

SMALL SEWAGE TREATMENT PLANTS WITH LOW RUNNING COSTS



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41st Annual WIOA

Queensland Water Industry Operations Conference and Exhibition

Central Queensland University Sports Centre,

Rockhampton

1 & 2 June, 2016

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ABSTRACT

The Kelair-Blivet™ is a packaged Sewage Treatment Plant used extensively around the world in both developed countries and emerging economies.

It is well suited for small remote applications such as: small towns, regional councils and their waste water operations, golf courses, caravan parks and remote temporary operational bases for military camps and mine sites.

This paper gives an overview of the technology employed and makes reference to typical Australian case studies across different types of users.

The suitability for small remote applications is based on the following attributes:

- Low power consumption – 10 kWh per day. Solar or Wind power options.
- Low maintenance - only periodic desludging and bearing inspection.
- Unattended operation – Telemetry options for remote monitoring.
- Compact – small footprint with low visual impact - above or below ground.
- Durable - steel construction with glass reinforced polyester
- Flexible & modular - temporary or permanent installation.

1.0 INTRODUCTION

Barnbogle Dunes is a championship links golf course, comprising of two 18-hole courses, located on the edge of the small Tasmanian town of Bridport, just one hour's drive north-east of Launceston. It was recently ranked 49th in the world by US Golf Magazine, an outstanding accomplishment for such a new course.



Figure 1: *Barnbogle Dunes Golf Course.*

The development contains a clubhouse, bar, restaurant and bungalow accommodation that required a unit capable of treating sewage for approximately 300 visitors and staff. The sewage and wastewater from the bungalows is gravity-reticulated to the treatment plant which comprises primary settlement, aerobic zone, final settlement (humus tank) and sludge storage, whereas the outflow from the clubhouse is pumped to the plant by a Kelair poly-packaged pump station.

Kelair Pumps proposed the Kelair-Blivet™ BL3000 packaged Sewage Treatment Plant, sized to cater for the full development of the course which is located in an environmentally-sensitive area.

2.0 DISCUSSION

The Kelair-Blivet™ BL3000 unit is capable of treating 57,500 litres and 13.75kg of BOD per day during the coldest winter months, and more as the temperature rises. The high quality final effluent is held in a 45,000 litre in-ground tank with disinfection being achieved through a Kelair-designed dual disinfection system utilising a circulation pump, 3-pass UV unit and in-line chlorine unit, ensuring an extremely low thermo-tolerant coliform count.



Figure 2: *Typical Below Ground Installation.*

The course irrigation system runs between 9.00pm and 7.00am and delivers up to 1.5 megalitres of water. A Kelair-manufactured duty/standby irrigation injection pump set is utilised to discharge the final treated effluent into the main irrigation pumps' manifolds during the irrigation cycle. These have been sized to cover the maximum volume in the minimum irrigation time-frame. The injection pumps are inter-locked with the main irrigation pumps and are regulated to inject only between the hours of 11pm and 4am, minimising the risk of the public coming into contact with the treated effluent.

The Barnbougale Dunes Kelair-Blivet™ installation proves that a sewage treatment plant can not only be low maintenance, quiet, odourless and efficient but also looks good.

2.1 Construction & Technology

The Kelair-Blivet™ is a stand-alone packaged sewage treatment plant comprising primary settlement, aerobic zone, final settlement (humus tank) and sludge storage. The aerobic zone utilises the standard Kelair-Aerotator™ Biozone plant.

The Kelair-Aerotor™ range is an established and innovative system for highly efficient process reduction of BOD, Suspended Solids (S.S.) and Ammonia etc. It combines the best features of existing RBC technology with the additional advantage of active aeration.

The Kelair-Blivet™ is designed to accept raw (unsettled) sewage and produce a high quality final effluent without the need for ancillary tankage or equipment. As the final appearance of the unit is critical, the system may be buried up to deck level, such that the impact on the landscape is not intrusive. The units are covered, preventing noise and fly nuisance. The Kelair-Blivet™ is a modular unit that lends itself to future expansion or relocation.

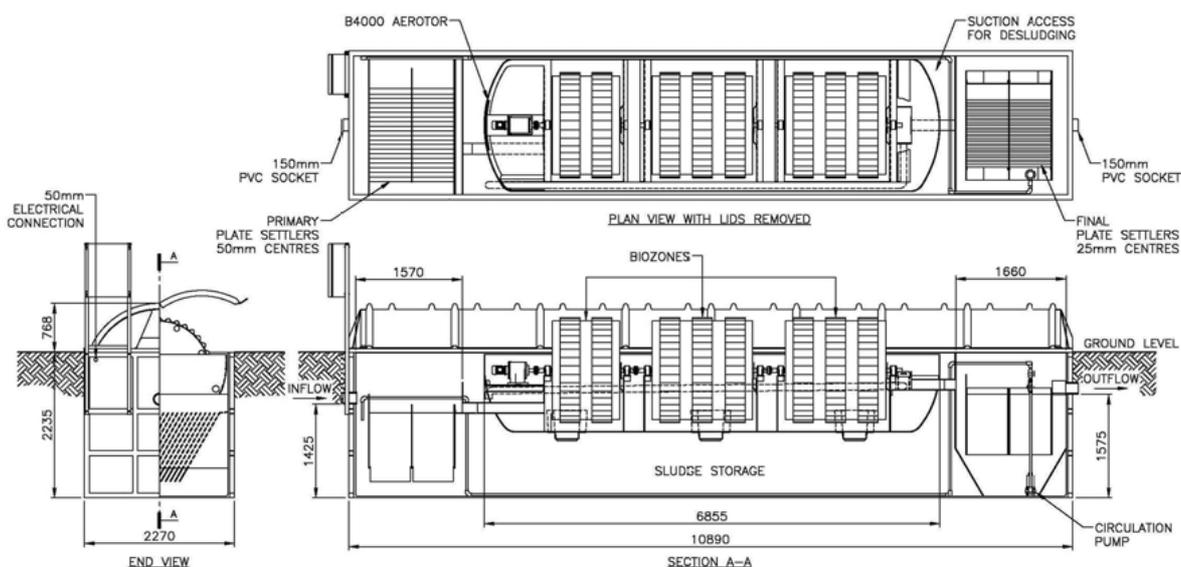


Figure 3: *Diagram of Kelair – Blivet.*

The Kelair-Aerotor™ Biozone is available as a separate unit in a range of standard modular sizes. It can be installed as an adjunct to an existing works, or as a discrete system in conjunction with primary settlement and humus tanks of separate supply (e.g. concrete tanks). Further, its flexibility makes it especially suitable as an ‘Add-On’ to a septic tank or an overloaded works.

2.2 Sizes & Technical Data

Additional rotor length is provided within the treatment plant to provide for the conversion of ammonia to nitrate (nitrification) and an internal recycle within the treatment plant back to the anoxic zone to provide for the con-version of nitrate to nitrogen gas (de-nitrification). The removal of BOD is catered for within the aeration zone.

Table 1: *Kelair-Blivet™ Size Data.*

| Tank Size | Unit Average Flow | BOD Applied Level | Average (People) | Approx. Weight Empty | Approx. Weight Operating | Drive Unit | Connection (mm) | Unit Sizes in Metres | | |
|-----------|-------------------|-------------------|------------------|----------------------|--------------------------|------------|-----------------|----------------------|---------------------|--------|
| | | | | | | | | No. | m ³ /day | kg/day |
| BL 300 | 4.1 | 1.1 | 20 | 1.5 | 9.5 | 0.37 | 100 | 2.1 | 2.02 | 2.2 |
| BL 500 | 11.5 | 2.75 | 50 | 3 | 17.5 | 0.37 | 150 | 4.9 | 2.27 | 2.9 |
| BL1000 | 23 | 5.5 | 100 | 3.35 | 19.25 | 0.55 | | 5.375 | | |
| BL1500 | 34.5 | 8.25 | 150 | 4 | 23.75 | 0.55 | | 6.4 | | |
| BL2000 | 46 | 11 | 200 | 4.7 | 28.25 | 0.75 | | 7.5 | | |
| BL3000 | 57.5 | 13.75 | 250 | 5.85 | 35.25 | | | 9.275 | | |
| BL3500 | 74.75 | 17.875 | 325 | 6.3 | 38.25 | | | 10.1 | | |
| BL4000 | 92 | 22 | 400 | 6.8 | 41.5 | | | 10.9 | | |

2.3 Biological Nutrient Removal Plant.

For treatment of waste water with high nutrients, the Kelair-Blivet™ is also available with the following option:

The Kelair-Blivet™ NR Biological Nutrient Removal Plant treatment plant layout is based on the well-established Modified Ludzck Ettinger (MLE) process.



Figure 4: *View with Inspection Covers Lifted.*

The treatment plant layout has 6 sections all of which are accommodated within one to two Fibre Reinforced Plastic (FRP) tanks depending on the effluent loadings.

The treatment plants are divided into the following zones:

- Primary Settlement
- Denitrification Zone: Anoxic Zone
- Aeration Zone: Removal & Nitrification Zones
- Splitter Box
- Final Settlement
- Sludge Storage

2.4 Installation

The Kelair-Blivet™ can be installed either above or below ground.



Figure 5: *Below Ground Installation – Savage River Mine.*



Figure 6: *Above Ground Installation – Queensland Rail.*

2.5 Accreditation

Tasmania has some of the most stringent environmental standards in the world. We are therefore very pleased that the Ministry for Infrastructure, Energy and Resources in Tasmania has accredited all sizes of the Kelair-Blivet™ range following comprehensive testing of the system to facilitate assessment of its compliance to the relevant performance standards.

ON-SITE WASTE WATER MANAGEMENT SYSTEM

CERTIFICATE OF ACCREDITATION

This Certificate of Accreditation is hereby issued by the Treasurer pursuant to Section 59(2) of the Building Act 2000 (the Act).

TO: KELAIR PUMPS AUSTRALIA PTY LTD - ABN
28001308381
1/112 SOUTH STREET, INVERMAY TAS 7248

FOR: KELAIR-BLIVET™ PACKAGED SEWAGE
TREATMENT PLANT MODELS: BL500,
BL1000, BL1500, BL2000, BL3000, BL3500 and
BL4000

Treatment type: Aerobic Biological Treatment System with
Rotating Biological Contactor

Waste water source: Domestic sewage

This is to certify that the above on-site waste water management system (the system) is a plumbing system accredited for use by the Director of Building Control for the purposes of Part 6 of the Act, subject to the attached conditions.

A separate permit (the permit) is required from the relevant permit authority (municipal council) before installation, pursuant to Section 75 of the Act. The permit is to govern the use and maintenance and monitoring of the system.

Accreditation number: BSR0296/2014
Date of issue: 1 December 2014



DALE WEBSTER
DELEGATE
DIRECTOR OF BUILDING CONTROL

This Certificate of Accreditation is valid until 2 December 2019 subject to conditions unless withdrawn earlier by the Director.

Figure 7: *Accreditation Certificate – Tasmanian Government.*

3.0 CONCLUSION

The Kelair-Blivet™ packaged sewage treatment plant allowed Barnbougale Dunes to achieve the environmental requirements stipulated by the Tasmanian authorities – with cost effectiveness as well as low visual impact.

Richard Sattler, the Barnbougale Dunes course owner says, “we’re rapt with the Blivet, it blends in with the surroundings, works really well and the backup service from Kelair has been first class.”

4.0 ACKNOWLEDGEMENTS

We would like to extend our thanks to the management Barnbougale Dunes for letting us use this installation as a case study. Also our gratitude to the golf course operations personnel for working closely with our staff to achieve this result.

Also, many thanks to the Tasmanian Kelair Pumps team, Peter Doran & Paul Walker for their hard work in providing Barnbougale Dunes with the most efficient waste water treatment solution. Not to forget to mention the National Technical Manager, Jeff Greely, and the Marketing team for their help in preparing this paper.

5.0 REFERENCES

Kelair Pumps Website: www.kelairpumps.com.au

Barnbougale Dunes Website: www.barnbougale.com.au