

HST™ turbocompressors reduce operational costs at Boneo wastewater treatment plant

Boneo is an Australian rural town located 83 km south of Melbourne on the Mornington Peninsula. The Mornington Peninsula has long been a favorite holiday destination for residents of Melbourne. It has a permanent population of around 125'000 which can double during summer. The Boneo wastewater treatment plant serves most of the Peninsula and was upgraded by South East Water (SEW) to better handle the peak summer loads. The upgrade included two Sulzer HST turbocompressors in addition to the existing old PD (positive displacement) blowers, and four OKI aerator units. The machines were installed in December 2014.



“Highly efficient high-speed magnetic bearing blowers can be operated along with the existing PD machines. The payback period was calculated at just over two years of operation under optimal operating arrangements.”

Ramandeep Singh, Sales Manager, Sulzer Pumps Wastewater Pty Ltd.

The challenge

Due to higher than anticipated growth, SEW predicted that the plant would reach the limits of its process capacity in the summer holiday peak period of 2015. UGL was selected as the contractor to work with SEW to assess the plant capacity and upgrade possibilities. Duplication of the plant was not practical as the existing plant could cope with the load for most of the year. It would also have been excessively costly, so the upgrade was tailored specifically to handle the summer peak loads. The capital expenditure had to be minimised as a major upgrade is planned in the medium term, and the solution had to be installed without disrupting the plant operation.

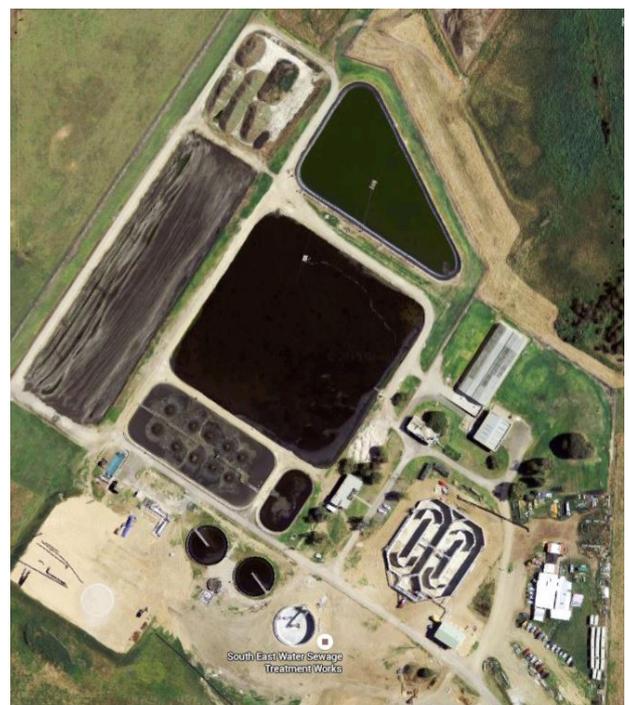
The solution

The contractor UGL along with Sulzer came up with an excellent solution to use two Sulzer HST turbocompressors and four OKI aerator units for a very challenging requirement, with the aim of deferring a large capital expenditure to SEW. There was an initial preference to duplicate the existing positive displacement blowers, as it would have been straightforward with standardized spare parts and maintenance. UGL performed a life-cycle cost calculation against the Sulzer HST compressors. The capital investment was higher, but the payback period was calculated at just over two years of operation under optimal operating arrangements. In addition to the energy saving, the maintenance requirements, noise levels and footprint of the HSTs were superior to the existing blowers.

Several options were analyzed for aeration equipment. The existing diffuser system functioned well, but duplication of the system was not possible without taking the bioreactor off-line and demolishing some concrete baffle walls. The solution was to install four submerged OKI aerators - two in each bioreactor to cater for the peak periods. The OKI units were ideal for this application as they could be installed, moved and removed for maintenance without taking the bioreactor off-line.

The HST turbocompressors were factory tested and field tested. The new turbocompressors offer energy savings of approximately 33% compared to the existing positive displacement blowers. Originally, the new compressors were to run only during the peak period, but they are so efficient that it makes more sense to run them continuously and use the old blowers only when necessary.

Overlooking Boneo wastewater treatment plant



Payback period for Sulzer HST 20 turbocompressor

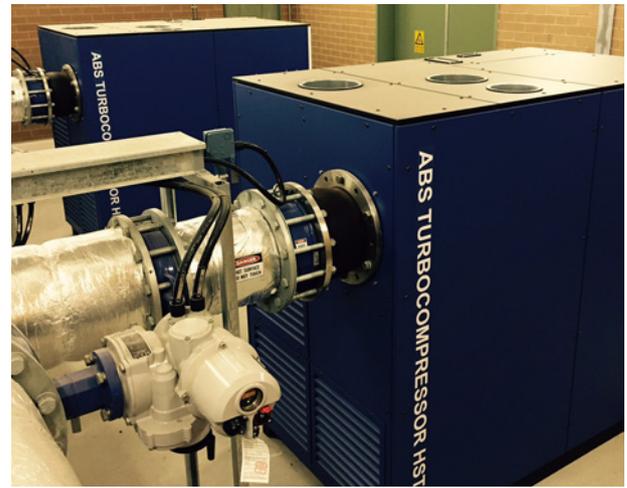
	Flow rate Nm ³ /h	Pressure kPa	Energy consumption kW	Duty hours p.a.	Energy cost AUD/h	Total AUD p.a.
HST 20 turbocompressor	5'500	65	115	8'760	0.13	130,960
Existing PD blower	5'500	65	170	8'760	0.13	193'600
Annual saving with HST 20						AUD 62'640

Customer benefit

- Dramatic increase in efficiency and reliability over old PD blowers.
- Reduced footprint, noise and maintenance costs. Nearly maintenance-free operation – replacement of filters only.
- Sulzer's catalogue claimed performance was achieved in site testing. More than 33% lower energy consumption compared to previous equipment. This amounts to a saving of AUD 60'000 per year for the end user.
- Easy installation of the OKI units - no fixing to the floor is required.
- The successful modernization resulted in an efficient treatment plant equipped for nitrogen and phosphorus removal.
- Less vibration.
- HST technology with 100% air cooling, compact installation and active magnetic bearing control are the key elements for South East Water.

The Sulzer difference

- The Sulzer HST turbocompressor offers reliable operation and top efficiency.
- Best whole life cost while minimizing the environmental impact.
- In the high-speed turbocompressor market, Sulzer is the leader in magnetic bearing technology. No other solution offers the same efficiency, stability or component life. Magnetic bearings offer unmatched rotor stability allowing tighter tolerances, which give both higher efficiency and predictability when performing in pulsating manifold environments.
- Easy installation of the OKI aerator units provides a unique solution to upgrade the treatment capacity of wastewater treatment plants.



The Boneo blower room



OKI aerator unit being lowered into the bioreactor

Product data:2 units HST 20-6000-150 turbocompressor

Power	150 kW
Flow rating	2'500 – 7'000 Nm ³ /h
Pressure rating	30 – 90 kPa
Peak total efficiency	76%
Peak isentropic efficiency	86%
Quantity	1 duty, 1 standby
Biological process	IDAL
Maximum required flow	5'500 Nm ³ /h (humid)
Maximum required pressure	65 kPa
Minimum required flow	2'700 Nm ³ /h (humid)
Minimum required pressure	40 kPa

The HST 20 is an integrated package. The turbocompressor is designed for ease of installation and operation, with an inlet silencer, an outlet silencer and a silenced blow-off valve incorporated into the cabinet. Complexity is reduced, along with the cost of installation.

The project was a retrofit so it was essential that the solution fitted well into the existing compressor room, making it easy to replace the old, inefficient machines.

For any inquiries please contact

ramandeep.saroya@sulzer.com

[sulzer.com](https://www.sulzer.com)

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