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| <p>KLM Technology Group</p> <p>Project Engineering Standard</p> |  <p>Solutions, Standards and Software</p> <p>www.klmtechgroup.com</p> | <p>Page 1 of 20</p> |
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| <p>KLM Technology Group #03-12 Block Aronia, Jalan Sri Perkasa 2 Taman Tampoi Utama 81200 Johor Bahru Malaysia.</p> | <p>Pipeline Pigging and Hydrostatic Test</p> <p>(PROJECT STANDARDS AND SPECIFICATIONS)</p> | |

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1.0 SCOPE

- 1.1 This specification covers the design and equipment necessary to perform the pigging operations and the hydrostatic test of the installed pipelines at the Facility.
- 1.2 The pigging and hydrostatic test shall fully comply with all relevant contractual requirements specified in the Scope of Work and Technical Specification of the Contract.

2.0 STANDARD SPECIFICATIONS

- 2.1 The pigging and hydrostatic test equipment shall conform in design, materials and performance, except where otherwise specified, with the current issue and amendments of the following prevailing on effective date of the Contract:

2.1.1 International Standards

- | | |
|-------------|---|
| ASME 831.4 | Liquid Transmission Systems for Hydrocarbons, Liquid Petroleum Gas, Anhydrous Ammonia, and Alcohols |
| ASME 831.8 | Gas Transmission and Distribution Piping Systems |
| API RP 1110 | Recommended Practice for Pressure Testing of Liquid Petroleum Pipelines |

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2.2 Compliance with this specification shall not relieve the Contractor of its responsibility to supply equipment suited to meet the specified service conditions and applicable regulations.

2.3 Where conflicts exist between this specification and other Drawings, standards, codes or specification, the most stringent shall be applied.

3.0 SERVICE CONDITIONS

3.1 The pigging and hydrotest equipment shall be suitable for continuous operation at this location under high ambient temperatures and humidity. The atmosphere at the Facility is generally dusty and corrosive and may contain traces of hydrogen sulphide.

3.2 The pigging and hydrotest equipment shall in all respects be suitable for continuous operation in the service conditions.

4.0 TECHNICAL REQUIREMENTS

Cleaning, pigging, gauging, flooding and hydrostatic test shall be carried out in accordance with the Company approval procedures.

5.0 CLEANING, PIGGING, GAUGING AND FLOODING

5.1 The Contractor shall submit in writing a Cleaning, Pigging, Gauging and Flooding Procedure Manual for Company approval a minimum of eight weeks prior to commencing the work. Pipeline cleaning, pigging and flooding shall not commence until written approval of the cleaning, pigging and flooding procedures have been obtained.

5.2 The manual shall include but not be limited to:

5.2.1 Proposed location and source of water, additives and chemicals proposed.

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- 5.2.2 Details of all equipment, materials, instrumentation and spares used during cleaning, pigging and flooding, including the type and rating of all test equipment.
- 5.2.3 Calculations of time, required pressure and flow for pigging and a typical pig position calculation in a format to be agreed upon with the Company.
- 5.2.4 Testing procedures for all main equipment and instruments.
- 5.2.5 Procedure for monitoring pressure and flow at both ends of the pipeline section(s).
- 5.2.6 Procedure for controlling flow, pressure and control of spacing of pigs.
- 5.2.7 Procedure for pig launching/receiving using temporary facilities.
- 5.2.8 Sequence of all operating, including pig examination.
- 5.2.9 Procedure for water sampling and analysis.
- 5.2.10 Procedure for determining level of cleanliness of pipeline.
- 5.2.11 List of nominated personnel supervising the cleaning, pigging and flooding with dates and time of duty, location and duration of activities of all personnel required. The Contractor shall name its authorised representative for the duration of activities.
- 5.2.12 Current certification (not more than six months old) for all instrumentation.
- 5.2.13 Procedure for gauging the pipeline, including full details of the pig proposed and gauging plate records.
- 5.2.14 Procedure for locating and tracking pigs.

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5.2.15 Contingency/recovery procedure to dislodge a stuck pig.

5.2.16 Pig types and details of temporary launchers and receivers.

5.2.17 Details of all chemicals used and rates of dosage, and all safety precautions required.

5.2.18 P&IDs, plot plans and layout details of all items of equipment used in cleaning, pigging and flooding.

5.2.19 Procedure for disposal of inhibited water, debris, and any chemicals used for cleaning, gauging and flooding and sizing of evaporation ponds.

5.2.20 Model of log book.

5.3 All pumps and/or compressors shall be of suitable pressure and capacity required for pipeline cleaning, pigging and flooding.

5.4 Test water for the pipelines shall be provided by the Contractor and pumped around the system as required to flood the pipeline section(s) prior to hydrostatic testing.

5.5 The Contractor shall provide a means for determining the continuous location of all pigs while in the pipeline. Such methods shall be approved by the Company. The first and last pig in every pig train shall be fitted with pig location devices.

5.6 The Contractor in the presence of the Company shall be required to carefully examine all recovered pigs to establish the wear or damage of the cups or discs of the pig and record the results. Spare new cups and discs shall be available at all stages.