

# Automation of furrow irrigation

## Overview

### Site details

The National Centre for Engineering in Agriculture (NCEA) received funding from SRA to investigate the automation of furrow irrigation in the sugar industry. The first phase involved a review of potential commercially available control hardware, sensors and radio systems. The most suitable combination of automation equipment was selected and automation systems on three Burdekin farms were installed. These farms were chosen because they represented three different, but common, types of irrigation infrastructure.

The sites are: delta farm (Airville) with multiple pumps, interconnected pipelines and recycling; BRIA farm (Upper Haughton) with channel supply and no pumping or recycling; BRIA farm (Leichhardt) with river pumps and recycling.

All three farms are using WiSA radio equipment and software which can enable the control of existing butterfly valves and pumps and can interface with a wide variety of monitoring devices.

This is a computer-based system which stores all the

information on the grower's own computer – as opposed to a web based program that stores data online (the cloud).

Radios are used to convey information and instructions between the computer/base station and the field. Sensors can be used to detect problems in the supply system and notify the grower or shut the system down if desired. End of row sensors can be added to enable the system to self adjust run times to manage tail-water volumes.

The system design and equipment required is different for each farm, and this affects the cost. For the project sites, the total cost per hectare ranges from \$600/ha at the Upper Haughton site to \$2,200/ha at the Airville site. This is largely a reflection of the area supplied by each valve and the number of pumps. Each of the growers has contributed to the system with their own funding, in addition to the funding provided by Sugar Research Australia (SRA).

The equipment that has been installed on the project farms is designed to be modular. That is, different areas can be automated as time and funds permit. It is not necessary to automate the whole farm at one time.

### Equipment description

#### Base station and computer

Communicates with all field radios, is generally a once-off cost regardless of the size of the system.

#### Pump controller

For remote starting and stopping of pump.

#### Pressure transducer

Provides a way to monitor the system e.g. if the pressure rises above a calibrated level then it is likely that one of the valves hasn't opened.

#### Actuator control radios

Controls the opening and closing of the valves (hydrants). Each radio is capable of controlling at least two actuators, each must be located within 10m of the radio.

#### Linear actuators

Open and close the butterfly valves.

#### Advance/Drainage monitoring radios

To relay data from the advance/drainage sensors so that either the farmer can be notified or can be used to automatically start the next irrigation set.

#### Advance sensors

Buried soil sensor to detect water advance before it reaches the end of the field.

#### Drainage sensors

Sensor to detect water level in the end of field drain.

## Costings

The following table contains a breakdown of costs for each site. The figures reflect a best estimate of these costs at a commercial rate installed in the field rather than simply raw component costs.

	Site					
	Upper Haughton		Leichhardt		Airville	
<b>Irrigation delivery system</b>	<b>Gravity feed</b>		<b>River pumps and recycling</b>		<b>Bores, open water and recycling pumps</b>	
Area (ha)	82		53		27	
Total cost	\$49,700		\$63,365		\$59,700	
Cost/ha	\$606		\$1,290		\$2,211	
	Equipment installed at each site					
Item	No.	Cost	No.	Cost	No.	Cost
Base station, pc & software	1	\$6,900	1	\$7,700	1	\$7,700
Pump controller & installation	0		2	\$7,000	1	\$3,500
Pressure transducer	1	\$800 <sup>1</sup>	2	\$800 <sup>2</sup>	1	\$800 <sup>1</sup>
Water meter & installation	0		2	\$11,465	0	
Actuator control radios	5	\$15,000	6	\$18,000	5	\$15,000
Actuators, brackets & fitting	5	\$4,500	11	\$9,900	8	\$7,200
Advance monitoring radios	3	\$9,000	2	\$6,000	5	\$15,000
Advance sensors & installation	5	\$8,500 <sup>3</sup>	3	\$2,500 <sup>4</sup>	6	\$5,500 <sup>4</sup>
System commissioning	1	\$5,000	1	\$5,000	1	\$5,000

### Notes

- (1) 4m submersible transducer
- (2) 4m external transducer
- (3) In-field sensors – extra cabling and trenching required
- (4) Drain sensors

## For more information

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