TECHNICAL SPECIFICATION FOR

MAGNESIUM HYDROXIDE LIQUID DOSING UNIT

Scheme: Gladstone Area Odour Control
Reference No: 300203170

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<th>Rev</th>
<th>Date</th>
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<th>Reviewed</th>
<th>Approved</th>
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<td>Draft</td>
<td>S. Muliawan</td>
<td>A.Shammay</td>
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1 Introduction

This specification is for the provision of a standard plug in vendor package for a Magnesium Hydroxide Liquid (MHL) chemical dosing system to be installed at Sewage Pumping Station (SPS) A05 which is located at Agnes Street, South Gladstone QLD. This specification is based on the design, fabrication, supply, installation and commissioning of the system.

The design intent is for the chemical to be dosed into the wet well. The intention of this is to maintain a downstream pH in excess of 8.5, which will suppress the formation of gaseous H₂S that could result in odour issues if released to the atmosphere.

The A05 SPS is located in a flood zone. The flood level is 1.3 above the NGL.

2 Scope

The vendor’s Scope of Works includes the design, fabrication, supply, assembly, shop testing, delivery to site, unloading, installation and commissioning of the chemical dosing unit.

The dosing system shall include but not be limited to the following:

- A storage tank that can hold a minimum of 30 days of MHL as a self-bunded MHL bulk storage tank (1.6 kL storage tank is estimated to hold 30 days of MHL usage on site). In the event where 30 days of storage cannot be achieved, vendor to advise GRC on the frequency of the chemical delivery.
  - Storage tank including:
    - Manufactured from HDPE (AS/NZS 4766) or other suitable material for MHL
    - One suitably sized access hatch (AS 2996, Class A)
    - Level transmitter with local display (either ultrasonic or load transmitter)
    - Level switch interlocked to dosing pumps
    - Storage tank mixer with automatic/manual control and a control timer (if required). Chemical is to remain in suspension for extended period of time (i.e up to six months).
    - Bund sensor to detect if there has been a leak
  - Tanker connection point (50 mm Camlock type) complete with interlocked GPO, flashing beacon and audible high level alarm during tank filling
- Appropriate single duty peristaltic MHL dosing pump (see Table 1) operating in auto/manual complete with 25 mm Camlock flushing points either side of the pump
- Boxed spare dosing pump
- Safety shower and eyewash facility
- Hose reel
- All the above to be installed on a slab or raised platform (slab thickness or platform height shall be 500mm above the highest flood level). The dosing tank may be installed within the flood level as long as it is impenetrable by the flood water and is provided with suitable protection against floating in the flood water.
• Dosing pipeline injecting into wet well. Underground pipeline installation is preferred however above ground installation is also acceptable provided dosing pipeline is tamper-proof.

• Associated pipework, valves, fittings, flanges, couplings, nuts, bolts, washers, gaskets, pipe anchors, supports and guides that are necessary to complete the work

• Operational lighting

• Electrical, instrumentation and control system works, including the provision of all materials, plant and labour of whatever kind necessary for the complete and proper design, documentation, manufacture, programming, configuration, supply, testing, delivery, installation, termination calibration, commissioning, tuning and maintenance of mechanical, electrical, controls and instrumentation equipment and software for the Works

• Local control panel with vendor supplied controller to be capable to connect with to the station RTU for local/remote control and monitoring as per following I/O list:
  o Chemical dosing tank level (analogue signal)
  o Dosing pump fault
  o Dosing pump running status
  o Dosing tank not high level
  o Dosing tank not low level
  o Dosing start command
  o Online gas phase H2S monitoring (to be located at SPS A05 discharge manhole) with connection back to GRC’s Network SCADA system.

• Control panel with dedicated circuit breaker to receive single phase 240 V AC supply from existing power supply on site and shall contain all electrical, incoming control and switch gear associated with the package plant

• Factory Acceptance Testing, Site Acceptance Testing (including offsite monitoring control verification), commissioning and Operator training

The vendor’s Scope of Work is also inclusive of but not limited to the following:

• Clear layout drawings that show all the equipment and pipeworks both as part of the chemical dosing unit and in the field

• A Hazards and Operability Study (HAZOP)

• Inspection and Test Plans (ITPs)

• Material Safety Data Sheets

• Performance testing report

• Commissioning, testing and operator training including O&M manuals and all appropriate documentation

• Mobilisation and pre-construction activities

• Documentation including but not limited to:
Management Plan
Chemical Delivery Requirement
Work Method Statements
Quality Plan
Establish and maintain a Quality Assurance System including the preparation of Inspection and Test Plans
Instrumentation list
Electrical equipment list
Control philosophy
Critical parts list
Interfaces with existing switchboard and SCADA communications

- Obtain permits and approvals, including payment of all statutory fees and charges
- Labelling and signage
- Civil and mechanical construction works (if required, including supply of all materials, labour and plant), including raising the dosing unit above the flood level
- As-constructed survey and provision of as constructed information, including, drawings and operations and maintenance manuals
- Completed ITPs, including witness signatures and dates
- Defects liability services for a period of 12 months
- All other works including the requirements of this specification
- Approvals for chemical supplier(s) to deliver to this facility
- Monitoring of the MHL level in the storage tank and supply chemical to site as required for the first six months upon commissioning

3 Reference Documentation and Drawings

The documents listed below form part of this specification. They are listed in order of precedence. Where conflict exists between documents the higher precedent document shall be used.

- This document
- Magnesium Hydroxide Liquid Dosing Data Sheet included in the Tender Schedules
- Relevant Australian Standards
- Relevant International Standards
- Industry guidelines
4 Limit of Work

4.1 Electrical

The vendor will supply and install conduits and wiring from the dosing unit equipment to the vendor supplied control panel.

The vendor will supply and install all electrical connections from vendor supplied control panel to the SPS Switchboard.

As part of the installation, the Contractor shall ensure that all telemetry from the dosing unit equipment and instrument are transmitted back to SPS A05 SCADA system and the SCADA system is updated.

4.2 Water

Water connection point shall be agreed prior to dosing unit installation, however it is anticipated that the contractor will extend the existing water supply point to the dosing unit.
5 Interface

5.1 Control Interface

MHL dosing system shall be fully automated and monitored via the SPS A05 SCADA system. The inputs and outputs for the system are shown in Table 1 below.

Table 1. SCADA Interface

<table>
<thead>
<tr>
<th>Analogue Inputs (4-20 mA to RTU)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Chemical tank level</td>
<td>0-100%</td>
</tr>
<tr>
<td>2 Chemical dosed flow</td>
<td>L/h</td>
</tr>
<tr>
<td>3 Dosing pump speed</td>
<td>0-100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analogue Outputs (4-20mA from RTU)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Dosing pump speed</td>
<td>0-100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Inputs (to RTU)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Site power supply</td>
<td>Failed/available</td>
</tr>
<tr>
<td>2 MHL tank in service</td>
<td>Yes/no</td>
</tr>
<tr>
<td>3 MHL tank low level</td>
<td>Alarm/normal</td>
</tr>
<tr>
<td>4 MHL pump manual</td>
<td>Yes/no</td>
</tr>
<tr>
<td>5 MHL pump auto</td>
<td>Yes/no</td>
</tr>
<tr>
<td>6 MHL pump off</td>
<td>Yes/no</td>
</tr>
<tr>
<td>7 MHL pump</td>
<td>Stopped/running</td>
</tr>
<tr>
<td>8 MHL pump VSD</td>
<td>Tripped/healthy</td>
</tr>
<tr>
<td>9 High rate of change in tank</td>
<td>Alarm/normal</td>
</tr>
<tr>
<td>10 Re-order chemical alarm</td>
<td>Alarm/normal*</td>
</tr>
<tr>
<td>11 Bund level</td>
<td>Overflow/normal</td>
</tr>
<tr>
<td>12 Agitator manual (if required)</td>
<td>Yes/no</td>
</tr>
<tr>
<td>13 Agitator auto (if required)</td>
<td>Yes/no</td>
</tr>
<tr>
<td>14 Agitator off (if required)</td>
<td>Yes/no</td>
</tr>
<tr>
<td>15 Agitator thermistor (if required)</td>
<td>Alarm/normal</td>
</tr>
<tr>
<td>16 Gas phase H₂S Logging to be located at SPS A05 Discharge Manhole**</td>
<td>0-100ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Outputs (from RTU)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MHL pump inhibit</td>
<td>Off/On</td>
</tr>
</tbody>
</table>

*Vendor to also monitor alarm and restock chemical as required for the first six months upon commissioning after which GRC will take over or a continuation of service could be agreed upon.

**Small I/O radio may be utilised for signal boosting.

5.2 Alarms and Interlocks

The list of alarms and interlocks for the MHL dosing system are shown in Table 2 below.

Table 2. Alarm and Interlocks List

<table>
<thead>
<tr>
<th>Process Unit</th>
<th>Instrument</th>
<th>Descriptor</th>
<th>Alarm</th>
<th>Interlock</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low/Low</td>
<td>Alarm on SCADA</td>
<td>MHL dosing system shuts down</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low</td>
<td>Re-order alarm on SCADA</td>
<td>-</td>
</tr>
</tbody>
</table>

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### 6 Testing & Commissioning

The CDU shall be tested in accordance with the testing regime shown in Section 8. The vendor shall be responsible for correcting any defects arising from non-conformance with the requirements as nominated in this specification and in the datasheet (included in Tender Schedules). All equipment items supplied as part of this subcontract shall have defects guarantee period of twelve (12) months.

Tests and inspections, unless otherwise specified or accepted, shall be in accordance with the relevant standards of the Standards Association of Australia or in their absence, those of the British Standards Institution and ASCE standards.

The commissioning shall demonstrate that all guaranteed performance criteria have been met for individual as well as the complete system during:

- Normal operating conditions
- Extreme operating conditions, where possible
- Fault conditions
- Alarm conditions
- Power failure condition

All tests referred to in this and other sections, unless otherwise specified, shall be carried out at the vendor’s expense. GRC reserves the right to have its representative present at any or all of the tests for the purposes of observation, result verification, obtaining technical information or operator training. The vendor, unless specified otherwise, shall advise GRC at least five (5) working days in advance of the time and location of all tests.

The design and testing of the chemical storage vessels shall be done generally in accordance with BS4994. Any non-compliance shall be advised to GRC in writing along with the proposed rectifications to be undertaken. The vessels shall be retested after any rectification work and a report provided.

The vendor shall provide all necessary resources to enable effective testing including but not be limited to all necessary labour, materials, equipment and instruments. Additional staff shall be provided for testing for contingency purposes.

All relevant information and experiences gained during these tests, including readings such as flow, noise, odour, vibration, power draw, shall be integrated into the Operation and Maintenance Manuals, SOP’s, UPG’s and Work-As-Executed drawings, including P&I diagrams.

A representative nominated by GRC shall witness and sign all testing and commissioning checklists.

All data taken during each commissioning phase shall be recorded and used in the assessment of performance of that phase. All data obtained shall be recorded in an easily referenced manner and...
stored in a safe place. The vendor shall, on request from GRC, provide copies of any data or information, in a format to be agreed, within 24 hours. GRC shall have unhindered access as and when requested to examine the original records.

7 Performance Testing
At the agreed time, performance testing shall be undertaken to prove compliance with the rectification. If the compliance requirements are not met, the installation shall be determined as a fail and the contractor shall make good and re-test.

Table 3. Performance Test Requirements

<table>
<thead>
<tr>
<th>No</th>
<th>Sample Point</th>
<th>Sample Type</th>
<th>Method</th>
<th>Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CDU Dose Rate</td>
<td>Flow</td>
<td>Measured through change in level</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>SPS A05 Discharge Manhole</td>
<td>pH</td>
<td>Logging instrument 0 to 14 pH unit</td>
<td>pH &gt;8.5</td>
</tr>
</tbody>
</table>

8 Special Requirements

8.1 Tools, Spares and Consumables

All special tools required to operate and maintain the equipment shall be supplied. Special tools shall be regarded as the tools that cannot be procured “over the counter” at the local hardware store.

These special tools shall not be used for the erection of the Works and must be handed over in a completely new and unused condition.

The vendor shall, at the time of tendering, nominate a recommended list of spare parts and stock levels (inclusive of description, part number, supplier details, price, minimum stock and reorder level) suitable for 24 months continuous operation.

9 Documentation to be supplied by the Vendor

Prior to the commencement of installation, the vendor shall provide to GRC, for approval, all drawings of the proposed installation. The drawings shall show the layout of all equipment within the chemical dosing unit area, and the location of the power supply and services connections, if applicable. The drawings shall include piping and instrumentation diagrams, electrical schematics and loop drawings in AutoCAD to GRC template standards. In addition, a fully detailed asset list shall also be provided for approval. The work shall not commence until approval has been received from GRC.

Upon completion of commissioning of the dosing unit, the vendor shall provide pump curve over the full range of operating duties to the GRC representative. The vendor shall also provide all settings and printouts on the calibrated instrumentation, e.g. flow meter, flow switch, level switch, pressure transmitter, etc.

The vendor shall provide operation and maintenance manuals including:

- Operation and maintenance manuals for all control equipment and ancillary equipment as supplied by the manufacturer.

As part of this contract, the vendor shall be required to provide, in addition to other documents described elsewhere, the documents listed below in electronic format:
• Management Plan
• Chemical Delivery Requirement
• Work Method Statements
• Quality Plan
• Establish and maintain a Quality Assurance System including the preparation of Inspection and Test Plans
• Instrumentation list
• Electrical equipment list
• Control philosophy
• Critical parts list
• Interfaces with existing switchboard and SCADA communications