

CASE NOTE

# ABB drive systems control coal export conveyors in New South Wales, Australia



— Coal export terminal on Kooragang Island, New South Wales, Australia.

ABB supplied 32 ACS1000i medium voltage drive systems, rated at 1000 and 1250 kW, for one of Australia’s largest coal export terminals on Kooragang Island, New South Wales, Australia.

The drives provide soft start and speed and torque control for 20 conveyors. 8 of the conveyors feature a single drive, while 12 conveyors each have 2 single drives in a master-follower arrangement. Among the benefits are energy savings, accurate and fast load sharing, high availability and smooth ramp up.

**Valle 1 and Valle 2 solar power plants**

The Newcastle Coal Infrastructure Group Pty Limited (NCIG) owns and operates one of Australia’s largest coal export terminals with rail, storage and ship loading facilities and associated infrastructure. The terminal serves long life coal mines in New South Wales by providing access to port infrastructure for exporting the coal.

NCIG’s terminal started operation in 2010 and at the time of the drives supply had an installed capacity of 53 million tonnes per annum (Mtpa).

**Highlights**

- Accurate load sharing
- Energy savings
- Extended lifetime and increased availability of conveyors
- Low speed operation for belt inspection
- Smooth ramp up
- High control accuracy

**Coal export conveyors**

The coal export terminal features 20 conveyors which transport the coal from the unloading facilities to the stockpiles or to the wharf for loading onto ships.

# ABB drive systems for NCIIG, Australia

## Challenge

To sustain the coal supply chain, the conveyors, which have a total length of more than 13 kilometers, have to be available 24 hours per day, seven days a week.

This requires the coordination of the 20 conveyors to maximize the terminal's throughput.

The conveyors need to start up smoothly to avoid mechanical stress and tripping. Furthermore, the material demand might require that the conveyors start up at short notice.

## Solution

ABB supplied 32 ACS1000i medium voltage variable speed drives with integrated transformers and 32 ABB induction motors, rated at 1000 and 1250 kW. The drives and motors soft start and control the speed and torque of the 20 conveyors.

Two different variable speed drive configurations are implemented, depending on the load requirement of the conveyor:

- Single drive
- Two single drives in master-follower configuration

To simplify maintenance and spare part handling, the same type of drives and motors are installed for all conveyors on site.

## Benefits

### Energy savings



Starting and stopping conveyors with variable speed drives (VSDs) does not cause additional stress to the equipment.

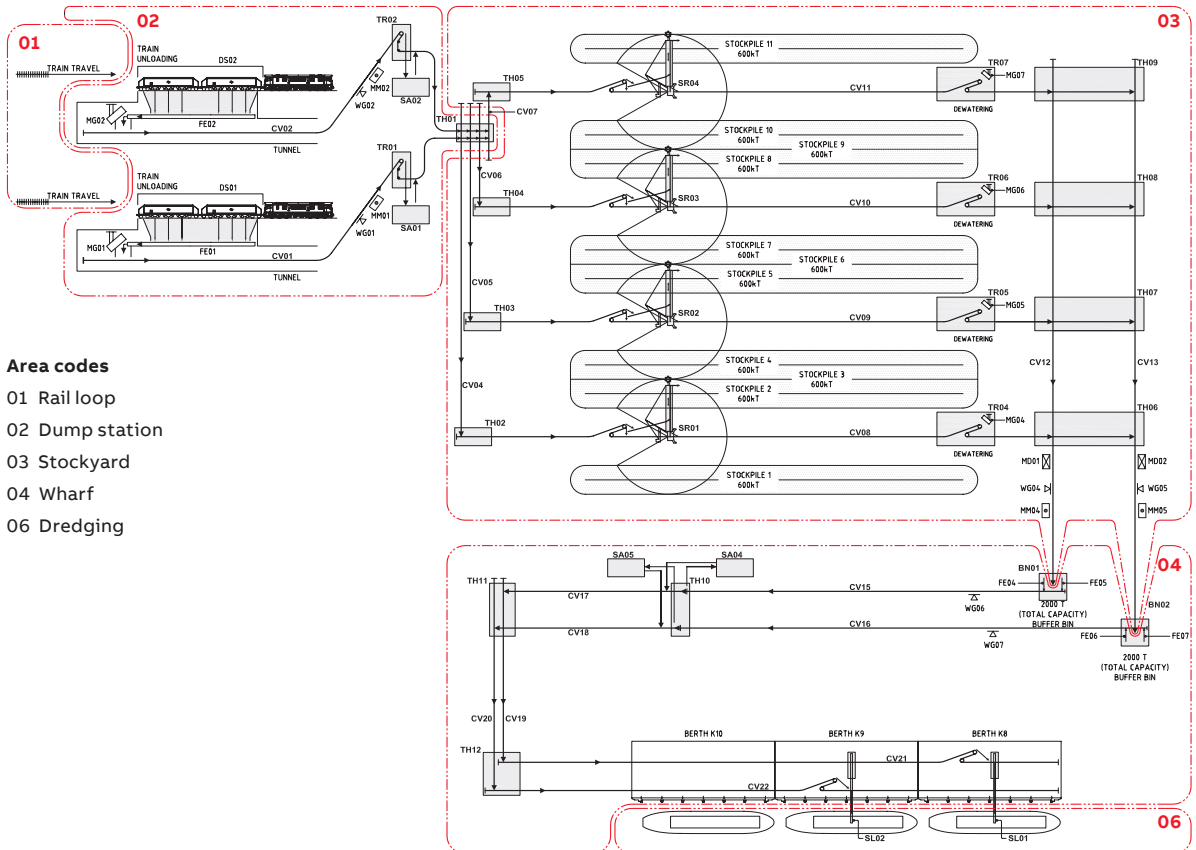
Therefore, conveyors can be stopped or operated at reduced speed if material demand is intermittent or low, resulting in less energy consumed.

### Accurate and fast load sharing



ABB medium voltage drives provide an accurate and fast load sharing between several drives. This is useful for conveyor applications, where two or more motors operate on the same conveyor, making sure all motors are loaded as needed. The converter control provides speed limitation to prevent belt slippage.

NCIG coal export terminal plant flow diagram (source: NCIIG)



### Area codes

- 01 Rail loop
- 02 Dump station
- 03 Stockyard
- 04 Wharf
- 05 Dredging
- 06

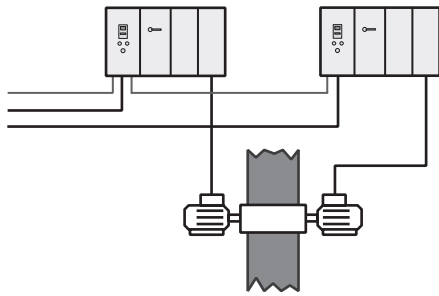


Figure 1: Hard coupled conveyor configuration.

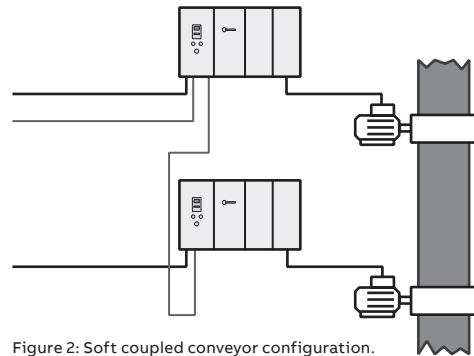


Figure 2: Soft coupled conveyor configuration.

At NCIG’s coal export terminal, 12 of the 20 conveyors are equipped with two ACS1000i variable speed drives in master-follower configuration.

In a master-follower configuration, two motor shafts are either hard coupled, i.e. connected to the same pulley (same shaft), see Figure 1, or they are soft coupled, i.e. connected to different pulleys, see Figure 2.

The two configurations require different converter control schemes which are part of the standard software package available for ABB’s medium voltage drives. This software ensures accurate load sharing in either master-follower configurations.

**High availability**

The master-follower configuration permits the continued use of the conveyor system with reduced power in case of failure of one variable speed drive system.

Due to the power loss ride through function, ABB drive systems are able to withstand disturbances on the power supply. The drive will continue to operate in an active but non-torque producing mode if the incoming supply voltage is cut off. The drive is active as long as the motor rotates and generates energy to the drive. It will bumplessly resume normal operation immediately upon return of the power supply.

ABB’s scope of supply includes 32 induction motors, rated 1000 and 1250 kW at 1000 rpm and 32 ACS1000i variable speed drives.

**Low speed operation for belt inspection**

For maintenance inspection, belt changes and repairs it is possible to run the conveyor at low speed.

**Smooth ramp up**

VSDs provide a smooth ramp up of conveyors. They deliver high starting torque for the current drawn from the power system and have a programmed upper limit to reduce peak torque during the start of the conveyor. The low starting currents and high starting torque enable a smooth start-up of the conveyor, even when it is fully loaded.

**High control accuracy**

ABB’s drive control platform is based on the award-winning Direct Torque Control (DTC), resulting in the highest torque and speed performance, as well as lowest losses ever achieved in medium voltage drives. Control of the drive is immediate and accurate under all conditions.

**Extended lifetime and increased availability**

Variable speed drives provide accurate torque and speed control of conveyors. This reduces the stress on mechanical equipment such as gearboxes, pulleys and belts, especially during start-up and stopping, but also during operation and maintenance.



ACS1000 key data	
Inverter type	Three-level Voltage Source Inverter (VSI)
Power range	Air cooling: 315 kW - 2 MW Water cooling: 1.8 MW - 5 MW
Output voltage	2.3 kV, 3.3 kV, 4.0 kV, 4.16 kV (optional: 6.0 kV - 6.6 kV with step-up transformer)
Maximum output frequency	66 Hz (optional: 82.5 Hz)
Converter efficiency	Typically > 98%
Type of motor	Induction motor
Special feature	Air-cooled ACS1000 available with integrated transformer and input contactor (ACS1000i)

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For more information please contact:  
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**[www.ncig.com.au](https://www.ncig.com.au)**

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