

INSTALLATION, OPERATION & MAINTENANCE MANUAL

DISSOLVED AIR FLOTATION UNIT
SUEZ Treatment Solutions Canada LP, Poseidon® products line

SUEZ Poseidon® PPM™ Flotation Unit Model PPM 700-E

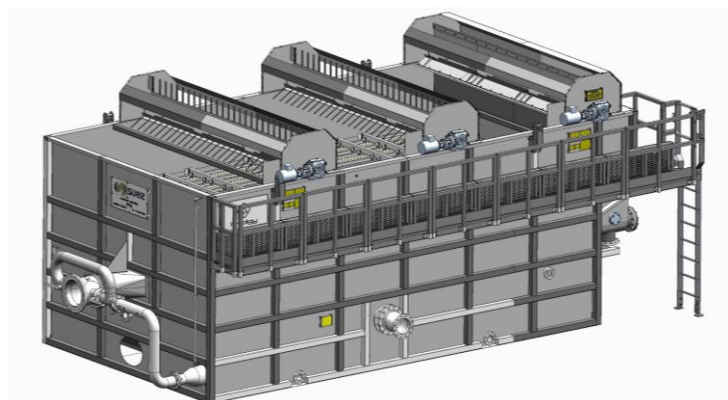
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PPM FLOTATION UNIT MODEL PPM 700-E

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SECTION 1 - SAFETY GUIDE

OPERATIONS PERSONNEL RESPONSIBLE FOR THE OPERATION OF THE DAF UNIT(S) AND THE WASTEWATER TREATMENT PLANT MUST BE SUITABLY TRAINED AND CERTIFIED AS PER FACILITY AND NATIONAL REQUIREMENTS. THE DAF UNITS ARE PIECES OF EQUIPMENT WITH MANY COMPONENTS, REQUIRING SPECIFIC KNOWLEDGE AND SKILLS FOR PROPER OPERATION.

MAINTENANCE AND INSTALLATION PERSONNEL MUST HAVE THE APPROPRIATE TRAINING AND CERTIFICATION FOR THE TASK THAT IS REQUIRED.

Introduction

To assure your **SUEZ Poseidon PPM™** flotation unit works properly under normal operating conditions, please follow the recommendations contained in this guide. It contains important safety and maintenance information on the use of your SUEZ Poseidon flotation unit.

All operators and maintenance people should read this guide prior to starting up or working on the unit. Although this equipment is equipped with safety devices, there are precautions to take in order to avoid accidents and damage to the unit. All operators should be familiar with the controls of this unit and those established by the customer.

Safety Instructions and Operating Precautions

SUEZ Poseidon's flotation unit uses state of the art technology and care must be taken when effecting repairs to the unit. **ONLY ORIGINAL SUEZ POSEIDON MANUFACTURED OR SPECIFIED SPARE PARTS CAN BE USED ON THIS UNIT.** The use of non-standard replacement parts could result in safety hazards to personnel and/or damage to the unit.

To avoid damage to the unit or electrocution of personnel, only qualified electricians are allowed to install the electrical connections of this unit.

When installing moving parts or doing maintenance on or near them, remember to shut off and lock out the electric and/or the pneumatic feed to those parts. For example, the sludge scraping system and sludge skimmers or thickeners can cause serious injury. You need to pay attention when moving around the recirculation pump and around the pump shaft.

FOR PROPER SAFETY DO NOT...

-  • Start the unit up before it has been fully assembled, installed on site and that all safety devices have been put in place and are functional.
-  • Do any maintenance, repairs or any other kind of work on the unit without having completely shut off / locked out electrical power to the unit as well as any pneumatic feed.
-  • Let the unit run with damaged, missing or extremely worn parts.
-  • Modify or remove safety devices that are necessary for the safe operation of the unit.
-  • Touch any moving or rotating parts of the unit.
-  • Use any tools or other object between sludge scrapers, sludge skimmers or thickeners when they are moving.

Cleaning of the unit

Cleaning procedures of the unit are clearly described in the verification and maintenance section of the manual (refer to **SECTION 10 – VERIFICATION AND MAINTENANCE**). It is important to wear safety glasses when washing the unit with a water hose as dirt can be projected into the air. Also due to numerous irregular shapes of the unit, splashing can occur. Therefore, it is suggested to wear waterproof clothing for this work.

	⚠ CAUTION	
	FLYING DEBRIS CAN BE PRESENT WHILE CLEANING THE UNIT Wear Safety Glasses and Water-proof clothing	

It is recommended to keep the safety tags clean so that they are visible to anyone working around the unit. The safety tags that can be found on the flotation unit are as shown below.

	⚠ WARNING
	FLAMMABLE MATERIAL Do not weld on the side of the flotation unit, inside of the flotation unit or over the flotation unit.

CAUTION	
	READ AND UNDERSTAND MANUAL BEFORE SERVICING.

	⚠ WARNING
	Moving part inside can cause severe injury Do not operate with guard removed. Follow lockout procedure before servicing

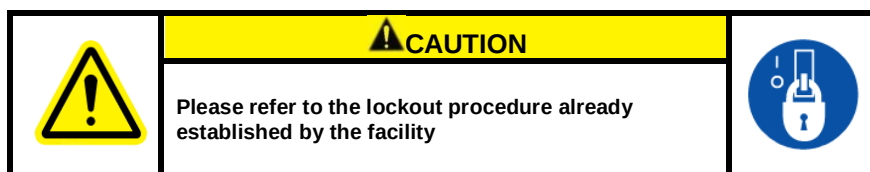
⚠ CAUTION	
	

			⚠ WARNING
Scrapper blade automatically starts up. Do not attempt to the blades or the fingers of the scraper blade). Moving parts crush and cut. Follow lockout procedures before servicing			

Lockout Procedure

Lockout procedures are established to protect workers so that they can safely perform their maintenance duties on the **SUEZ POSEIDON** Flotation unit. The lockout procedure must be applied for:

- Internal Inspection.
- **Poseipump®** installation, assembly and disassembly maintenance procedures.
- Sludge removal system installation, assembly and disassembly maintenance procedures.



SAFETY INSTRUCTIONS

SUGGESTED LOCKOUT PROCEDURE

1. Announce lockout to other personnel
2. Turn power OFF at main panel(s)
3. Lockout power in OFF position
4. Put key(s) in your pocket
5. Clear Unit of all Personnel
6. Test lockout by hitting the RUN button(s)
7. Begin work if all of the previous steps are satisfied
8. Clear unit of personnel before restarting
9. Announce unit will soon be ON to other personnel
10. Take key(s) form your pocket and unlock the lockout device(s).
11. Turn power ON at the main panel(s)
12. Announce unit is ON to other personnel.

Internal Inspection

Internal inspection requires a **CONFINED SPACE** and **LOCKOUT** procedures. A confined space is an area where accessibility is reduced and where air can be confined. The principal risks are oxygen deficiency, presence of toxic and explosive gases and physical injuries due to body falls, pinning of the body, restricted visibility, noise and temperature.

The flotation unit must be empty and should be clean for a better inspection (Refer to **SECTION 10 Cleaning procedures**). **Please refer to the confined space and lockout procedures already established by the facility.**



SAFETY INSTRUCTIONS

SUGGESTED CONFINED SPACE INSPECTION PROCEDURE

1. Obtain a work authorization or permit for confined space inspection.
2. Empty and clear the flotation unit as described in **SECTION 10**.
3. Close and lock all flotation unit inlet and outlet water valves (Manual & Automatic)
4. Follow lockout procedure for the supply pump, **Poseipump®**, sludge removal system, dosing pumps and the drain valves.
5. Prior to entering the unit, a continuous gas measurement can be performed with a calibrated gas detector if deficient oxygen or toxic/explosive gases are potentially present.
6. If the gas detector signals an alarm, an air blower system should be installed in order to change the air volume during adequate frequencies.
7. Supervisors must determine if special personnel protection is required such as respiratory protections and/or worker evacuation devices that can be operated outside of the unit.
8. Prior to entering the flotation unit, a supervisor should always remain outside of the unit during the work period in order to visually check and communicate with the worker(s) inside. The supervisor must be able to engage emergency procedures if needed.

SECTION 2 - PROCESS DESCRIPTION

The **PPM™** flotation unit model PPM 700-E was selected for the treatment of oily wastewater at Oilfield Water Logistics.

PPM™ Flotation Unit Specifications

Model	PPM 700-E
Poseipump® Model	403-PF
Maximum inlet flowrate	3000 usgpm
Maximum inlet Total Suspended Solids concentration	500 to 1000 ppm
Maximum inlet Oil and grease concentration	500 to 1000 ppm

For a detailed description of the individual process steps, refer to the subsequent sections of this manual.

Flotation unit – PPM™ series

The **PPM™** flotation unit is an open-top tank unit, which extends horizontally and uses air microbubbles for separation of suspended solids and oil and grease from the liquid phase.

The raw water is preferably coagulated (if coagulation is necessary) at the inlet of the feed pump to take advantage of the strong mixing action provided by the pump's impeller and to allow the longest contact time possible for the coagulant to react. The flocculation process normally occurs at the junction of the feed water line and the recirculated water line, located at the inlet of the unit, or a few feet before.

After chemical conditioning, the process water is mixed with a stream of recirculated water which is saturated with air by the POSEIPUMP®. This air is released from the recirculated stream as microbubbles ranging between 30-50 µm which will adhere to the suspended solids, allowing them to float to the surface of the water in the DAF unit. This initial mixing and flotation of contaminants occurs in the inlet compartment of the unit which is divided from the main separation zone by a partial baffle.

The water continues into the main separation zone of the unit and flows downwards through the **POSEIPACK®** assembly and into the clarified water collection piping. The clarified water will be evacuated from the unit through additional piping.

The air/particle conglomerates float to the surface of the flotation unit forming the sludge blanket which is continuously moved and evacuated from the unit by the sludge removal system.

If any heavy particles are present, most will settle in the inlet compartment which is equipped with dedicated drain piping. Any other particle that settles in the unit's main separation zone will accumulate in the heavy solids collection zone at the very bottom of the unit. This zone is also equipped with dedicated drain piping.

Poseipump® Air Saturation System

A part of the treated water is recirculated through the recirculation pump, called the **POSEIPUMP®**, in order to produce proper air dissolution. Air is injected into the recirculation pump through the hollow shaft of the pump. The **POSEIPUMP®** recirculation pump is specifically designed to pressurize the air/water mixture.

The air is dissolved in the recirculation system by means of the mixing action of the **POSEIPUMP®**'s impeller, application of pressure via the pressure release valve and proper retention time within the air dissolution pipe.

The microbubbles are generated following the pressure drop that takes place right after the release valve, near the inlet of the flotation unit. It is this depressurization to atmospheric pressure that causes the dissolved air to be released as micrometer sized air bubbles within the range of 30-50 µm. These are ideally sized for the removal of fine particles.

Poseidon Injector

The Poseidon injector is located slightly upstream of the inlet into the SUEZ Poseidon flotation unit and represents the junction between the process water feed line, the recirculated water line and, in most cases, the flocculant injection point. The feed water passes through the center section of the injector while the recirculated water and flocculant are brought to the outer ring. The recirculation line release valves used to increase pressure in the recirculation line will be located close to the injector. For convenience regarding the flocculant feed lines, there are also two (2) dedicated one (1) inch flocculant injection points located on either side of the injector. Only one of these two points needs to be used and though injection quills cannot be used, the design of the injector insures maximum mixing of the water and the flocculant.

POSEIPACK® Separation Cells

The principle of projected surface is applied by using inclined corrugated plates with a defined gap between them. This results in a better solids separation since the separation efficiency is directly proportional to the projected surface.

Most of the agglomerates will float immediately in the inlet compartment of the unit however, particles with a slow ascent velocity are separated from the water in the **POSEIPACK®** assembly. This part of the system operates on the principle of countercurrent separation. Due to the plate distance and fluid velocity, a laminar flow is maintained between the plates. This means that a fluid has "zero velocity" at the plate surface. Particles can travel uninterruptedly to the nearest plate. Once the particles reach the plates, they will start moving upward contrary to the direction of the flow. This is due to the velocity distribution of a laminar flow pattern where flow velocity at the plate's surface is zero. Traveling in an upward direction can therefore take place in a virtually unhindered way. Due to the corrugations of the **POSEIPACKS®**, particles will all tend to move along the top of the corrugations. Flocs will increase in size and adhere to microbubbles in the assembly which will increase their buoyancy until they rise out of the **POSEIPACK®** completely.

SUEZ Poseidon DAF unit flotation accessories

The following are the auxiliary items and accessories that are included in the SUEZ Poseidon scope of supply for this project. This is not a complete list of all the necessary auxiliary equipment for the SUEZ Poseidon dissolved air flotation unit.

- Air dissolution pipe
- Pneumatic control box
- POSEIPUMP® model 403-PF
- POSEIPUMP® motor 75 HP
- Sludge removal system
- Automatic oiler for the rotary joint
- Walkway and access ladder

Equipment Overview

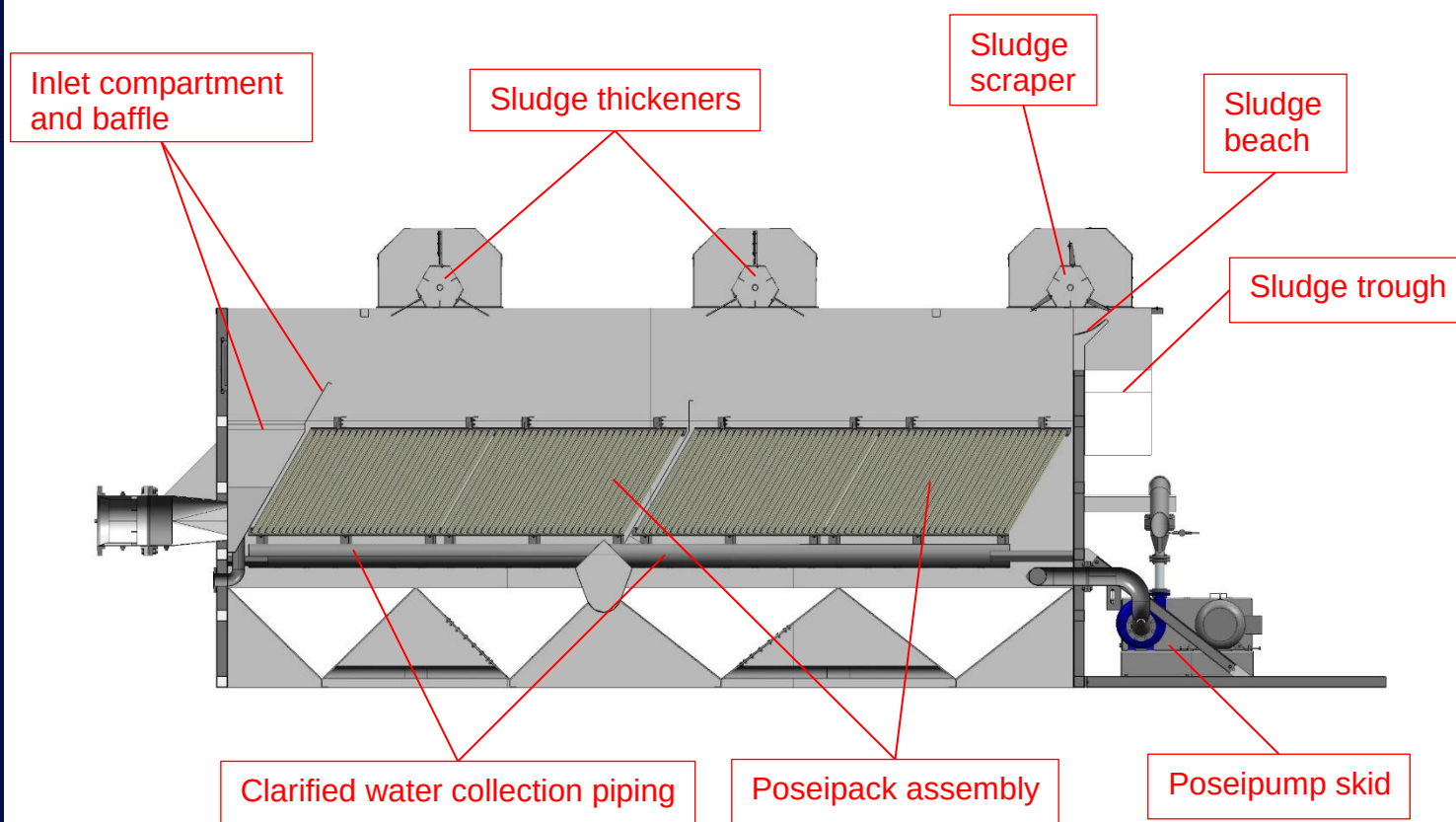


Figure 1 DAF tank internals (side view)

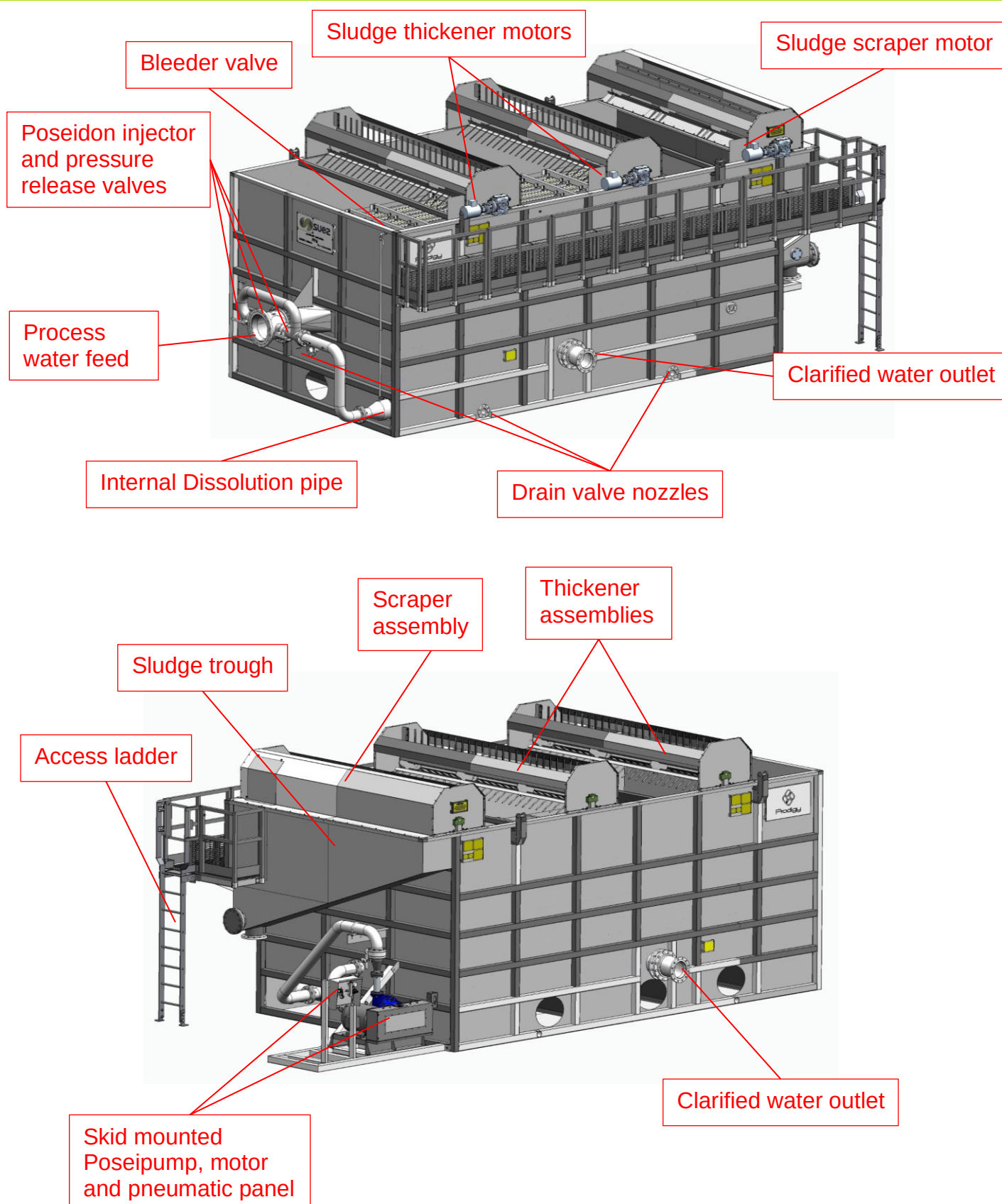


Figure 2 DAF tank externals

SECTION 3 – SHIPPING & RECEIVING

Shipment

The PPM Flotation unit is shipped along with the dissolution pipe, one crate containing the **Poseipump®** and one or more crate(s) containing all the parts necessary for completing SUEZ Poseidon's supply. For specific details of equipment weights, please refer to the certified shipping drawings.

Receiving and Pre-Start-up

When receiving the flotation unit ...

- Perform a complete general inspection inside and outside the unit in order to verify if any damage occurred during shipping.
- If ready to install, remove all mechanical blocks and straps used in transporting the unit to prevent blockage of moving parts such as the scraper, pump shaft etc.
- Make sure that all moving parts move as intended
- Insure that there are no loose parts on the unit
- Verify the proper emplacement of safety devices and guards
- When the unit is ready for start-up, fill it with fresh water to avoid any risk of running the recirculation pump dry.

Lifting and Hoisting Procedures

IMPORTANT: Always refer to the certified drawing 7472.D.01.03.0166.1M. Information within this drawing supersedes any typical hoisting procedure presented below.

The equipment required for lifting and hoisting the PPM flotation unit is one crane, one forklift, cables or lifting belts and hooks. The following hook-up instructions describe the hoisting procedures for setting the PPM flotation unit on its feet.

Hook-up instructions for the PPM flotation unit

1. Install a shackle on the four (4) lifting lugs on each side of the unit. Attach lifting belts between the shackles and the crane. Start putting tension on the belts with the crane in order to stabilize the unit in the horizontal position.



Lifting the PPM flotation unit

- Lift the PPM flotation unit from the ground with the crane. Use caution when lifting. Install the flotation unit in its location and remove the cross beams located in between each of the legs of the unit. Their only purpose is to protect the legs during the shipping. Refer to the certified drawings.

IMPORTANT: The crossbars on top of the unit must not be removed. Serious damage may occur to the unit if they are removed.

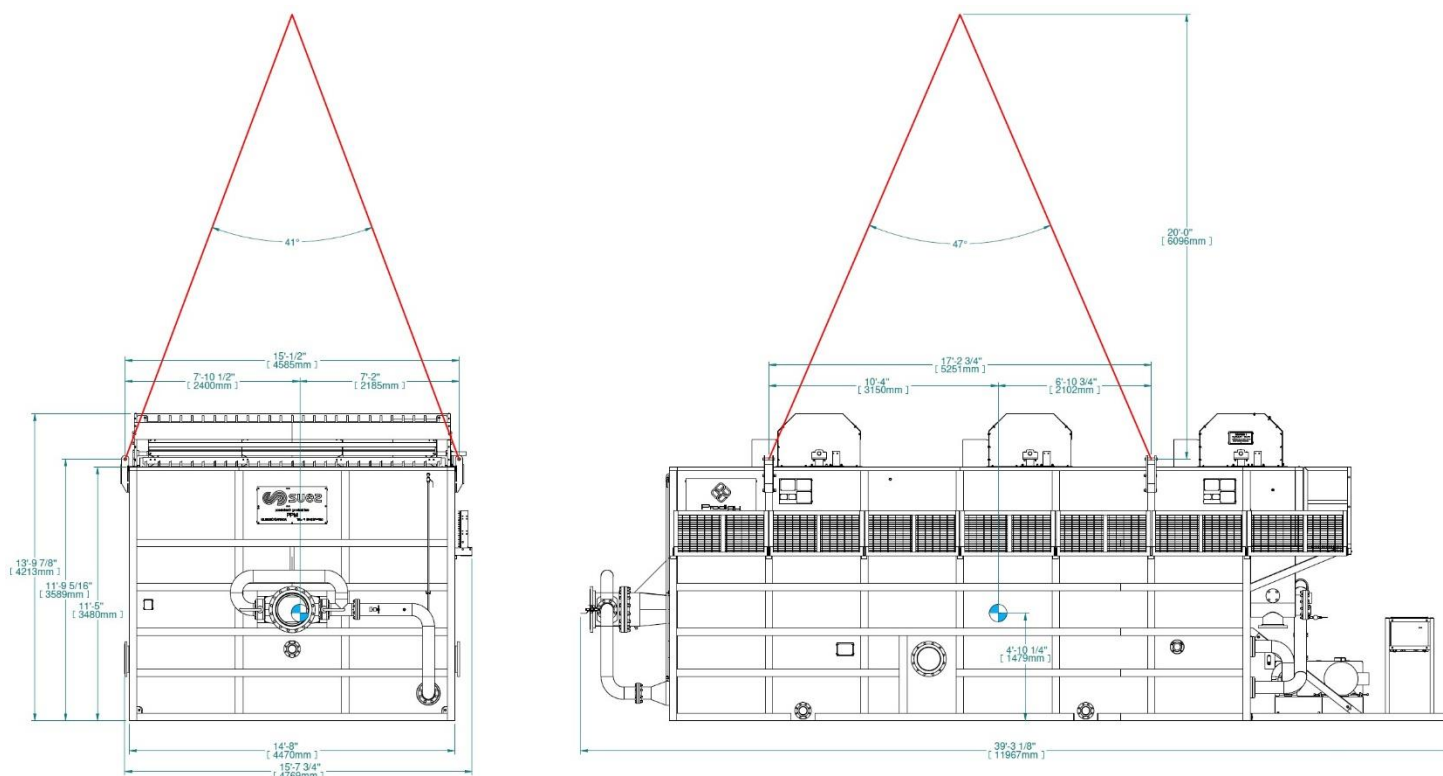


Figure 3 Lifting the unit



Removal of Wooden structure and Plywood/Steel caps

For shipping purposes, plywood sheets are installed to protect the **POSEIPACK®** inside the **PPM®** unit. Remove the plywood sheets when the unit is in place and before start up. All flanged outlets of the unit have been capped with plywood or steel caps. Please remove all these caps in order to start working with the piping.

Protection of Poseidon Flotation unit for Overseas and Winter Shipments

The following information concerns the corrosion protection solution that could be applied to the SUEZ Poseidon **PPM™** Flotation unit, depending on the type of packaging, and how this solution can be removed when the unit arrives at the facility.

Description of protective coating

In order to protect the SUEZ Poseidon **PPM™** Flotation unit during overseas and winter shipment and to preserve the original manufacturing quality, the surface of the unit may have been treated with a rust inhibiting coating at SUEZ Poseidon's manufacturing plant. This special coating protects metal against rust, salt and corrosion. The following are descriptions of the composition and physical properties of the coatings that may have been used.

Composition of the protective coating

Ingredients:

Asphalt	47%
Mineral Oil	22%
Extensive Wax and Oils	31%

Physical properties of the protective coating

Pure Material or Blend:	Blend
Physical State:	Liquid
Color:	Translucent Liquid
Relative Density (water = 1):	0.93 ± 0.2
Viscosity:	3200 cps at 25°C (77°F)
Solids per Volume:	33 ± 3%
Volatiles (% w/w):	48%
Solubility in water:	0.01%
Flash Point:	60°C (140°F) min. Open cupel "Cleveland"
Consistency:	Thixotropic Fluid
Evaporation Rate:	0.16
Tension of Vapor (mm Hg):	0.4
Density of Vapor (air = 1):	4.7
Corrosion Resistance:	Salt Vaporization (1000 hrs) Dry thin layer of 2.5 mm

This material is flammable and contains solvents derived from petroleum products. It belongs to the bituminous compounds chemical family.

Removal of protective coating

The protective coating can be removed from the surface of the unit with a Solvent-based cleaner.

Suggested Removal Procedure:

1. Apply the solvent (or equivalent) on the surface of the unit with spraying equipment or otherwise.
2. Leave the solvent for approximately 10 minutes.
3. Wash the surface of the unit with high-pressure water.

	CAUTION	
	SPLASH HAZARD CAN BE PRESENT WHILE CLEANING THE UNIT	
	Wear Safety Glasses and Water proof clothing	

Composition of Bio-Progard – Permanent Anti-Rust Treatment

Ingredients:

Quaternary Ammonium Compound with bentonite	5-10 %
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Physical properties of Bio-Progard – Permanent Anti-Rust Treatment

Pure Material or Blend:	Blend
Physical State:	Cream semi-liquid
Color:	Cream
Relative Density (water = 1):	0.9-1.0
Viscosity:	>1000 cSt @ 40°C
Solubility in water:	N/A
Flash Point:	~210°C
Evaporation Rate:	N/A

Refer to the Bio-Progard SDS for additional information on the product.

Long Term Storage at Site Procedure

The flotation unit will arrive on-site along with the dissolution pipe and will be accompanied by one or more crates. The unit can be kept outside until you are ready to perform the installation. The unit should be placed on the ground with the same kind of supports that it came on during shipping. It should also be kept away from traffic where it will not be in the way. However, no special precautions need to be made in regards to maintenance of the DAF unit itself. There may be a cross bar structure or lifting lugs installed to make lifting the unit easier. These can be left in place until all lifting procedures are complete. For long term storage, the plywood caps on the flanges of the unit do not have to be removed until necessary. The crates must be moved indoors into a temperature and humidity-controlled warehouse for safe keeping.

Preservation Procedures during Construction, Start-Up and Commissioning Period

Not unlike the **Long Term Storage at site Procedure**, no special precautions need to be taken in regards to preservation during the Construction, Start-Up and Commissioning Period. Once in service, you can begin following a routine maintenance schedule including proper lubrication and cleaning of the unit.

In case of potential freezing risks, make sure there is no water accumulation in the unit.

Miscellaneous equipment extended storage recommendations

When storing rotating equipment such as pumps or motors, it is important that certain precautions are taken.

Poseipump®:

- Always store the spare Poseipump® indoors in a clean, dry location. Avoid locations with large temperature swings that will result in condensation.
- Pumps cannot be stored around running equipment where resonance vibration can cause bearing damage.
- Regardless of the duration of storage, pumps should be rotated at least every six weeks, no less than five full revolutions.
- Pumps should be stored in a corrosion less environment.

Valves:

- Always store the valves indoors in a clean, dry location.
- Regardless of the duration of storage, valves should be manipulated (opening and closing them 4 to 5 times) every six months.

Motors:

- Always store the motors indoors in a clean, dry location. Avoid locations with large temperature swings that will result in condensation.
- Please note the reduced grease utilization period of the ball bearings after storage periods exceeding one year.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance to do this.
- Motors must be covered to eliminate airborne dust and dirt.
- If the storage location exhibits high vibration, place isolation pads under motor to minimize damage to motor bearings.

Please read the manufacturer's Operating instructions manual for more information.

Gear units:

Gear units of the "extended storage" type have:

- An oil fill suitable for the mounting position so the unit is ready to run. You should still check the oil level before start-up;
- A higher oil level in some cases. Correct the oil level before start-up.

Comply with the storage conditions specified in the following table for extended storage:

Climate zone	Packaging *	Storage location	Storage time
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones).	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap.	With roof, protected against rain and snow, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity <50%).
	Open	With roof, enclosed at a constant temperature and atmospheric humidity (5°C-60°C, <50% atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads.	Two years or more, given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.
Tropical (Asia, Central and south America, Australia, New Zealand, excluding temperate zones).	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap. Protected against insect damage and mildew by chemical treatment.	With roof, protected against rain, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity <50%).
	Open	With roof, enclosed at a constant temperature and atmospheric humidity (5°C-60°C, <50% atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads. Protection against insect damage.	Two years or more, given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.

*Packaging must be performed by an experienced company using the packing materials that have been expressly specified for the particular application.

Please read the manufacturer's Operating instructions manual for more information.

SECTION 4 – INSTALLATION

Installation of the DAF unit tank

The DAF must be installed level. Permissible deviation will be maximum 1/32" from left side to right side and maximum 1/8" between front side and rear side. Improper leveling will result in operational issues such as inconsistent sludge mat distribution and unequal sludge mat removal.

The design of the flotation unit means that it cannot be supported solely by its edges and therefore it should be installed onto a flat and level concrete slab with room for small shims to accommodate for small discrepancies and to allow for proper leveling of the unit. If a concrete slab can not be made to accommodate the unit, it must be installed on a base that is as flat as possible so that the bottom of the unit can be uniformly supported.

The base must be made to support the total weight of the unit. As per the certified drawings the mass of the empty unit is approximately 39600 lbs (17962 kg) which increases to 238400 lbs (108400 kg) once it is filled with water.

The unit should also be electrically grounded to prevent electrocution risks.

Installation of the Recirculation Pump (POSEIPUMP®)

Please refer to **SECTION 5 – POSEIPUMP®** for installation procedures of the Poseipump®.

Installation of the Recirculation Pneumatic box

It is recommended to install the recirculation pneumatic box near the **POSEIPUMP®** in order to facilitate an optimal operation. Refer to **SECTION 6 - Pneumatic Control Box**

Installation of the Sludge Removal System

Please refer to **SECTION 7 – SLUDGE REMOVAL SYSTEM** for installation procedures for the sludge removal system

Installation of the Recirculation Injector and the Chemical Products Injection Points

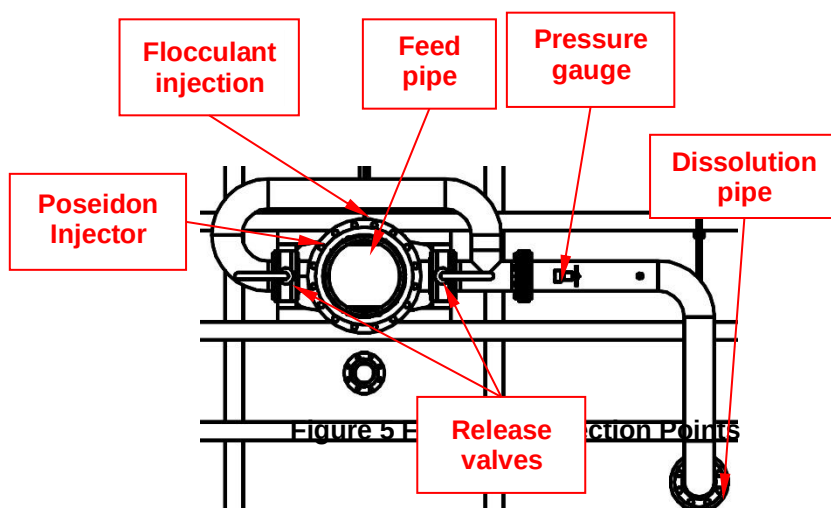
Recirculation Injector

The recirculation injector is shipped in one of the crates. Please refer to the certified drawings for specific details for the connection of the recirculation injector.

1. Install the recirculation injector to the raw inlet water flange of the flotation unit with the appropriate bolts.
2. Install the feed pipe to the main flange of the recirculation injector with the appropriate bolts
3. Install the release valve (Gate valve) on the side flange of the recirculation injector and connect

the **POSEIPUMP®** discharge pipe to the other end of the release valve.

4. Connect the flocculant line to the recirculation injector dosing points. (Refer to **Figure 4**)



Flocculant injection Points

The flocculant injection points can be placed at one of several different locations on the flotation unit feed pipe or at one of a different predetermined locations on the tubular flocculator if one is installed. The location of the flocculant injection point depends on the speed of the floc formation, which is partly dependent on the water being treated. At start-up it is recommended to try different injection points for the flocculant and to evaluate their respective effectiveness by doing turbidity and/or TSS analyses.

In the majority of applications, the optimum injection points are located on the recirculation water injector of the unit. A flocculant injection point located between the recirculation water injector and the unit inlet can be used for a very quick flocculation contact time.

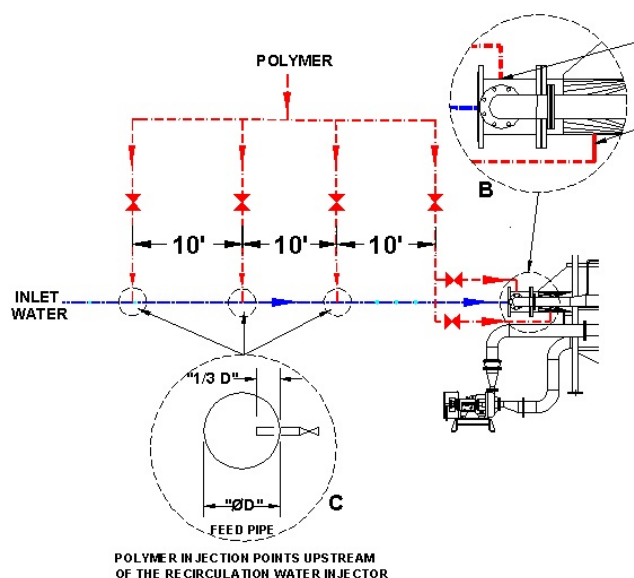


Figure 4 Recirculation Injector Installation

Coagulant Injection Point

Some water treatment programs require the addition of a coagulant for conditioning the water. The coagulant injection point should be placed as far as possible upstream of the flotation unit in order to optimize the contact time between the coagulant and the water. Prior to the start-up of the equipment, it is recommended to install the injection point, where possible, at the suction of the feed pump. Alternatively, it can be installed at a location encouraging quick mixing and an adequate contact time.

If a tubular flocculator is not used then the coagulant injection tube should penetrate the feed pipe to a length $\frac{1}{3}$ the diameter of the feed pipe. This will permit an adequate dispersion of the coagulant.

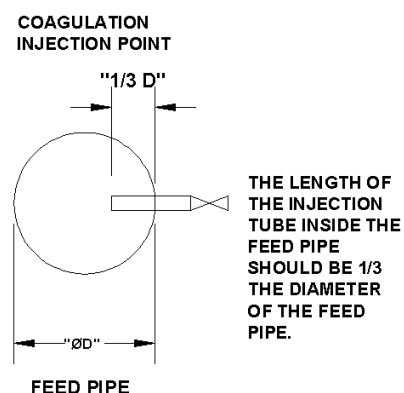


Figure 6 Coagulation Injection Point

pH Correction Injection Point (if applicable)

Depending on the nature of the raw water, a pH correction may be required downstream of the coagulant addition point. The pH correction injection point should be placed approximately halfway between the coagulant injection point and the flocculant injection point. Furthermore, the length of the pipe between the flocculant injection point and the pH correction injection point should be long enough in order to promote a quick mixing and an adequate contact time of the pH correction product. The injector should penetrate inside the feed pipe to a length equal to $\frac{1}{3}$ the diameter of the feed pipe. A pH probe should be placed in the flocculation tank in order to control the required pH correction chemical product addition rate.

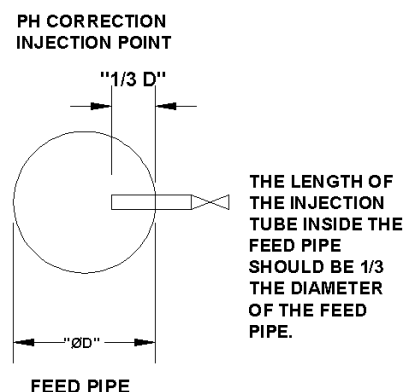


Figure 7 pH Correction Injection Point



CAUTION

If a corrosive coagulant is used, such as Ferric sulfate or Ferric chloride, then the injection point should not be placed at the pump suction. In such a case, the injection point should be installed in a pre-determined position in a tubular flocculator made of an appropriate material.

Installation of miscellaneous equipment.

The general installation location of various equipment can be found on the SUEZ Poseidon flowsheet identified as certified drawing 7472.D.01.03.0131.1L. This can be a reference for the following equipment unless stated otherwise.

Drain Valves installation

Install the Automated and Isolation drain valves to the drain water flange of the flotation unit with the appropriate bolts.

Pressure gauges installation on the recirculation line

Install one pressure gauge (0-150 psig) just before the release valve (Figure 4) and another one at the POSEIPUMP® discharge.

Pressure Transmitter on the recirculation line

Install a Pressure Transmitter on the recirculation line. This pressure transmitter must be relayed to the PLC. In specific cases, the pressure switch located in the recirculation system pneumatic box can be used as a replacement. Ask SUEZ Poseidon about this feature before doing any changes to your configuration.

Level transmitter installation

Install a Level Transmitter on the tank. This level transmitter must be relayed to the PLC or DCS. Please refer to the certified drawings for specific details.

A flange for a level transmitter is also mounted on the side of the sludge hopper. This can be used to monitor the level in this section as well as serve as control device for the sludge transfer pump.

Clarified water pipe

Install the clarified water pipe which must be bolted at the clarified water flange of the flotation unit. Please refer to the certified drawings for specific details.

Recirculated water pipe

Install the recirculated water piping which includes the air dissolution pipe. Please refer to the certified drawings for specific details.

SECTION 5 – POSEIPUMP®

INTRODUCTION AND OVERVIEW

The Poseipump® is a central component of the DAF flotation unit and provides the mean to create an appropriate air/water mixture to generate air microbubbles. Proper installation, operation and maintenance of this equipment is critical for the DAF flotation unit to perform as intended. Understanding operational principles and limits will help guide the operation of this device.

To ensure reliable operation of your Poseipump® in all circumstances it is essential for you to read and familiarize yourself with this section. It contains instructions to avoid accidents and damages to the pump before and during its operation. It also contains safety and maintenance tips.

All operators and maintenance personnel must be aware of the contents of this section and be aware of the precautions to take when doing work on or around the Poseipump®. The department supervisor must ensure that the staff understands and respects the rules of this guide and those established by the customer. Therefore, it is strongly recommended that this document be read by the user (s) of the pump before it is started for the first time. It is also desirable that the operator be familiar with the general operation of the dissolved air flotation unit.

Always refer to the design of the pump in order to proceed with the installation or replacement of any spare parts.

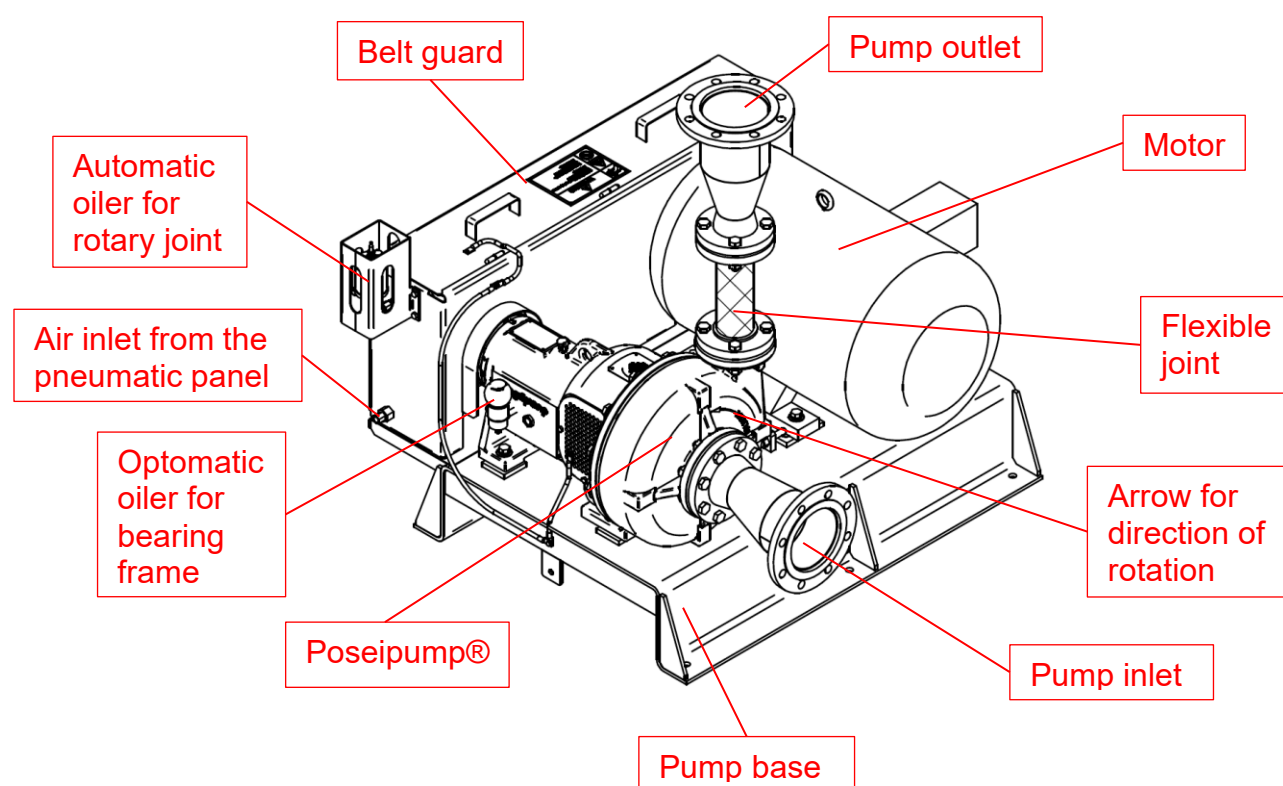


Figure 8 Typical Poseipump® Configuration

GENERAL COMPONENTS

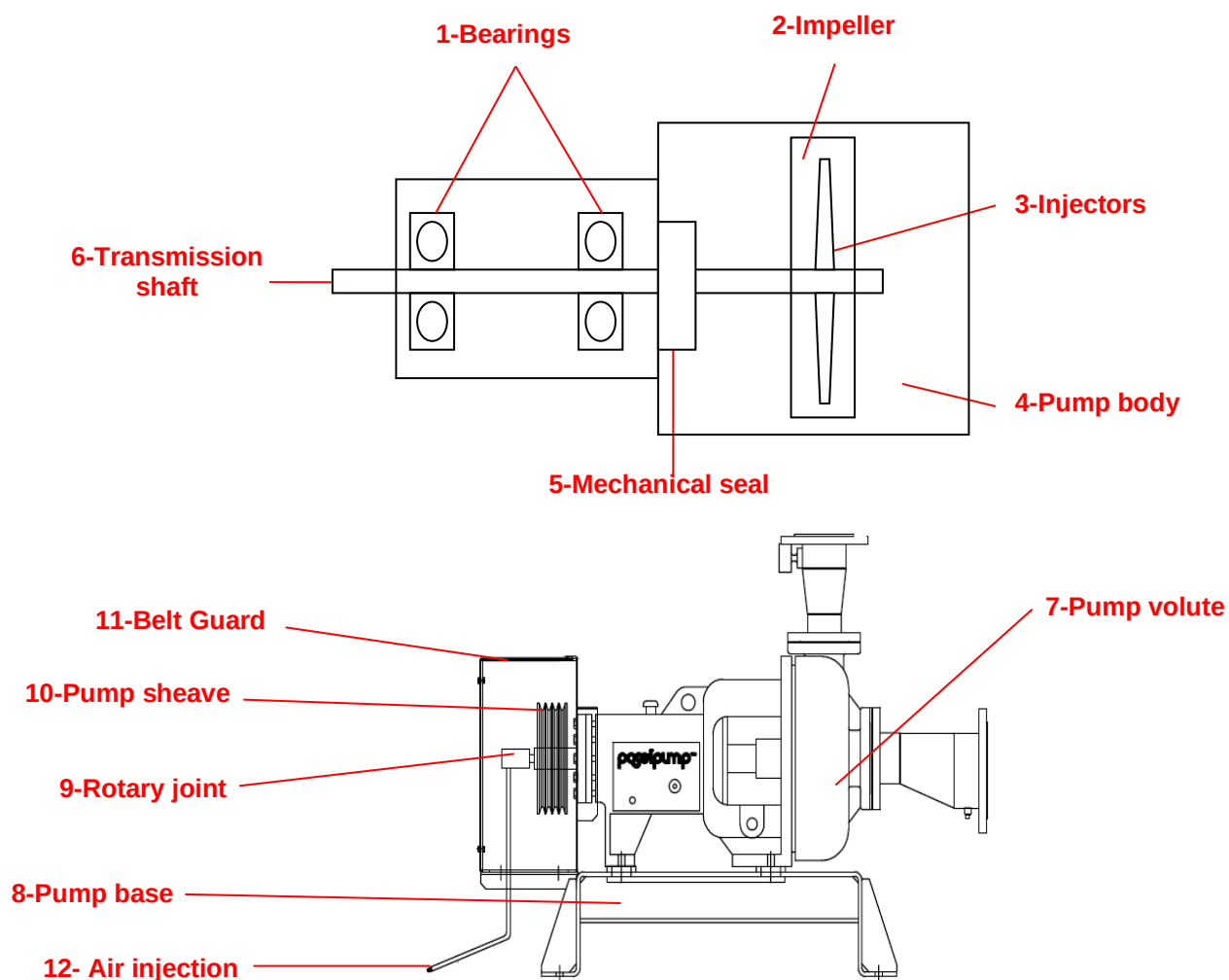


Figure 9 General components

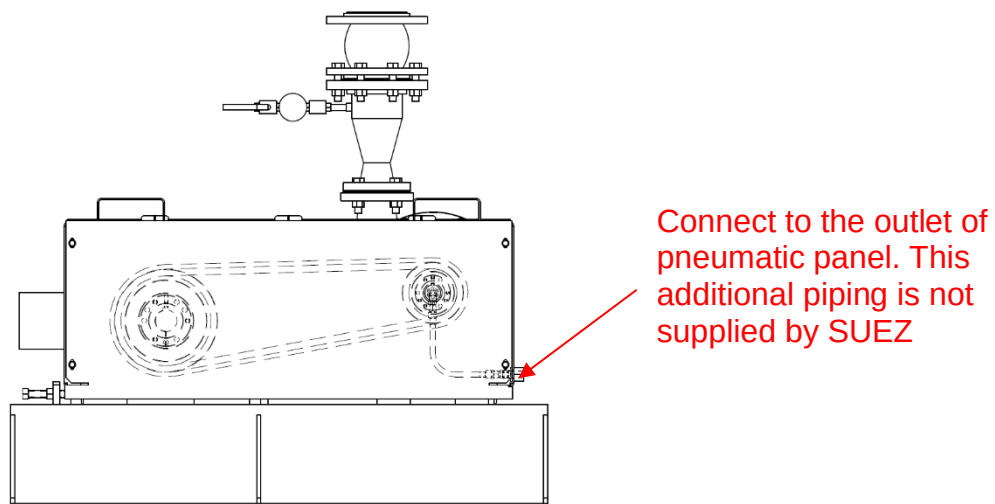


Figure 10 Air connection location

RECEIVING THE PUMP

Upon receiving the pump:

- Proceed with a complete visual inspection to make sure there was no damage during transport;
- Remove all parts and locking fasteners that could have been used for transportation and make sure no object obstructs or blocks the rotation of the pump shaft;
- Observe if all moving parts have indeed free movement;
- Check the strength of all guards and safety devices because they must be strong to play their roles properly;
- When the flotation unit is ready to be started, fill the unit with water to avoid the risk of starting the recirculation pump dry.

Installation of the Poseipump®

The **POSEIPUMP®** is already mounted on its pump base when shipped. The installation requires a few steps prior to start up.

Location

The pump should be located as near to the liquid source as possible so that the suction line is both short and direct. The pump should be located below the level of the liquid to eliminate the necessity of priming.

Foundation

The foundation should be sufficiently rigid and substantial. A concrete foundation, poured on a solid footing of adequate thickness to support the pumping unit, provides the most satisfactory foundation. The base plate should be installed in a level position.

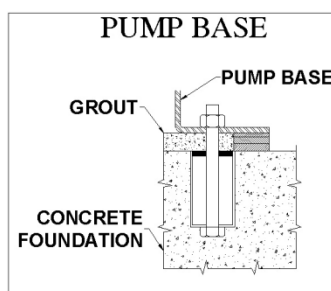


Figure 11 Pump Base

Grounding

The **POSEIPUMP®** must be electrically grounded and details for the grounding lug can be found on certified drawing for the Poseipump.

Piping (general)

NOTE: Piping must not be connected to the pump until the grout has hardened and foundation bolts and pump hold-down bolts have been tightened.

Piping should be anchored independently of the pump and as near to it as possible. Pipe companion flanges should line up naturally with pump flanges. **DO NOT DRAW THE PIPE TO THE PUMP WITH FLANGE BOLTS.**

Piping (suction)

Properly selected and installed suction piping is extremely important to eliminate vibration and cavitation in the pump. Vibration and cavitation can cause packing problems, mechanical seal damage and/or undue bearing loads that will lead to premature failure.

- The suction line diameter should be equal to or larger than the pump suction.
- The suction line should be designed to eliminate any air pockets. In general, this will include piping that is gradually sloped upward from the source of supply to the pump. Suction elbows and other bends should also be minimized to improve suction head and reduce air pockets.
- The suction line should have a straight section into the pump of a length equivalent to at least 6 times the pump's inlet pipe diameter.

A POSEIPUMP® SHOULD NEVER BE ADJUSTED BY THROTTLING THE SUCTION ISOLATION VALVE OR THE DISCHARGE ISOLATION VALVE.

However, a positive shut-off valve should be installed on both the suction and discharge lines to permit the closing of the line so that the pump can be taken out of service for inspection and maintenance.

Piping (discharge)

- All piping should be independently supported and accurately aligned. **THE PUMP MUST NOT SUPPORT THE WEIGHT OF THE PIPE OR COMPENSATE FOR MISALIGNMENT.**

NOTE: With the POSEIPUMP®, flow in either direction through the pump is possible when the pump is turned off and the isolation valves are open.

- The flexible joint must be installed on the discharge pipe upstream of the isolation valve.

Initial Lubrication (Poseipump and rotary joint)

The **POSEIPUMP®** and the other oil reservoirs are shipped dry/empty. Before starting the equipment, a SAE10W30 grade oil must be added to the bearing frame, the Opto-matic oiler and the rotary joint's automatic oiler reservoir. The appropriate oil level in the bearing frame is at 1/2 of the sight glass.

Oil fill up for the POSEIPUMP®

Attach the Automatic Glass Oiler to the bearing housing. Verify that the assembly is level and parallel with the desired oil level. Set the top arm of the oil level adjuster mechanism to the desired level (1/2 of the pump reservoir sight glass). Lock the top arm with the low arm. Fill the bottle with recommended grade SAE10W30. The correct volume for the oil level to be at the center of the sight glass is 2.2 L and the oiler capacity is 100 mL. The required tool is a 7/16" key.

Recommended SAE10W30 Grade Oil

American Oil Company
Arco
Continental Oil Company
Exxon Company
Mobil Oil
Shell Oil Company
Texaco Inc.
Union Oil Company

Amoco No. 31
Gascon S-315 or 68A
Conoco Dectol Medium
Forum 50
Flow Rex Extra Heavy
Carnea 68
URSA P68
Turmaco 315

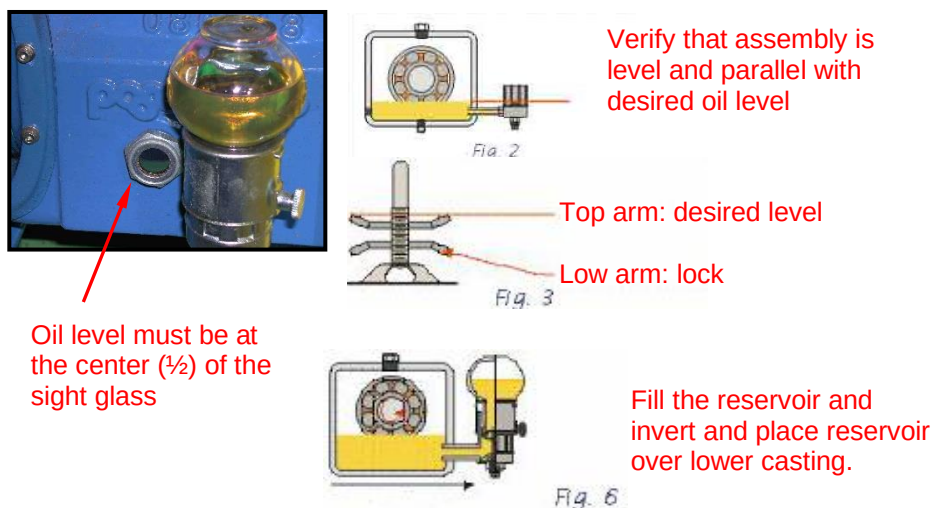


Figure 12 Oil Level & Oil Reservoir

Automatic Oiler

Opto-Matic® installation instructions

Installing:

1. Remove reservoir and level adjuster mechanism from lower casting.
2. Be sure that all connecting hardware is free from contaminants (burrs, chips, dirt, etc.) to prevent clogging or damage to the equipment to be lubricated.
3. Connect lower casting to bearing chamber through the side connection (Fig. 1). Use thread compound on all threaded areas, except supplied plug.
4. Verify that assembly is level and parallel with desired oil level. (Fig. 2) Make necessary adjustments if required.
5. Set oil level adjuster mechanism. Thread top adjuster arm to desired level, then thread lower adjuster arm together with top to lock into place.
6. Fill reservoir with oil. Back out set screw on reservoir casting to avoid interference with lower casting upon assembly.
7. Invert and place reservoir over lower casting.
8. Run equipment to check proper lubrication levels. If oil level is too low, remove reservoir and raise arms on level adjuster mechanism slightly, then repeat steps 6 and 7. Turn set screw to hold reservoir assembly in place.
9. **Adjustment tip:** Measure distance between bottle & casting edge (Fig. 4), replace bottle on adjustment arm in lower casting - mark dimension on outside of lower casting with temporary marker. (Fig. 5) This is the level setting.

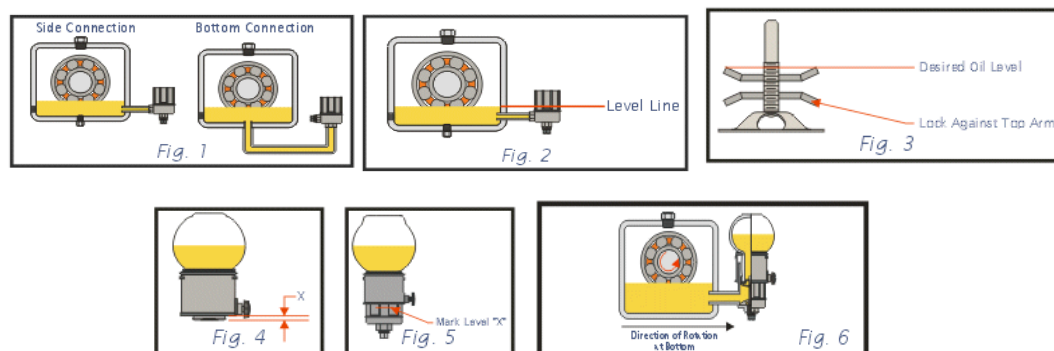


Figure 13 Opto-Matic Oiler

Operation:

1. Overfilling of equipment may occur due to repeated removal and replacement of reservoir. Add oil only when less than 1/3 of reservoir capacity remains to reduce filling frequency.
2. Oiler location with respect to bearing type, rotating speed of equipment, multiple start-ups, slinger rings, etc. may cause the oiler to misfeed. Check lubricant levels periodically to ensure proper application. Mount oiler facing direction of rotation at bottom of shaft. (Fig. 6)
3. When environmental conditions such as rain, steam, dust, etc. are a concern, closed system oilers will lessen the chance of lubricant contamination.

Installation and wiring of the electrical motor

Please refer to the Manufacturer's manual for the installation and the wiring of the motor.

Verification of the motor rotation

NOTE: It is important to perform the following steps when the pump is turned off and locked. Refer to the LOCKOUT PROCEDURE.

When verifying the pump motor rotation, make sure that the pump's **drive belt is disconnected** from the motor sheave. For safety measures it is suggested to put on and lock the belt guard before starting the verification. Please refer to the arrow on the pump casing to know the rotation of the pump.

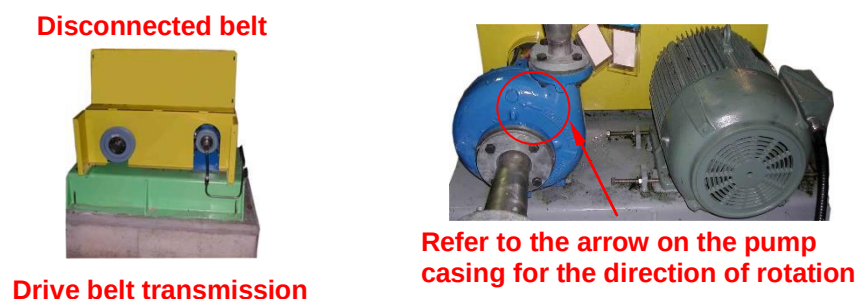


Figure 14 Rotation check-out



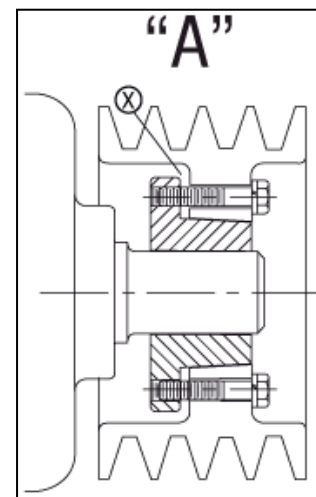
WARNING

Never rotate the recirculation pump in the opposite direction when the drive belt is connected to the pump.

Assembling the transmission system

CAUTION: DO NOT USE LUBRICANT

1. Assemble the bushing and pulley as shown in illustration "A". When the bolts are only slightly in, the hub slides freely on the shaft.
2. Set the key on the shaft and slide the pulley with its hub at the desired position by placing the top of the bolts on the outside.
3. Tighten the bolts gradually. There must be a space between the pulley's solid hub and the detachable hub flange.



TIGHTENING THE BOLTS - IMPORTANT

Tighten bolts evenly and progressively. The space between the pulley's solid hub and the detachable hub flange should not be less than 3.2 mm and not more than 6.4 mm. See the indication "X" in the illustration. If excessive force is applied, the hub of the pulley can break.

Figure 15 Hub and pulley

Pulley alignment

1. Install the belt on the pulleys. The engine must not be fixed to the base of the pump and should let the belt to be installed easily, without being too tight.
2. Tighten the belt by moving the motor in the direction opposite to the pump.
3. Check pulley alignment with a small diameter string or a ruler. The pump should be fixed solidly and should not move during the operation.
4. If the pulleys are not aligned, adjust the motor so that the string or the rule equally touches the four faces of the pulleys, while checking the belt tension. Belt tension and static conductivity should be checked once every month.
5. When the pulleys are aligned, secure the motor in place.

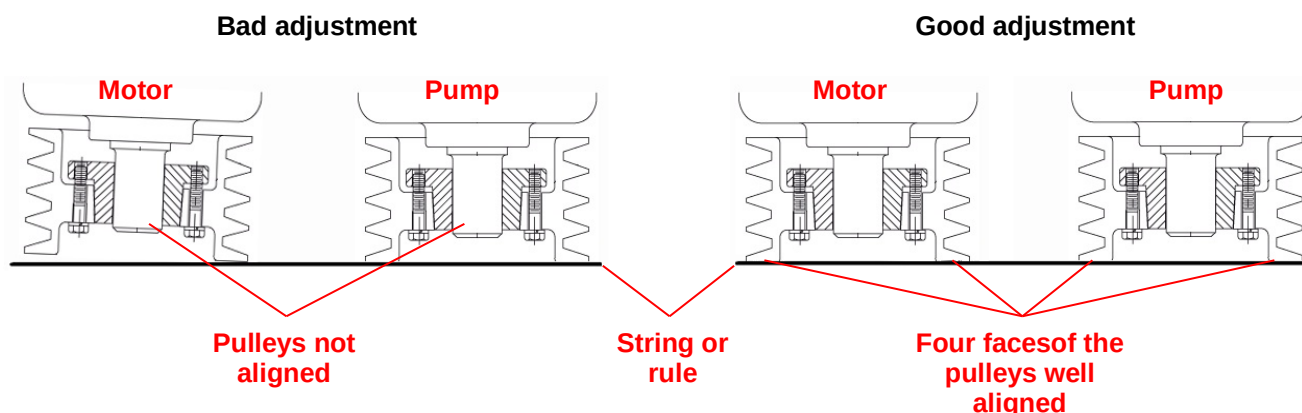


Figure 16 Pulley alignment

Belt Tension Adjustment

Belt tension adjustment values	New belt	Used belt
Frequency (Hz)	44.3	36.2
Deflection (lbs force and inch)	50.9 lbs, 0.44"	34.2 lbs, 0.44"

Disassembling the drive system

CAUTION: DO NOT USE LUBRICANT

1. Remove the bolts.
2. Insert the bolts into the other set of threaded holes on each pulley, tighten them equally and the hubs will be able to move free on the shafts.

Mechanical seal installation

Before starting the pump, refer to the seal manufacturer's specification and installation instructions. Refer to section "**Mechanical seal Replacement and/or Installation**".

	WARNING
	<i>Never start the POSEIPUMP® when the flotation unit is empty. POSEIPUMP® uses the process water for the lubrication of the mechanical seal</i>

Rotary joint installation

No exterior bracing should be used to prevent the housing of a ball bearing type union from rotating. To compensate for any eccentricities occurring from installation, it is imperative that a flexible connection be used. **DO NOT PIPE SOLID.** Use a 45-degree elbow and pipe union on the riser, making certain there is a slight curve in these. Do not install hose taut. To install the rotary joint on the shaft, you need to screw it counter clockwise.

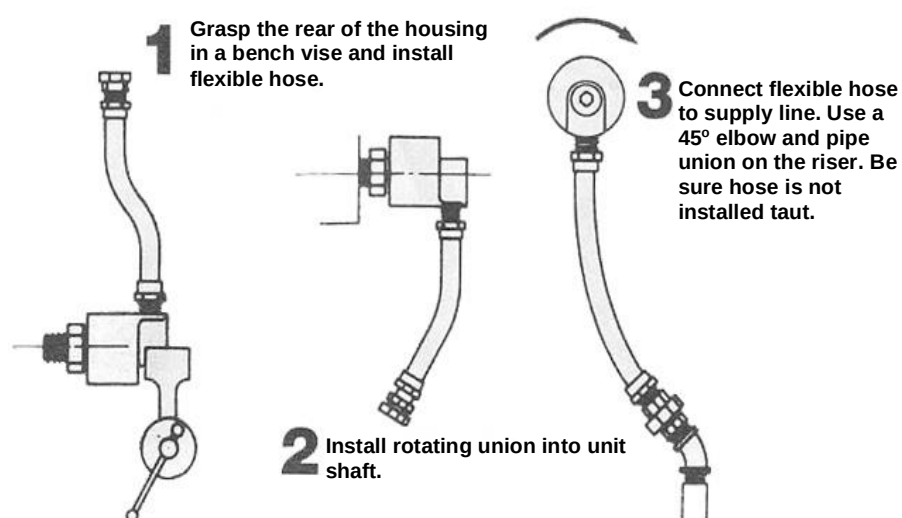


Figure 17 Rotary joint installation

Rotary joint Lubrication

Rotating unions are shipped and delivered pre-lubricated with special grease for the internal components. Occasional lubrication is still necessary and there are two methods to apply oil to the rotary joint. An automatic oiler may be installed on the side of the belt guard, as shown in **Figure 8 Typical Poseipump® Configuration**. Additionally, the rotary joint's casing will have a small lubrication point next to the tap for the automatic oiler. In either case we recommend lubricating the rotary joint with the same SAE10W30 grade oil that is used for the pump's bearings. In a dry environment, the manufacturer recommends applying 3-5 drops a month, if the manual oiling method is used.

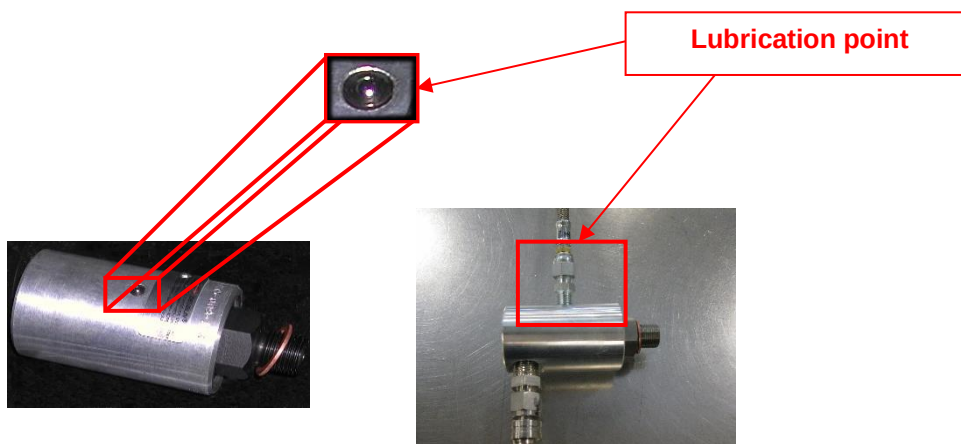


Figure 18 Rotary joint oil fitting

Operation

Priming

Vent air from suction line and fill with liquid. Make sure that the pump isolation valves (at the suction and the discharge) are fully open. Start the pump with the release valves slightly open. These valves are near the feed of the flotation unit. After discharge pressure stabilizes, gradually open the release valves to required position; with the Poseipump® model 403-PF, the pressure must be between 85 and 105 psig. Allow the pressure to stabilize before feeding air into the Poseipump and monitor the operation of the pump to make sure that it does not lose its prime.

Continued flow difficulty indicates an improper selection of installation. Running the pump too long with improper prime may destroy the sealing faces of the mechanical seal. It may also cause mechanical damage from pulsation and interference between rotating and stationary components. Thermal shock may crack the ceramic stationary seat of a mechanical seal if temperature is raised to 180°F in less than 30 seconds.

Start-up

Check the following items before starting the pump:

1. Pump rotates freely by hand.
2. Rotation direction: It is absolutely essential that the rotation of the motor be checked before connecting the belt. Incorrect rotation of the pump could cause damage to the pump. The pump shaft must turn according to the arrow indication.
3. Belt drive tension and alignment.
4. Oil level should be $\frac{1}{2}$ of the sight glass
5. Suction and discharge valves fully open.
6. Pump and suction line full of fluid.
7. Release and bleed valve slightly open.



Preventive maintenance

Pump records

Maintain data cards or pumps records whenever possible. This will provide ready access to information for ordering spare parts, and for evaluating pump and mechanical seal performance.

Information to be included in these records should be:

- Pump size and serial number
- Pump model number and impeller diameter
- Fabrication material
- Mechanical seal manufacturer, type, code, and drawing number
- Motor horsepower and speed of operation
- Record of maintenance, including parts usage and general condition of pump
- Name and part numbers of replacement items.

Lubrication

The oil level for the Poseipump's bearings should be checked once a week and the oil level must be at the center ($\frac{1}{2}$) of the sight glass. Add oil in the Opto-Matic oiler if the level is too low. A full oil change should be done after the first 200 hours of operation and subsequent oil changes every 8000 hours (or annually) with a SAE10W30 grade oil. The same grade of oil can be used to lubricate the rotary joint, either with a manual application or by using the automatic oiler.

Recommended SAE10W30 Grade Oil

American Oil Company	Amoco No. 31
Arco	Gascon S-315 or 68A
Continental Oil Company	Conoco Dectol Medium
Exxon Company	Forum 50
Mobil Oil	Flow Rex Extra Heavy
Shell Oil Company	Carnea 68
Texaco Inc.	URSA P68
Union Oil Company	Turmaco 315

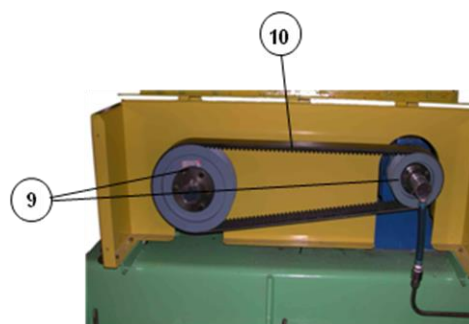
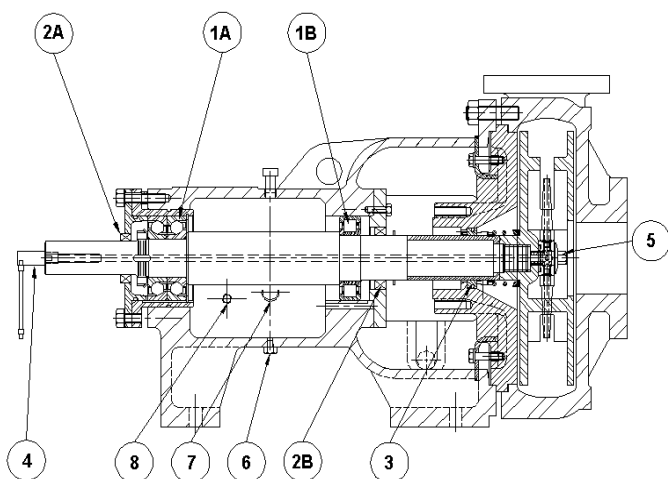
Belt Tension Adjustment and Maintenance

Belt tension adjustment values	New belt	Used belt
Frequency (Hz)	44.3	36.2
Deflection (lbs force and inch)	50.9 lbs, 0.44"	34.2 lbs, 0.44"

NOTE: These parameters should be validated on a monthly basis. It is important to perform these steps when the pump is turned off and locked out. Refer to **LOCKOUT PROCEDURE** in **SECTION 1**.

Long term storage

- Always store the pumps inside in a clean and dry area. Prevent the pumps from condensation.
- The pumps should be not exposed to excessive vibration; these could possibly cause damage to bearings.
- Regardless of the length of storage, at least five (5) complete manual rotations should be performed every six (6) weeks.
- Pumps should not be stored in an environment conducive to corrosion.

POSEIPUMP® 403-PF PREVENTIVE MAINTENANCE & CHECK POINTS


No.	Cleaning	Inspection	Lubrication	Equipment Part	Description	Frequency	Lubricant Volume	Tool
1A/1B		X		Outboard/Inboard Bearings	Verify the state of the bearings	Annually		7/16" key
2A/2B		X		Outboard/Inboard Bearings Isolators	Verify the state of the bearings isolators	Annually		
3		X		Mechanical Seal	Verify the mechanical seal and replace if necessary	Annually		
4			X	Rotary Joint	Lubricate with a SAE10W30 oil	Monthly	3-5 drops/month	Nipple adaptor (manual or auto.)
		X			Inspect and replace if necessary	Bi-annually		
5		X		Injectors	Verify the state of the impeller's injectors	Annually		
6			X	Drain Plug	Change oil	200 hours / 8000 hours (or annually) ¹	2.2 L	
7		X		Oil Level (sight glass)	Verify the oil level (oil level = ½ sight glass)	Weekly		7/16" key
			X		Add oil if necessary			
	X				Keep the sight glass clean			
8			X	Automatic Oiler	Verify and add oil if necessary	Weekly	100 ml.	N/A
9		X		Pulleys	Verify the state of the pulleys (pump and motor)	Annually		
10		X		Belt	Verify the tension and state of the belt	Monthly		
		X			Change the belt	Annually		

Note 1: Perform the first oil change after 200 hours of operation. Subsequent oil changes can be performed every 8000 hours or once a year.

Mechanical seal Replacement and/or Installation

John Crane Type 21 Mechanical seal

NEVER RUN THE POSEIPUMP® DRY! IT WOULD DAMAGE THE MECHANICAL SEAL. ALWAYS PRIME THE PUMP BEFORE STARTING. MECHANICAL SEAL FOR THE POSEIPUMP® USES PROCESS WATER AS A LUBRICANT.

NOTE: Protect precision lapped faces of new seal seat and seal ring from DAMAGE, DIRT and FINGERMARKS.

1. Disassemble pump housing to expose defective seal.

NOTE: Pay attention to how the old seal is assembled to be sure replacement seal is installed in identical manner.

2. Carefully move old seal head and seat, taking care not to scratch shaft of seal counterbore.

3. Clean shaft and counterbore surfaces using emery cloth or equivalent. Remove rust, burrs, and wipe clean. Avoid making flats spots or reducing shaft diameter.

4. Lubricate the shaft, elastomer inner diameter (I.D.) of the rotating seal head and elastomer outer diameter (O.D.) of the stationary seal seat with a light coating of water, soapy water or approved seal installation liquid. Seal faces (parts that touch when the seal rotates) should not be lubricated with any liquid.

NOTE: NEVER use grease or any type of oil as an installation lubricant. Any oil or grease on the seal faces may cause the seal to leak.

5. Press seal seat firmly into counterbore. This can be done by hand or with a rawhide mallet. During the pressing operation be sure that the seal faces are protected and that there are no direct blows with any metal object. Use a piece of plastic between the face and any driving force.

6. Check all seal surfaces to assure they are free of any foreign matter. Slide rotating seal head by hand pressure along shaft to a completely parallel contact with the stationary seat. Avoid extreme installation pressure or hammering of seal. Make sure spring correctly engages shoulder or shaft spring retainer.

7. Reassemble impeller and pump housing. (Refer to section POSEIPUMP® Reassembly).

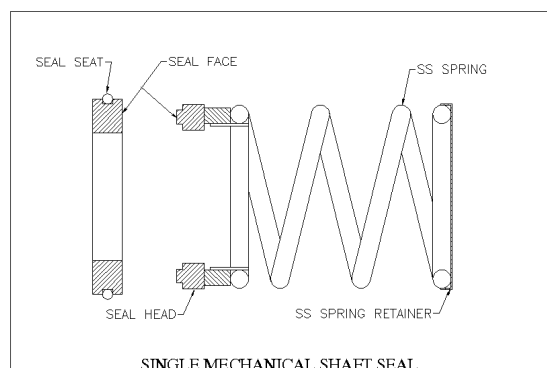


Figure 19 Mechanical Shaft Seal

POSEIPUMP® Maintenance

POSEIPUMP® Disassembly

Remove case (1) and mechanical seal (31)

1. Remove all nuts (25).
2. Remove Pump Case (1).
3. Restrain Pump Case Shaft (5) at the coupling end (not the shaft) to prevent rotation while removing the Impeller (2). **TURN IMPELLER COUNTER-CLOCK-WISE AS VIEWED FROM SUCTION END.**
4. Remove Mechanical Seal Cover (3) from frame on the back side in the area where the box fits into the Frame (4). If the disassembly being performed does not require the replacement of the mechanical seal, the stationary seat must not be removed from the stuffing box.
5. Remove Shaft Sleeve (7) only if it is to be replaced. A wedge may be driven between end of sleeve and shoulder on shaft to free the sleeve. If the pump has a mechanical seal that does not need to be replaced, care must be taken to avoid damaging by dropping the rotary seal faces when removing the sleeve.

NOTE: If the disassembly is being performed to replace or install a mechanical seal and/or shaft sleeve only, no further disassembly is required. Refer to the Mechanical seal Replacement and/or Installation section.

Removal of pump/bearing

6. Remove Deflector/Slinger (16).
7. Remove the Inboard Bearing Cap (13).
8. Loosen the Outboard Bearing Retainer Bolts (27).
9. The complete shaft and bearing sub-assembly can now be pulled out of the bearing frame casting from the back (motor) side.
10. Remove Snap Ring (24) from outboard bearing retainer and remove Bearing Retainer (14) and Housing (15) from bearings.
11. Remove Lock Nut and Washer (11 & 12) from shaft. Then remove the Inboard Bearing (8) and both Outboard Bearings (9).

Removal of the impeller

1. Unscrew the bolt of the injector.
2. Unscrew the nozzles screwed on the injector.
3. Remove the rings of the injector.

Inspection of components

- **Shaft (5):**

Check for run out to see that shaft has not been bent. If run out exceeds 0.0002 in., replace shaft. Bearing seats and oil seal area must be smooth and free of scratches or grooves. Shaft threads must be in good condition. Replace shaft if necessary.

- **Shaft sleeve (7):**

Sleeve surface must be smooth and free of grooves. If grooved, replace.

- **Mechanical seal (31):**

Seal faces, gaskets, and shaft sealing members must be in perfect condition or excessive leakage may result. Replace worn or damaged parts.

- **Bearings (8, 9)**

Replace if worn, loose or rough and noisy when rotated. New bearings should not be unwrapped until ready for use. Replacement bearings must be of proper size and type as supplied with original equipment.

- **Seals**

It is recommended that all O-Rings (19, 21) and Gasket Seals (17) and Lip Seals (22, 23) be removed during disassembly and replaced. In those cases where new seals are not available, the old ones can be reused if they are not torn or otherwise damaged.

- **General**

All parts should be clean before assembly. This is especially important at retaining ring and O-ring grooves, threads, gasket surfaces, and bearing lubricated areas. All burrs should be removed with crocus cloth. Keep water and moisture off the parts and assembly.

NOTE: For motor problems, contact your local motor repair shop.

POSEIPUMP® Reassembly

Shaft and bearing subassembly:

NOTE: Installation of the bearings with a press is an acceptable substitute for the following method. **APPLY LOAD TO THE INNER FACE ONLY, PRESSING THE BEARINGS ONTO THE SHAFT.**

1. Heat bearing to 200-250°F.

NOTE: One-half hour in an oven at 200-250°F will work nicely. Do not exceed 250°F, as this may damage bearing.

2. Remove from oven and slip the bearings into position and allow cooling. Thrust surface of bearing should be to shaft shoulder.
3. Pack bearings with grease (if not an oil-bearing application).
4. For assembly of shaft and power frame, reverse Steps of the **Disassembly** section, beginning with the Step 11 and working back to Step 1. Replace Lip Seals (22, 23).

Impeller assembly

1. Apply Loctite on the threads of the injector nozzles, insert the rings and screw the injector nozzles on the injector.

2. Apply Loctite 242 on the threads of the bolt and screw it on the injector.

Power frame subassembly

1. Lubricate the inside of the frame where the stuffing box cover slips in with an anti-seize compound.
2. Lubricate Shaft (5) threads and face of Shaft Sleeve (7) followed by impeller O-Ring (19). Thread the Impeller (2) onto the shaft. Tighten to approximately 40 lb/ft.
3. Rotate the shaft. **THE IMPELLER SHOULD TURN FREELY WITHOUT RUBBING.** If necessary, adjust outboard Bearing Retainer Bolt (27) and Jack Screws (28) to provide clearance between impeller and case. For most pumps, this running clearance is 0.100 to 0.150 inches. If in doubt, contact the factory for each setting for your pump.
4. Install Casing Gasket (17). Hold it in place with grease if necessary.
5. Install Casing (1) on the frame using Studs (25) and Nuts (29). Put a small quantity of anti-seize lubricant on the threads on the nut-end of the studs. Tighten nuts to 35lb/ft using a criss-cross tightening pattern.

Poseipump®: Problems and Possible Causes

		PROBLEMS					
		Noise or vibration	No flow	Insufficient Pressure	Excessive Power required	Intermittent Flow	Short Bearing Life
POSSIBLE CAUSES	Bearing worn	X			X		X
	Bent shaft	X			X		X
	Excessive discharge head		X				
	Oil level too low						X
	Improper foundation	X					
	Improper electric motor wiring or voltage				X		
	Misalignment of the pulleys	X			X		X
	Belt too tight				X		X
	Belt too loose	X				X	
	Plugged suction or discharge line	X	X	X		X	
	Impeller damage	X	X	X	X	X	X
	Impeller clogged		X	X		X	
	Impeller out of balance	X					X
	Rotating element bent	X			X		X
	Speed too low			X			
	Suction or discharge piping not anchored	X					
	Wrong direction of rotation	X	X	X	X	X	X

PARTS LIST

#	Part #	Title	Qty.	Description	Material	Mass
1	C-100-403.par	Casing 403	1	Casing 403	ASTM A351 CF3M	157 lbm
2	D-200-403-14.0_01W.pwd	Impeller 403-13.5	1	Impeller 403-13.5	ASTM A351 CF3M	48 lbm
3	SB-300-403.par	Back Plate 403	1	Plate 1-1/2" x 15-1/64"dia.	SA240-316/316L	61 lbm
4	B-400-403.par	Bearing Frame 403	1	Bearing Frame 403	Ductile Iron - Painted	203 lbm
5	D-500-403.par	Drive Shaft 403	1	Round Bar 2-29/32" dia. x 28-19/32"	SA276/SA479-316/316L	35 lbm
6	D-501-403.par	Drive Shaft Key 403	1	Square Bar 1/2" x 3"	SA276/SA479-316/316L	0 lbm
7	S-600-403.par	Shaft Sleeve 403	1	Round Bar 2-1/2" dia. x 5-33/64"	SA276/SA479-316/316L	3 lbm
8	IB-002-403.par	Inboard Bearing 403	1	Bearing #NUP 213 ECP	Steel	2 lbm
9	OB-002-403.par	Outboard Bearing 403	2	Bearing #7311 BECBY	Steel	6 lbm
10	V-800.par	Vent Bearing Frame	1	Vent Alemite #313650	Steel - Galvanised	0 lbm
11	L-900-403.par	Bearing Locknut 403	1	Bearing Locknut - N11	Steel	0 lbm
12	L-901-403.psm	Locknut Lockwasher 403	1	Locknut Lockwasher - W11	Steel	0 lbm
13	C-1000-403.par	Inboard Bearing Cover 403	1	Round Bar 7 3/4" dia. x 1"	Steel 1018 - Painted	8 lbm
14	R-1100-403.par	Outboard Bearing Cover 403	1	Round Bar 7-3/4" dia. x 1-3/8"	Steel 1018 - Painted	6 lbm
15	H-1200-403.par	Outboard Bearing Housing 403	1	Round Bar 7-3/4"dia. x 3-5/8"	Steel 1018 - Painted	10 lbm
16	D-1300-403.par	Deflector 403	1	Plate 1/4" x 3-3/4" dia.	Neoprene	0 lbm
17	CG-1500-403.par	Casing Gasket 403	1	Gasket 1/16" x 14-15/16" dia.	Garlock 3000	0 lbm
18	CG-1501-403.par	Inboard Bearing Cover Gasket 403	1	Gasket 1/16" x 7-3/4" dia.	Garlock 3000	0 lbm
19	O-1600-403.par	O-Ring	1	O-Ring #223	Viton	0 lbm
20	O-1601-403.par	O-Ring	1	O-Ring #246	Nitrile	0 lbm
21	O-1602-403.par	O-Ring	1	O-Ring #251	Nitrile	0 lbm
22	LS-1700-403.par	Inboard Bearing Isolator 403	1	Inboard Bearing Isolator PI0000007	Brass	1 lbm
23	LS-1702-403.par	Outboard Bearing Isolator 403	1	Outboard Bearing Isolator PI0000018	Brass	1 lbm
24	SR-1800-403.par	Snap Ring	1	Snap Ring 5000-475	Steel	0 lbm
25	SC-1900-403.par	Stud	12	Threaded Rod 3/4"-10 x 3"	F593-316	5 lbm
26	B.01.02_B0100A_0.375_16_1.250.PAR	B0100A Hexagonal Bolt (in) 0.375_16_1.250	4	Hex. Bolt 3/8"-16 x 1-1/4"	F593-316	0 lbm
27	B.01.02_B0100A_0.500_13_1.000.PAR	B0100A Hexagonal Bolt (in) 0.500_13_1.000	5	Hex. Bolt 1/2"-13 x 1"	F593-316	1 lbm
28	B.01.02_B0100A_0.500_13_2.000.PAR	B0100A Hexagonal Bolt (in) 0.500_13_2.000	3	Hex. Bolt 1/2"-13 x 2"	F593-316	0 lbm

PARTS LIST CONTINUED

#	Part #	Title	Qty.	Description	Material	Mass
29	B.01.02_E0100A_0.750_10.PAR	E0100A Hexagonal Nut (in) 0.750_10	12	Hex. Nut 3/4"-10	F594-316	1 lbm
30	B.01.02_B0100A_0.313_18_0.750.PAR	B0100A Hexagonal Bolt (in) 0.313_18_0.750	8	Hex. Bolt 5/16"-18 x 3/4"	F593-316	0 lbm
31	MSR-001-403.par	Mechanical Seal 403	1	Mechanical Seal John Crane Type 21 2-1/2"	-	2 lbm
32	P-1115.par	Rotating Joint	1	Rotating Joint Deublin 1115-009-386 upgrade	Aluminum	1 lbm
33	B.01.02_R01A_0.313.PAR	R01A Flat Washer (in) 0.313	8	Flat Washer 5/16"	SA240-316/316L	0 lbm
34	GG-001.par	Glass Oil Level Gauge	1	Oil Level Gauge Oil Rite #A-2890-14	Steel - Galvanised	0 lbm
35	GO-001.par	Glass Oiler	1	Glass oiler Trico #30003	Steel - Galvanised	1 lbm
36	403PFE36.par	Outboard Bearing Cover Bushing 403	3	Pipe 3/8" c40 x 15/32"	SA312-316/316L	0 lbm
37	403PFE37.par	Injection Bolt 403	1	Round Bar 1-3/4" dia. x 2-3/16"	SA276/SA479-316/316L	0 lbm
38	403PFE38.par	Injector Distributor 403	1	Round Bar 2" dia. x 15/16"	SA276/SA479-316/316L	1 lbm
39	403PFE39.par	Injector 403	5	Hex. Bar 3/4" x 3-7/8"	SA276/SA479-316/316L	1 lbm
40	B.01.02_R01A_0.375.PAR	R01A Flat Washer (in) 0.375	4	Flat Washer 3/8"	SA240-316/316L	0 lbm
41	DP-001.par	Drain plug	1	Hex. Plug 3/8" NPT	SA182-316/316L	0 lbm
42	B.01.02_R01A_0.500.PAR	R01A Flat Washer (in) 0.500	10	Flat Washer 1/2"	SA240-316/316L	0 lbm
43	BB-4200-403.par	Backing Plate Bracket 403	2	Angle 3/16" x 3" x 3" x 1-1/4"	Steel - Painted	0 lbm
44	IO-4400-403.par	O-Ring	5	O-Ring #013	Viton	0 lbm
45	PW-4501-403.par	Shaft security guard 403	2	Sheet 11g x 7-17/32" x 9-3/8"	SA240-316/316L	3 lbm
46	B.01.02_B0100A_0.500_13_1.750.PAR	B0100A Hexagonal Bolt (in) 0.500_13_1.750	2	Hex. Bolt 1/2"-13 x 1-3/4"	F593-316	0 lbm
47	SB-310-403.par	Stuffing Box (single seal type 21)	1	Round Bar 7-13/16" dia. x 1-15/16"	F593-316	12 lbm
48	O-301-403.par	O-Ring	1	O-ring #257	Viton	0 lbm
49	B.01.02_R02A_0.500.PAR	R02A Lock Washer (in) 0.500	6	Lock Washer 1/2"	SA240-316/316L	0 lbm
50	B.01.02_B0100A_0.500_13_1.250.PAR	B0100A Hexagonal Bolt (in) 0.500_13_1.250	4	Hex. Bolt 1/2"-13 x 1-1/4"	F593-316	0 lbm
51	B.01.02_R01A_0.750.PAR	R01A Flat Washer (in) 0.750	12	Flat Washer 3/4"	SA240-316/316L	1 lbm
52	NAME PLATE.psm	Name Plate	1	Sheet 1/32" x 2-3/4" x 4-1/2"	SA240-316/316L	0 lbm
53	B.08.02_DriScr_SN.376807.par	Round U Drive Screw #2 x 1/4"	8	Drive Screw #2 (3/32") x 1/4"	F593-316	0 lbm
54	B.02.02_BouM_0.250V_150.PAR	Plug 0.250_V_150	1	Plug 1/4" NPT M 150#	SA182-316/316L	0 lbm
55	B.02.02_BouM_0.750V_150.PAR	Plug 0.750_V_150	1	Plug 3/4" NPT M 150#	SA182-316/316L	0 lbm
56	PW-4502-403.psm	Shaft security guard 403	1	Sheet 20G x 4" x 4"	SA240-316/316L	0 lbm

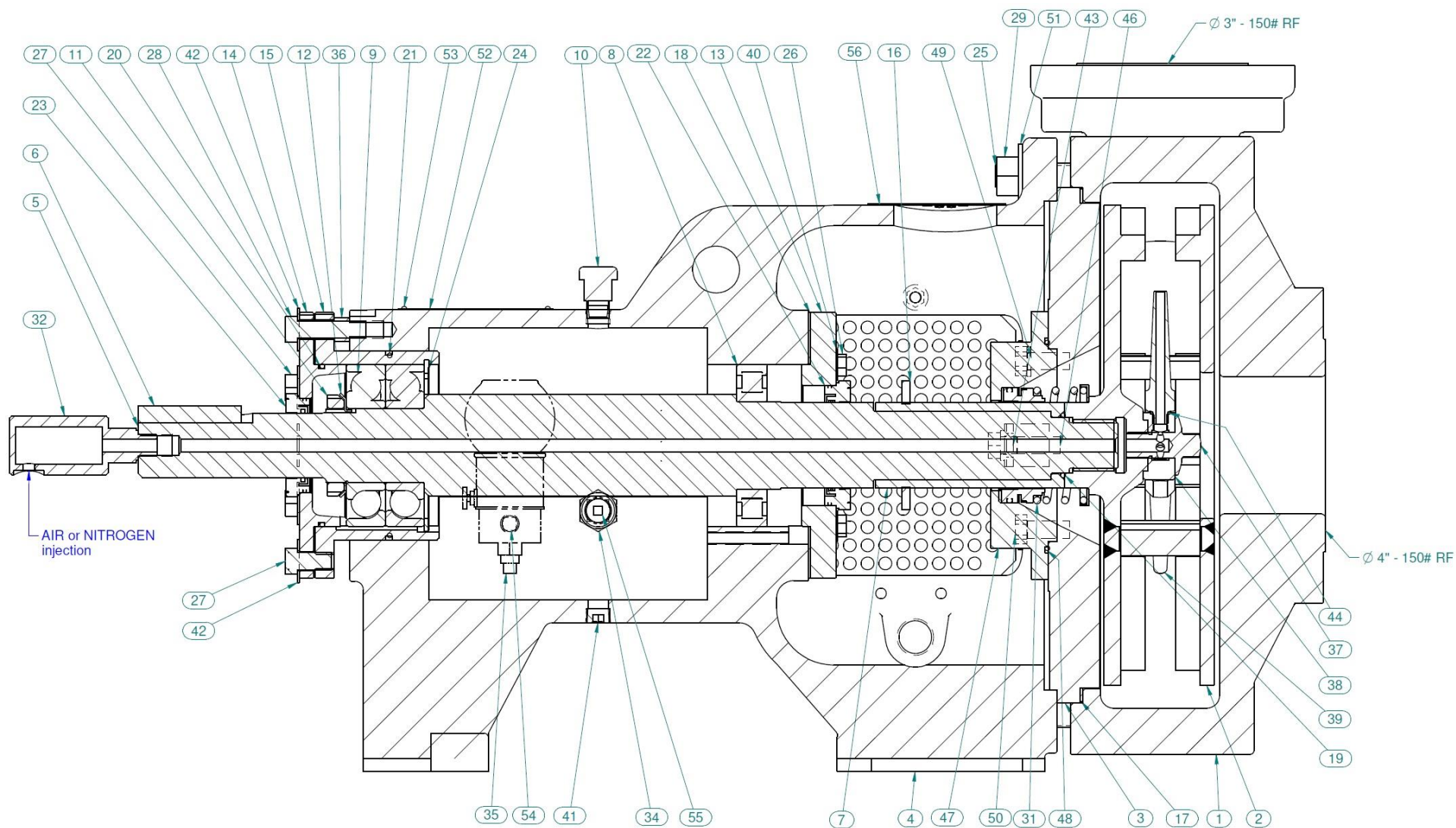


Figure 20 Poseipump® Internal View

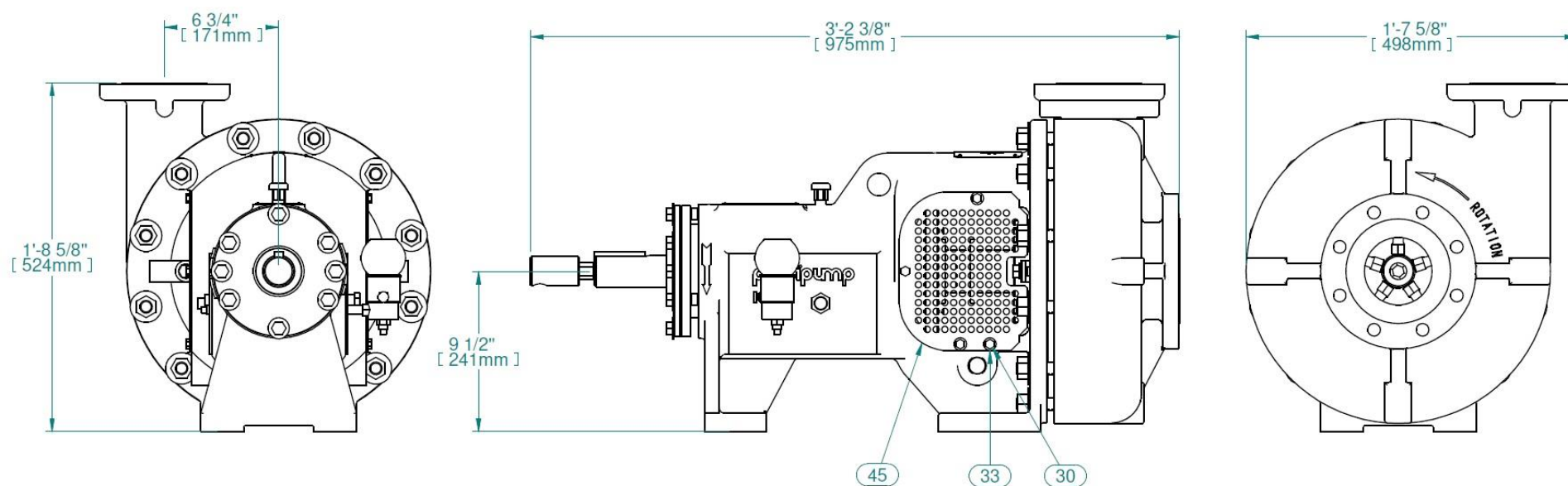


Figure 21 Poseipump® External View

SECTION 6- PNEUMATIC CONTROL BOX**Description and installation**

The recirculation pneumatic box houses the necessary equipment to control the flow and pressure of air that is injected into the **POSEIPUMP®** and as such it is integral to the proper operation of the flotation unit. The items inside the panel are preinstalled and only minor assembly is required to complete the panel. It is recommended to install the recirculation pneumatic box near the **POSEIPUMP®** in order to facilitate optimal operation.

The panel can be mounted on a support beam or wall. If installed outdoors the panel should provide some protection to the components from the elements and it should not be exposed to freezing temperatures or severe rain events. Add additional protection if deemed necessary.

Pneumatic Box Parts List

ITEM #	DESCRIPTION	PART NUMBER
1	Filter regulator unit	SS172AECCS
2	Pressure Gauge	SS17070AA
3	Single solenoid valve	SS1432CB101L
4	Flow regulator	1/4" SS14RFUL
5	Flowmeter (Dwyer)	RMB-57 (60-600 scfh)
6	Pressure gauge	2.5" 0-160 psi 1/4"M-NPT
7	Back Pressure valve	BPG050S
8	Check valve	SS12VU03SV8N
9	Electrical Terminal	STANDARD

Connection of the Pneumatic Box

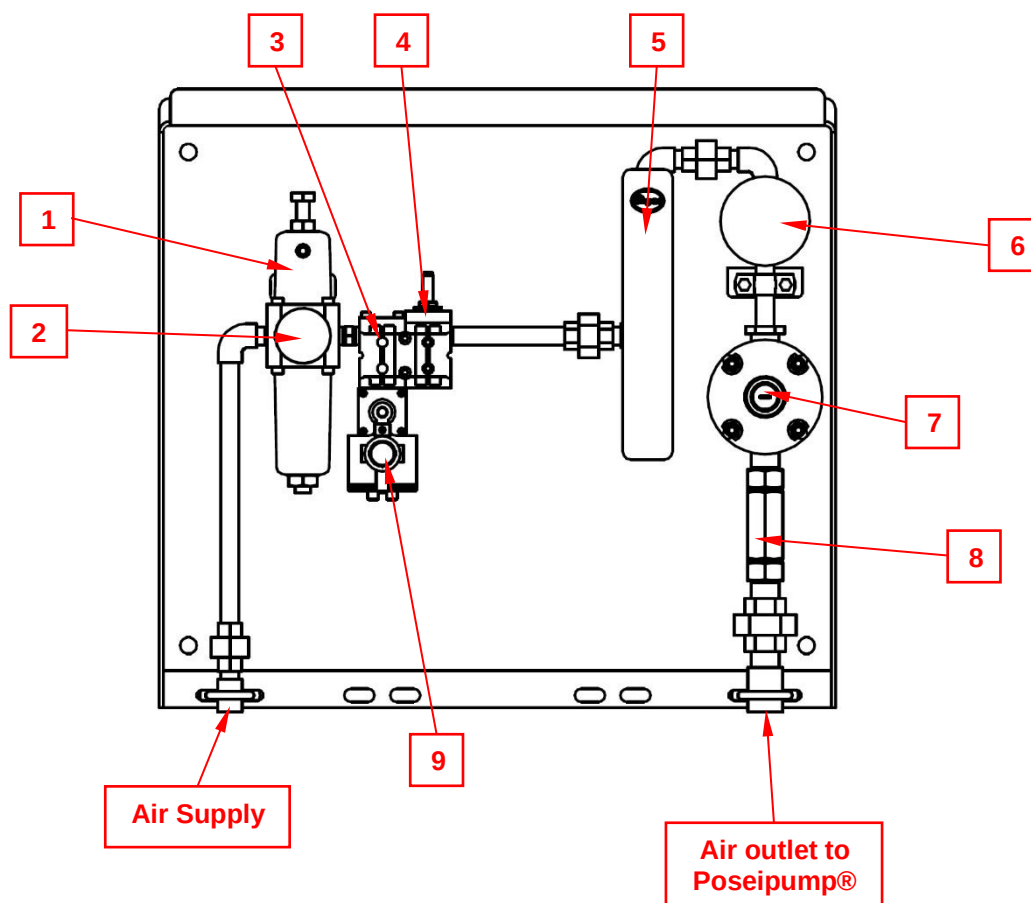


Figure 22 Pneumatic Box Overview

Adjustment Settings of the Pneumatic Box

1. Adjust the air regulator to 70 psig.
2. Adjust the air flow on the rotameter as recommended (133-148 scfh).
3. Verify that the manual switch of the solenoid valve is closed for automatic mode.

NOTE	
	The solenoid valve should be open and in automatic mode during normal operation. However, it can be operated manually, if necessary, by using the manual switch. The back-pressure valve is normally pre-adjusted to 50 psig.

SECTION 7 – SLUDGE REMOVAL SYSTEM

Description

The SUEZ Poseidon Flotation unit is equipped with a sludge removal system. This mechanical system is composed of a scraper driven by a motoreducer which evacuates the sludge into a trough and by thickener(s), driven by motoreducer(s), which help carry the sludge bed toward the sludge scraper. This system includes two or more motoreducers, transmission shafts, and a scraper with three blades and thickener(s) with fingers.

Sludge scraper and thickener installation

Location of specific components when receiving the flotation unit

All components for the installation are located inside a wooden crate.

Prior the installation (refer to the certified drawings)



Installation of the Scraper and the Thickener

1. Installation of scraper and thickener transmission shafts. The transmission shafts (A) and (B) for the scraper must be inserted in the scraper tube (1). The shaft (A) must be inserted on the side of the motoreducer (7) to be installed. The shaft (B) must be installed on the other side. To determine the side of the motoreducer, please refer to the certified drawings or to the holes on the flotation unit that are ready to receive the motoreducer bushings supports. Please note that bolts, washers and nuts must be removed from the scraper tube before installation of the shafts.

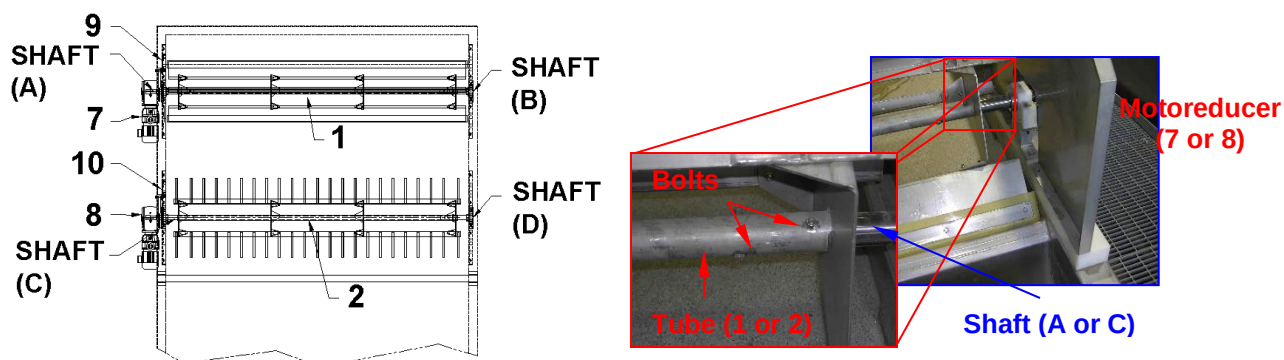


Figure 23 Installation of the transmission shaft

- The transmission shafts (C) and (D) for the thickener must be inserted in the thickener tube (2). The shaft (C) must be installed on the same side as the motoreducers and the shaft (D) must be installed on the other side. Please note that bolts, washers and nuts must be removed from the thickener tube before installation of the shafts. Please refer to **Figure 23**.

Grease nipple

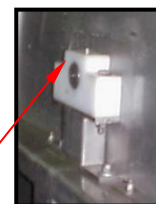


Figure 24 Bushing greasing

- Installation of scraper and thickener bushings. The scraper bushings (A) and (B) must be installed on the transmission shafts before the scraper is positioned on the edge of the flotation unit. The thickener bushings (C) and (D) must be installed on the transmission shafts before the thickener is positioned on the edge of the flotation unit. Grease must be added to prevent premature wear of bushings.
- Installation of scraper and thickener. Install the scraper and thickener and align the mark on the bushings with the marks (3) on the edge of the flotation unit. Fix bolts, washers and nuts on the unit (4). To verify if the scraper is correctly positioned, turn the scraper and check if the scraper runs efficiently. The blades (5) of the scraper must be aligned on the sludge discharge beach (6) in a manner to remove the sludge efficiently, starting from the bottom of the beach and pushing it upwards into the sludge outlet. Since the blades are slotted, this can be done easily by loosening the nuts on the blades and moving the blades accordingly.

Scraper and thickener rotation verification: In Figure 25 the thickener and scraper are supposed to be rotating clockwise.

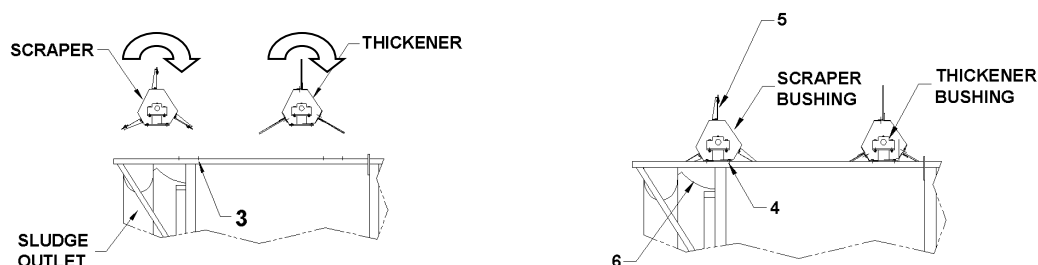


Figure 25 Installation of Scraper & Thickener

Installation of the Motoreducers

- Refer to the motoreducer manufacturer manual for specific installation details of the torque arm supports and the motoreducers.
- The torque arm supports of the motoreducers must be installed with bolts, washers and nuts supplied.
- To install the motoreducers, the retaining key must be installed on the transmission shaft. Fix the motoreducers on the torque arm supports with bolts.
- Check the oil level. The level may be low at time of shipping.

Please refer to the Lubrication section of this manual for more information about oil and grease recommendations.

Installation of the Safety Guards

The safety guards must be installed on each side of the scraper and thickener to prevent injuries when the scraper and thickener are in operation.

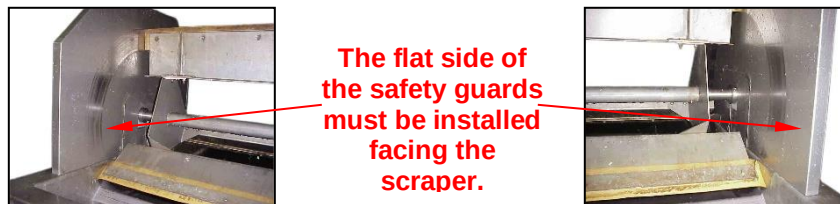
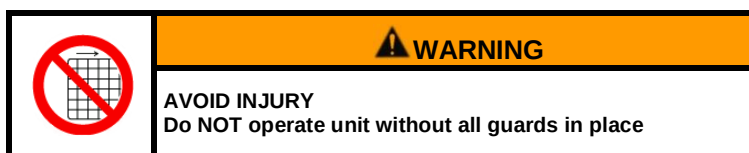


Figure 26 Installation of Safety Guards



Connection of electrical supply.

Connect the electrical supply to motoreducer. Please refer to the Manufacturer Operation and Maintenance Manual for specific details.



Recommended lubricants (grease)

We recommend using Shell Alvania RL3 or equivalent grease. This is a general purpose industrial grease with anti-wear and anti-rust additives.

Adjusting the Sludge Removal System

Make sure the blades are set in a position where they touch the beach on its entire length as described in the **Installation of the Scraper and the Thickener** section.

The rotation speed of the motoreducer is between 1.3 and 6.4 rotations per minute (RPM). The speed will usually be adjusted to between 1.4 and 1.8 rotations per minute, depending on the application and on the desired sludge level and consistency.

Sludge removal System Maintenance

1. Keep the sludge removal system motoreducers, the scraper blades and the thickener fingers clean. Refer to the Cleaning Procedure for the cleaning frequencies.
2. Check the oil level of the sludge scraper gearbox semi-annually. Some manufacturers recommend an oil change every 3 years. Please refer to the Manufacturer Maintenance Manual for specific details
3. Regularly apply grease (standard bearing mineral grease, no graphite) to scraper and thickener plastic bushings to prevent premature wear.

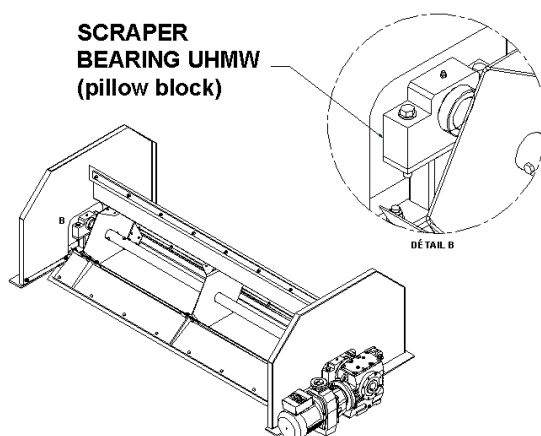


Figure 27 Scraper Gear Box

			 WARNING Scraper blade automatically starts up. Do not attempt to reach the scraper blade. Moving parts crush and cut. Follow lockout procedures before servicing
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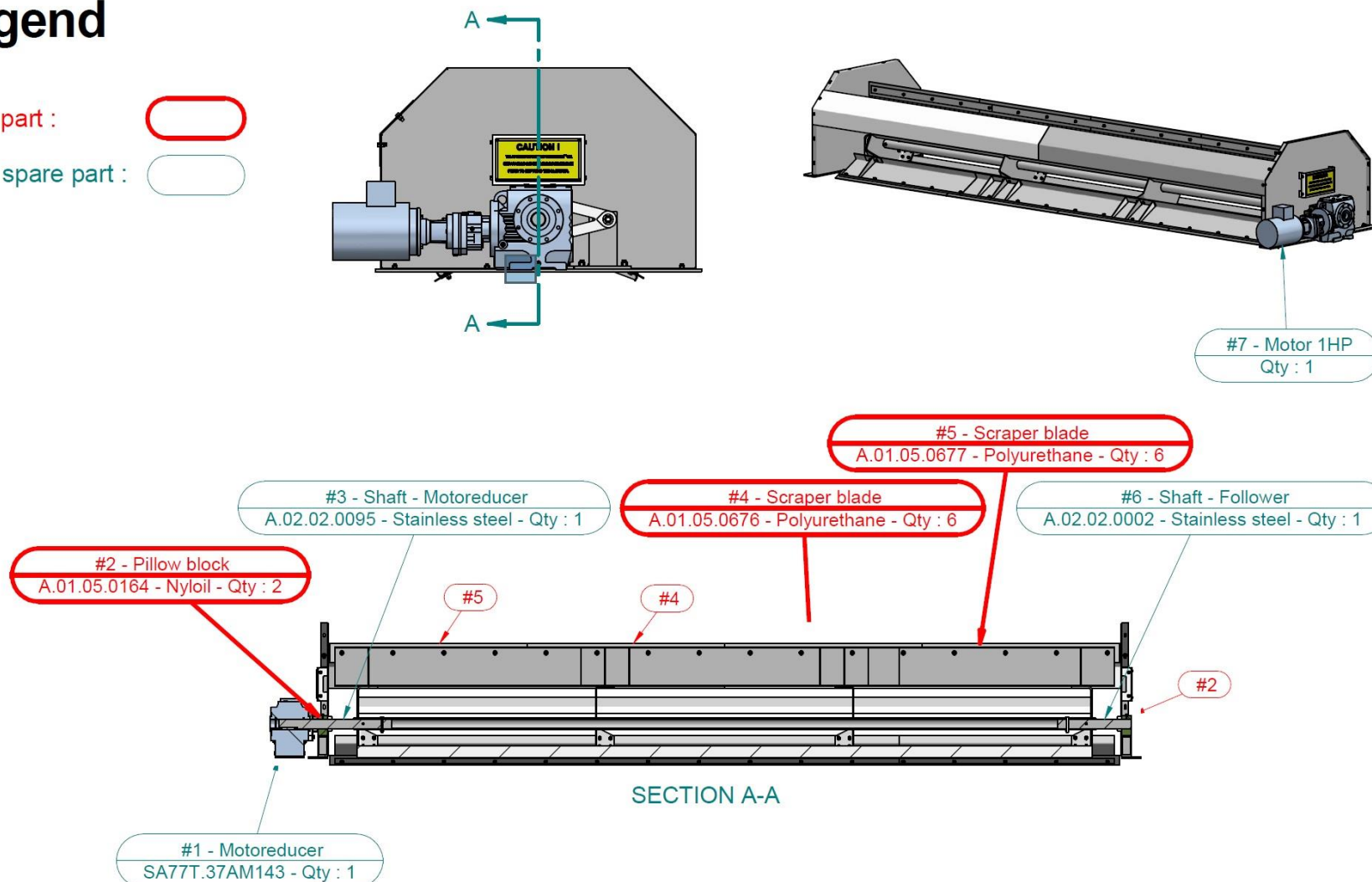
Sludge Removal System Spare Parts - Scraper

Legend

Wear part :



Other spare part :



Sludge Removal System Spare Parts - Thickener

Legend

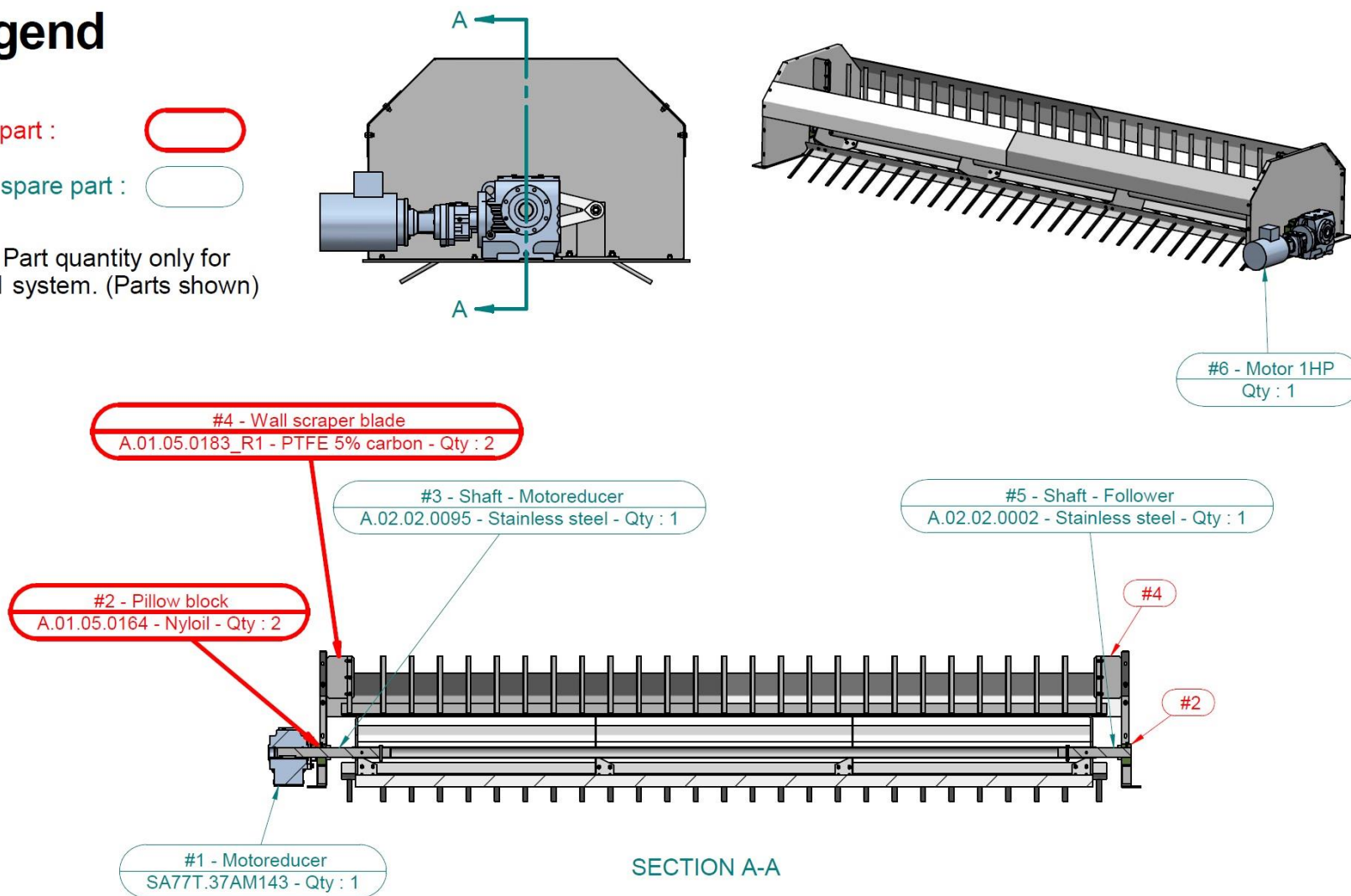
Wear part :



Other spare part :



Note : Part quantity only for
1 system. (Parts shown)



SECTION 8 – POSEIPACKS®

Description

The **POSEIPACK®** is a multiple corrugated plate arrangement used to increase the projected surface of the SUEZ Poseidon dissolve air flotation unit. This in turns allow for a high throughput rates in a comparatively smaller footprint. The **POSEIPACK®** plates are made of a fiberglass reinforced plastic (FRP) material and are chemical resistant.

IMPORTANT INFORMATION ABOUT THE POSEIPACK®

This item is an “article” as defined in 29 CFR 1910.1200 (c). In addition, this article does not release or otherwise result in exposure to a hazardous chemical under the conditions of its intended use. The Hazard Communication Standard does not apply to such articles, therefore a Material Safety Data Sheet is not available.

During installation of the SUEZ Poseidon **PPM®** flotation units, it is very important to use caution when working close to the **POSEIPACKS®**. The **POSEIPACKS®** shall be protected and/or covered from welding sparks or direct flames. The **POSEIPACKS®** can be composed of flammable materials.

	 WARNING
	FLAMMABLE MATERIAL Do not weld on the side of the flotation unit, inside of the flotation unit or over the POSEIPACKS®

SECTION 9 - OPERATION

Prior to Start-up

Flotation unit Settings

1. Fill the flotation unit with **fresh water** through the top (by placing a low pressure water hose within the Poseipack) or through the clarified water pipe, until the low low level set point is OFF (the low low level set point is approximately 4 to 6" below the bottom of sludge ramp/beach).
2. Continue to fill the flotation unit with fresh water until the level reaches ½ inch below the scraper blade. This level will be the "near-to" operation set point.
3. The High level set point is determined when the water level overflows into the sludge trough.
4. Verify for water leaks on all pipe flanges.

Recirculation & Aeration Settings

5. The **POSEIPUMP®** can be started only once the rotation direction and the transmission have been previously verified, the oil level has been adjusted and the unit has been filled with fresh water above the Poseipacks®. **Make sure that the POSEIPUMP® discharge and suction isolation valves are fully open so that the recirculation line is completely full of water.**
6. The recirculation rate normally corresponds to 15% of the total design flow treated by the flotation unit. Adjust the recirculation pump pressure with the release valve next to the feed pipe of the flotation unit. The pressure gauge reading should be between **85-105 psig** only when the **POSEIPUMP®** runs and the unit is full of water.
7. Adjust the air regulator in the pneumatic box to **70 psig**.
8. Adjust the air rotameter in the pneumatic box to get a flow of **133-148 scfh**. This flow should give an optimum separation of suspended particles. If not, it should be readjusted. The air rotameter should be adjusted to what has worked recently, generally close to the recommended setting.

Do not exceed the recommended air flow because a higher air flow rate will cause the pump to lose its prime and possibly run dry for an undetermined amount of time; this could damage the mechanical seal inside the pump.

	⚠ CAUTION Do not exceed the recommended air flow because a higher air flow rate could damage the recirculation pump.
---	---

9. On the highest location of the air dissolution pipe, a bleed line is installed, which runs to the bleed valve at the top of the unit. This valve shall always be partially open to allow excess air to escape. When the recirculation system is well adjusted, the recirculated water will appear milky white due to the presence of air microbubbles. If the quantity of excess air being bled off is excessive, the air flow must be reduced.

Drainage of Heavy Solids Settings

10. Heavy solids must be drained with the automatic drain valves situated at the cone-shaped bottom of the unit. During start-up, it is recommended to increase the opening frequency of the automatic drain valves to avoid any heavy solids build-up at the bottom of the flotation unit. An automatic drain sequence should be 5-10 seconds purge by the drain valves, opening alternately every 2 hours. The frequency of draining can be extended if there is little heavy material present.

	CAUTION
	Clog-up of the drain pipes shows the absolute necessity of draining more frequently.

Sludge Removal System Settings

11. Prior to start up, adjust the sludge removal system speed to the minimum rate in order to get the sludge drier while still maintaining a good sludge evacuation. Re-evaluate the speed during the start up.

Calibration of the chemical dosing pump(s)

12. With the use of calibration cylinders, calibrate the chemical dosing pump(s) for different dosages when using the flotation unit's maximum inlet water flow. If the chemical products need to be diluted, determine the concentration of the make down system.

CHEMICAL SETTINGS						
	Coagulant			Flocculant		
	Dosage (ppm)	Conc. (%)	Flow (ml/min)	Dosage (ppm)	Conc. (%)	Flow (ml/min)
Pump # 1						
Pump # 2						

AUTOMATIC FLOCCULANT MAKE-DOWN STATION			
Solution (%)	Dosing screw (g / L)	Dosing pump (L / hr)	Water dilution (L / hr)

$$\text{Dosing Pump Flow} = \frac{\text{UNIT inlet flow (L/min)} \times \text{Optimum Dosage (ppm)}}{\text{Make down solution concentration (ppm)}} = \text{ml/min}$$

It is strongly recommended to automate the chemical dosage as a function of the flotation unit.

Overall Operation Settings

No	Description	Settings
1	Air Regulator	70 psig
2	Air Rotameter	133-148 scfh
3	Recirculation Pressure	85-105 psig
4	High Level Alarm set point (HLA)	Overflow in the sludge trough
5	Low Level Alarm set point (LLA)	Approx. ½" below the sludge ramp/beach
6	Low Low Level Alarm set point (LLLA)	Approx. 4 to 6" below the sludge ramp/beach
7	Sludge Removal System	Minimum Speed
8	Bleed Off Valve	Slightly open + Milky water
9	Drain Valves	5-10 seconds purge every 2 hours, alternately
10	Dosing pump	Optimum dosage

Start- up

Start-up the system as described in the automated start up sequence (**Refer to SECTION 12 – Logic Sequences & Diagrams - Start up sequence**). A group start can be programmed in order to start all the flotation unit components:

1. The level control valve of the flotation unit is closed if the unit level is controlled by a control valve.
2. The level in the flotation unit feed chest is reached.
3. The low level alarm of the flotation unit is off.
4. The recirculation pump starts.
5. When the discharge pressure of the **POSEIPUMP®** reaches 60 psig, 10 seconds later the recirculation pneumatic box solenoid valve is triggered and opens.
6. The sludge removal system starts at this point.
7. 15 seconds later the feed pump and the dosing pump start.
8. The level control valve of the flotation unit opens to maintain the level at the selected set point.
9. At the same time, the drain sequence begins with a 5-10 seconds purge through the drain valves, opening every two hours.

Flocculation and Sludge Layer Consistency

Once the system has started, verify the quality of the flocculation by looking through the sight glass. Large flocs and clear water are generally seen when the chemical system is adjusted properly. Jar tests can be performed once a month to evaluate the coagulant and/or flocculant dosages as well as their respective injection points.

The level in the flotation unit is important for the balance between sludge consistency and sludge removal by the sludge removal system.

In a properly adjusted system, variations in solids loading at the inlet can be handled easily by the high tolerance of the unit with respect to sludge layer thickness. The flotation unit can operate with a sludge layer thickness in the range of 1-2 feet.

An increase in solids loading will result in an increase in the thickness of the sludge layer. An increase in the level in the unit will mean that the sludge removal system removes more sludge per rotation. If the level is too high, the sludge layer will be thin and water will be removed along with the sludge. The same effect will be observed if the sludge removal system speed is too fast.

Lowering the level or the sludge removal system speed will result in smaller amounts of sludge being removed per rotation and at the same time, the consistency will increase since the sludge will have more time to thicken prior to final removal. If the level is too low or the sludge removal system speed is too slow, there will be a build-up of sludge, which could eventually lead to floc (solids) carry-over in the clarified water.

Combining proper level and proper sludge removal system speed adjustment will lead to an optimum sludge layer consistency.

Level Control

The **PPM™** flotation unit is equipped with a level control system composed of an actuated valve with positioner, level transmitter and controller. The level control system allows the maintaining of a constant level in the flotation unit, even during flow and solids loading variations of the raw water.

Automation

For all recommended logic sequences, please refer to the **SECTION 12 – Logic Sequences & Diagrams**

Starting sequence
Stopping sequence
High level alarm (flotation)
Low level alarm (flotation unit)
Low low Level alarm (flotation unit)
Low pressure alarm (recirculation pump)
Low pressure alarm (recirculation pneumatic box air supply)
Recirculation pump (motor) defective
Sludge removal system defective
Feed pump (motor) defective
Dosing pump (motor) defective
Drain frequency
Clarified water pump motor (defective)

Manual Control and Operation

All mentioned components should be able to start manually.

Manual start-up should be done only in case of extreme necessity.

	CAUTION If the installation is working in manual mode, the securities and locks are no longer in service. Do not forget that the recirculation pump should never run dry.
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Cold temperature operation

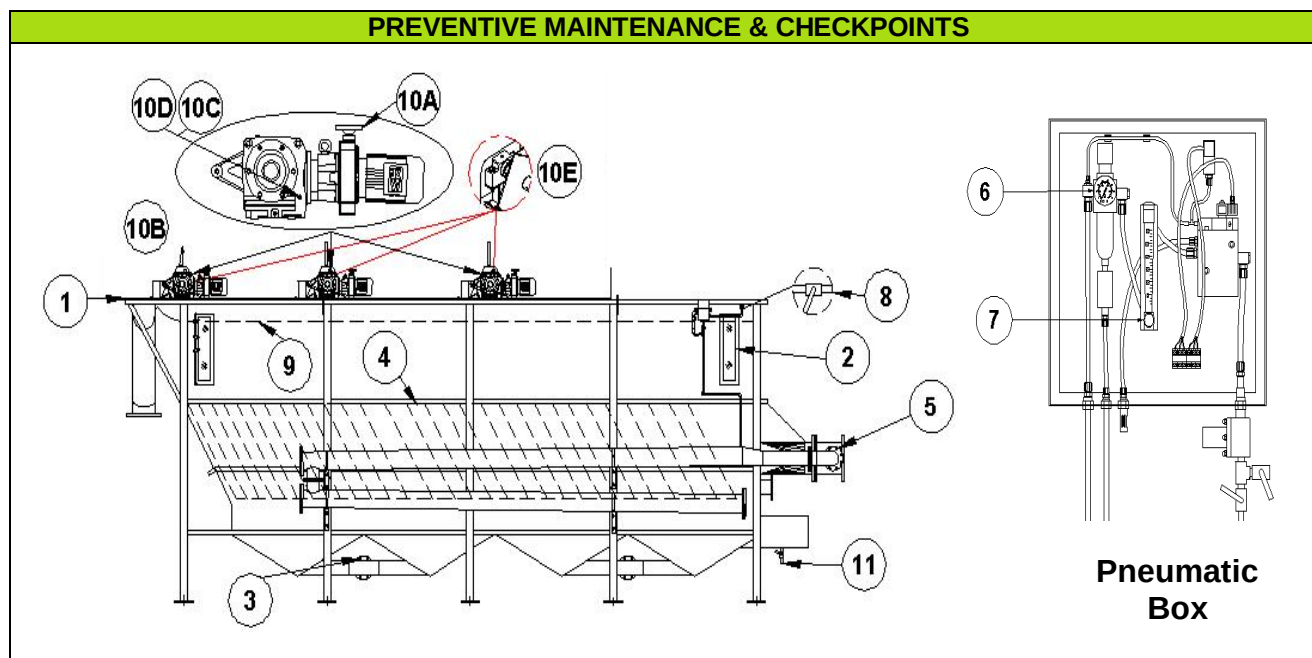
To avoid damage that can be caused by freezing conditions, make sure the piping and the equipment related to the operation of the unit are properly insulated and heat traced.

In case the unit is shut down while potential freezing risks are present, the unit and its related piping must be completely drained.

SECTION 10 – VERIFICATION AND MAINTENANCE

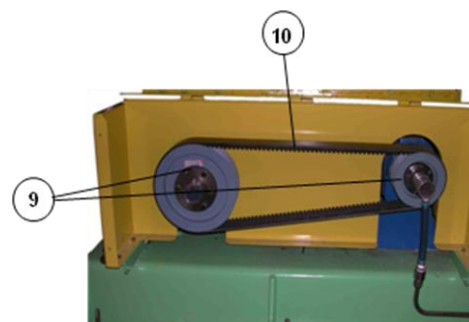
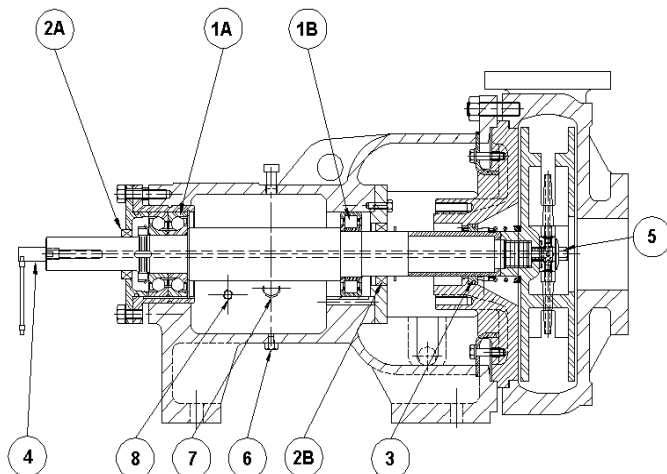
Preventive Maintenance Schedule

The installation is designed so that maintenance is reduced to a minimum. Cleaning, inspecting and lubricating should be performed on different equipment parts. Please refer to the following tables for the detailed verification check points and frequencies.



No.	Cleaning	Inspection	Lubrication	Equipment Part	Description	Recommended Frequency
1	X	X		Flotation unit	Inspect the inside of the flotation unit, clean if needed	Annually
2	X			Sight Glasses	Clean the sight glasses	Daily
		X			Verify the flocculation quality	Daily
3		X		Drain pipes	Verify the state of the drain pipes	Annually
4	X			Poseipacks®	Clean the Poseipacks® if needed	Annually
		X			Verify the state of the Poseipacks®	Annually
5		X		Poseipump®	Verify the recirculation pressure	Daily
6		X		Pneumatic box	Verify the air pressure	Daily
7		X			Verify the air flow	Daily
8		X		Bleed valve	Make sure the valve is slightly open	Daily
	X				Clean the valve if clogged	Annually
9		X		Unit level	Verify the water level and the sludge mat quality	Daily
10A		X		Sludge removal system	Verify the speed of the sludge removal system	Daily
10B	X				Clean the sludge removal system if needed	Annually
10C		X			Verify the oil of the motoreducers	Semi-Annually
10D			X		Change the oil of the motoreducers	Every 3 years
10E			X		Apply grease to the pillow blocks	Monthly/2g
11		X		Water outlet	Verify the water quality	Daily

POSEIPUMP® 403-PF PREVENTIVE MAINTENANCE & CHECK POINTS



No.	Cleaning	Inspection	Lubrication	Equipment Part	Description	Frequency	Lubricant Volume	Tool
1A/1B		X		Outboard/Inboard Bearings	Verify the state of the bearings	Annually		7/16" key
2A/2B		X		Outboard/Inboard Bearings Isolators	Verify the state of the bearings isolators	Annually		
3		X		Mechanical Seal	Verify the mechanical seal and replace if necessary	Annually		
4			X	Rotary Joint	Lubricate with a SAE10W30 oil	Monthly	3-5 drops/month	Nipple adaptor (manual or auto.)
		X			Inspect and replace if necessary	Bi-annually		
5		X		Injectors	Verify the state of the impeller's injectors	Annually		
6			X	Drain Plug	Change oil	200 hours / 8000 hours (or annually) ¹	2.2L	
7		X		Oil Level (sightglass)	Verify the oil level (oil level = ½ of sightglass)	Weekly		7/16" key
			X		Add oil if necessary			
	X				Keep the sight glass clean			
8			X	Automatic Oiler	Verify and add oil if necessary	Weekly	100 ml.	N/A
9		X		Pulleys	Verify the state of the pulleys (pump and motor)	Annually		
10		X		Belt	Verify the tension and state of the belt	Monthly		
		X			Change the belt	Annually		

Note 1: Perform the first oil change after 200 hours of operation. Subsequent oil changes can be performed every 8000 hours or once a year.

Lubrication

Poseipump®:

The oil level for the Poseipump's bearings should be checked once a week and the oil level must be at the center ($\frac{1}{2}$) of the sight glass. Add oil in the Opto-Matic oiler if the level is too low. A full oil change should be done after the first 200 hours of operation and subsequent oil changes every 8000 hours (or annually) with a SAE10W30 grade oil. The same grade of oil can be used to lubricate the rotary joint, either with a manual application or by using the automatic oiler.

Recommended SAE10W30 Grade Oil

American Oil Company	Amoco No. 31
Arco	Gascon S-315 or 68A
Continental Oil Company	Conoco Dectol Medium
Exxon Company	Forum 50
Mobil Oil	Flow Rex Extra Heavy
Shell Oil Company	Carnea 68
Texaco Inc.	URSA P68
Union Oil Company	Turmaco 315

Gearbox motor:

Refer to the manufacturer's manual for schedule, grease type and quantities to be used.

Gearboxes:

We recommend verifying the oil level in the gearboxes every 6 months and changing it every 3 years. Refer to the manufacturer's manual for oil types and quantities to be used. If the manufacturer proposes a different lubrication schedule, the latter should be used in place of SUEZ Poseidon's lubrication schedule.

Bushings:

Using Shell Alvania RL3 or an equivalent type of grease, apply ≈ 2 grams (about 5 pumps from a grease gun) of grease to scraper and thickener plastic bushings once a month to prevent premature wear. A normal quantity of standard bearing mineral grease is recommended. Do not use graphite-based grease

Extended storage recommendations

When storing rotating equipment such as pumps or motors, it is important that special precautions are taken.

Poseipump®:

- Always store the spare Poseipump® indoors in a clean, dry location. Avoid locations with large temperature swings that will result in condensation.
- Pumps cannot be stored around running equipment where resonance vibration can cause bearing damage.
- Regardless of the duration of storage, pumps should be rotated at least every six weeks, no less than five full revolutions.
- Pumps should be stored in a corrosion less environment.

Valves:

- Always store the valves indoors in a clean, dry location.
- Regardless of the duration of storage, valves should be manipulated (opening and closing them 4 to 5 times) every six months.

Motors:

- Always store the motors indoors in a clean, dry location. Avoid locations with large temperature swings that will result in condensation.
- Please note the reduced grease utilization period of the ball bearings after storage periods exceeding one year.
- Check whether the motor has absorbed moisture as a result of being stored for a long time. Measure the insulation resistance to do this.
- Motors must be covered to eliminate airborne dust and dirt.
- If the storage location exhibits high vibration, place isolation pads under motor to minimize damage to motor bearings.

Please read the manufacturer's Operating instructions manual for more information.

Gear units:

Gear units of the "extended storage" type have:

- An oil fill suitable for the mounting position so the unit is ready to run. You should still check the oil level before start-up;
- A higher oil level in some cases. Correct the oil level before start-up.

Comply with the storage conditions specified in the following table for extended storage:

Climate zone	Packaging *	Storage location	Storage time
Temperate (Europe, USA, Canada, China and Russia, excluding tropical zones).	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap.	With roof, protected against rain and snow, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity <50%).
	Open	With roof, enclosed at a constant temperature and atmospheric humidity (5°C-60°C, <50% atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads.	Two years or more, given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.
Tropical (Asia, Central and south America, Australia, New Zealand, excluding temperate zones).	Packed in containers, with desiccant and moisture indicator sealed in the plastic wrap. Protected against insect damage and mildew by chemical treatment.	With roof, protected against rain, no shock loads.	Up to three years with regular checks on the packaging and moisture indicator (relative atmospheric humidity <50%).
	Open	With roof, enclosed at a constant temperature and atmospheric humidity (5°C-60°C, <50% atmospheric humidity). No sudden temperature fluctuations and controlled ventilation with filter (free from dirt and dust). No aggressive vapors and no shock loads. Protection against insect damage.	Two years or more, given regular inspections. Check for cleanliness and mechanical damage as part of the inspection. Check corrosion protection.

*Packaging must be performed by an experienced company using the packing materials that have been expressly specified for the particular application.

Please read the manufacturer's Operating instructions manual for more information.

Cleaning procedure

When the flotation unit and the feed tank accumulate solids, they must be drained and cleaned out. An annual visual inspection of the inside of the unit will enable the facility to determine if the unit needs to be cleaned. The exact frequency will be determined by the facility once the installation is in operation. The cleaning must be done with respect to the following steps:

1. Increase and maintain the water level of the flotation unit to the maximum until the sludge layer is evacuated.

The sludge layer must be removed with the sludge removal system before the unit is drained. This is to prevent any accumulation of sludge in the Poseipacks®.

2. Initiate the Stop sequence. This should stop the feed pump, the chemical dosing pumps, the recirculation pump and the sludge removal system.
3. Open the drain valves in order to empty the flotation unit.
4. Clean the inside of the flotation unit with a water hose with a maximum water jet pressure of 100 kPa (15 psi) at 3 meters of distance. Do not use a high-pressure hose when cleaning the Poseipacks® since this could damage them in the process.
5. Close the drain valves and the bottom manholes.
6. Fill the flotation unit with fresh water prior to introducing water to be treated

If the unit is filled with water and remains stopped while there is a danger of freezing, then the whole installation must be drained

	 CAUTION		
	FLYING DEBRIS CAN BE PRESENT WHILE CLEANING THE UNIT Wear Safety Glasses and Waterproof clothing		

SECTION 11 - TROUBLESHOOTING

NOTE: Strong variations in the inlet water characteristics, like solid loading, pH, etc., could affect the overall performance of the flotation unit.

Problem	Possible Causes		Solution	
Deterioration of the clarified water: <u>Unclear or colored water</u>	1	Malfunction of the dosing station	A	Setting of the dosing pump(s) controller incorrect.
			B	Problems with dosing pump(s).
	2	Influent flow rate	A	Reduce the inlet flow if possible.
Clear water but excessive floc carry-over	1	Malfunction of the dosing station	A	Setting of the dosing pump(s) controller incorrect.
			B	Problems with dosing pump(s).
	2	Sludge layer too thick	A	Raise the water level.
			B	Increase the sludge removal system speed.
	3	Insufficient aeration	A	Check the recirculation system.
	4	Influent characteristics variations	A	Check flow and solids loading of the raw water.
			B	Re-evaluate the chemical program
	5	Accumulation of settled solids at the bottom of the unit	A	Verify the state of the draining system
			B	Verify the draining sequence
			C	Verify chemical dosages
			D	Verify recirculation system
Recirculation system does not function properly: <u>Large air bubbles</u>	1	Bleed valve blocked	A	Open the bleed valve completely to take away the blockage and readjust to allow a small flow through this valve.
	2	Release valve is not properly tuned	A	Verify the recirculation pressure. Adjust the valve to obtain a pressure between 85-105 psig.
	3	Excessive air supply	A	Reduce air flow on rotameter.
	4	Air injection nozzles clogged	A	Open pump to clean the air injection nozzles.
Recirculation system does not function properly: <u>No milky liquid</u>	1	Not enough/no air supply	A	Check the air rotameter reading.
			B	Check for air leaks on the feed line
	2	Insufficient recirculation pressure	A	Check pressure on manometer and throttle the release valve to increase the pressure.
	3	Excessive solid loading in influent water	A	Find causes in plan operation and determine next action.
	4	Depriming of the recirculation pump when air is injected	A	Verify the rotameter air flow.
			B	Verify the recirculation pressure at the release valve.
Low sludge consistency	1	Short retention time	A	Lower level in flotation unit and/or lower speed of the sludge removal system.
	2	Insufficient aeration	A	Study options to increase the rotameter air flow rate.
			B	Check if release valve is properly adjusted.
	3	Slow rising rate and/or poor floc formation	A	Check chemical dosage(s) and dosing points.
			B	Re-evaluate the chemical program

FLOTATION UNIT: Problems and possible causes

		PROBLEMS				
		Deterioration of clarified water quality	Excessive floc carry-over in clarified water	Large air bubbles	Insufficient aeration – No milky liquid	Low sludge consistency
POSSIBLE CAUSES	Air flow in the Poseipump® too low or no air	X	X		X	X
	Air flow in the Poseipump® too high ¹			X		
	Bleed valve plugged or closed			X		
	Variations of influent water characteristics (pH ² , TSS, O&G, etc...)	X				
	Chemical dosage not adjusted	X	X			
	Dosing pump(s) defective or not adjusted	X	X			
	Draining sequence not adjusted		X			
	Sludge mat too thick		X			
	Influent flow rate too high	X	X			
	Chemical injection point(s) not optimal	X				
	Flocculant batch too old ²	X				
	Flocculant concentration too low or high	X				
	No air supply pressure or too low	X	X		X	X
	Recirculation flow rate not adjusted		X	X		X
	Recirculation pressure not adjusted		X	X	X	
	Drain plugged		X			
	Water level in unit too low		X			
	Water level in the unit too high					X

¹ Do not exceed the maximum air flow rate sustained by the Poseipump®

² If the flocculant solution is too old or if the pH varies too much, the flocculant will lose its efficiency. Usually, flocculants gradually lose their efficiency after 24 hours after they are in aqueous solution.

Poseipump®: Problems and Possible Causes

		PROBLEMS					
		Noise or vibration	No flow	Insufficient Pressure	Excessive Power required	Intermittent Flow	Short Bearing Life
POSSIBLE CAUSES	Bearing worn	X			X		X
	Bent shaft	X			X		X
	Excessive discharge head		X				
	Oil level too low						X
	Improper foundation	X					
	Improper electric motor wiring or voltage				X		
	Misalignment of the pulleys	X			X		X
	Belt too tight				X		X
	Belt too loose	X				X	
	Plugged suction or discharge line	X	X	X		X	
	Impeller damage	X	X	X	X	X	X
	Impeller clogged		X	X		X	
	Impeller out of balance	X					X
	Rotating element bent	X			X		X
	Speed too low			X			
	Suction or discharge piping not anchored	X					
	Wrong direction of rotation	X	X	X	X	X	X



NOTE

If you have any problems with the mechanical seals, you should contact the manufacturer. Consult the factory if the problem persists

SECTION 12 - LOGIC SEQUENCES & DIAGRAMS

These typical logic diagrams and logic descriptions are provided by SUEZ Poseidon and should serve only as an indication. Final detailed logics and control narratives shall be performed by others. Any request for additional modifications may be subject to extra costs.

All the optional logic descriptions that refer to the optional equipment are written in blue.

Logic Sequences

Start Sequence A and B

Note: Prior to this start sequence, the flotation unit has already been filled with service water.

A- Start the flotation unit

The water level must always be higher than the low low level set point.

1. Start the recirculation pump # 1, *recirculation pump # 2 pending.*
2. If the discharge pressure of the recirculation pump is > 60psi for 10 seconds.
Open the solenoid valve of the pneumatic air panel.
3. Start the sludge removal system.
4. Delay of 15 seconds is required before starting feeding the unit. (Start sequence B).

B- Start the feed of the flotation unit.

5. Start the influent feed pump.
6. *Start the feed control valve and / or the clarified water pump.*
7. Start the dosing pumps.
8. Start modulating the level control valve to achieve the level set point.
9. Initiate the Drainage sequence.

Stop Sequence A and B

A- Stop the feed of the flotation unit.

1. Stop the feed pump.
2. *Stop the feed control valve and / or the clarified water pump.*
3. Stop the dosing pumps.
10. Stop the control valve and gradually close the level control valve.
4. Stop the Drainage sequence (store in memory the next drain valve to be opened).

B- Stop the flotation unit.

5. Close the solenoid valve of the pneumatic air panel.
6. Stop the recirculation pump.
7. Stop the sludge removal system.

Drainage sequence.

1. Open the next drain valve.
2. Start the programmable drainage period timer (5 to 10 seconds).
3. After the drainage period timer expired, close the drain valve.
4. Start the programmable drainage frequency timer (2 to 8 hours).
5. After the drainage timer frequency expired, repeat steps (1 to 5).

All the optional logic descriptions that refer to the optional equipment are written in blue.

Start button

1. Initiate a Start sequence A and B.

Stop button

1. Initiate a Stop sequence A and B.

High level alarm (Level transmitter installed)

1. The high-level set point is reached.
2. An alarm indicates a high level (overflows in the sludge hopper).

Low level alarm (Level transmitter installed)

1. The low-level set point is reached.
2. An alarm indicates a low level (the sludge removal system no longer removes sludge).

Low low level alarm. (Level transmitter installed)

1. The level sensor detect a water low level or the low low level set point is reached.
2. An alarm indicates a low low level.
3. Initiate a Stop Sequence A and B.
4. After rectifying the water level at a low flow rate without damaging the poseipack.
5. Manual Reset of the fault is required for the Start sequence to be ready.

Low pressure alarm: recirculation pump (Pressure transmitter installed)

1. Recirculation pump pressure switch detects a pressure ≤ 60 psi or low pressure ≤ 60 psi is reached.
2. An alarm indicates a recirculation pump pressure ≤ 60 psi.
3. Immediately close the solenoid valve of the pneumatic air panel.
4. Initiate a Stop sequence A and B.
5. Manual Reset of the fault is required for the Start sequence to be ready.

Low pressure alarm: pneumatic air panel

1. Air pressure switch detects a low air supply pressure (≤ 60 psi).
2. An alarm indicates air pressure ≤ 60 psi.
3. If the situation is not corrected within five (5) minutes.
4. Initiate Stop sequence A.
5. If the situation is corrected initialize the Start Sequence B.
6. If the situation is not corrected within thirty (30) minutes.
7. Initiate Stop Sequence B
8. Manual Reset of the fault is required for the Start sequence to be ready.

All the optional logic descriptions that refer to the optional equipment are written in blue.

Recirculation pump: defective motor

1. Fault of recirculation pump motor detected.
2. An alarm indicates the fault detected
3. Initiate Stop Sequence A and B.
4. Manual Reset of the fault is required for the Start sequence to be ready.

Defective sludge removal system

1. Failure of the sludge removal system detected.
2. An alarm indicates the fault detected
3. Initiate Stop Sequence A and B.
4. Manual Reset of the fault is required for the Start sequence to be ready.

Feed system: defective

1. Failure of the feed pump and / or the feed control valve detected.
2. An alarm indicates the fault detected
3. Initiate Stop sequence A.
4. If the situation is not corrected within thirty (30) minutes.
5. Initiate Stop Sequence B
6. Manual Reset of the fault is required for the Start sequence to be ready.

Dosing pump: defective

1. No dosing pump detected.
2. An alarm indicates the fault detected
3. If the situation is not corrected within five (5) minutes.
4. Initiate Stop sequence A.
5. If the situation is corrected initialize the Start Sequence B
6. If the situation is not corrected within thirty (30) minutes.
7. Initiate Stop Sequence B
8. Manual Reset of the fault is required for the Start sequence to be ready.

Clarified water pump (motor): defective

1. Failure of clarified water pump detected.
2. An alarm indicates the fault detected
3. Initiate Stop sequence A.
4. If the situation is not corrected within thirty (30) minutes.
5. Initiate Stop Sequence B
6. Manual Reset of the fault is required for the Start sequence to be ready.

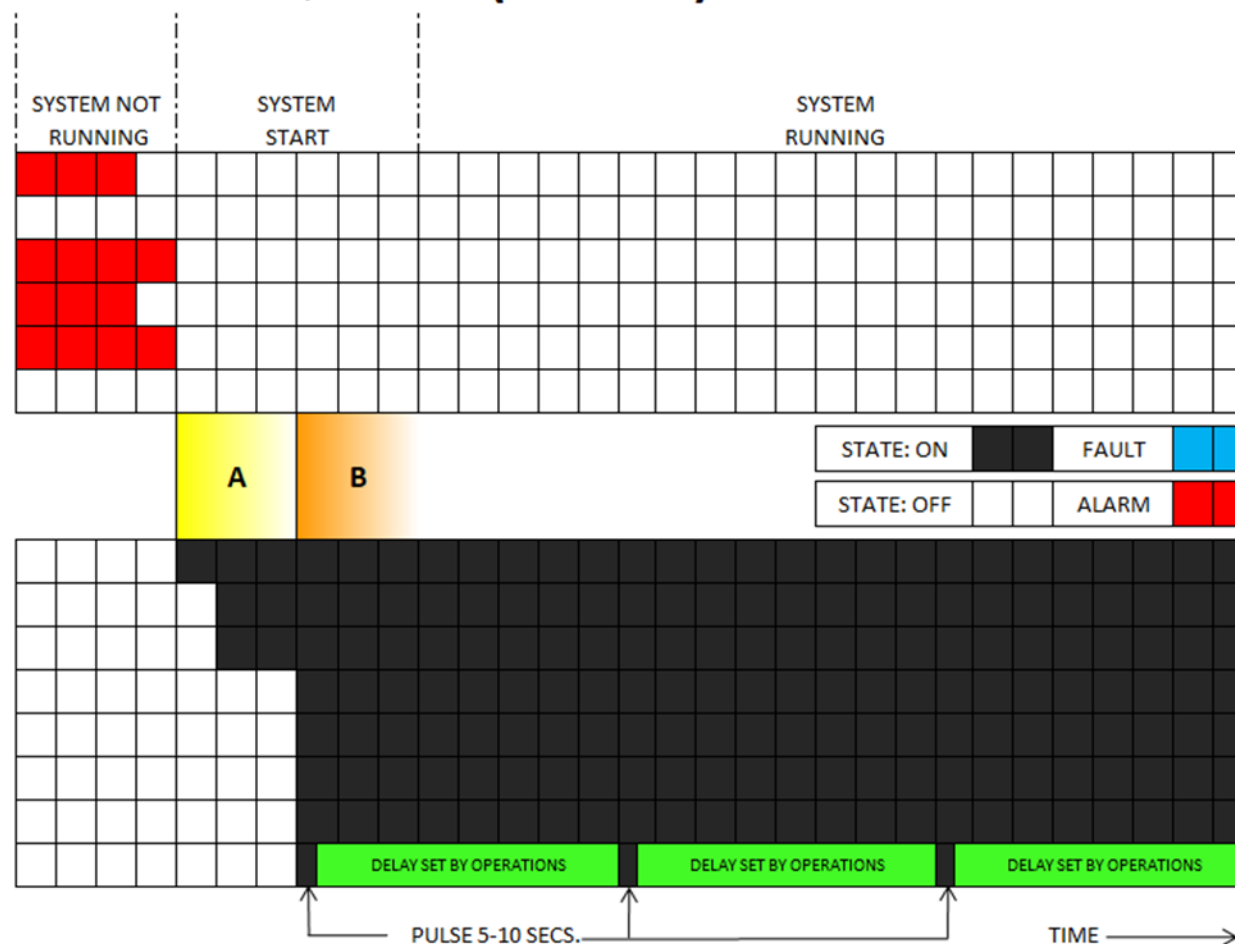
START SEQUENCE (A and B)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
FLOTATION UNIT HIGH LEVEL ALARM
FLOTATION UNIT LOW LEVEL ALARM
FLOTATION UNIT LOW LOW LEVEL ALARM
LOW PRESSURE ALARM (POSEPUMP)
LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEPUMP
PNEUMATIC BOX SOLENOID VALVE
SLUDGE REMOVAL SYSTEM
LEVEL CONTROL VALVE
FEED PUMP / FEED CONTROL VALVE
DOSING PUMPS
CLARIFIED WATER PUMP
DRAIN VALVES



NOTE: *PNEUMATIC BOX SOLENOID VALVE IS NOT OPEN IF THERE IS NO OR LOW PRESSURE (≥ 60 PSI) AT THE DISCHARGE OF THE POSEPUMP.

**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.



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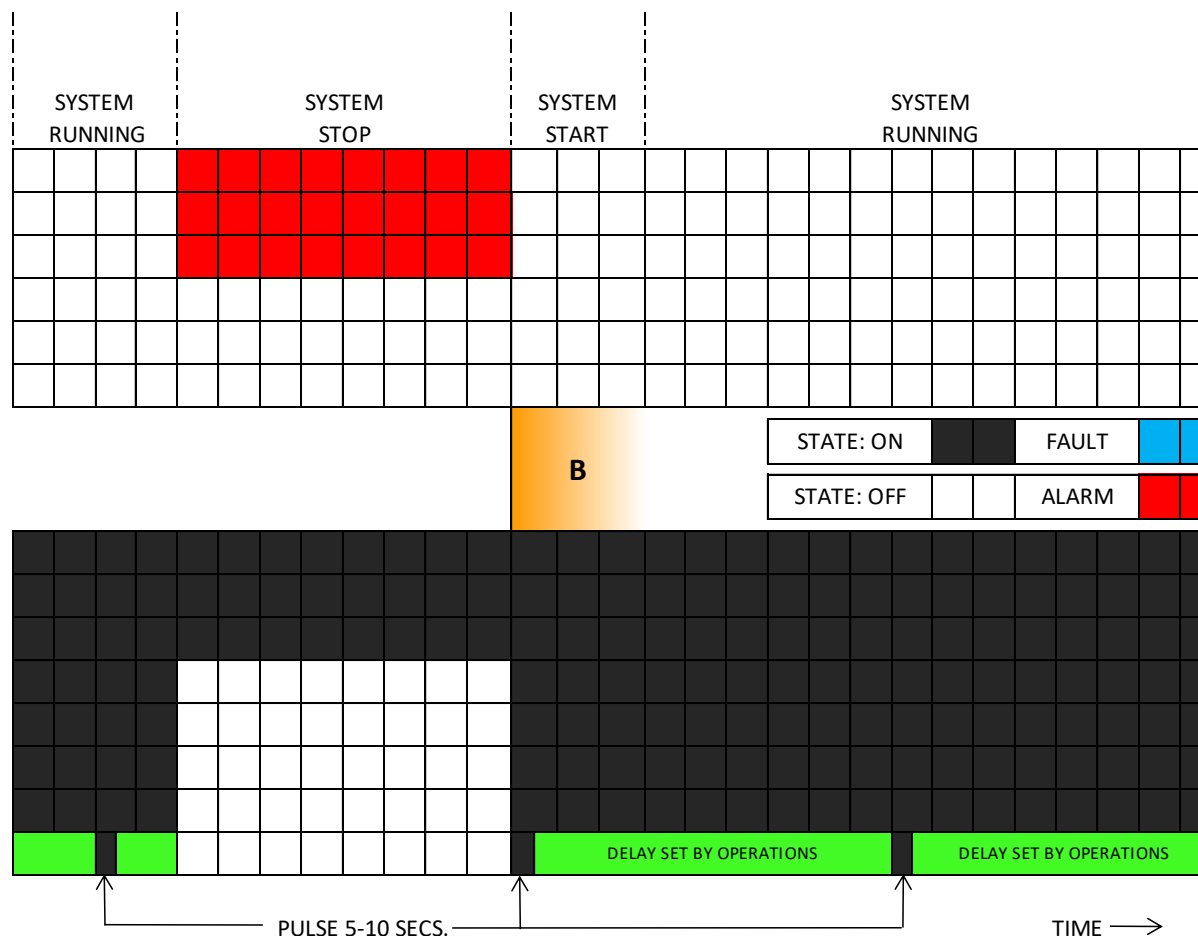
STOP SEQUENCE (A)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
FLOTATION UNIT HIGH LEVEL ALARM
FLOTATION UNIT LOW LEVEL ALARM
FLOTATION UNIT LOW LOW LEVEL ALARM
LOW PRESSURE ALARM (POSEİPUMP)
LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEİPUMP
PNEUMATIC BOX SOLENOID VALVE
SLUDGE REMOVAL SYSTEM
LEVEL CONTROL VALVE
FEED PUMP / FEED CONTROL VALVE
DOSING PUMPS
CLARIFIED WATER PUMP
DRAIN VALVES



NOTE: *PNEUMATIC BOX SOLENOID VALVE IS NOT OPEN IF THERE IS NO OR LOW PRESSURE (≥ 60 PSI) AT THE DISCHARGE OF THE POSEİPUMP.

**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.



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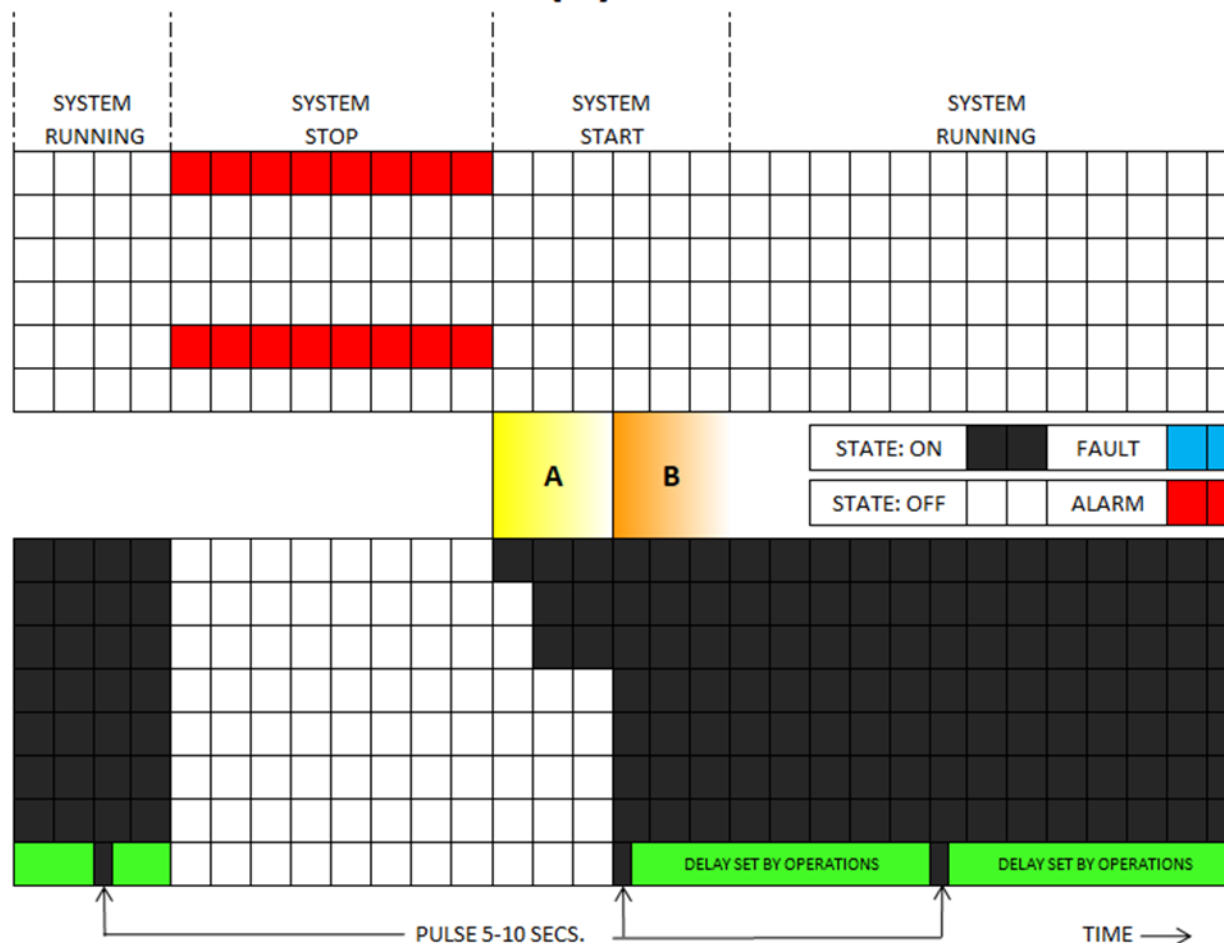
STOP SEQUENCE (B)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



NOTE: *PNEUMATIC BOX SOLENOID VALVE IS NOT OPEN IF THERE IS NO OR LOW PRESSURE (≥ 60 PSI) AT THE DISCHARGE OF THE POSEIPUMP.

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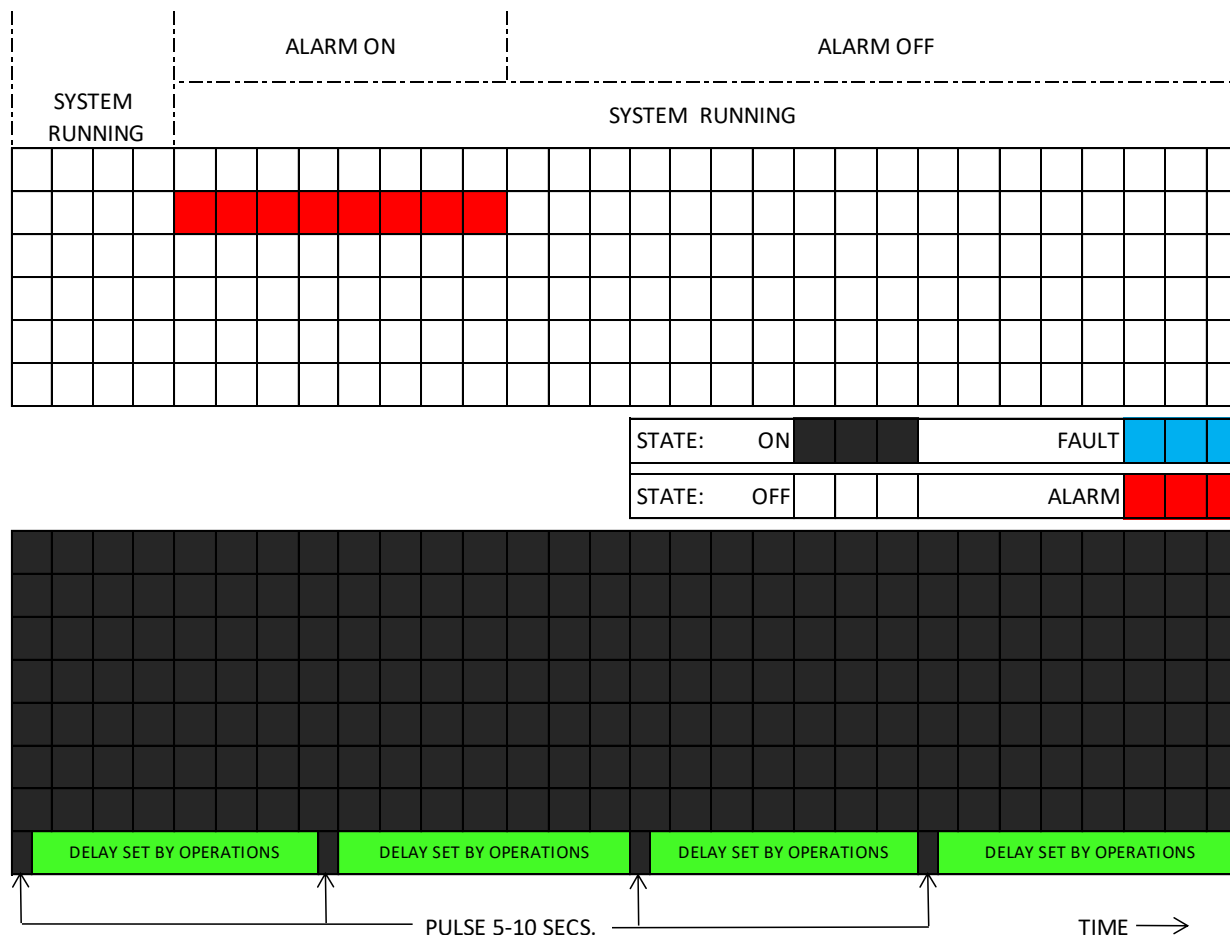
HIGH LEVEL ALARM FLOTATION UNIT

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



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 Revision Date: 2015-12-03

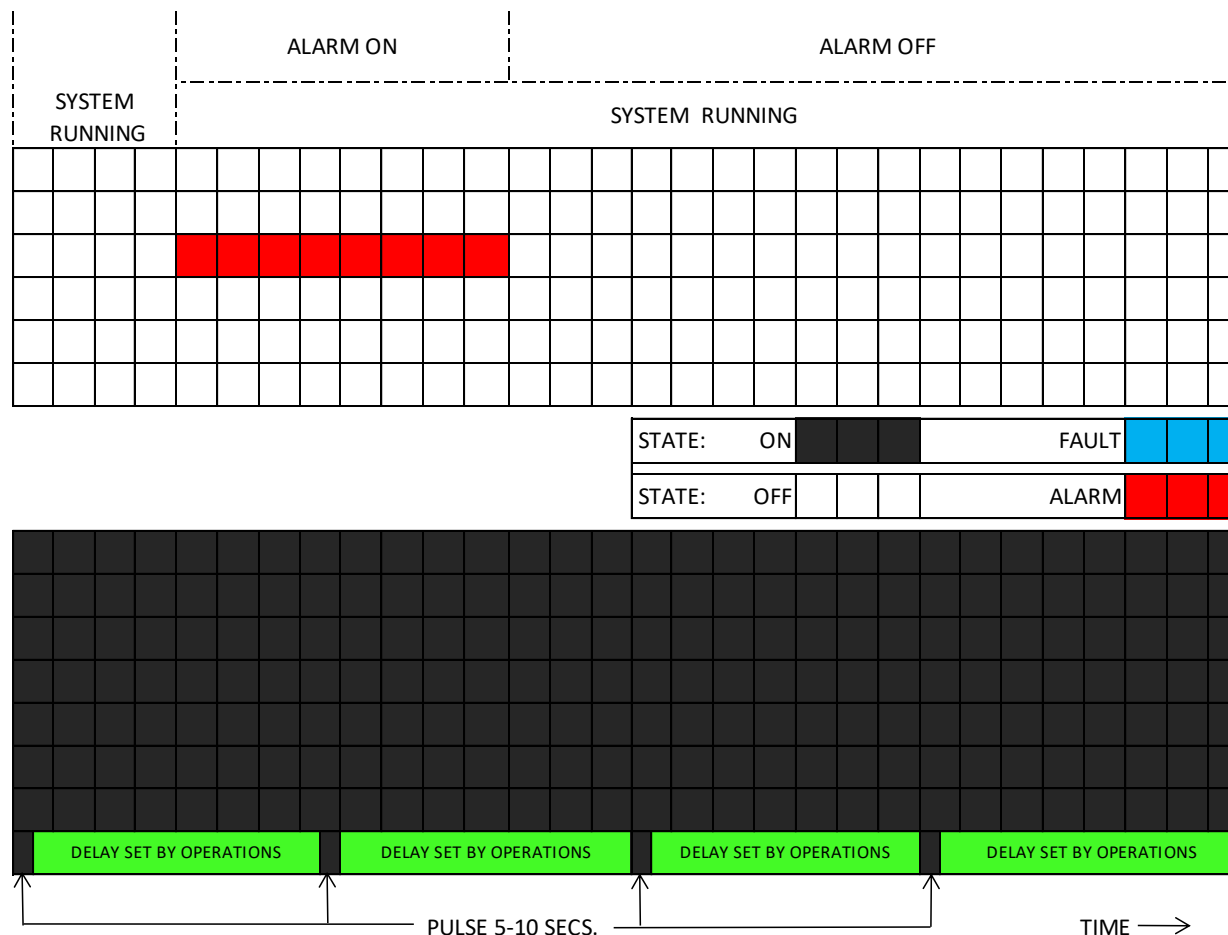
LOW LEVEL ALARM FLOTATION UNIT

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
FLOTATION UNIT HIGH LEVEL ALARM
FLOTATION UNIT LOW LEVEL ALARM
FLOTATION UNIT LOW LOW LEVEL ALARM
LOW PRESSURE ALARM (POSEİPUMP)
LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEİPUMP
PNEUMATIC BOX SOLENOID VALVE
SLUDGE REMOVAL SYSTEM
LEVEL CONTROL VALVE
FEED PUMP / FEED CONTROL VALVE
DOSING PUMPS
CLARIFIED WATER PUMP
DRAIN VALVES



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**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.

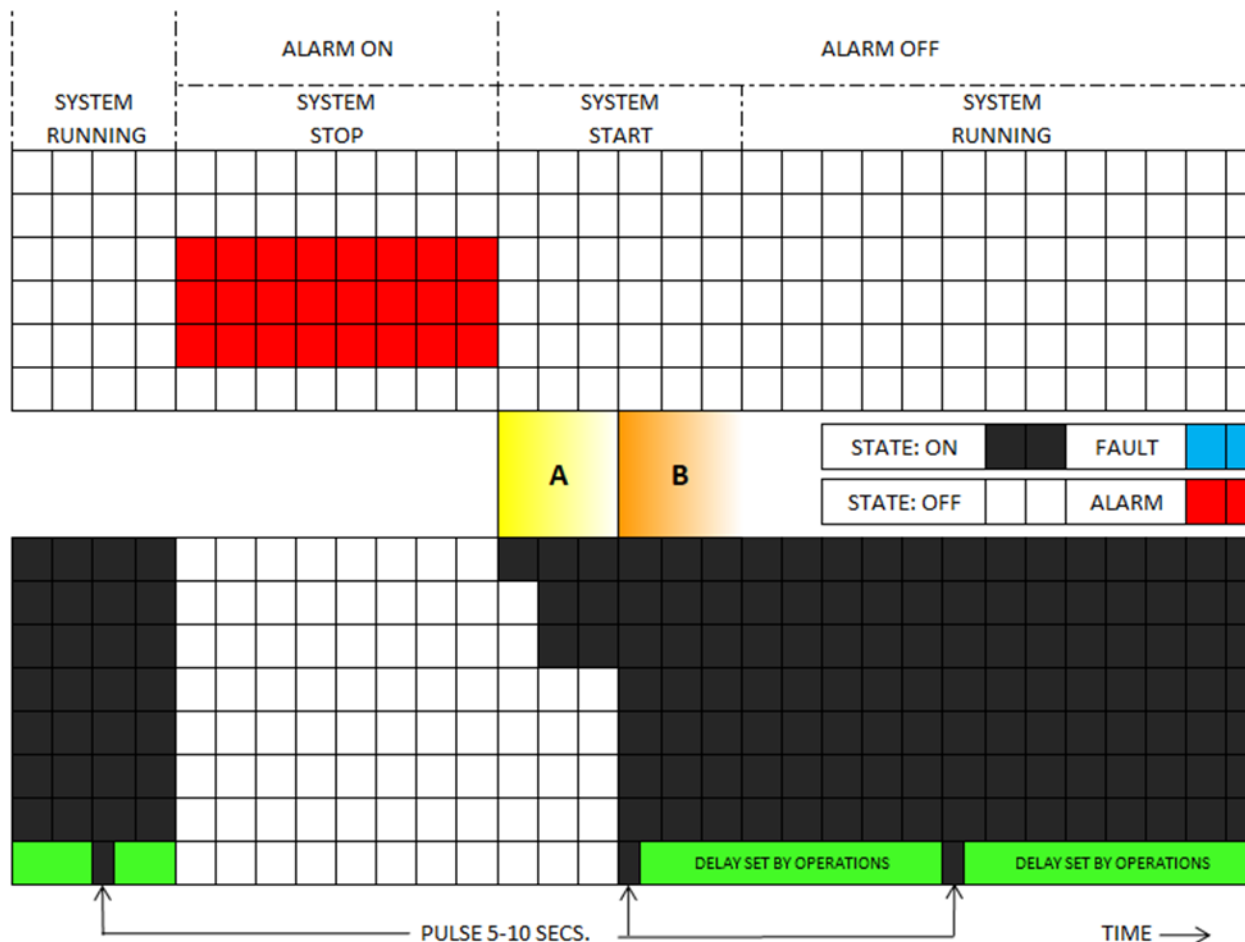
LOW LOW LEVEL ALARM FLOTATION UNIT

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
FLOTATION UNIT HIGH LEVEL ALARM
FLOTATION UNIT LOW LEVEL ALARM
FLOTATION UNIT LOW LOW LEVEL ALARM
LOW PRESSURE ALARM (POSEIPUMP)
LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
PNEUMATIC BOX SOLENOID VALVE
SLUDGE REMOVAL SYSTEM
LEVEL CONTROL VALVE
FEED PUMP / FEED CONTROL VALVE
DOSING PUMPS
CLARIFIED WATER PUMP
DRAIN VALVES



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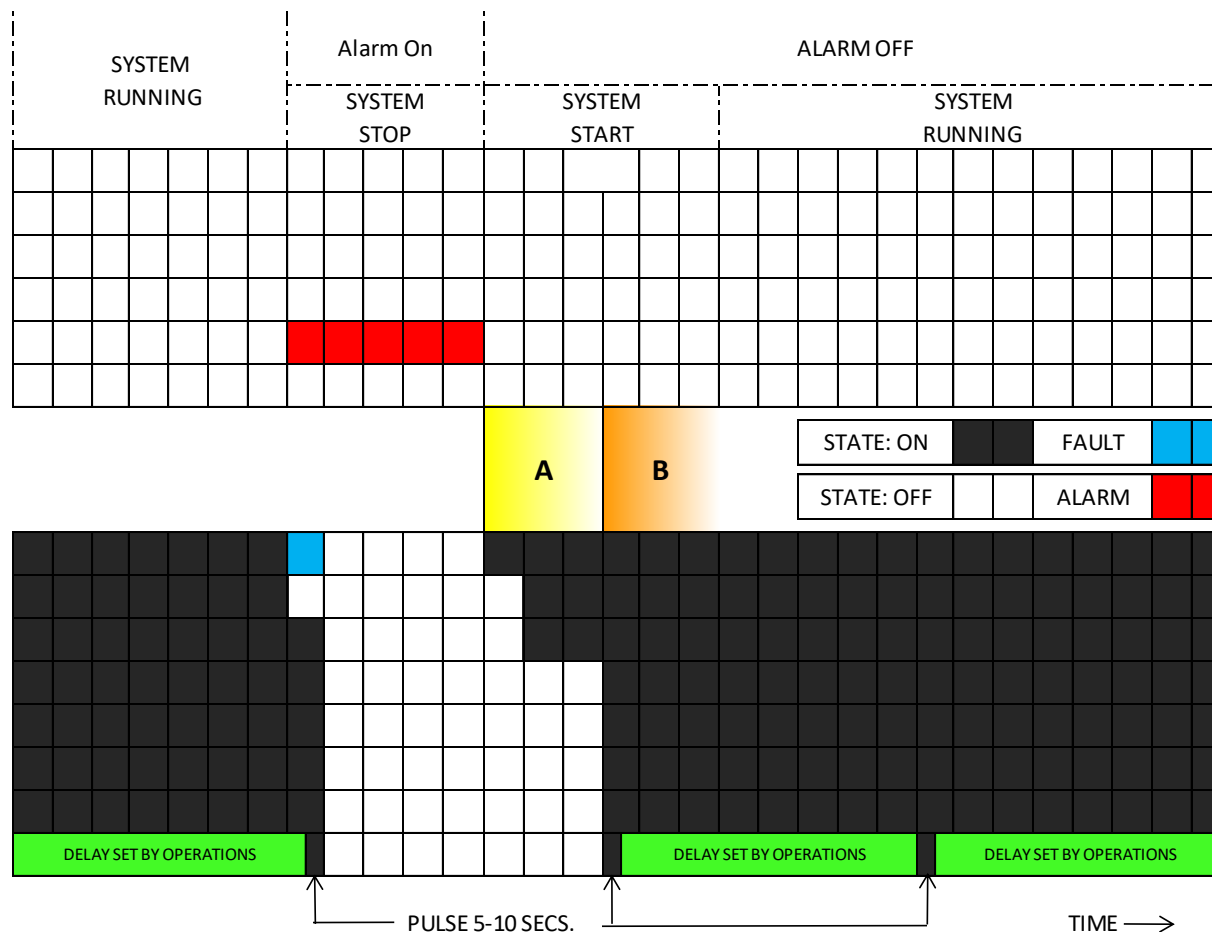
LOW PRESSURE ALARM POSEİPUMP

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEİPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEİPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



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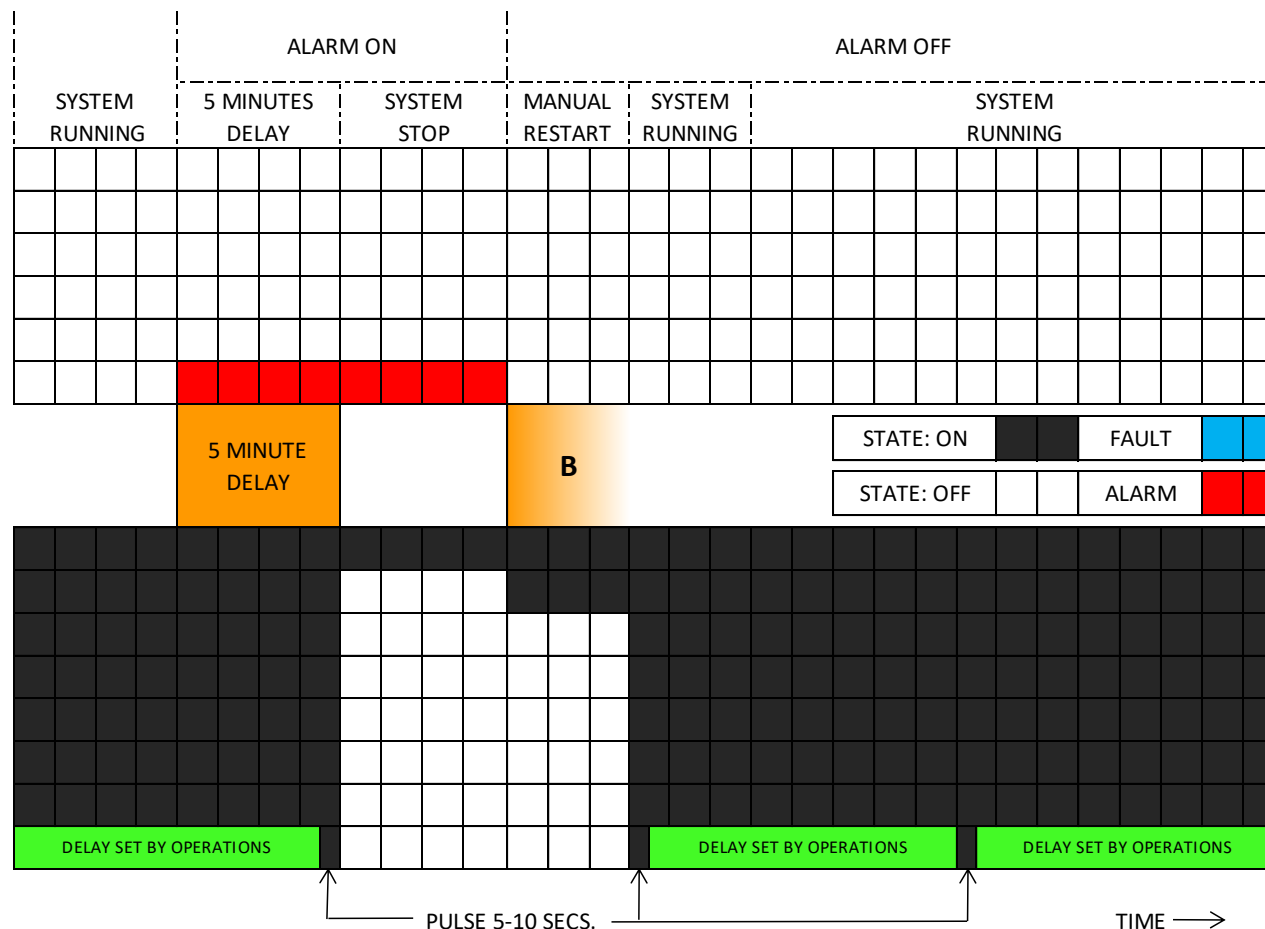
LOW PRESSURE ALARM (PNEUMATIC BOX AIR SUPPLY)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



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**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.



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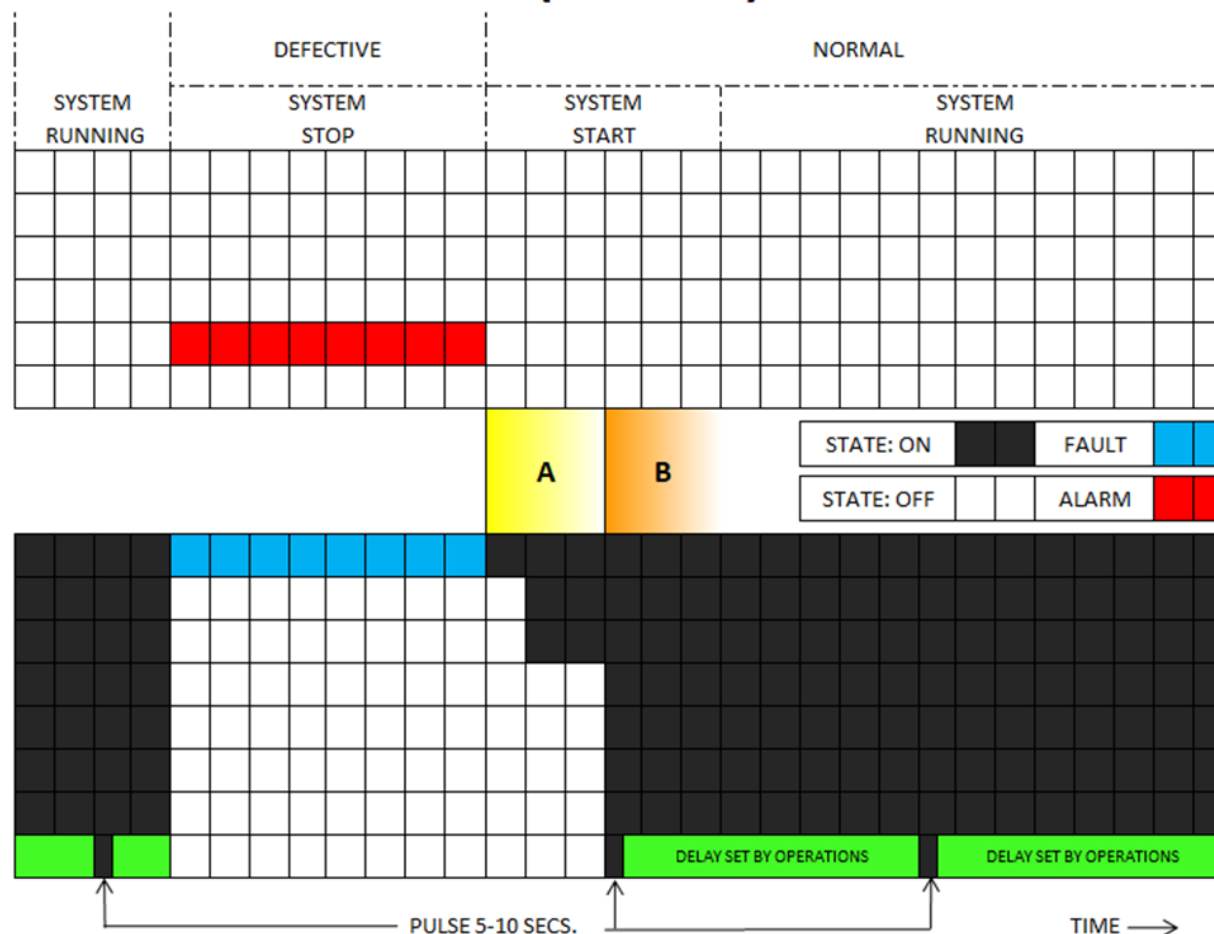
DEFECTIVE POSEIPUMP (MOTOR)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



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**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.



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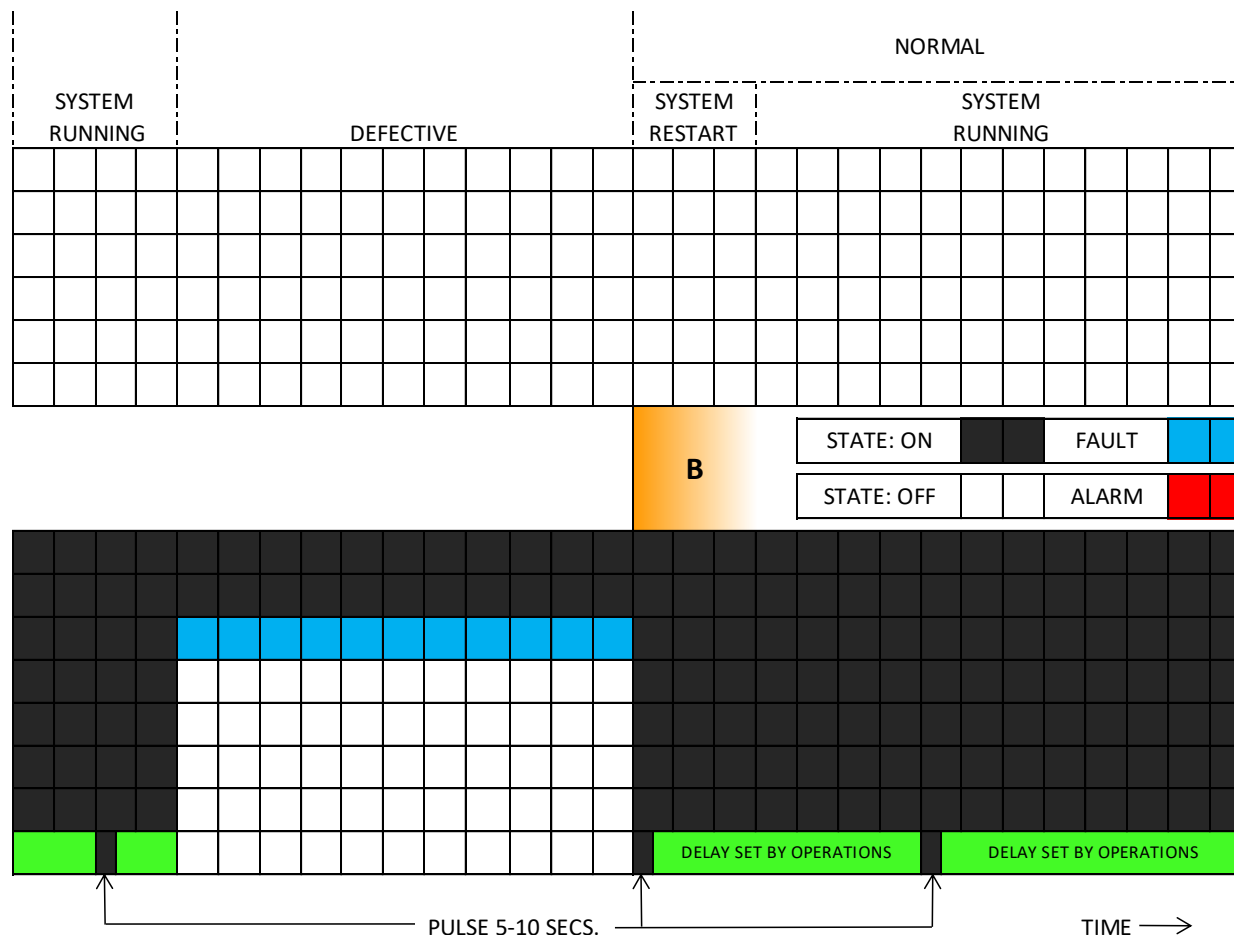
DEFECTIVE SLUDGE REMOVAL SYSTEM

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
FLOTATION UNIT HIGH LEVEL ALARM
FLOTATION UNIT LOW LEVEL ALARM
FLOTATION UNIT LOW LOW LEVEL ALARM
LOW PRESSURE ALARM (POSEIPUMP)
LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
PNEUMATIC BOX SOLENOID VALVE
SLUDGE REMOVAL SYSTEM
LEVEL CONTROL VALVE
FEED PUMP / FEED CONTROL VALVE
DOSING PUMPS
CLARIFIED WATER PUMP
DRAIN VALVES



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**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.

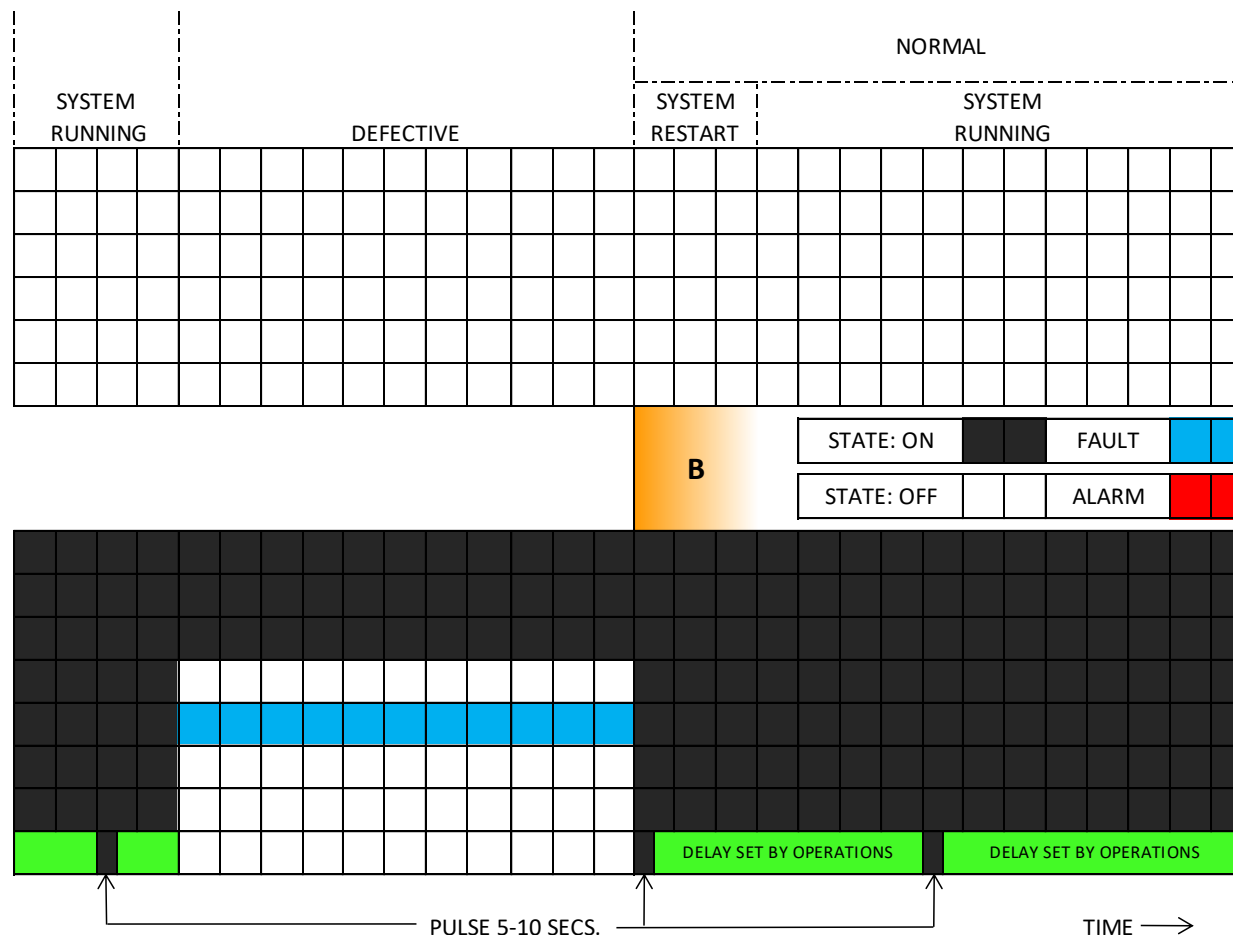
DEFECTIVE FEED PUMP (MOTOR) / FEED CONTROL VALVE

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



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**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.

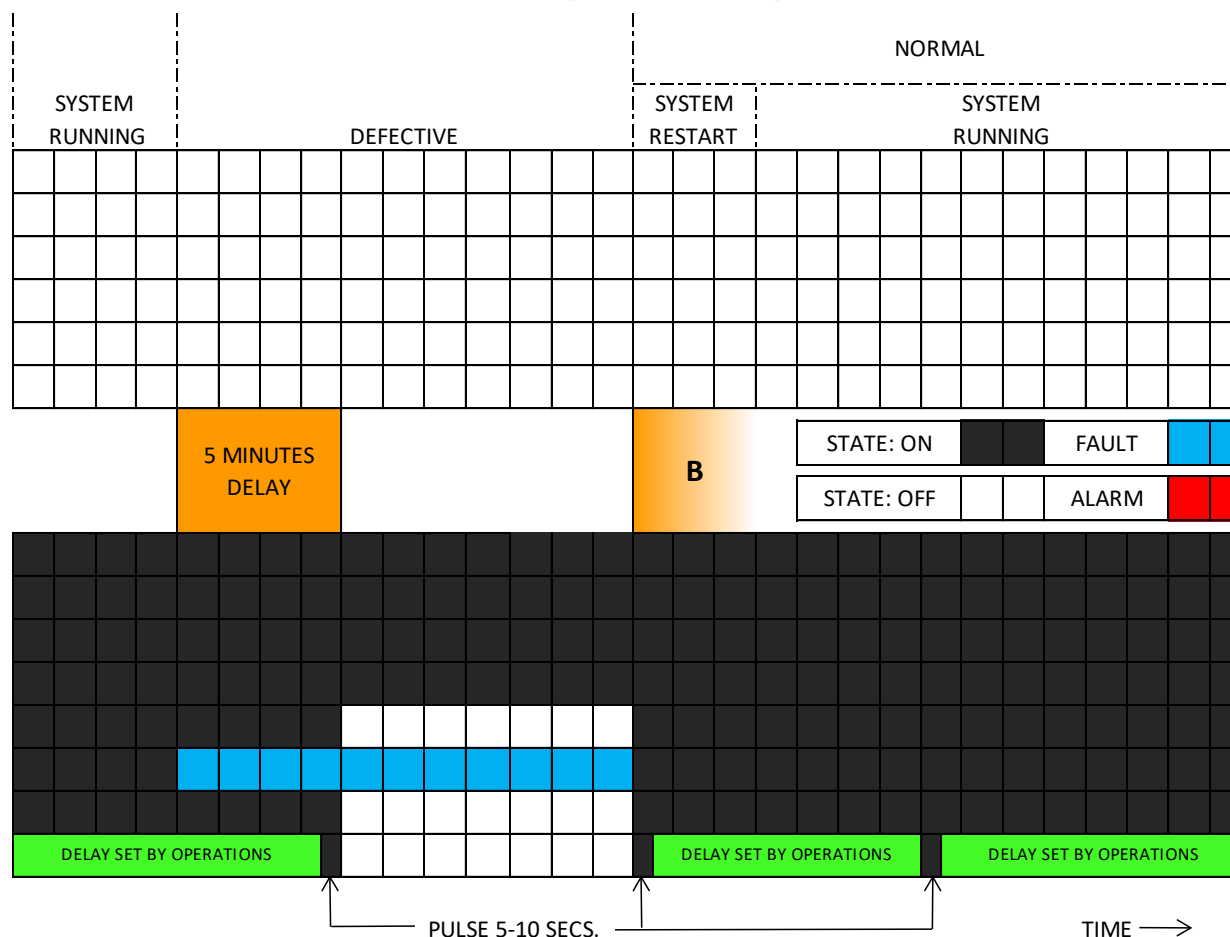
DEFECTIVE DOSING PUMP (MOTOR)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



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**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.

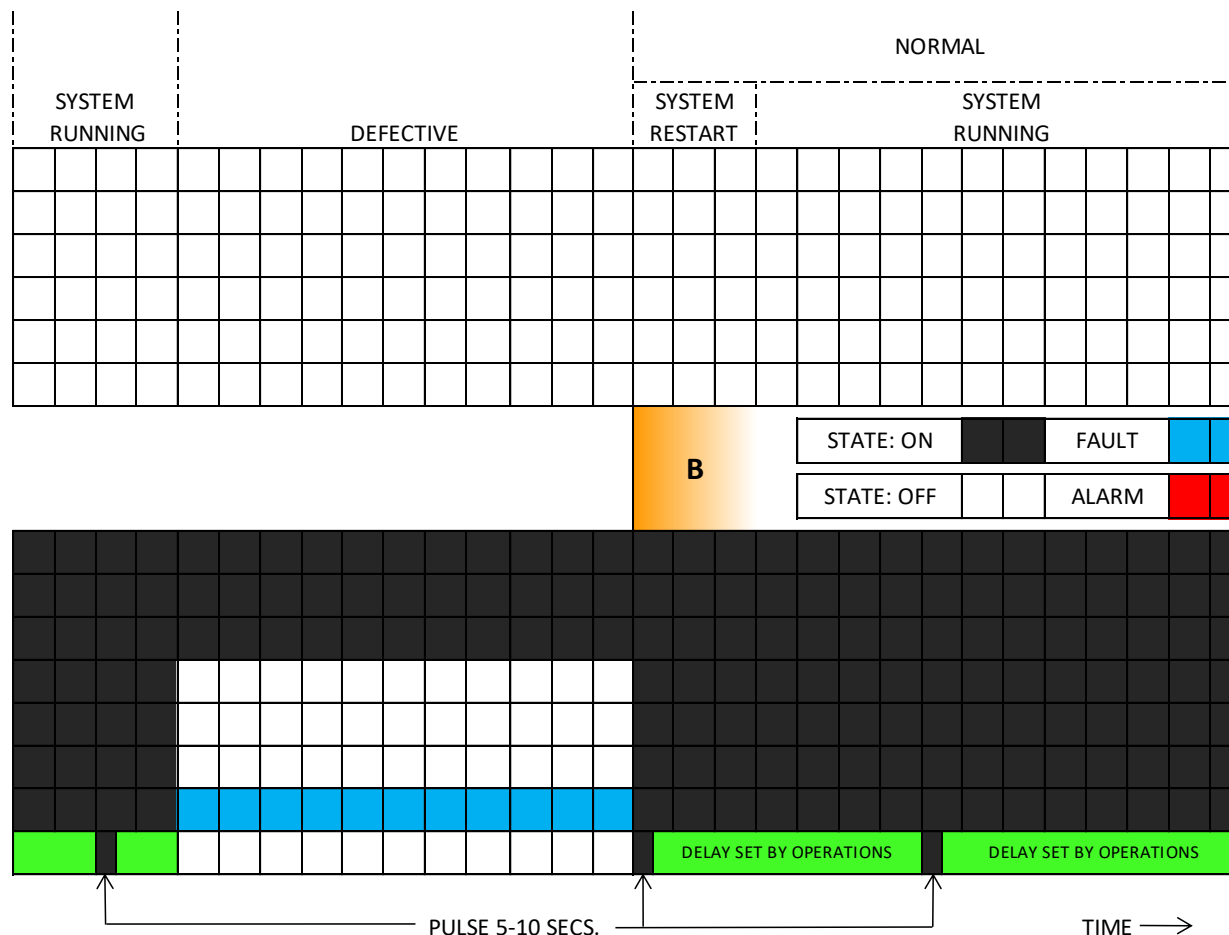
DEFECTIVE CLARIFIED WATER PUMP (MOTOR)

MEASURING INSTRUMENTS

FEED CHEST LEVEL ALARM
 FLOTATION UNIT HIGH LEVEL ALARM
 FLOTATION UNIT LOW LEVEL ALARM
 FLOTATION UNIT LOW LOW LEVEL ALARM
 LOW PRESSURE ALARM (POSEIPUMP)
 LOW AIR SUPPLY PRESSURE

PROCESS CONTROL

POSEIPUMP
 PNEUMATIC BOX SOLENOID VALVE
 SLUDGE REMOVAL SYSTEM
 LEVEL CONTROL VALVE
 FEED PUMP / FEED CONTROL VALVE
 DOSING PUMPS
 CLARIFIED WATER PUMP
 DRAIN VALVES



NOTE: *PNEUMATIC BOX SOLENOID VALVE IS NOT OPEN IF THERE IS NO OR LOW PRESSURE (≥ 60 PSI) AT THE DISCHARGE OF THE POSEIPUMP.

**SLUDGE REMOVAL SYSTEM INCLUDES THICKENER AND SCRAPER.

SECTION 13 – START UP PARAMETERS

Start-up parameters check list

PPM™ Flotation Unit Model PPM 700-E

PARAMETERS	SYSTEM	SETTINGS	COMMENTS
RECIRCULATION SYSTEM			
Recirculation pressure	Release valve	85-105 PSIG	Pressure under 80 PSIG may overload the pump's motor
Air flow	Rotameter	133-148 scfh	Do not exceed the recommended flow
Air pressure	Air regulator	70 PSIG	Do not exceed the recommended pressure
Bleed line	Bleed valve	Open	Small water flow should come out
Low air pressure	Air pressure transmitter	60 PSIG	To insure adequate air supply pressure
Air counter pressure	Back pressure valve	50 PSIG	Factory adjusted
REMOVAL OF FLOATING AND SETTLING SOLIDS			
Sludge removal	Sludge removal system	Optimum speed to obtain a thick sludge mat	The speed is adjusted as function of the solid loading
Settling solids removal	Drain valves	Opens every 2 hours for 5-10 secs.	Solid build up can occur if the drain frequency is not appropriate
FLOTATION UNIT			
Level set point	Automatic control valve	Adjust the water level to the bottom of the sludge removal beach	Optimum level in order to obtain a thick sludge mat
Inlet flow	Flow meter	Maximum 3000 usgpm	The efficiency can be affected if the maximum capacity is exceeded
Inlet TSS concentration	Lab test	500-1000 ppm	The efficiency can be affected if the maximum capacity is exceeded
Inlet O&G concentration	Lab test	500-1000 ppm	The efficiency can be affected if the maximum capacity is exceeded