Turbocompressors boost treatment capacity and lower costs, noise and footprint

Ballarat is a city located at the Yarrowee River in the Central Highlands of Victoria, Australia, with around 101'600 inhabitants. In terms of population, Ballarat is the third largest inland city in Australia and one of the fastest growing cities in regional Victoria. The Ballarat South Wastewater Treatment Plant (BSWWTP) has undergone an AUD 10 million upgrade, including the installation of a new clarifier. A new aeration system with three Sulzer HST™ turbocompressors to replace the old positive displacement blowers has also been installed. This enables optimum biological nutrient removal and a reduction in energy consumption and greenhouse gas emissions by over 30 per cent.

> *The high-speed turbo blowers with magnetic bearing offered us greatly improved efficiency and reliability. The noise was reduced down to nearly 70 dBa in the blower room.*
>
> **Fawzi Saldin, Process Engineer, Ex Central Highlands Water (CHW)**

The Sulzer difference

- The Sulzer HST turbocompressor offers reliable operation and top efficiency.
- Long-term partnership – the first HST turbocompressor has been operating since 1996.
- 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.

Overlooking Ballarat South Wastewater Treatment Plant

The challenge

Major capital works at BSWWTP are being implemented to meet the demand of an increasing population. It is anticipated that the plant will accommodate another 18'000 connections by 2035. Another challenge is to decrease the greenhouse gas emissions by 30%. The current capital upgrade projects will enable CHW to meet both challenges while being 100% compliant with environmental and regulatory requirements.

The Ballarat South plant was suffering from frequent breakdowns of the existing positive displacement blowers, affecting the aeration, which meant a serious challenge to meet EPA (Environment Protection Agency) regulatory requirements. The existing machines were also very inefficient and the noise was quite a nuisance, bringing complaints from the neighbourhood residents, some escalating to EPA.

The solution

One of the tasks was to increase the air capacity and identify the most efficient and reliable blowers available in the market. Once the power consumption, maintainence requirements, noise levels, footprint and life cycle cost of Sulzer's HST were benchmarked against the existing blowers, it was easy to choose the HST. Based on the unpredictable population growth, Sulzer offered smaller machines that provide better turndown, system efficiency and also the flexibility to add another unit if the population would increase more than expected.

The next task was to install the additional aeration equipment. Due to the small footprint of the machines, it was quite easy to fit them into the same space as the existing blowers. Switchboard and electrical upgrades were made to accommodate the higher capacity of the blowers.

The HST turbocompressors were factory tested and then field tested. The results were heavily scrutinized due to the competitive situation. The turbocompressors passed all tests, showing that Sulzer delivers what is promised. The new blowers offer energy savings of approximately 30% compared to the existing positive displacement blowers.

Key performance requirements and tests met by the new blowers

- Ability to provide air flow within the required range without instability: The blowers met the required performance at an inlet air temperature of up to 35°C.
- The blowers are capable of operating without surge, shutdown or bearing damage at an inlet temperature of 50°C, though at reduced efficiency.
- The new blowers meet the power consumption figures of the equipment data sheet.

Customer benefit

- Dramatic increase in efficiency and improvement in reliability over old PD blowers
- Reduced footprint, noise and maintenance costs
- Nearly maintenance-free operation, reduced to replacing filters and backup batteries
- Sulzer's catalogue-claimed performance was achieved in site testing – more than 30% lower energy consumption compared to previous equipment
- Easy installation
- Less vibration
- The successful modernization resulted in an efficient treatment plant equipped for nitrogen and phosphorus removal
- HST technology with 100% air cooling, compact installation and active magnetic bearing control are key elements for Central Highlands Water.

The HST 20 turbocompressor is an integrated package, 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 more information on our products and solutions for wastewater treatment, please visit sulzer.com.

Three Sulzer HST turbocompressors	
Type	HST 20-6000-150
Power	150 kW
Flow rating	2'500 – 7'000 Nm^3/h
Pressure rating	30 – 90 kPa
Quantity	2 duty, 1 standby
Biological process	IDAL (Intermittently decanted aerated lagoon)
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

Applicable markets	Applicable products	Contact
Municipal and industrial wastewater treatment	HST turbocompressors	ramandeep.saroya@sulzer.com