

SWEET SUCCESS

Receiving an invitation to work in an often-turbulent country such as Pakistan would be too much to ask of many. But when an Innisfail-based refrigeration company put the proposition to its staff, there was no shortage of volunteers, as Sean McGowan reports.



On-site at JDW Sugar Mills – one of Pakistan's largest sugar cane producers.

Though the production and use of sugar in Pakistan and the sub-continent can be traced back to 520BC and beyond, the modern cultivation of white sugar in this region is much more recent.

British colonialism brought with it the first modern sugar mills, but it was not until the advent of World War II that sugar's place as a valuable commodity gained greater importance.

With Europe's industrial base turned over to the war effort, the sub-continent became a major supplier of sugar to war-torn Europe, and an industry was born.

Since gaining independence following the end of the British Raj in 1947, the area under sugar cane cultivation in Pakistan has grown to cover more than one million hectares – more than any other crop.

As a result, Pakistan sits among the world's top 10 sugar producers. According to the Pakistan Sugar Mills Association, more than 80 sugar mills scattered around the country are capable of crushing over 80 million tonnes of cane annually. Yet despite ranking fifth in the world in terms of area under sugar cane cultivation, it remains 60th in the world in terms of yield.

It's a situation that Pakistan's sugar industry – and government – is seeking to address. As the country's second biggest agricultural industry, it is a source of billions of rupees to a government that has, at times, meddled with the industry to its own detriment.

Socially, the presence of a sugar mill in Pakistan's under-developed rural regions has an even greater effect. Not only do mills bring jobs to small towns, but they also bring improved infrastructure in the form

of roads, rail, electricity and communications, as well as better schools and hospitals.

JDW SUGAR MILLS

As one of Pakistan's largest sugar producers, JDW Sugar Mills operates three mills in Pakistan – two in the eastern province of Punjab, and another in the province of Sindh, to the country's south.

Along with cultivating and processing sugar cane, the company is also known for its support of innovative farming techniques that augment its core business.

In 2010, JDW Sugar Mills engaged one of Australia's pre-eminent experts in sugar cane science, Dr Nils Berding, to improve their sugar cane production.



The three-chamber photo-period facility has controlled day length and dark-time temperatures.

A former scientist with the Bureau of Sugar Experimental Stations (BSES) in Meringa near Cairns, Berding has carried out many plant-improvement projects to benefit Australia's sugar cane industry. His advice is much sought-after around the world.

Berding had previously worked with local Innisfail refrigeration company Jackson & Jackson Refrigeration to develop different facilities for BSES experiments. Despite the distance involved, Berding turned to Jackson & Jackson again for the JDW assignment.

"I received a phone call from Dr Berding when he was in Pakistan," recalls Bob Jackson, assistant manager with Jackson & Jackson Refrigeration.

"He had told JDW Sugar Mills that he could improve their production significantly, but would need to build special scientific facilities ... [and] he'd been bold enough to inform them that we would build the facilities for him."

The facilities would be similar to those that Jackson & Jackson Refrigeration had built for BSES in the past. The brief involved overseeing the construction of a germination chamber, a photo-period facility and a seed-packing and storage chamber at two of JDW's three mills.

"The whole idea of the project is to cross different cultivars (of sugar cane) to come up with varieties that

suit the local soil and climate conditions," says Jackson. "A small percentage increase in sugar content in the cane can result in very significant financial gains."

Having never worked outside of Queensland, let alone Australia, the management team at Jackson & Jackson immediately recognised the opportunity afforded the company, and set about making it happen.

Following a meeting in Pakistan, planning the project logistics became the number one priority.

Jackson sought the advice of a local customs agency about transporting shipping containers from Innisfail to Karachi, which would prove relatively simple. He also engaged the assistance of the Queensland Government to clarify the issues involved with working overseas.

He then took the opportunity to his staff.

"We informed them that it was a Muslim country, that it was a dangerous country and that if they weren't interested in going, they simply had to say no," he says.

"Surprisingly enough, there was no shortage of volunteers. We even took some of our sub-contractors."

The company organised immunisations for staff, as well as around-the-clock security while on the ground in Pakistan. Jackson & Jackson staff were paid an allowance of \$300 per day while in Pakistan, on top of their normal pay, while sub-contractors were paid double their normal rate.

"At one stage, on one trip, we had six of our staff and two sub-contractors working over there. Some did a couple of trips, and anyone who went once was keen to go back a second time."

Designed to Berding's specifications, all elements of the three installations were built in Innisfail before being shipped to Pakistan.

While this ensured quality control, it also meant every conceivable piece of equipment, including tools for installation and maintenance, needed to be transported to site – even a scissor lift.

GERMINATION

In Pakistan's eastern Punjab province, Rahim Yar Khan is home to JDW's largest sugar mill.

Here, Berding specified the installation of a purpose-built germination chamber.

Designed and built in Innisfail before being shipped to site, the chamber is constructed from cold room panel. It is now used to germinate sexual sugar cane seed and vegetative buds.

It is fitted with 40 Gro-lux fluorescent tubes that simulate sunlight. A reverse-cycle refrigeration system provides heating and cooling as required to maintain temperatures in the chamber – 36°C for seed and 28°C for eyes.

Jackson says the installation of this facility was relatively straight-forward.

"We had a lot of willing hands to assist us while on site," he says, adding that ensuring each installation had safe electrics was a priority.

"We installed safety switches, fitted BP connectors over the bare wires that were simply twisted together and exposed, fitted J-boxes and generally tidied up the electrical installation."



SUGAR CANE BREEDING

Located in the south of Pakistan at Makli Hills, JDW's sugar cane breeding station includes a new three-chamber photo-period facility and seed-packing chamber installed by Jackson & Jackson.

The 9m high photo-period facility features three chambers – each with its own train holding sugar

cane plants – which allows for the initiation and development of the sugar cane flowering process, in an environment of controlled day length and dark-time temperatures.

Each chamber features its own roller shutter door to allow each train to be fully enclosed, in either a lit or unlit environment. This lighting, provided at a red to far-red (R:FR) ratio of 1:4, is installed to allow modification of the ambient photo-period – the plant's daily exposure to light – as required.

The chambers also feature two industrial ceiling-mounted fans to provide air movement. A reverse-cycle air conditioning system maintains a set temperature of 21°C once the roller shutter is closed.

Each train is fitted with its own winching system to allow it to be hauled in and out of the chamber as required. Irrigation is provided to the trains by irrigation couplers at the end of each track.

Although Jackson & Jackson provided the equipment for the fit-out, the predominantly concrete building was constructed by local Pakistani contractors. So were the three trolley lines that emerge from each chamber.

Jackson says that while the buildings were well-engineered, one of the biggest challenges during the installation was dealing with Pakistan's inconsistent power supply.

"They would be lucky to get 18 hours supply per day," he says.

To counter such issues, an 80kVA generating set was supplied and installed, as was a 40kVA uninterrupted power supply (UPS). This combination provides for constant clean power, and allows the facility to operate independently of the external electrical supply if required.

A seed-packing chamber was also designed and installed at the Makli Hills Sugar Cane Breeding station.

It features two chambers of identical size, constructed from cold room panels.

The first is the seed-packing chamber, fitted with stainless steel work benches and power outlets. Here, the sugar cane seed is stripped from the cane flowers, then marked and placed into drying bags.



The second is the seed-drying chamber, where the bags of seed are dried on custom-made stainless steel hanging rails. This reduces their moisture content to less than 6 per cent moisture (fresh weight basis), allowing for long-term deep-freeze storage of the seed.

According to Jackson, this chamber is fitted with a dehumidification system and refrigeration system to provide consistent conditions of 10 per cent RH and 12°C.

The facility has been designed so that some of the air from the drying chamber is fed into the packing chamber to provide conditions of 30 per cent RH and 20°C.

All facilities have also been fitted with BMS controls to allow for automatic operation, extensive data-logging and remote monitoring.

EXPANDING HORIZONS

Since their commissioning in early 2011, the facilities have operated as designed.

Jackson & Jackson staff have returned to the site to service the equipment on one occasion. The remote log-in provided by the BMS systems has proved extremely beneficial, allowing them to change settings for a range of experiments without the need to be on-site.

Such experiments, as part of JDW's sugar cane crop-improvement program, are expected to deliver



increases in cane yield and sugar content to benefit the company and the country for years to come.

In fact, such has been the success of the project that Jackson & Jackson Refrigeration is now fielding enquiries from many other countries.

A similar project planned to proceed in Iran was scuttled following US sanctions that collapsed the Iranian currency. However, a seed-packing and growth-chamber project is under way in Fiji's sugar capital, Lautoka.

"We have also priced facilities for Thailand, and have had enquiries from Ethiopia, Saudi Arabia and Egypt," says Jackson.

He says based on the firm's experience with JDW Sugar Mills in Pakistan, and now in Fiji, it would have no hesitation working in any of these countries.

"Working on this project has widened our horizons," says Jackson. "It was a great experience for both the company and staff." ▲