English

Installation, Operation and Maintenance Instructions

Hydra Weir Pump

NOV Mono®

One Company, Unlimited Solutions

MPA627

The Mono Hydra is a packaged weir wall wash system for final effluent tanks. It is a fully packaged system consisting of control panel, Mono Compact Range pump suction and delivery pipe work, in line filter and spray head assembly.
Water is taken from the weir pool and blasted at high pressure against the weir wall and edge, effectively removing weeds, moss and algae bloom. Continual use prevents re-growth and keeps the weir operating at it's full capacity. The Hydra's intelligent control system operates more frequently during summer months, when algae growth is most troublesome, and intermittently during winter months to conserve power and significantly reduce whole life costs and maintenance requirements.

The pump is fitted with a suction skimmer to reduce ingress of solid debris within the effluent which in turn is processed through an in line basket filter.

Figure 1

1.1 INSTALLATION

1.1.1 INSTALLATION & SAFETY RECOMMENDATIONS

In common with other items of process plant a pump must be installed correctly to ensure satisfactory and safe operation. The pump must also be maintained to a suitable standard. Following these recommendations will ensure that the safety of personnel and satisfactory operation of the pump is achieved.

1.2 GENERAL

When handling harmful or objectionable materials, adequate ventilation must be provided in order to disperse dangerous concentrations of vapours. It is recommended that wherever possible, Mono pumps should be installed with provision for adequate lighting, thus ensuring that effective maintenance can be carried out in satisfactory conditions. With certain product materials, a hosing down facility with adequate draining will simplify maintenance and prolong the life of pump components.

1.2.1 HANDLING

During installation and maintenance, attention must be paid to the safe handling of all items.

1.2.2 STORAGE AND INFREQUENT OPERATION

The situation where a pump is used infrequently is also covered by the instructions in this section.

SHORT TERM STORAGE

Where a pump has to be stored for 6 months or less then the following steps are advised:-

1. Store pump inside wherever possible or if this is not feasible then provide protective covering. Do not allow moisture to collect around the pump.

2. Remove the drain plug, if fitted. Any inspection plates fitted should also be removed to ensure that the suction housing can drain and dry completely.

3. Loosen the packed gland and inject sufficient grease into the stuffing box. Tighten the gland nut hand tight. If a water flush system is to be used do not grease, a small amount of light oil is recommended for these.

4. See Manufacturers Instructions for motor/ gearbox/drive instructions for storage procedures.

LONG TERM STORAGE

If the pump is to be kept in storage for more than six months then in addition to the above the following procedures should be carried out regularly (every 2 - 3 weeks if possible):

1. If practicable rotate the pump at least three quarters of one revolution to avoid the rotor setting in the stator.

2. Note, however, that the pump is not to be rotated for more than two revolutions each time because damage could be caused to the rotor/ stator elements.

IMMEDIATELY PRIOR TO INSTALLATION AND STARTING

Before installing the pump please ensure that all plugs and inspection plates are replaced and that excess grease/oil is removed from the stuffing box.

1.3 ELECTRICAL

Electrical connection should only be made using equipment suitable for both rating and environment.

Where any doubts exist regarding the suitability of equipment, Mono Pumps Limited, should be consulted before proceeding. Normally the Mono pump should be installed with starting equipment arranged to give direct on line starting.

Earthing points will be provided on electric drives (if supplied) and it is essential that these are correctly connected. When the motor is being wired and checked for rotation, the start/stop sequence must be instantaneous to prevent dry running (see 2) or pressurising upstream equipment. (Check direction arrow on pump nameplate).

The electrical installation should include appropriate isolating equipment to ensure that the pump unit is safe to work on.

1.4 OVER PRESSURE PROTECTION

It is recommended that a suitable safety device is installed on the discharge side of the pump to prevent over-pressurisation of the system.

IMPORTANT

The pump must never run against a closed inlet or outlet valve, as this could result in mechanical failure.

1.5 GENERAL SAFETY

GREAT CARE MUST BE TAKEN TO PROTECT ALL ELECTRICAL EQUIPMENT FROM SPLASHING WHEN HOSING DOWN. WHERE MONO PUMPS LIMITED HAVE SUPPLIED A BARESHAFT PUMP THE ONUS IS ON THE USER TO FIT ADEQUATE GUARDS IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT REGULATIONS.

All nuts and bolts, securing flanges and base mounting fixtures must be checked for tightness before operation. To eliminate vibration, the pump must be correctly aligned with the drive unit, and all guards must be securely fixed in position.

When commissioning the plant, all joints in the system must be checked thoroughly for leakage. If, when starting, the pump does not appear to operate correctly (see 2), the plant must be shut down immediately and the cause of the malfunction established before operations are recommenced. It is recommended that depending upon plant system operation, either a combined vacuum and pressure gauge, or a vacuum gauge only be fitted to the pump inlet port, and a pressure gauge fitted to the outlet port, these will then continuously monitor the pump operating conditions.

1.6 DUTY CONDITIONS

Pumps should only be installed on duties for which Mono Pumps Limited have specified the materials of construction, flow rates, pressure, temperature, speed etc. Where dangerous materials are to be pumped, consideration must be given to the safe discharge from relief valves, gland drains etc.

IF THE DUTY SHOULD BE CHANGED, MONO PUMPS LIMITED SHOULD BE CONTACTED AND THEIR RECOMMENDATIONS SOUGHT IN THE INTEREST OF APPLICATION, SAFETY OF PLANT, EFFICIENCY AND PUMP LIFE.

Pump	Compact Pump C1XK Positive Displacement Pump Flow Rate Max 100 l/min Max head 6 bar Operating pressure 4.5 bar
Drive	Helical Geardrive 411 rpm
Motor	1.5kW 400V/3ph/50Hz B5 4 pole 1450rpm IP55 Eff1 motor c/w 110V heater
Suction Skimmer	316 Stainless Steel
Suction Pipe work	316 Stainless Steel 1” NB
Filter	Simplex Cast Iron Ports Rc 1” 316 Stainless Steel Basket, 20 mesh (0.91mm)
Over Pressure Protection	Pressure Switch 2”NB PN16 Flange Set at 6 bar
Delivery Pipe Work	316 Stainless Steel
Spray Manifold	316 Stainless Steel and 32mm MDPE
Spray Guard	316 Stainless Steel Cover and PVC skirts
Nozzle	7-off Brass Tongue Type
Pipe Work Supports	316 Stainless Steel rubber lined pipe clamps
Controls	IP55 Single Compartment - Manual / Auto (timed) Starter See panel Specification
Electrical	16A MCB Type B mounted at source of supply Power cables 2.5mm SWA Control Cables 1.5mm SWA
Insulation	Thermal protective jacket to Pump, local delivery pipe work and basket filter

A Mono Compact range progressive cavity pump lifts final effluent from the FST and directs flow via a filter to a high pressure manifold where tongue nozzles direct the fan flow at high velocity onto the weir wall and notch plate to clear residual algae and prevent further build up.

The pump will be mounted onto bridge walkway with power taken from a suitable point of supply from existing bridge controls. The pump suction line is fitted with a suction skimmer to reduce the amount of residual surface and rising solids (floc) being drawn into the system and thus reducing the load on the delivery line basket filter.

The Control panel allows manual and timed automatic operation reducing operator interface to intermittent cleaning of the basket filter once a month.

The delivery pipe work will be mounted to the bridge structure directing flow to the discharge manifold.

To be read in conjunction with Typical Arrangement Drawings, see Appendix A.

3.1 Mechanical

Installation should be carried out by suitably qualified and competent mechanical engineers whilst utilising the following recommended tools and specialist PPE as follows;

Tool List
Pipe threader 1”
Mag Drill and Drill bits 11mm
Hand Drill
Holes Saw 36mm
Stilson wrenches 24” x 2
Adjustable Spanner 18”
Angle Grinder / chop saw

PPE – non standard
Personal floatation device
Harness and lanyard c/w scaffold hook

3.1.1 Pump
The pump is to be fitted direct to the bridge walkway.

Figure 2.

3.1.2 Suction Pipe Work
The suction pipe work should be assembled in accordance with 99B14011 and fixed to pump suction flange ensuring that the ‘skimmer plate’ protrudes by approx 25mm above the top water level. Fit a pipe support bracket to the bridge structure.

3.1.2 Delivery Pipe Work.
The delivery pipe work should be assembled in accordance with the Delivery Pipe Drg. No. 99B14011 ensuring that horizontal runs are secured at maximum 1m intervals and at least one fixing on the vertical leg to ensure that the pipe work is stable.

3.1.3 Insulation
Fit the insulation jacket around the pump first section of delivery pipe work and filter body.

3.1.4 Spray Head
This is to be connected to the delivery pipe work with a union to afford removal for maintenance. It will normally consist of two spray bars see Typical Spray Bar Assembly drawing No. 99B14011

Each spray assembly will be configured to suit the individual weir wall arrangement. The first has three nozzles No’s 1 to be positioned centrally over the weir wall ‘V’ notch plate and No.’s 2 and 3 equally spaced over the weir wall top. Each nozzle is to be orientated at 5 degrees to the tank radius, see fig 4.

Figure 4 Typical only

The second will consist of four nozzles, No. 4 will act on the corner or chamfer of the weir wall with No’s 5, 6 and 7 equally spaced down the vertical wall.

Again these should be rotated at 5 degrees to the tank radius.

Nozzle tips are to be approximately 75 mm from the surface onto which they are acting or further to achieve full wash of the surface.

Ensure nozzle spray fans overlap to obtain complete wall wash.

Ensure sprays fans do not interfere with each other as this will reduce / nullify cleaning.

3.1.5 Spray Guard
Assemble in accordance with Spray Guard arrangement Drawing No. 80C04098
The spray guard cover is to be secured to the vertical pipe work leg utilising a 'long screw and four lock nuts see fig 5 with a union above for removal.

Ensure no protrusions from the Settlement tank structure, liquor discharge trough or scum removal mechanism will interfere with the guard.

To accommodate irregularities in concentricity of the tank construction allow 50mm clearance for all horizontal dimensions and 25mm for all vertical dimensions.

Figure 5

Fit skirts, nominal 300mm wide strips overlapped by 50mm vertically from the guard lip utilising the pre-drilled holes and stainless steel clamping strips. Cut the plastic strips to lengths so that they are just above the weir wall height and normal channel water level. Profile the strip at the weir wall to suit, see fig 6

Figure 6

3.2 Electrical

Electrical installation should be carried out only by suitably qualified and competent electrical engineers in accordance with local regulations.

Suitably mount control panel adjacent to pump either on unistrut secured to handrail fig.7 or bolt directly to side of existing control panel.

Figure 7

Run cable on existing channel or secure 3" tray to lower hand rail.
Allow suitable cable coil for pump removal for maintenance.

Supply
415V / 3ph / 50 Hz
To be rated at 16A minimum

Cables Supply	2.5mm 4 core SWA, 3phases plus protective conductor.
Motor	2.5mm 4 core SWA, 3phases plus protective conductor.
Heater – motor	1.5mm 3 core SWA, Line, neutral plus protective conductor.
Pressure Switch	1.5mm 3 core SWA, Line, neutral plus protective conductor.
Pipe earth bond	10mm2 PVC green / yellow

3.3 Commissioning Checks

Test	Result
Motor connections	
Earth bonding complete	
Check motor phase to earth resistances using a 500V Megger, the resistance should be greater than 2MΩ	
Electrical test and inspect prior to power up	
Thermal Overload setting to pump 415 V / 3 ph / 50 Hz motor 1.5kW FLC 3.2A	
Clocks Set	
Running current and phase to phase voltages	
Running pressure	
Check spray fan coverage	
Check Sprays do not interfere with each other	
Check guard does not interfere with spray	
Run bridge full circle to check for guard / spray bar interference with structure and other equipment	

The unit can be operated continuously in hand or timed operation in auto.

4.1 Hand
With the hand / off / auto selector positioned in 'Hand', the wash pump will start on activation of the start push button. To stop activate the stop push button.

4.2 Auto
With the hand / off / auto selector positioned in 'Auto' the Hydra pump will start when the timer reaches its pre-programmed run time. On reaching the end of the run period the Hydra pump will stop.

The internal mounted timers will be set to run for 4 on/off periods per day. Summer and winter times will be set independently and automatically selected.

5.0 Maintenance

5.1 Filter cleaning
The in line filter should be removed every month and thoroughly cleaned.

5.1.1 Electrically isolate at control panel.

5.1.2 Loosen filter 'T'bolt ¼ of a turn and allow any residual pressure to bleed.

5.1.3 Once pressure has bled, fully loosen T bolt and swing yoke clear of cover.

5.1.4 Remove cover and filter basket.

5.1.5 Clean filter basket.

5.1.6 Refit filter basket, place squarely on basket seat ensuring handle is high enough to be compressed by the cover.

5.1.7 Inspect O-ring and seal surface, clean and replace as required.

5.1.8 Replace cover, swing yoke over cover and ensure full contact with the yoke stud. Tighten the centre T-bolt.

5.2 Electrical Maintenance
The system should be electrically inspected every twelve months to ensure compliance with local electrical regulations.

5.3 Pump Maintenance
To be carried out in accordance with Compact Pump O&M Instructions OMMP/032/.

5.3.1 Electrically isolate at control panel

5.3.2 Maintain in accordance with Compact Operating and Maintenance Manual.

5.3.3 Replacement is reverse of steps 5.3.1 to

5.4 Nozzle Removal
Access to the effluent spill channel is required, therefore ensure appropriate PPE is worn, recommend wellingtons, waterproofs and either safety harness or PFD.

5.4.1 Don safety harness or PFD and locate nozzle assembly, which will be mounted below bridge level but on the outside of the bridge.

5.4.2 Lift the spray guard flexible covers to access the spray head assembly. The nozzles can be removed utilising the appropriate spanner.

Check for damage or trapped debris and replace or clean as required.

6.0 Control Panel

Enclosure Mild Steel IP55 Single Compartment, finish Grey to RAL7032, bottom cable entry
400 h x 400 w x 210 d

Supply 400 V / 3 ph / 50 Hz 3 wire

Power 1.5kW Pump Drive
100VA Control

Control Voltage 110 V AC

Operation Duty only Hand / Auto

In Hand
With the hand / off / auto selector positioned in 'Hand', the Hydra pump will start on activation of the start push button. To stop activate the stop push button.

In Auto
With the hand / off / auto selector positioned in 'Auto' the Hydra pump will start when the timer reaches its pre-programmed run time. On reaching the end of the run period the Hydra pump will stop.

Auto Timer
The internal mounted timers will be set to run for 4 on/off periods per day. Summer and winter times will be set independently and automatically selected.

Auto Timer

Timer	Summer - Channel A		Winter - Channel B	
	ON	OFF	ON	OFF
1	06:00	08:00	06:00	07:00
2	12:00	14:00	12:00	13:00
3	18:00	20:00	18:00	19:00
4	00:00	02:00	00:00	02:00

Load Protection
With either Auto or Hand selected both thermal overload and over pressure circuits are active, if either trips the individual trip lamps will illuminate, reset via relevant push button.

1 - Mains Isolator 25A
3 – Control Fuses
1 – Heater fuse
1 – 100VA control transformer
1 – Contactor
1 – Thermal overload
1 – Control relay
1 – Time clock
1 - Thermostat
1 – Panel Heater

1 – Hand / off / auto selector switch
1 – Start push button
1 – Stop push button
1 – Reset push button – thermal overload
1 - Reset push button – over pressure
1 – Trip Lamp – thermal overload
1 – Trip lamp – over pressure

Terminals for connection of
Motor phases
Motor heater
Overpressure switch

7.0 Fault Finding

Fault finding should be carried out by suitably qualified personnel wearing appropriate PPE for the task in hand.

Fault	Problem	Action
Tramlines	Nozzles too close to wall	Reposition spray bar
	Nozzles too far apart	Reposition nozzles
	Nozzle sprays interfering	Re-orientate nozzles
	Blocked nozzle(s)	Clean out nozzles
Not cleaning	Nozzle too far from wall	Re position spray bar
	Nozzle blocked	Clean out nozzles
	Filter Blocked	Clean out filter
	Motor not turning	Check control panel
	Pump worn	Replace pump rotor and / or stator
	Pump not pumping	Check suction tube is below effluent surface
	Nozzle sprays interfering	Re-orientate nozzles
	Timer not set	Reset to instructions
	Timer / panel not set to Auto	Set timer / panel to auto
Nozzle Sprays poor	Filter dirty	Clean filter
	Damaged Nozzle	Replace nozzle
	Dirty Nozzle	Clean nozzle
Overload trip	Blockage	Clean filter / nozzles
	Motor fault	Electrically test motor
	Nozzle blockages	Clean out nozzles
	Motor overload	Check for nozzle blockages and relief valve operation Electrically test motor
Pump not running	Selector switch in off	Check selector switch
	Panel isolator off	Check isolator
	Short circuit protection operated	Check fuses / mcb
	No times in auto timers	Check timer programs
	Overload tripped	Reset overload
	No Power to Panel	Check supply fuses or mcb

7.0 Fault Finding cont.

Fault	Problem	Action
Tripping on over pressure	Nozzles and / or pipe work blocked	Clean pipe work and or nozzles
	Switch setting incorrect	Reset pressure switch valve
	Nozzle sprays interfering	Re-orientate nozzles
	Blocked nozzle(s)	Clean filter
Short circuit protection operates.	Motor fault	Electrically test motor
	Wiring fault	Electrically test wiring

Appendix A Drawing

Drawing No.	Description
99B14011 Sht 1	General Arrangement
99B14011 Sht 2	Isometric
99B14011 Sht 3	Pipe Work Assemblies
80C04098	Spray Guard Assembly
A2/C22800LK	Control Panel

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