CASE STUDY

An Affordable Wastewater Treatment Solution for Commercial Properties

KIWI CORRAL, NEW ZEALAND

Problem Kiwi Corral Country Backpackers is a hostel in New Zealand's Bay of Plenty that caters to seasonal workers. As part of the renewal process for its wastewater discharge-to-land Resource Consent (discharge permit), the hostel wanted to upgrade its treatment system so its facilities could accommodate up to 500 people at a time. Along with the fluctuating loads common to the lodging industry, another large challenge was the very limited land space available for effluent dispersal.

Solution After considering many treatment options, planners chose a two-stage AdvanTex® Wastewater Treatment System, followed by another Orenco® technology, a high-infiltration shallow pressurized dispersal system (SPDS). The AdvanTex system has a small footprint and consistently produces the high-quality effluent necessary for the SPDS to be effective in a tight space.

Growing Pains

Known for its kiwifruit orchards, the town of Te Puke, New Zealand, is found in the North Island's Bay of Plenty region. Te Puke is also the home of Kiwi Corral Country Backpackers, a hostel that serves seasonal workers and backpackers, billing itself as "the perfect base for your working holiday in New Zealand."

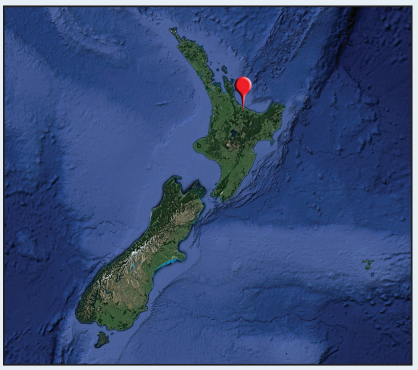
The facilities at Kiwi Corral include dormitories, cabins, and campsites, plus a shared kitchen, bathrooms, and recreation areas. Due to the many nearby fruit and vegetable farms, Kiwi Corral typically houses migrant seasonal workers from throughout the Pacific Islands during harvesting and packing season, which usually lasts from March to June.

Kiwi Corral, a New Zealand hostel that can lodge up to 500 people at a time, chose an AdvanTex® Wastewater Treatment System to handle the widely variable flows from its facilities.

Commercial Market

Project Overview

TE PUKE, NEW ZEALAND



Design Parameters
- 500-bed hostel
- 45 m^3/day (11,900 gpd) average flow
- 60 m^3/day (15,850 gpd) capacity

Resource Consent Limits
- 10 mg/L $cBOD_5$
- 10 mg/L TSS
- 1000 CFU/100mL E. coli

Effluent Quality*
- 2 mg/L $cBOD_5$
- 6 mg/L TSS
- 12 CFU/100mL E. coli
- 7 mg/L TP

Start-Up Date
- March 2018

Stage 1 Collection & Treatment
- Three above-ground, 25-m^3 (6,600-gallon) septic tanks for primary treatment
- Two 70-m^3 (18,500-gallon) septic tanks with Biotube® effluent filters
- One 70-m^3 (18,500-gallon) recirculation tank with dosing pumps
- Nine AdvanTex® AX100 units

Stage 2 Treatment
- One 70-m^3 (18,500-gallon) post-anoxic tank
- One 25-m^3 (6,600-gallon) recirculation tank with dosing pumps
- Three AdvanTex AX100 units

** Samples collected and analyzed by a third party between 9 May 2018 and 6 June 2019.*

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KIWI CORRAL, NEW ZEALAND

Construction plans were constrained by the size of the site: a space of only about 15 by 25 meters (49 by 82 feet). To reduce the facility's footprint, large process tanks were built on-site, and the AdvanTex treatment units were then positioned on top of them.

During other parts of the year, backpackers from around the world stay at the hostel while they work and sightsee.

Kiwi Corral's developer wanted to add facilities to accommodate more guests, but knew that some infrastructure analysis would be required before beginning the process of expansion.

The hostel's wastewater discharge-to-land Resource Consent was scheduled to expire in November of 2017. As part of the renewal process, its onsite wastewater treatment system underwent an assessment, which determined that an upgrade would be necessary for the hostel to increase its capacity to a potential 500-person occupancy.

The developer hired a consulting firm to research possible wastewater solutions and obtain a new discharge-to-land Resource Consent. The firm considered many options, including various onsite packaged wastewater treatment systems and even transporting the hostel's wastewater to town for treatment.

One of the most significant limitations on designing and installing an appropriate onsite wastewater treatment system was the land available for the application of effluent. "Aerial area" is the amount of land needed when using minimum spacing between effluent dispersal trenches. The estimated aerial area required for effluent application and land treatment at Kiwi Corral was 6,000 m^2 (1.48 acres) for primary-treated effluent and 3,600 m^2 (0.9 acres) for secondary-treated effluent.

However, the only aerial land available was a recreational field called the "Green Oval," originally thought to include 1,600 m^2 (0.4 acres), with a basal area (the land area required at the base of the trenches) of 480 m^2 (0.12 acres). Later, this basal area was found to be even smaller, just 430 m^2 (0.11 acres). And the options to acquire more land or limit the occupancy of the hostel weren't desirable.

Another major challenge was the fluctuation in occupancy throughout the year. During the packing and harvesting season, Kiwi Corral is fully occupied. But during the rest of the year, the number of guests is much lower. For this reason, only a wastewater treatment system that could consistently handle fluctuating loads could be considered.

An AdvanTex Solution

In October 2017, Innoflow Technologies was hired to design a wastewater treatment and land application solution that would work for Kiwi Corral despite limited space and highly variable loads.

To address both challenges, the proposed design called for a two-stage AdvanTex® Wastewater

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Treatment System followed by a high-infiltration shallow pressurized dispersal system (SPDS). Each stage starts with a series of primary treatment (anoxic) tanks, followed by recirculation tankage and AdvanTex secondary treatment units. The design retained existing septic tanks for primary treatment and included an ultraviolet disinfection unit for tertiary treatment.

AdvanTex technology can consistently produce high-quality secondary wastewater treatment, even when presented with fluctuating loads. It uses a recirculating packed-bed filter, which provides advanced treatment of effluent via aerobic, biological methods. Textile sheets hang like curtains inside each AdvanTex unit and are dosed with blended effluent through a network of pipe laterals. The effluent is intermittently dosed in small volumes throughout the day by spray nozzles.

The use of this Orenco shallow pressurized dispersal system (SPDS) allowed for higher soil hydraulic-loading rates, which was necessary for Kiwi Corral's small dispersal field of just 430 m² (0.11 acres).

The recirculation tanks use hydraulic splitter valves to balance fluctuating loads. In low-flow conditions, these valves direct effluent from the packed-bed filter back into the system for more treatment. And in high-flow conditions, the filtrate is directed to the treated-effluent tank for discharge.

On average, the splitter valve provides a 4:1 recirculation ratio, meaning that filtrate is recirculated over the textile four times before splitting off to the treated-effluent tank. Through the action of these valves, the recirculation tanks provide a consistent minimum level of organic and nutrient material to the microorganisms on the packed-bed filter.

Efficient Land Dispersal

The use of an Orenco SPDS as a land dispersal method allows for higher soil hydraulic-loading rates than what is typically recommended for conventional treatment and dispersal methods. The higher the soil can be loaded, the less land required – which was exactly what the Kiwi Corral project needed.

An SPDS allows for this higher soil-loading rate when the risk of soil clogging or long-term failure due to biomat buildup is eliminated, which is accomplished by pre-treating the applied effluent so that the majority of organic and nutrient contaminants are removed. That means the upstream AdvanTex wastewater treatment system had to be able to reliably remove these contaminants.

For an SPDS to operate successfully, treated effluent must meet these three conditions:

- It must be consistently treated to less than 10 mg/L of both $cBOD_5$ and TSS.
- It must be applied to the SPDS trenches in timed microdoses.
- It must be uniformly dosed over the entire infiltration surface area.

This shallow dispersal of highly treated wastewater can be beneficial to plant and animal life, because more than 98% of organisms live within the the top 400-mm (16-in) of the soil and more than 40% of plant roots lie within the top 300-mm (12-in).

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Fast-Tracked Installation

To be ready in time for the 2018 harvest and packing season, the installation and commissioning of Kiwi Corral's new wastewater treatment facility had just a 6-week timeline. Besides this quick turnaround time, construction was also constrained by the size of the site: an area of approximately 15 by 25 meters (49 by 82 feet). To reduce the facility's footprint, large process tanks were built on-site, and the AdvanTex treatment units were positioned on top of them.

Installation and start-up of the AdvanTex treatment facility took place in only six weeks – in time for the start of the harvest and packing season that would bring an influx of seasonal workers.

Following system startup, the AdvanTex performance has been superb, with effluent testing well below required limits outlined in the Resource Consent. And the new wastewater treatment facility attracts little attention from guests. Wes Archer, the Site Manager for Kiwi Corral, notes that "campsites are right next to the fenced-off [AdvanTex] pod areas, and we have had no complaints or comments of smell or noise … we notice no smell or sound to date."

The SPDS is also functioning as designed, and the Green Oval (the land treatment area) is once more in use as a recreational area for guests, who are totally unaware of its dual purpose. Archer adds, "The system is so effective and self-managing that I have to make a point of walking around it to make sure it's still here … it is truly like we're connected to [the] town supply."

Commercial Market

Treated Effluent Storage and Tertiary Treatment
- One 70-m^3 (18,500-gallon) treated effluent tank with discharge pumps
- One UV disinfection unit
- Two pulse water meters

Shallow Pressurized Dispersal System (SPDS)
- 1,433 lineal meters (4,701 feet) of SPDS trenches
- 430 m^2 (0.11 acres) basal area

Monitoring and Control
- Orenco Controls™ TCOM™ telemetry panel

Equipment Supplier
- Innoflow Technologies NZ Ltd.

Operation and Maintenance
- S3 Ltd. (a subsidiary of Innoflow)

"Campsites are right next to the fenced-off [AdvanTex] pod areas, and we have had no complaints or comments of smell or noise … we notice no smell or sound to date."

– **Wes Archer**
Kiwi Corral Site Manager

For information about Prelos™ Sewer, AdvanTex® Wastewater Treatment, or Orenco Controls™, contact Orenco Systems®, Inc.

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Data used by Orenco to derive the representations and conclusions contained within this Case Study were current as of September, 2019.

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