Hydraulic systems advance drum reclaimer technology

Following the recent commissioning of two thyssenKrupp drum reclaimers at the Medupi Power station and the delivery of a further three to Kusile, *MechChem Africa* talks to Klaus Marggraff, systems sales manager for Hytec, about the novel hydraulics being used to advance the performance of thyssenKrupp Industrial Solutions (TKIS) South Africa's specialist technology.

TKIS South Africa has now completed the delivery of five drum reclaimers to the new-build power stations in South Africa, two to Medupi and three to Kusile. "Hytec developed and supplied the hydraulic systems for these machines, which include: the system to operate the rakes; the heel adjustment mechanism that sits underneath the rakes; and a new conveyer belt adjustment system," begins Marggraff.

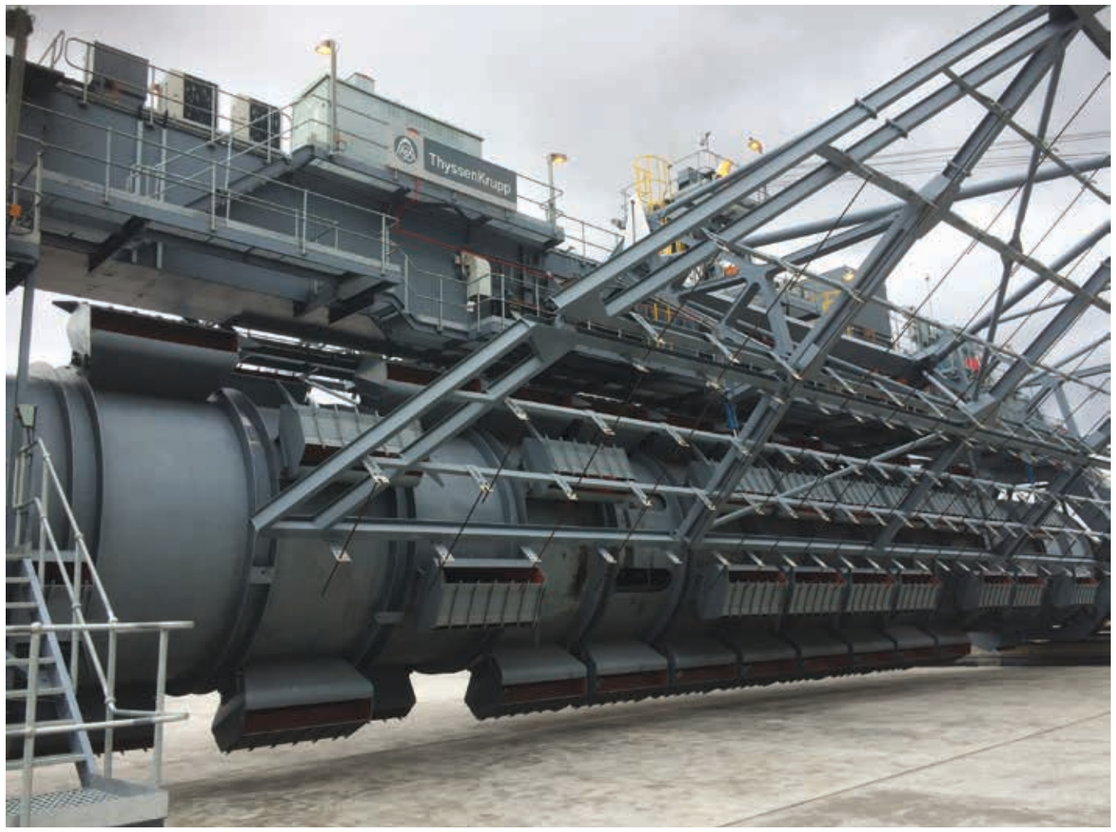
These are dual drum reclaimers, which means that they can reclaim coal down the one side of the stockpile while the stacker is adding coal behind. Then, when at the end of the pile, the front rake is switched off and the rear rake is activated for reclaiming in the opposite direction. Marggraff adds that the machines are fully automated. "There is an operator on each reclaimer, but his role is to respond to safety issues and unusual events. The routine reclamation process proceeds under full automatic control," he says.

Coal stacking and reclamation at power stations is essential for blending purposes, so that the pulverised coal that enters the boiler has relatively consistent calorific value. This is to prevent excessive temperature, pressure and power fluctuations.

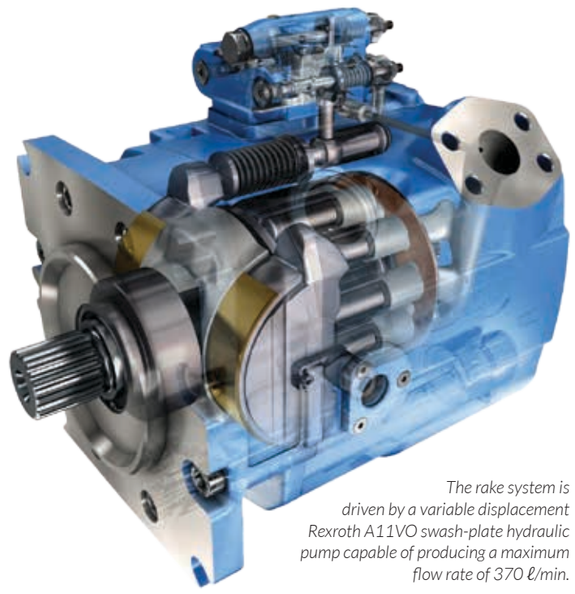
The thyssenKrupp drum reclaimers are used to feed blended coal into common bunkers, from where coal is fed to all six units at the respective power stations.

Describing the role of the rakes on the reclaimers, Marggraff says: "The rakes oscillate across the stockpile so that a steady stream of coal flows down the pile, into the drum and onto the conveyor inside the drum. The rake's role is to initiate material flow without causing avalanches, which could cause the system to overload.

"The reciprocating movement of the rakes is achieved using a single through rod cylinder with a 2.0 m stroke on each rake," he informs *MechChem Africa*. Cylinders with a 160 mm bore and a 120 mm rod are used at an operating pressure of around 160 bar, with the through rod cylinder design ensuring that speed in either direction can be easily maintained.



The reciprocating movement of the rakes on thyssenKrupp drum reclaimers is achieved using a single through rod cylinder with a 2.0 m stroke on each rake.



The rake system is driven by a variable displacement Rexroth A11VO swash-plate hydraulic pump capable of producing a maximum flow rate of 370 ℓ/min.

"The rake system is driven by a 90 kW hydraulic power pack, with an electric motor driving a variable displacement Rexroth A11 swash-plate hydraulic pump capable of producing a maximum flow rate of 370 ℓ/min," Marggraff says.

"Speed control and direction change is achieved via a proportional control valve, with an input signal coming directly from the system's main controller," he adds.

Turning attention to the heel adjustment system, he says that this mechanism is driven from the same power pack used for the rake and is also centrally controlled by the drum reclaimer's master controller.

Explaining the heel's role, Marggraff says that in order to control the coal feed flow into the drum reclaimer, the rake angle has to be adjusted to match the inclination angle of the stockpile at the point where the surface material can flow freely. "Wet coal, for example, will be more sticky so it will need a steeper rake angle, while dry coal will flow at lower inclinations," he explains, adding that the rake angle adjustment is done via a mechanical pulley system.

In addition to the rake angle, these modern systems incorporate an adjustable heel that sits below the rake and just above the drum for additional fine flow adjustment. This regulates the amount of coal being picked up by the drum's buckets and dropped onto the belt inside.

The third hydraulic system incorporated in these new drum reclaimers is a hydraulically operated conveyor belt tensioning system – the first ever application of continuous belt tensioning to be used on drum reclaimer belts in South Africa.

"Previously, if the belt started running skew or began to slip, tensioning had to be done manually. The machine had to shut down, the locking nuts loosened and portable hydraulic jacks were used to reposition the idler pulley, which was then locked into position again.

"The new hydraulic system enables the belt to be kept at its ideal tension continuously," Marggraff explains. This is accomplished using two parallel cylinders on either side of the belt, which are connected to the shaft of the idler pulley. Integrated position transducers on the cylinder rods are used to ensure belt adjustments on either side are within 3.0 mm to ensure that the belt always runs true.

Tension is achieved very simply, by maintaining the hydraulic pressure that produces the exact belt tension required. "The system also gives an early warning of belt tears, overloading or other problems, since such problems will also cause the cylinder positions or the tension-related pressure to fall outside of their tolerance bands," Marggraff adds.

"The cylinder stroke of 1.5 m gives a nice adjustment flexibility and the system makes it very easy to slacken the belt, should a splice be required, for example," he adds.

"Most importantly, the hydraulics continuously maintains a constant belt tension, which reduces the downtime associated with tensioning the belt as it stretches and actively compensates for the differential loading on the belt. With the previous locked-position arrangement, the tension would spike if the belt was overloaded, potentially damaging the belt," he explains, adding that the active system also autocorrects for belt misalignment.

"The cylinders are driven by a small 2.2 kW power pack. It's a very elegant use of hydraulics and, although a little more expensive in term of capital outlay compared to a manually adjusted pulley, the added reliability, uptime and belt-life benefits make for very rapid payback times," Marggraff argues.

The total value of the hydraulics contract? "About R5-million for all of the hydraulic systems on all of the machines," he reveals.

Marggraff says that with Medupi's Unit 4 having been synchronised to the grid on Thursday, 1 June 2017 and with Unit 6 and Unit 5 already in full commercial operation, the Lephalale power station is now producing 50% of its eventual 4 800 MW. Unit 4 is now expected to reach full commercial operation ahead of its early 2018 schedule.

Hytec is the hydraulic systems and turnkey solutions specialist for the Hytec Group of companies. It has branches in Cape Town – with specialist skills in systems for marine vessels – and Durban, which focuses mostly on systems for mobile equipment such as Bell Equipment's off-road construction vehicles. ❑