

REDUCING ODOURS AND SAFE GUARDING WORKERS FROM HYDROGEN SULPHIDE AT BRISBANE'S LARGEST WASTEWATER TREATMENT PLANT

In line with Queensland Urban Utilities' commitment of reducing the health and safety risk for operators at the Luggage Point Resource Recovery Centre (RRC) and reducing odour nuisance to the surrounding Community, CleanTeQ Aromatrix were engaged to construct an Air Treatment Facility (ATF) which comprised covering of the Inlet Works (together with other significant odour sources) with extraction and treatment of the foul air. The facility was completed in 2019.

The new ATF was designed to treat an airflow of 26,000 m³/h with design hydrogen sulphide concentrations (under ventilated conditions) of 61 ppm and 145 ppm respectively. The facility comprised two Biotrickling Filters (BTFs) followed by three Activated Carbon Filters. Each of the BTFs were constructed as hybrid vessels with a continuously recirculated bottom media bed section treating H₂S and other sulphur based compounds. The top bed section incorporated a once-through recycled water irrigation system treating other volatile organic compounds. The facility included extraction fans, a pre-carbon filter inline heater (to control the humidity to the carbon vessels) and a 20m high ventilation stack as shown in Figure 2. The design extraction airflow rate and inlet gas concentrations (based on odour and gas sampling surveys) are presented in Tables 1 and 2.

Effective capture of H₂S and other emitted gases from the Inlet Works was a critical requirement for the treatment facility. In order to meet this objective at minimal cost, an innovative covering system was implemented which utilised the existing platform with the application of a corrosion resistant FRP chequer plate covering system over the walkway surface with additional sealing around screens, screw presses, transfer pipes and other appurtenances. The result was a pressure sealed enclosure which avoided the total scrapping of the existing structurally sound platform and walkway system and resulted in significant program savings and a substantially lower cost than more conventional covering means.

The results of performance testing are presented in Table 3.

Over the last two years since it began operation, the ATF has performed to its design intent of achieving containment of all emissions from the Inlet Works and effective treatment of the extracted pollutants using recycled water and with minimal operator supervision or intervention.

By implementing this project of containment and treatment of the Inlet Works emissions, several objectives were achieved as follows:

- Eliminated the extremely high H₂S emissions emanating from the Inlet Works structure thereby improving the safety of persons working around the plant;
- Applied innovative means to cover the Inlet Works at minimal cost;
- Implemented best available technology in the treatment of extracted air from the Inlet Works;
- Achieved significant odour reduction to the areas surrounding the RRC;
- Delivery of the abatement project on budget and within the agreed project timeframe.

The success of the project has been due to the excellent cooperation between stakeholders and the companies involved with the investigation, design and construction of the facilities. All parties demonstrated a strong commitment to the objectives of implementing the most effective and innovative containment and treatment system available in order to reduce the health and safety risks to personnel and reduce the impact of odour to industries surrounding Community.



Figure 1 Air Treatment Facility (Inlet Works in the background to the left)

Table 1 Design Parameters (Inlet Gas Flow) for Luggage Point ATF

Design Parameter	Units	Value
Gas flow rate	Am ³ /hr	26,000
Gas temperature	°C	0-45
Gas Relative Humidity	% RH	60-100%

Table 2 Design Parameters (Inlet Gas Concentrations) for the ATF

Design Parameter	Units	Average	Peak
Hydrogen Sulphide (H ₂ S)	ppm	61	145
Mercaptans (R-SH)	ppm	3.2	6.0
Dimethyl Sulphide (DMS)	ppm	2.8	4.4
Dimethyl Disulphide (DMDS)	ppm	2.8	4.4
VOCs	ppm	8.3	31.5
Ammonia (NH ₃)	ppm	16.8	24.2

Table 3 Performance Levels of the ATF

Parameters	Measured Inlet Concentrations (Ave / Peak)	Design Criteria	Performance Test Results	
			Discharge Conc'n (Max)	Percentage Removal
Biotrickling Filter Inlet / Removal Efficiencies / Discharge				
Hydrogen Sulphide (H ₂ S)	82.5 / 262 ppm	>99.5%	0.05 ppm	99.94%
Mercaptans (R-SH)	0.44 / 0.78 ppm	>90%	0.016 ppm	96.3%
Dimethyl Sulphide (DMS)	0.12 / 0.16 ppm	>40%	0.013 ppm	88.8%
Dimethyl Disulphide (DMDS)	0.14 / 0.34 ppm	N/A	0.011 ppm	92.3%
Ammonia (NH ₃)	0.51 / 0.78 ppm	>60%	0.025 ppm	95.0%
VOCs	12.2 / 16.0 ppm	>60%	1.7 ppm	86.1%
Odour	N/A	<3,500 OU	≤2,200 OU	N/A
ATF Removal Efficiencies / Discharge				
Hydrogen Sulphide (H ₂ S)	N/A	0.05 ppm	≤0.001 ppm	99.999%
Mercaptans (R-SH)	N/A	0.05 ppm	≤0.002 ppm	99.5%
Dimethyl Sulphide (DMS)	N/A	0.05 ppm	≤0.002 ppm	98.3%
Dimethyl Disulphide (DMDS)	N/A	0.05 ppm	≤0.002 ppm	98.6%
Ammonia (NH ₃)	N/A	0.2 ppm	0.023 ppm	97.0%
VOCs	N/A	0.05 ppm	≤0.05 ppm	99.8%
Odour	N/A	500 OU	≤310 OU	N/A