponents and drives, bucket wheels and drives, cabins and electrical equipment.

The stockyard machines provided are among the largest and heaviest of their type to be installed in the U.K. and this, combined with the limited load bearing capability of the ground at Portbury, lead to the choice of twin standard gauge (1,435 mm) rail tracks rather than the single rail systems usually employed on machines of this size. The travel bogies and drives are standardised and the individual wheel loading is limited to 20 t on the 500 mm diameter wheels. The bogies are fully equalised both longitudinally and transversely to allow for settlement of the ballasted track and in each case the machines are three point support. The geared travel speed is 24 m/min and the drives are AC with controlled start and shaft mounted bevel/helical gearboxes.

The power supply to each of the machines is by trailing cable and motorised reeling drum at 11,000 volts. A separate reeling drum carries the control signals and serial link to the central control. A water spray dust suppression system is fitted at each of the transfer points on the machines and at the bucket wheels and this is supplied by a trailing water hose via a reeling drum. All three reeling drums together with the main transformer and air conditioned and pressurised electrics house are carried on a gantry which also provides the main access route on to the machine.

Identical slewing bearings are used on the three machines and these are 4.0 m diameter two row ball/roller type with external ring gear. The slewing drives are powered by DC motors and the bevel helical/planetary gear units have extended output bearing cartridges which pass through the slew deck to support the drive pinion.

The cell-less type bucket wheels are 7.5 m diameter and fitted with 1,100 litre capacity buckets and are driven by AC

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Stacker



Reclaimer
Stacker reclaimer



motors, fluid couplings and bevel helical/planetary shaft mounted gearboxes.

In order to minimise dust emissions, in addition to the dust suppression system, all conveyors on the machines are totally enclosed, as are the transfer points. The conveyor drives are conventional, shaft mounted bevel/helical gearboxes with AC motors and luffing systems in each case are twin cylinder hydraulic.

In the case of the stacker reclaimer, the stockyard belt is reversible and a collapsible type tripper is supplied which is raised to feed material to the elevating conveyor for stacking and lowered to allow material to pass back over the tripper when in reclaim mode. Raising and lowering of the tripper is by means of twin hydraulic cylinders and radius arms.

Stacker

Type:	'C' frame pantograph luffing
Stacking rate:	4,000 t/h
Boom length:	65 m
Rail gauge:	11.85 m (twin rail)
Belt width:	1,800 mm
Total connected load:	420 KVA
Max. power demand:	335 kW
Total service weight:	598 t

Reclaimer

Type:	Rocker
Reclaim rate:	2,500 t/h
Boom length:	50 m
Rail gauge:	9.0 m (twin rail)
Belt width:	1,400mm
Bucket capacity:	1,100 l
Bucket wheel diameter:	7.5 m
Total connected load:	650 KVA
Maximum power demand:	520 kW
Total service weight:	565 t

Stacker Reclaimer

Type:	'C' frame pantograph
Stacking rate:	4,000 t/h
Reclaim rate:	2,500 t/h
Boom length:	50 m
Rail gauge:	9.0 m (twin rail)
Belt width:	1,800 mm boom 1,800 mm elevat- ing conveyor
Bucket wheel diameter:	7.5 m
Bucket capacity:	1,100 l
Total connected load:	762 KVA
Maximum power demand:	610 kW
Total service weight:	806 t

The machine design including the control system software, which was exhaustively tested before being installed at site, was executed at Strachan & Henshaw Head Office in Bristol to the Specifications of National Power and the Port of Bristol.