Standing by a stacker/reclaimer, the small scale of everyday machinery becomes clear. Cars, buses – even bulldozers – have nothing on this giant. At 150 m long and 42 m high, each of the seven stacker/reclaimers at EMO in Rotterdam houses an entire world of automation.

EMO Rotterdam is Europe’s largest dry bulk terminal, unloading and shipping more than 60 million tpa of coal and iron ore from ships that come into port. Vital to all of EMO’s operations are these stacker/reclaimers, built by ThyssenKrupp Fördertechnik and automated with Siemens process instrumentation and control systems.

Process precision
As waiting ships are unloaded and material stacked throughout the 135 ha. stockyard, EMO knows exactly where materials are and how much each stockpile houses.

“Quality is very important to us,” says Peter de Klerk, project manager at EMO. He is responsible for new construction projects, conveyor belts,
Belt scale measures fast-moving coal on Siemens Milltronics MMI double-idler stacker/reclaimers are at the heart of EMO’s operations. Automated with Siemens instrumentation and built by ThyssenKrupp Fördertechnik, stacker/reclaimers are at the heart of EMO’s operations.

An EMO operator points to the ultrasonic transducer located underneath the stacker/reclaimer’s operation.

Materials on the move
On the stacker/reclaimer’s 60 m conveyor belt, coal passes by at 1.25 tps. Belt scales are the heart of the stacker/reclaimer’s operation, measuring the amount of coal being transported from one location to another. When a ship first arrives at the quayside, EMO’s grab unloader lifts up to 50 t of coal in each scoop, deposits it in a hopper, which then unloads coal onto a conveyor headed for the stockyard. Once deposited, the stacker/reclaimer gets to work. The machine operates 24 hours a day, seven days a week, creating stockpiles reaching 20 m into the sky.

There are two ways to install a belt scale onto the stacker/reclaimer: the hard way or the easy way. The former is a labour-intensive operation involving a crane to lift and position the three, four, or six-idler scale. In the case of the Siemens Milltronics MMI dual-idler belt scale, installation involves an operator hoisting the scale over their shoulder and carrying it almost 22 m to the conveyor belt.

Eight bolts secure it to the conveyor frame and existing idler sets are fastened to the dynamic beams of the scale, meaning that no conveyor modification is required. With a Siiwarex FTC weighing module connecting the belt scale to EMO’s control system, the result is an accuracy percentage of ± 0.25%.

Another notable instrumentation solution is the Echomax XPS-30 ultrasonic transducer. It is mounted on the underside of the bucket wheel to measure the stacker/reclaimer’s distance from the stockpile and is connected to a Sitrans L U01 controller, which is mounted on the bridge. This ultrasonic level system confidently navigates beam and bucket wheel over the varying heights of the coal stockpiles.

The brains of the operation
If belt scales are the heart of EMO’s operations, the Simatic S7 automation system is the brains.

All of the process instrumentation and analytic devices monitoring the coal handling process are connected through a PROFIBUS DP network. This sends information to EMO’s control room. From their screens, operators can tell if a piece of equipment requires maintenance and, if so, they can then respond quickly. EMO carries out engineering onsite. If machinery or a certain process requires repair work, a service technician can fix the problem so it does not slow operations.

Other control room screens monitor North Sea ship traffic and the seven stacker/reclaimers. The process control system acts in a similar way to a car’s on-board navigation system for the stacker/reclaimers: e.g. it can find the best route from ship unloader number one to coal stockpile number six.

Because coal is shipped to EMO from countries around the world, it is necessary to mix different grades and types of coal. The top suppliers of coal to EMO’s facility are South Africa (40%), Australia (26%), and Colombia (18%). Coal is mixed in six blending silos, each with a capacity of 6000 t and a discharge rate of 3500 tph. The process control system knows when and how much coal is being blended, allowing EMO to provide the best quality products to end customers.

Deep freeze prevention
Once coal is ready for shipment, the stacker/reclaimer loads material onto a conveyor, which transports the coal 35 m upwards into the train load out hopper. Standing at the base of the 350 m² hopper, the earth moves and a deep boom echoes as 65 t of coal pours from the hopper into a waiting rail car.

Coal can freeze in the chilly winter temperatures of the North Sea, so on cold days EMO sprays railway loads of coal with a mix of glycol and water. A Sitrans F M MAG 5001 flowmeter sensor with a Sitrans F M MAG 5000 transmitter measures the water delivery rate, while another controls the amount of glycol sprayed on coal moving on the conveyor belt and a third controls the glycol sprayed on coal as it is being loaded into the rail car. A Sitrans FST020 clamp-on flowmeter controls the glycol supply, which is stored in a vessel monitored by a capacitance-level transmitter.

Once the coal has been sprayed, it is ready for transport to European centres. Germany and the Netherlands consume the majority of the coal that passes through EMO. 62% and 22%, respectively. A nearby coal-fired power plant in Maasvlakte, the Netherlands, uses 12% of this coal to supply power to this industrial area.

Machines have to run
From deep underground in continents thousands of kilometers away, coal continues its journey across EMO Rotterdam’s coal handling facility. Seven stacker/reclaimers, six blending silos and nearly 28 km of belt conveyors with process instrumentation and control systems linking it all. Making the complexities of coal handling at a facility of this size into a smooth, efficient operation.