

## PROVISION OF ZERO-MAN ENTRY & AUTO-TANK CLEANING & SLUDGE REMOVAL, TREATMENT & MGMT. SERVICES AT SELECTED RENAISSANCE FACILITIES

(RENAISSANCE Contract / Tender Nos.: CW-68582 / CW-515913)

### DOCUMENT TITLE: PROJECT IMPLEMENTATION PLAN (PIP) & METHOD STATEMENT SCOPE OF WORK (SOW)



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# SOW Methodology - For Zero-Man Entry & Auto-Tank Cleaning Services at Selected Renaissance Facilities

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## 1.0 PROJECT INTRODUCTION

South West Design Africa Limited (**SWDA**) has been Awarded the 18-Tank No-Man Entry (**NME**) & Auto-Tank Cleaning (**ATC**), Sludge Treatment & Management Project from Renaissance Africa Energy Company Limited (**RAEC**) through Contract / Tender Nos.: CW-68582 / CW-515913. The purpose of this document is to discuss the methodology selected for the provision of Zero-Man Entry & Auto-Tank Cleaning & Sludge Management Services at the Renaissance 18-Tank Cleaning Project at Selected Renaissance Facilities across Nigeria.

The SWDA Tank Cleaning equipment that will be deployed for this Project is intrinsically-safe, ATEX-certified and environmentally-friendly, it can be used in hazardous areas, such as the Tanks within various Renaissance facilities across Nigeria, which is the subject of this Tank Cleaning Project.

This Scope of Work (**SOW**) Methodology will provide all the stakeholders of the Project with an outline description of the various tasks and sequence of operations to be employed to deliver a successful Project. Furthermore, it discusses the list of equipment to be used and the limiting conditions in which the different tasks shall be carried out.

## 2.0 PROJECT LOCATION

The Renaissance NME Tank Cleaning Project will take place at four (**4**) different Renaissance facilities, namely: Bonny (**8 Tanks**), Forcados (**8 Tanks**), Gbaran (**1 Tank**) and Soku (**1 Tank**).

## 3.0 DESCRIPTION OF THE PROJECT

As part of the Renaissance campaign to either maintain, repair, change products in the Tanks or upgrade them, SWDA amongst other Companies was invited to bid for the provision of Zero-Man Entry & Auto-Tank Cleaning Services at selected Renaissance facilities. Now that this Project has been Awarded to SWDA, these Tank Cleaning & Sludge Management methodologies have been adopted for this Project, which shall be adhered to by all Project members & subcontractors.



See Typical Above Ground Petroleum Storage Tanks (ASTs) at PHC Refinery.

### **3.1 Tank Details (18 ASTs @ 4 Nigerian Locations):**

#### **3.1.1 Tank 9 - Crude Storage Tank, with Floating Roof - Bonny**

- Height = 22.1 Meters
- Diameter = 48.8 Meters
- Tank Volume = 41,335 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 207,998 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 1,870.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 11,764.8 Bbls

#### **3.1.2 Tank 11 - Crude Storage Tank, with Floating Roof - Bonny**

- Height = 19.0 Meters
- Diameter = 67.1 Meters
- Tank Volume = 67,187.7 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 338,088.5 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 3,536.2 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 22,242.7 Bbls

#### **3.1.3 Tank T-1201-A - Process Tank, with Fixed Roof - Bonny**

- Height = 10.5 Meters
- Diameter = 30.0 Meters
- Tank Volume = 7,422.03 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 37,347.7 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 706.9 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 4,446.4 Bbls

#### **3.1.4 Tank T-1201-B - Process Tank, with Fixed Roof - Bonny**

- Height = 10.5 Meters
- Diameter = 30.0 Meters
- Tank Volume = 7,422.03 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 37,347.7 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 706.9 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 4,446.4 Bbls

#### **3.1.5 Tank 13 - Crude Storage Tank, with Floating Roof - Bonny**

- Height = 19.0 Meters
- Diameter = 67.1 Meters
- Tank Volume = 67,187.7 M<sup>3</sup>

- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 338,088.5 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 3,536.2 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 22,242.7 Bbls

#### **3.1.6 Tank 21 - Crude Storage Tank, with Floating Roof - Bonny**

- Height = 22.9 Meters
- Diameter = 76.3 Meters
- Tank Volume = 104,706.9 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 526,885.1 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 4,572.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 28,760.4 Bbls

#### **3.1.7 Tank 22 - Crude Storage Tank, with Floating Roof - Bonny**

- Height = 22.9 Meters
- Diameter = 76.3 Meters
- Tank Volume = 104,706.9 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 526,885.1 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 4,572.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 28,760.4 Bbls

#### **3.1.8 Tank T-1401-A - Process Tank, with Fixed Roof - Bonny**

- Height = 10.5 Meters
- Diameter = 30.0 Meters
- Tank Volume = 7,422.03 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 37,347.7 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 706.9 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 4,446.4 Bbls

#### **3.1.9 Tank 206 - Crude Storage Tank, with Floating Roof - Forcados**

- Height = 21.9 Meters
- Diameter = 76.2 Meters
- Tank Volume = 99,872.3 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 502,557.4 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 4,560.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 28,684.9 Bbls

### **3.1.10 Tank 209 - Crude Storage Tank, with Floating Roof - Forcados**

- Height = 21.9 Meters
- Diameter = 76.2 Meters
- Tank Volume = 99,872.3 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 502,557.4 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 4,560.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 28,684.9 Bbls

### **3.1.11 Tank 620 - Process Tank, with Fixed Roof - Forcados**

- Height = 9.8 Meters
- Diameter = 33.5 Meters
- Tank Volume = 8,637.9 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 43,465.9 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 881.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 5,544.0 Bbls

### **3.1.12 Tank 901 - Process Tank, with Fixed Roof - Forcados**

- Height = 6.0 Meters
- Diameter = 15.0 Meters
- Tank Volume = 1,060.3 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 5,335.4 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 176.7 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 1,111.4 Bbls

### **3.1.13 Tank 203 - Crude Storage Tank, with Floating Roof - Forcados**

- Height = 21.9 Meters
- Diameter = 76.2 Meters
- Tank Volume = 99,872.3 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 502,557.4 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 4,560.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 28,684.9 Bbls

### **3.1.14 Tank 102 - Process Tank, with Floating Roof - Forcados**

- Height = 17.0 Meters
- Diameter = 48.0 Meters
- Tank Volume = 30,762.5 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 154,796.9 Bbls

- Sludge Volume (Est. 1.0 M Depth) = 1,809.6 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 11,382.4 Bbls

#### **3.1.15 Tank 601 - Process Tank, with Fixed Roof - Forcados**

- Height = 12.5 Meters
- Diameter = 30.0 Meters
- Tank Volume = 8,835.8 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 44,461.7 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 706.9 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 4,446.4 Bbls

#### **3.1.16 Tank 610 - Process Tank, with Fixed Roof - Forcados**

- Height = 9.8 Meters
- Diameter = 33.5 Meters
- Tank Volume = 8,637.9 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 43,465.9 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 881.4 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 5,544.0 Bbls

#### **3.1.17 GCPF Tank - Process Tank, with Fixed Roof - Gbaran**

- Height = 13.0 Meters
- Diameter = 39.0 Meters
- Tank Volume = 15,529.7 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 78,145.5 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 1,194.6 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 7,514.0 Bbls

#### **3.1.18 SGP Tank - Process Tank, with Fixed Roof – Soku Gas Plant**

- Height = 18.0 Meters
- Diameter = 30.0 Meters
- Tank Volume = 12,723.5 M<sup>3</sup>
- Tank Capacity (80% Total Vol. x 6.29 Bbls) = 64,024.7 Bbls
- Sludge Volume (Est. 1.0 M Depth) = 706.9 M<sup>3</sup>
- Total Sludge (6.29 Bbls = 1.0 M<sup>3</sup>) = 4,446.4 Bbls

## 4.0 TANK CLEANING STANDARDS

The following International Standards shall be adopted for the execution of this Renaissance 18-Tank NME Tank Cleaning, Sludge Recovery & Management Project:

- 1) **API 2015** – Requirements for safe entry and cleaning of petroleum storage tanks;
- 2) **API 2016** – Guidelines & procedures for entering and cleaning petroleum storage tanks;
- 3) **NFPA 326** – Safeguarding of tanks and containers for entry, cleaning and repair;
- 4) **99/92/EC (ATEX 137)** – ATEX Workplace Directive; and,
- 5) **94/9/EC (ATEX 95)** – ATEX Equipment Directive.

## 5.0 PROJECT PLANNING PHASE - HAZARD ANALYSIS AND RISK ASSESSMENT

For the successful completion of this NME Tank Cleaning Project with zero fatality, zero injury and incident as determined by the Project Targets / KPIs, the hazards, controls and responsible persons, as captured during the Planning Phase Hazard Analysis and Risk Assessment (**HA & RA**) meetings, shall be employed within the Job Safety Analysis (**JSA**).

## 6.0 PROJECT PERMITS

As part of the Quality Assurance & Quality Control (**QA / QC**) procedures, and in the safe execution of the various tasks which must comply with Renaissance's tenets of operational excellence, the following Work Permits will be properly sought and secured before Work shall proceed:

- A. General Work Permit (**GWP**) & NUPRC OGISP Tank Cleaning & WM (**NUPRC**) Permit;
- B. Confined Space Entry Permit (**CSEP**);
- C. Hot Work Permit (**HWP**);
- D. ER Water Permit (**ERWP**);
- E. Emergency Rescue Plan (**ERP**); and,
- F. Save Your Life Action (**SYLA**) & Start Work Checklist (**SWC**).

## 7.0 MANDATORY REQUIREMENTS

By way of ensuring that personnel that will be engaged to carry out the Tank Cleaning Projects at each Location are fit for purpose, the following mandatory regulatory requirements shall be fulfilled:

### i. **Medical Fitness (Fit-For-Duty – FFD)**

For the purpose of the project, the personnel that will be deployed to Location must have their medical fitness test at SPDC-approved hospital.

### ii. **Basic Off-Shore Safety Induction & Emergency Training (BOSIET)**

Personnel for the Location Projects must have their BOSIET Certification at two (2) OPITO Training Centers, and these are both located in Port Harcourt, Rivers State:

I. Charkins Maritime & Off-Shore Safety Centre; and,

II. OPEANS Safety Training Centre.

iii. **Off-Shore Safety Permit (OSP)**

The Department of Petroleum Resources (**DPR**), now the Nigerian Upstream Petroleum Regulatory Commission (**NUPRC**), has mandated that all personnel going off-shore must possess the Off-Shore Safety Permit (**OSP**), and this must be obtained and maintained by all personnel working off-shore or in riverine areas.

## 8.0 VARIOUS SPECIALISED TANK CLEANING EQUIPMENT

Due to the hazardous nature of the subject petroleum storage tanks, the requisite equipment to be used for the Tank Cleaning Projects are the air-driven type that can be used in both Zones 0 and 1, and so the following specialised Tank Cleaning Equipment will be used:



**SWDA's ATC & NME Tank Cleaning 4 Modules Mobilised to Tank Site in Ireland.**



**ATC & NME Tank Cleaning Modules being Set-Up at Tank Cleaning Site.**

| S/N | LIST OF TANK CLEANING EQUIPMENT                                                                                                                                      |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 4-Module No-Man Entry ( <b>NME</b> ) & Auto-Tank Cleaning ( <b>ATC</b> ) System & Sludge Mgmt. Equipment & 2-YRS Spare Parts (or Equivalent Semi-Auto Tank Cleaning) |
| 2   | Air Loader Pump (also known as Vacuum Recovery Unit), 900 CFM & 1,200 CFM                                                                                            |
| 3   | Air Compressor – 1,600 CFM operating @ a pressure of 10 bar                                                                                                          |
| 4   | Air Accumulator                                                                                                                                                      |
| 5   | Pneumatic Air Dryer                                                                                                                                                  |
| 6   | Mariner 320-E Breathing Air Compressor                                                                                                                               |
| 7   | PAS Air Pack 1                                                                                                                                                       |
| 8   | Heavy-duty Flapper / Sandpiper Pump                                                                                                                                  |
| 9   | Pneumatic Ventilators or Exhaust Fans with Ducting                                                                                                                   |
| 10  | High-pressure Pumps                                                                                                                                                  |
| 11  | Nozzles for the High-pressure Pumps                                                                                                                                  |
| 12  | Explosion-proof Lighting                                                                                                                                             |
| 13  | Self-Contained Breathing Apparatus ( <b>SCBA</b> )                                                                                                                   |
| 14  | Fire Extinguishers & Brass Buckets, Shovels, Scrapers & Packers                                                                                                      |
| 15  | MSA Altair 5X Gas Detectors                                                                                                                                          |
| 16  | Approved Hand-held Radios                                                                                                                                            |
| 17  | Emergency Eye Wash Stations                                                                                                                                          |
| 18  | Emergency Alarm System (Sirens)                                                                                                                                      |

## **ANCILLARY TANK CLEANING EQUIPMENT**



**1,600-CFM Air Compressor**



**Air-Loader Vac Sludge Pump**



**Breathing Air Generator**



**BA Air Accumulator Tank**



**Sandpiper / Wilden Sludge Pump**



**BA Hose Trolley Pump**

### **9.0 CONSUMABLES & PPEs**

Consumables & Personal Protective Equipment (**PPEs**) to be used during the Tank Cleaning Projects include, but are not limited to, the following:

| <b>S/N</b> | <b>LIST OF COSUMABLES &amp; PPEs</b>                                                                                                          |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 1          | Hard Hat                                                                                                                                      |
| 2          | Safety Glasses                                                                                                                                |
| 3          | Various Hand Gloves                                                                                                                           |
| 4          | Disposable Coveralls over Fire-Retardant Coveralls                                                                                            |
| 5          | Oil Absorbent Pads                                                                                                                            |
| 6          | Steel-Toed Safety Boots                                                                                                                       |
| 7          | Approved Rain Gear (Up & Down)                                                                                                                |
| 8          | Approved Intrinsically-Safe Brass Shovels, Scrapers, Buckets & Squeegies                                                                      |
| 9          | Approved 1-Tonne Woven Bags for Sand Conveying and/or Waste Skips                                                                             |
| 10         | Approved Self-Contained Breathing Apparatus ( <b>SCBA</b> ) & Respirators & Cartridges, as required during Post-NME Phase during Final Mop-Up |

## 10.0 METHOD OF WORKS

The following processes shall be adopted in cleaning above-ground storage tanks (**ASTs**), be it Crude Oil, Heavy Oil and their likes, having fixed or floating roofs or whether of single or double decks.

### 10.1 RENAISSANCE-LED SUBJECT TANKS INSPECTION (PRE-MOBILIZATION)

Prior to mobilizing to any Renaissance Tank Cleaning Site location, there will be Pre-Mobilization Inspection of each Subject Tank to be cleaned, led by Renaissance Representatives. The purpose of this exercise is to identify, determine & confirm the Tank & Site integrity, contents & atmospheres within each Tank, depth & volume of Tank contents & for Waste profiling purposes. These per Tank details must be confirmed before any Mobilization to any Site, in order that Final Mob arrangements are designed for each Tank. After the successful Tank Inspection exercise, Renaissance shall sign-off on each Tank particulars.

4X or 5X Gas  
Detector used  
to ID Tank  
Atmospheres



Oil / Water Interface Probe  
used to ID Depth of Oil, Water  
& Sludge in Tanks

### 10.2 EQUIPMENT INSPECTION (PRE-MOBILIZATION)

Prior to mobilizing to any Renaissance Tank Cleaning Site location, there will be Pre-Mobilization Inspection of the Tank Cleaning Equipment by Renaissance Representatives, and this event will take place on a Renaissance-appointed date in Port Harcourt, at our SWDA Kidney Island Warehouse. After the successful exercise, Pre-Mobilization Clearance Stickers will be stamped on each of the equipment. In addition, all pre-qualified Tank Cleaning Crew Personnel shall also be pre-mobbed by Renaissance with regards to the provision, review & approval of all appropriate Fit-For-Duty (**FFD**) medicals, training & certifications.



#### VARIOUS PRE-MOB ACTIVITIES

### 10.3 NME TANK CLEANING EQUIPMENT MOBILIZATION TO THE SITE

Our specialised No-Man Entry (**NME**) & ATC Tank Cleaning equipment, which are containerized in 4-Main 20-FT Containers (**Modules - M1 to M4**) & 4-Support Containers will be mobilized to site within 72-HRS of receipt of our Renaissance-provided Notice to Proceed (**NTP**), and shall include, but not be limited to, the following:

- 1) Auxiliary Container 20-FT, capacity 23 Tons (containing pipes, the Suction Module [**M1**], air compressor and electrical panel), with power rating 1-KW;
- 2) Recirculation Module (**M3**), Container 20-FT, capacity 17 Tons & power rating 88-KW;
- 3) Frequency Converter & Power Stabilizer;
- 4) Office Container 20-FT, capacity 6 Tons & power rating 4-KW;
- 5) Nitrogen Generator, Container 20-FT, capacity 10 Tons & power rating 96-KW;
- 6) Separation Module (**M2**), Container 20-FT, capacity 10 Tons & power rating 87-KW;
- 7) Skimming Module (**M4**), Container 20-FT, capacity 6 Tons & power rating 2-KW; and,
- 8) Spare Parts Container of 40-FT, capacity 5 Tons, with no power usage.



ATC SUCTION MODULE-1



ATC SEPARATION M-2



ATC 3-PHASED DECANTER



HIGH-SPEED CENTRIFUGE

The required ATC System operational Total Power Rating is 293 KW (**385.52 HP or 366.25 KVA**), and the requisite current is 415V, 50Hz & 3-Phase. For Safety reasons, the power supplied by the Client Renaissance to run the ATC equipment should be slightly higher than this.

Once mobilized, these ATC Main 4 Modules (**M1 to M4**) shall be positioned in accordance with individual Site features & any space limitations, and after the Tank Site Inspection, SWDA shall provide an Equipment Mob Plan, complete with a diagram of the specific Modules' positioning for each Site. In general, the Tank Roof should rest on its legs (**maintenance position**), and the Tank must be drained of water, prior to Tank atmosphere inerting.

### 10.4 TANK ATMOSPHERE INERTING

The Subject Tank to be cleaned, shall initially be inerted with a **“Nitrogen Blanket” (95% purity)** to reduce the Oxygen (**O<sub>2</sub>**) level to below 8%, and this is to eliminate any risk of explosion, the Tank's internal O<sub>2</sub> level is monitored and maintained all through the Tank Cleaning period, if exceeded, the system (**specifically the Recirculation Module – M3**) will shut down automatically. The Tank Cleaning Operation is controlled from the Recirculation Module (**M3**). This **“Nitrogen Blanket Inerting System”** is Approved under ATEX – 1999 / 92 / EC for Zone 1 Work.



### VARIOUS TANK INERTING PROCEDURES



## 10.5 TANK ROOF SPRAY NOZZLES INSERTION – “COLD TAPPING”

The ATC Patented Spray Nozzles used for cleaning the Tank are inserted into the Tank from the roof through holes that are safely cut with the “**SafeTap Cutting Tool**”, which is designed in accordance with the European Standard E 1343-1 for Category 1 & 2 Work, and this “**Tool**” is hydraulically-driven, and of course Tank inerting precedes this process. The number of Spray Nozzles used is dependent on the diameter & height of the Tank.



TANK ATMOSPHERE MONITORING



“SAFETAP” COLD TAPPING TOOL



ARRAY 8 - 16 SPRAY NOZZLES

## 10.6 TANK DESLUDGING / CLEANING PROCEDURES

The SWDA No-Man Entry (**NME**) & Automatic Tank Cleaning (**ATC**) System is a closed-loop system, and the Desludging & Cleaning Process is detailed below.

Tank Desludging is achieved with the use of patented Single Nozzle Sweepers, and the number of Nozzles “**Cold-Tapped**” into the Fixed or Floating Roof (**8 - 16 Nozzles**), depends on the diameter & height of the individual Tank, which shall be taken into consideration during the Pre-Mob Tank Site Inspection. The Oil initially residing in the Tank is used for this Desludging, and with these Nozzles, the Oil is injected into the Sludge to break up and liquefy it, such that it becomes pumpable, should the Sludge be such that it is too sticky or too viscous to pump, fresh Oil, which we refer to as “**Cutter Stock**” will be used to liquefy it. The “**Cutter Stock**” is added to the Sludge in batches, and the process will continue until the Sludge is completely liquefied.



NOZZLES CLEAN TANK SIDES & TOP



REMOTE-OPERATED JETS IN TANK



ATC NME WELL-CLEANED TANK

For the Recirculation of the Tank contents, the drain valve of the Tank will be connected to the ATC Suction Module (**M1**), from here, it is pumped with a feed pump (**flow rate 150 M<sup>3</sup>/Hr**) at a pressure of 5 bar to the Recirculation Module (**M3**), which is then pumped with a booster pump (**100 M<sup>3</sup>/Hr**) at a pressure range of between 12 to 15 bar back to the Tank. Tank Desludging and Cleaning can take place simultaneously.

### 10.6.1 Oil, Water & Solids Separation Procedures

After proper agitation, the homogenous mixture (**liquefied sludge**) is pumped to the Separation Module (**M2**), where oil and solids are separated with the use of the 3-Phased Tri-Decanter. The solid waste (**sands**) is placed into Waste Skips, the Water is recirculated & treated, while the Recovered Oil is pumped to the Client.

### 10.7 RECIRCULATED WATER WASHING & OIL SKIMMING PROCEDURES

Once the Tank is evacuated of the Sludge, it is then filled with washing water to about 10-CM in height, the moment suction is established, recirculation of this water commences. The water is pumped to the Skimming Module (**M2**) where Oil is skimmed off, and this Oil is pumped to the Client, and the water pumped to their on-board Waste Water Treatment Plant (**WWTP**).

### 10.8 TANK VENTING PROCEDURES

Once the Tank is completely emptied of the wash water, the man-way covers will be opened for forced venting of the Tank internal atmosphere with the use of pneumatic blowers and fans with proper ducting.

### 10.9 FINAL TANK CLEANING PROCEDURES

After all the Tank residues have been removed, and the Tank is certified of having sufficient oxygen for breathing, a 3 to 5-Man Crew of Recovery Technicians (**RTs**) shall enter the Cleaned Tank with proper Self-Contained Breathing Apparatus (**SCBA**) or full / half-faced respirators with proper cartridges, to manually collect the remaining sand and remove any rust scales (**should there be any**) with intrinsically-safe brass scrapers, shovels & buckets. These materials will be manually removed from the Tank by the **“Bucket Brigade”** method, and these sands and scale shall be placed into Waste Skips for further conveyance to the Client’s specified location.



FINAL TANK INSPECTION CREW READY



FINAL TANK MOP-UP CREW AT WORK



RESIDUAL SANDS & SCALE REMOVED

## **11.0 TANK CLEANING PROJECT – FINAL TANK CLOSE-OUT PHASE**

### **11.1 INSPECTION OF THE TANK**

After the final cleaning of the Tank, a team combining representatives of Renaissance and SWDA shall jointly inspect the Tank for cleanliness and sign-off prior to handing the Tank back over to the Client for resumption of operations.

### **11.2 HANDING OVER OF THE TANK BACK TO THE CLIENT**

After the Tank is ascertained for cleanliness, such that any necessary **“Hot Work”** can be carried out, the Tank will be handed back over to the Client (**Renaissance**); and, thereafter, a Job Completion Certificate (**JCC**) will be issued to SWDA for successfully completing the Tank Cleaning Project.

### **11.3 PROJECT EQUIPMENT & PERSONNEL DEMOBILIZATION & REPORTING**

Once the Tank has been successfully cleaned, certified, and the JCC provided, all Personnel and Equipment shall be de-mobilized from the site (**or to the next scheduled Tank Cleaning Site Location**) after completing **“proper house-keeping”** at the Project site. Thereafter, a Project Closure Report shall be prepared and submitted to Renaissance for Final Sign-Off, and then SWDA shall provide the Final Closure Report to NUPRC, as Final & proper Documentation for the Project, with copies of all Waste Manifests.