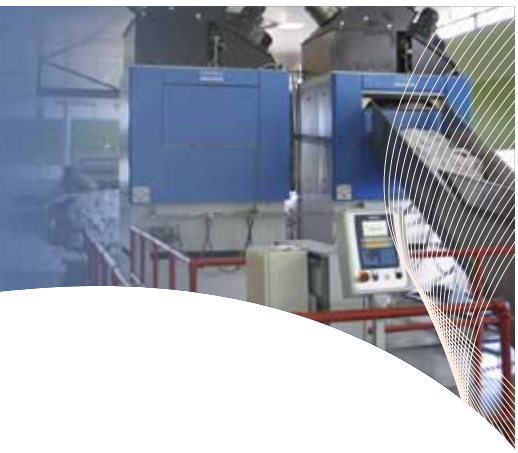
CASE STUDY

New technology dryers save $46,000 p.a. in energy costs and boost throughput capacity



Canterbury Laundry Service replaced two steam and electricity powered dryers with new, high tech, LPG direct fired dryers, and is saving itself $46,000 p.a. in energy costs, reducing its CO_2 emissions, and boosting throughput capacity.

About Canterbury Laundry Service

Canterbury Laundry Service (CLS) processes over 80 tonnes of linen each week for hospitals and accommodation providers throughout the region. There are many different types of linen from towels, pillow cases, and sheets through to operating theatre gowns and hats.

The CLS factory in Christchurch.

CLS owns the linen and provides it to customers as part of the contract. It also owns the trucking operation that picks up the dirty laundry and delivers the freshly cleaned, dried, ironed, and folded linen.

Over a quarter of a million individual linen items are picked up each week. They arrive in 12kg colour coded bags for batching and channelling through the laundering process.

Energy and the laundering process

The primary energy source at CLS is its 6MW LPG fired boiler. Steam from the boiler is used to heat water used in the washing process, run the pre-dryers and dryers, heat the ironing machine, and to provide space heating in the work areas.

The scale of the facility and equipment required to process 80 tonnes of laundry per week is impressive. Laundry bags are moved and sorted on rails similar to those found in a freezing works. The batched and sorted laundry then travels on conveyors through much of the remaining process.

The washing machine (continuous batch washer) stands three metres high and ten metres long.

The washer comprises multiple chambers that take the laundry through a range of separate decontamination, washing, and rinsing stages. The drum rotates back and forth like a pendulum to complete the washing cycle at each stage, then completes a full rotation to push the laundry through to the next chamber.

Water from the rinsing stage is reclaimed for use in earlier parts of the wash cycle.

After the rinsing stage, the laundry is pressed to remove excess water. It then moves to a light shaking and pre-drying stage, although this stage is not required for the new dryers.

The most energy intensive process is drying the linen (65% of total energy). A load of 130kg of wet laundry will contain around 65kg (50%) water that needs to be evaporated before the laundry can move on to the ironing or folding processes.

Old dryer technology

Until recently, CLS operated four large capacity dryers and two smaller ones, all operated on steam provided by the central boiler.

These steam-based dryers all work on similar principles. The steam is reticulated through large internal radiators over which electrical fans blow air. The resulting hot air from the radiators enters a rotating cage, blows through the laundry removing moisture as it goes, and then exits through a flue.

This old technology results in significant energy loss in the reticulation from the central boiler to the dryer, and in the heat escaping up the flue with the moist air.

The case for installing new dryers

The CLS Board of Directors has been supportive of any energy saving initiatives that stack up with a sound business case. Capital investments with three-to-five year payback periods will normally get the green light, particularly where the technology is proven with a sound track record.

The business case for replacing the dryers was fairly clearcut. Two of the large dryers were 26 years old and due for refurbishment. This provided the ideal opportunity to explore more energy efficient options.

Rod Fisher, Production Manager, has been with CLS for 12 years. When the opportunity came to consider possible replacement of the old dryers he was keen to explore some new technology dryers launched by the Jensen-Group in Europe just 18 months prior.

The Jensen-Group is a Danish-based manufacturer of industrial laundry equipment and associated process automation systems. They had launched a new micro-processor controlled, LPG direct fired dryer that promised greater energy efficiency and improved throughput capacity.

Rod Fisher, Production Manager, and energy efficiency champion.

By working with the New Zealand distributor, Kleentech, Rod was quickly able to establish a business case for replacing the two old dryers with two of the new Jensen units. The maths was pretty straightforward:

Project budget	$220,000
Forecast energy savings p.a.	$60,000
Forecast production efficiencies p.a.	$13,000
Simple payback (not NPV-based)	3 years

However, Rod faced an extra hurdle in that there were only eight installations of the new technology worldwide, and none in New Zealand. And, with only an 18-month track record, a commitment to the new technology would bring a degree of risk with it.

Fortunately the Energy Efficiency and Conservation Authority (EECA) was able to resolve that concern by providing financial support to the project. The project was given the green light by the CLS Board, and was implemented in late 2006.

Waste water heat recovery saves 15%.

EECA grants

Grants for demonstration projects are available to businesses in energy intensive sectors. Grants of up to 40% of the capital cost of the project are available, with a maximum of $100,000 for each grant. EECA is looking to support energy efficient technologies that are commercially available but are not yet commonplace in New Zealand.

EECA grants are available for businesses from the following sectors: heavy transport fleets, wood processing, basic metals, glasshouse crops, irrigated dairying, irrigated arable crops, food and beverage processing, fishing fleet operation, and non-metallic products.

Other businesses where energy is greater than 5% of their total business costs are also eligible.

Full details on the grants are available at www.eecabusiness.govt.nz/eib

With assistance from the team at EECA, Rod submitted a successful application and was granted a 40% subsidy on the capital cost of the project.

Rod says: "*The EECA grant for energy efficiency projects is a great concept and helped me get the project approved by the Board.*"

Energy & production efficiencies of the new Jensen dryers

There are four main factors contributing to the efficiencies of the new Jensen dryers: heat generation at point of use, recovery of waste heat, integration of the shaking and pre-drying stage, and faster drying.

Heat generation at point of use

The Jensen dryers directly heat the air being blown through the rotating laundry cage. This compares favourably, from an energy use perspective, to heating steam in a boiler 60 metres away and suffering energy losses in the reticulation. This is particularly relevant where the costs per unit of energy consumed are the same for both heating systems, ie, both systems run on LPG.

The two Jensen dryers installed at CLS.

Another factor is that the burner in the central boiler has two operating modes, either 100% or idle at 16%. This is not as efficient as modern PLC controlled burner heads that have infinitely variable output to precisely meet demand. The burners in the Jensen dryers work in conjunction with a frequency controlled drive motor on the rotation drum to deliver a range of drying programmes that are optimised for different kinds of linen.

Recovery of waste heat

Each dryer has two major air ducts that enter the ceiling above the factory. One duct takes the warm moist air flowing from the laundry cage out through the ceiling cavity to the roof and exhausts it into the atmosphere. The duct also passes through a Reco Cross heat exchanger located in the ceiling cavity. This air-to-air heat exchanger pre-heats the air flowing through the second duct and back into the burner. It lifts the heat of the air entering the dryer by about 35°C (ie, if the ambient air temperature is 20°C, it will be lifted to 55°C before entering the dryer). This provides a 35% energy saving over a dryer without the heat exchanger.

Integration of the shaking and pre-drying stage

Before the new dryers were installed, laundry was conveyed from the washing machine press into a separate shaking and pre-drying machine, and then on to the old dryers. With the new Jensen dryers, laundry can be conveyed straight from the press to the dryers. The flexible drying programmes include options for shaking, conditioning, or full drying of linen in the one dryer unit. Apart from the energy savings from combining these processes, there are also production efficiencies.

Faster drying

The intelligent drying programmes and removal of the separate pre-drying stage combine to speed up the overall drying process and boost production throughput. This is particularly important as CLS grows its business and when previously the drying process was a bottleneck in its production. The new dryers have removed that bottleneck enabling many other stages in the overall production cycle to operate more efficiently.

Assessment of the new dryer installation

Technical monitoring

EECA engaged Enercon Ltd, energy and utility consultants based in Christchurch, to assess the actual energy savings achieved by the new installation. Their consultants measured the energy requirement to dry loads of laundry in the old steam dryers in October 2006, and compared those results with loads put through the new Jensen dryers in November 2006.

The comparison methodology had to be sophisticated to deal with the different drying times and the absence of a pre-drying stage for laundry entering the new dryers. The critical measure became the amount of energy required by the respective machines to evaporate each kilogram of moisture from the wet laundry.

The table below summarises Enercon's findings from their measurements and calculations:

	Dryer		
	Steam	LPG	
Average wet weight	131	143	kg/load
Average dry weight	87	89	kg/load
Evaporation	44	54	kg/load
Cycle length	28	22	mins/load
Total energy	105	76	kWh/load
Total cost	$9.11	$6.62	/load
Benchmark	2.38	1.41	kWh/kg (evap)
	100%	59%	
Benchmark	$0.21	$0.12	/kg (evap)
	100%	59%	

Enercon concluded that, on an assumed 6,240 loads of laundry per dryer per year, each new dryer will save $23,200 per year, or a combined saving of $46,400 per year. This was less than the forecast in the original business case, but still provided an acceptable payback period for CLS's investment. The forecasts had been based on a similar project overseas; however, in that conversion, the dryer model used had a higher capacity so there may be economy of scale issues.

Enercon believes the new LPG fired dryers will use 40% less energy than the steam predecessors and concluded that, "*Not only are the new dryers much more efficient, but reducing the drying time allows higher throughput, benefiting the business by increasing sales.*"

CLS's assessment

Rod Fisher and CLS's General Manager, Bruce Humphreys, are happy with the result.

The planning and preparation for the decommissioning of the old dryers and installation of the new ones had been straightforward, and was aided by Kleentech. The actual installation of the new dryers took only 1.5 days.

Says Bruce Humphreys: "*The fast drying and higher throughput capacity has already started paying dividends. We recently had to rapidly expand our capacity after a fire at the Invercargill Hospital's laundry.*"

Further information

Topic:	Who:	Web address:
Laundry conversion business case	Canterbury Laundry Service Ltd	www.canterburylaundry.co.nz
Industrial laundry equipment and automations	Kleentech New Zealand Ltd	www.kleentech.co.nz
Energy and utility consultancy advice	Enercon Ltd	www.enercon.co.nz

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CONTACT EECA

For more information on EECA's technology grants and services, call 0800 358 676 or visit www.eecabusiness.govt.nz/eib