40th FORSTER IRRIGATION Anniversary

FORSTER IRRIGATION

WATER SPECIALISTS.

Catalogue

WELCOME TO OUR CATALOGUE

40TH YEAR EDITION

We present the latest Forster Irrigation Catalogue, featuring our range of products and services for various irrigation needs. It also includes technical information to help optimize irrigation system design and operation, saving you money and enhancing performance.

This edition celebrates our 40th year of providing high-quality irrigation systems for sustainable development in Zimbabwe. We are excited to introduce a range of new products to our offerings. This includes our innovative line of reservoirs, which we are now manufacturing in-house with specialized equipment. These reservoirs range in capacity from 20,000 liters to 1.5 million liters, offering both affordability and durability. Additionally, we have begun directly importing our pumps, solar, and irrigation equipment from manufacturers, ensuring that we can provide the best possible prices to our customers.

SALES TEAM

Items can be purchased by visiting our shop front or through ordering via E-mail over the phone or Whatsapp.

The staff below will be able to attend to your specific needs:

SALES

CJ
Sales & Irrigation Support

Maria
Sales & Installers

Keith
Sales & Online Ordering

PROJECTS

Mgcini
Sales & NGO Projects

Trevor
Pivots & Water Storage

Ricky
Large Solar Pumps and Irrigation Schemes

Contact Details:

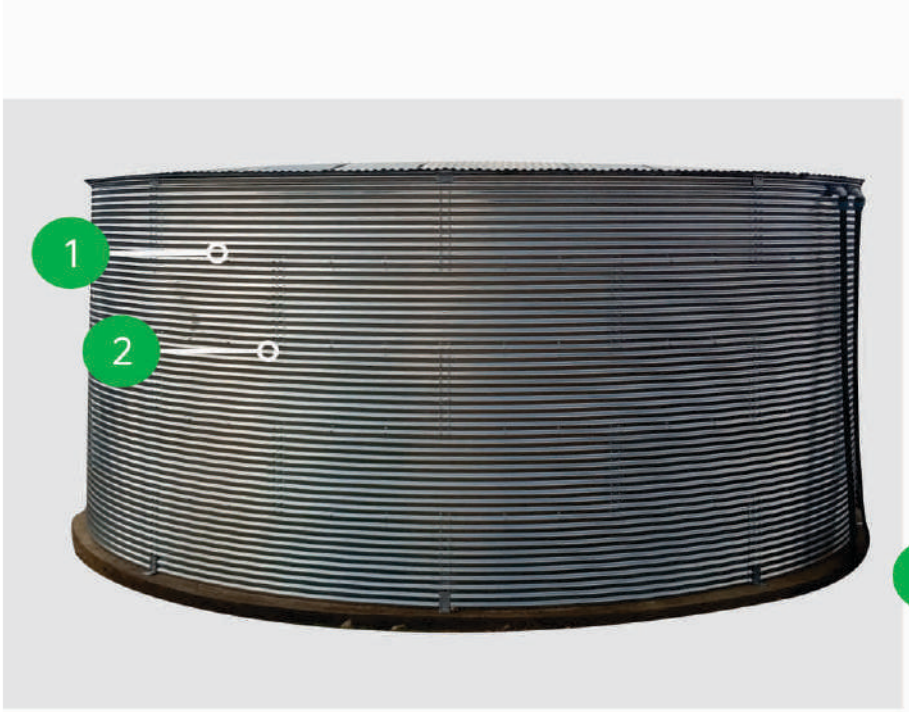
Address: 23 Josiah Chinamano Rd, Belmont, Bulawayo, Zimbabwe.

E-mail: sales1@forsterirrigation.com

Phone/Whasapp: +263782314403 or LL: +263292277704

CONTENTS

WATER RESERVOIRS



PRICELIST

Summary Capacity in kl (000's)	Size	No Roof with Agricultural Liner	With Roof and Drinking Water Liner
20	4m x 1,6mH	$ 1,100.00	$ 1,800.00
30	4m x 2,4mH	$ 1,550.00	$ 2,300.00
40	4m x 3.2mH		$ 2,750.00
45	6m x 1.6mH	$ 1,700.00	$ 2,800.00
65	6m x 2.4mH	$ 2,300.00	$ 3,700.00
90	6m x 3,2mH		$ 4,600.00
110	6m x 3,9mH		$ 5,200.00
130	6m x 4.6mH		$ 6,500.00
100	9m x 1.6mH	$ 3,000.00	
150	9m x 2.4mH	$ 4,100.00	$ 7,500.00
200	9m x 3.2mH	$ 5,300.00	$ 9,000.00
250	9m x 3.9mH		$ 10,500.00
270	12m x 2.4mH	$ 5,200.00	
350	12m x 3.3mH	$ 7,200.00	$ 12,400.00
440	12m x 3.9mH		$ 14,400.00
530	12m x 4.7mH		$ 17,500.00
700	17m x 3.2mH	$ 14,000.00	$ 27,000.00
890	17m x 3.9m		$ 31,000.00
1050	17m x 4.7mH		$ 37,000.00

FEATURES

1. Thick corrugated Galvanized sheet
2. Stretcher Bonded Joints for distributed strength.
3. Potable Reinforced Mesh PVC Liner.
4. Curved Square Tube Structural Support on top ring.
5. Cold Formed Steel Trusses.

Forster Irrigation proudly manufactures it's own range of Corrugated Steel Reservoirs. We offer a variety of sizes and can accommodate custom orders. Our tanks are designed for durability and quick assembly.

DRIP IRRIGATION

DESIGN CONSIDERATIONS

This is a highly controlled form of irrigation involving the delivery of water and fertilizer directly to individual plants through a pipe and pre-installed dripper.

Drip can be used very successfully on any crop but is most effective for crops such as Tomatoes, Paprika and Cabbages that require accurate water and fertilizer applications and have disease and pest issues with wet leaves.

1ha of drip requires an average of 45000 litre everyday. Hence, field sizes must be designed to match water availability.

FILTRATION REQUIREMENTS

If water comes from a borehole it must be filtered and if from a dam it must be sand disc filtered.

PRESSURE REQUIREMENTS

If gravity pressurized from a tank, the stand must be a minimum of 3 meters high for 1 ha and 5 meters high for any area greater than 1ha.

If pressurized by a pump, the pump must produce at least 2 bar pressure and pressure reducing valves installed to prevent excess pressure damaging the Drip lines.

BLOCK SIZING

A field should be designed so that at any time 1/6th of the field is being irrigated and 1/4 if supplied by solar pump.

PUMP/PIPE SIZING

Given block sizing above, the pump and pipe sizes must be designed to meet the flow requirement of the block. Flow required is calculated by first determining the length in meters of drip tape per block and then how many litres per meter the specific drip line you are using requires:

$$\textbf{Dripline length} = \frac{\text{Block size } m^2}{\text{Row Spacing}}$$

$$\frac{\text{Answer (Dripline length)}}{\text{Dripper Spacing (0.3m)}} \times \text{Dripper Flow Rate}$$

So a 1000m^2 Block, 1.5m row spacing with 30cm dripper spacing & 1l/h drippers needs:

$$\frac{1000}{1.5} \div 0.3 \times 1 = 2222 \text{ l/h}$$

The rule of thumb for pipe sizing is:

0-2000l/h = 40mm
2000-4000l/h = 50mm
4000-8000l/h = 63mm
8000-12000l/h = 75mm
12000-20000l/h = 90mm

Valves can be one size smaller than pipe eg 50mm pipe requires 1 ½" (40mm) valve.

DRIP IRRIGATION

INSTALLATION CONSIDERATIONS

IRRIGATION VALVES

Air valves will allow air into the system when its turned off and draining to prevent pipes being sucked flat and drippers from sucking in dirt. When the system is then turned on they release any air preventing airlocks or surges.

Put an air valve after the filter and at the highest point of the field. Also install one after the control valve before teeing off to the drip manifold.

Pressure Reducing Valves (PRV's) reduce the pressure to that of what the irrigation system requires despite of the upstream pressure, thus enhancing performance and preventing bursts.

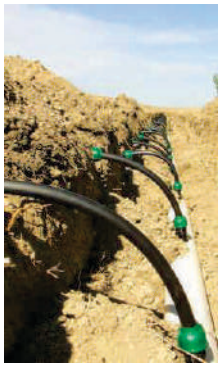
AIR VALVE

Pressure Reducing Valve (PRV)

DRIP MANIFOLD OPTIONS

If installing on a field that will be permanently used for drip, then bury a PVC pipe and use a lead out pipe. If you wish to move your fields around then use a poly pipe on the surface and connect directly.

Direct to Poly



Buried PVC

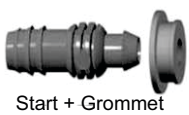
DRIP FITTINGS

Depending on your manifold pipe you will need a number of small fittings which we can help you select.

Quick start

Drip Valve

Universal



Start + Grommet

End Line

Lead to Drip

DRIP LAYING

Always lay the Dripline so the dripper is in the air so to prevent clogging. When first installing, flush every point prior to putting water through the drip and then leave the ends open for one minute. Flush every two weeks there after.

DRIPLINE RANGE

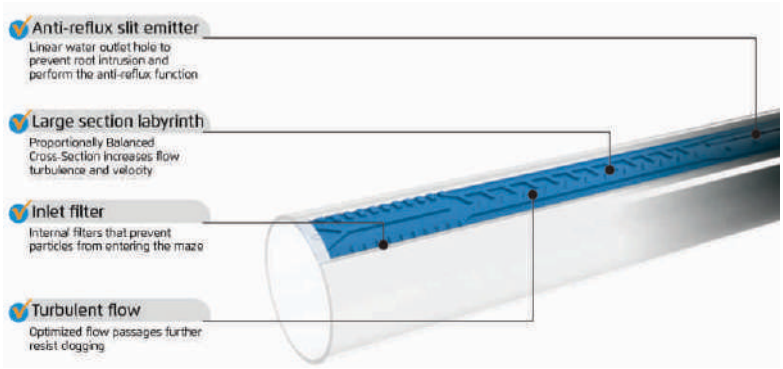
To cater to the requirements of the Zimbabwean drip irrigation market, we have conducted extensive product research and have developed a product offering that best suits your needs: Greenplains seamless labyrinth drip tape. This innovative constant tape offers several advantages over traditional drip lines with welded emitters.

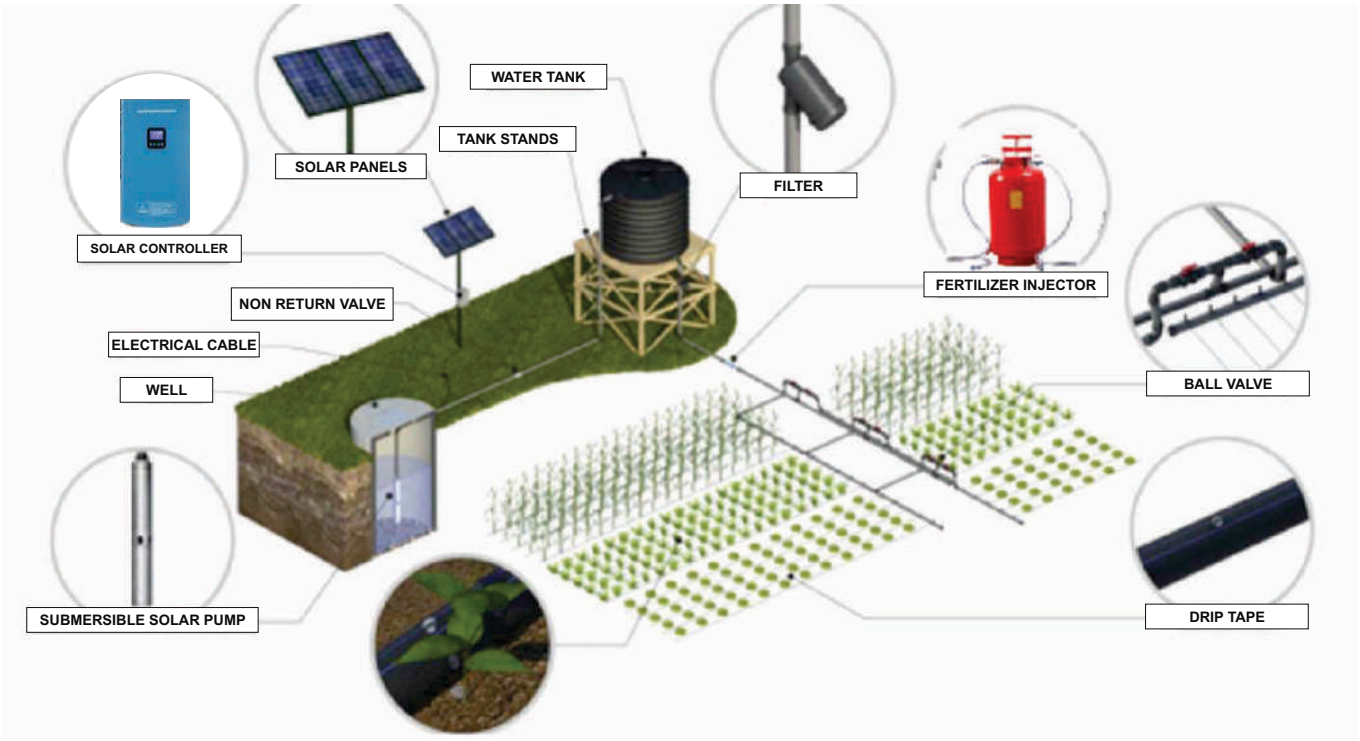
It features a larger filter and turbulent flow area, making it less susceptible to emitter blockages. The drippers are spaced every 10 cm, with only every third dripper open to provide a 30 cm spacing. Should you encounter blocked drippers, you can open another emitter, further extending the tape's lifespan. Our 1.25 l/hour emitters strike the perfect balance between sufficient crop irrigation in a short time and low-pressure loss, allowing for gravity feed from tanks and long runs of tape. We stock 0.2 mm and 0.3 mm thick tape, with the thickness choice generally based on your water and filtration quality.

WALL THICKNESS	DRIPPER FLOW	LENGTH
0.2mm	1.25 lph	2000m
0.2mm	1.25 lph	500m
0.3mm & 50cm spacing	1.25 lph	1500m
Plug In	4lph & 8.0 lph	N/A

SEAMLESS LABYRINTH DRIP TAPE - APOLLO

APOLLO drip tape can help you improve yield, water-use efficiency, and crop quality by putting water and fertilizer right where you need them.
Apollo Tape is the continuous labyrinth dripline ideal for low spacing between vegetable crops and flower cultivation.
The reduced distance between the drip points and the low flow rate guarantees excellent performance even on very sandy soil.





DRIP KITS

These are designed to be used from an elevated Tank

500m	Consists of 500m Dripline in two blocks with a 1inch filter, 32mm Polypipe.
1 Acre	Consists of 4000m of drip spaced 1m apart in four blocks with 50mm mainline, 40mm manifold and a 2" disc filter.
1 Hectare	Consists of 4 x 2000m rolls of dripline 1.25m spacing with access road for each of the four blocks.63mm mainline and 50mm manifold with a two bank 2" disc filter system.

DRIP MAINTENANCE

If using borehole water with high lime content, it is advisable to Inject 5L of phosphoric acid per ha weekly to prevent blockages. If drippers have already become blocked, they need to be treated with Hydrochloric acid, contact us for more info. If water is from a dam, chlorine treatment may be needed occasionally to flush algae.

Pre-Flushing ▶

SPRINKLER IRRIGATION

This form of irrigation applies an even application of water on the whole field whilst also making a cooling microclimate for crops but is not as water efficient as drip. There are 6 types of sprinkler irrigation we would recommend to suit your requirements.

1. MOVING QUICK COUPLING SPRINKLERS

This system is similar to the traditional aluminium sprinkler pipes but uses polypipe that is lighter and cheaper. This is the cheapest form of sprinkler irrigation but involves high labour costs with constantly moving pipes. It can also be used to germinate crops before using drip irrigation.

Suitable crops include: Lucerne, maize, wheat and lawn sports fields.

1Ha QC Sprinkler System Components:

2 x 2" to QC adaptor
2 x QC elbow
50mm QC Pipe HDPE
8 x Hydrants, Riser pipe 1.2m and sprinkler
1 x QC end cap

2. FIXED IRRI-STAND

This involves the installation of low flow sprinklers fed by 25mm polypipe permanently fixed for the duration of a season. This system provides a very uniform application of water with small droplets increasing germination. As it is fixed, there is little labour costs and irrigation frequencies are increased as pipes do not have to be moved.

Suitable crops include: Potatoes, Onions, Cabbage and Lettuce.

1Ha Irri-stand System Components:

Reduce to HDPE Pipe with end cap and Male adaptor to 2"

800m x 25mm LDPE Pipe

8 x sets of: 63 x 1" Saddle, 2 x 1" Nipples, 1" Valve, 1" Tee, 2 x 1" Swage nipple and 2 x 32mm hose clamps

64 x Sprinkler Stand, Sprinkler Spike & 1/2" Sprinkler

SPRINKLER IRRIGATION

3. DRAG HOSE SPRINKLERS

This is the use of a sprinkler on a tripod stand and a heavy duty drag line hose pipe. Different sprinklers can be used from low pressure wobblers with a 6m radius to a 6.5mm nozzle impact sprinkler with 20m radius. This is good for small areas but is not very uniform in application.

Suitable for: small scale farmers with small individual plots on a large scheme, back yard gardens and sports fields.

1Ha Drag Hose split in 6 blocks of 1600m2 for 6 Small Scale Farmers/Plots:

- 6 x 1.2m Tripod Sprinkler stand, Wobbler Sprinkler & 30m Draghose 20mm
- 12 x Sets of ¾" Geka hose fittings and 18 x 25mm hose clamps
- 6 x Sets of 3/4" Valve, , MF Elbow, Elbow and Galv Riser pipe 50cm and 32mm-3/4" HD Adaptor
- 3 sets of: 63 x 1" saddle, nipple, tee and 2 x 32mm -1" HD Adaptor
- 100m x 63mm HDPE pipe with end cap and Male adaptor to 2"
- 100m x 32mm HDPE pipe

4. MICRO SPRINKLERS OR MICROJET

Suitable for: Citrus, Pecans and Garden Beds.

There are 2 types of micro sprinklers:

Microjets that do a small radius of 2-3m installed along a permanent 20mm polypipe, these are perfect for citrus and residential gardens.

A new mini sprinkler called the **Rondo** can be used for orchards with larger tree spacing (eg Pecans) to apply a wider application with a radius of 8m.

These sprinklers are perfect for orchards where irrigation is only to be applied by trees root zones. As every orchard will have specific tree spacing there is no generic kit.

SPRINKLER IRRIGATION

5. PIVOT

This is a steel structure with a central fixed moves on wheels. This supplies an even and regular point that application of water with virtually no labour costs which makes it the perfect solution for large fields. We install Valley Centre Pivots who are the most premium brand available for seamless & hassle free operation which is vital when irrigating larger areas.

Suitable for: 12ha or bigger fields of Maize, Wheat, Soya, Lucerne and Potatoes

Recommended Pivot sizes: 12ha Towable, 20ha Fixed & 40ha Fixed.

6. POP-UP

Pop Ups are installed below ground level and when pressurised pop up and spray a pre-set section. They allow for customised irrigation patterns to suit irregular shaped gardens and allow for lawn mowers to move over them undisturbed and can be programmed to work automatically on a timer.

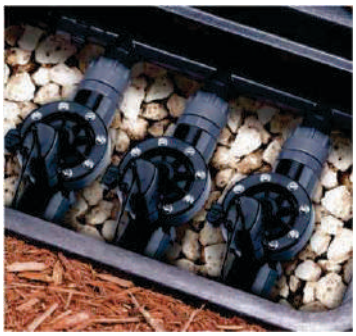
We recommend running 40mm or 50mm pipe to a central point and then putting a number of solenoid valves so that each valve commands max 7 pop ups which are connected using 25 and 32mm HDPE pipe and compression fittings that don't require clamps or glue.

Suitable for: Gardens and sports fields.

Pop Up items to be used:

6 station water computer & 1" Solenoid valves
HDMA 25 x 1" or 32 x 1"
HD Tees 25mm + 32mm: Plain, or ¾" & ½" threaded connection
HD Elbows 25mm + 32mm: Plain, or ¾" & ½" threaded connection
¾" Rotor Pop Up – 12m Radius approx. 650l/h
1/2 " Mini Rotor Pop Up – 9m Radius approx. 500l/h
½" Fan Pop up – 6m radius approx. 500l/h
*Due to higher application rate Fan popups should be on separate Valves with shorter irrigation cycles than the rotor pop ups.

▼ 1" Solenoid Valves:



¾" Rotor Pop Up:

25mm to ¾" FF Tee:

6 Station Water Computer

SPRINKLER IRRIGATION

Sprinkler name	Flow in lph	Radius throw (m)	Pressure Req (Bar)
Microjet c/w tube and peg, 360 & 180”	50	3	1.5
Wobbler ½”	650	6	1.2
427 Plastic Sprinkler ½” Adjustable	650	12	3
5022 Plastic Irristand Sprinkler ½”	650	12	2.5
5035 Plastic Field/QC Sprinkler 3/4”	1100	14	3
233 Naan Brass Field/QC Sprinkler ¾”	1300 - 3000	14 - 18	3.5
Big gun 1	3600	20 - 25	3 - 4
Big gun 1.5	16000	30 - 35	3 - 5

*The 233 comes with either a 4mm or a 6.5mm nozzle hence the 2 performance ranges.

Microjet c/w tube and peg

5022 Plastic Irristand Sprinkler ½”

Wobbler ½”

427 ½” Adjustable Plastic Sprinkler

Big gun 1"

Big gun 1.5"

5035 Plastic Field/QC Sprinkler ¾”

233 Brass Field/QC Sprinkler ¾”

FILTRATION & FERTIGATION

FILTRATION

Filtration is used in drip and sprinkler systems to prevent blockages in the emitters/nozzles and therefore prolong their life span and prevent drop in crop yields due to uneven application of irrigation (dry spots).

There are 2 forms of irrigation filtration, disc and sand. Disc filtration is best suited for inorganic materials such as stones and is used for borehole and clean surface water. Sand filters can filter this out as well as organic material such as algae and is used for drip irrigation with dirty surface water.

Filters have to be cleaned by back washing which can be done manually or with automatic valves, generally automatic backwash makes sense if the flow rate is over 100m³/h or the field is 10ha and bigger.

These filters do not remove particles in suspension such as calcium/lime which is prevalent in most boreholes.

It is difficult to prevent lime build up as water volumes make treatment with a softener prohibitively expensive and other forms of treatment are highly erratic. When using drip where there is high lime content you should use thin walled single or 2 season dripline, regularly fertigate with phosphoric acid and clean out with hydrochloric acid at the end of the season.

If you have surface water with a lot of iron then aeration is needed and possibly chloride if in really high quantities.

Filter Banks:	Max Flow Rate	Max Field Size	Automated
2 x 2" Disc Long	15	3ha	N
2 x 3" Disc Long	40	8ha	N
3 x 3" Double Disc	100	20ha	Y
2 x 3" Sand	50	10ha	Y
3 x 3" Sand	80	16ha	Y

Filters:	Max Flow Rate in m³/h
1" Screen Mini Filter	2.5
2" Disc Filter	8
2" Disc Filter - Long	25
3" Double Disc Filter	60

SAND FILTERS

DISC FILTER BANK

DISC FILTER

FILTRATION & FERTIGATION

Fertigation is the process of incorporating fertilizer into the irrigation system and directly to the plants.

This is a much more efficient form of applying fertilizer with much lower application costs, it is most efficiently done using drip irrigation but can also be done with Pivot irrigation. It allows for precision application of certain nutrients at certain stages of plant growth and can be adapted in real time to adapt to certain unforeseen changes in plant health.

For what specific fertilizers to use for your crop please contact an agronomist for a recipe that suits your soils and crop requirements.

There are 3 ways of Fertigating: Venturi, Fertilizer tank and Injection Pumps.

A **Venturi** is the most cost effective solution where a valve is throttled down creating a pressure differential which allows the Venturi on a tee bypass to suck in fertilizer solution from a open tank. (See diagram below).

This has a disadvantage in that it requires a lot of pressure to work and therefore can not be used for gravity systems and the higher pressure significantly increases pumping costs.

A **fertilizer tank** is a pressurised tank which is filled with a fertilizer solution that is slowly filled from the main line via a throttled valve and tee bypass and with the diluted solution going back into the main line so works in a similar way to the venturi.

However the pressure differential required is much smaller so can be used on gravity systems and doesn't require significant additional pressure when pumping.

If not managed correctly and the fertilizer tank is drained too quickly it will cause an uneven allocation of fertilizer into the field, with a trickle fill/empty rate set it is the most appropriate fertigation solution in Zimbabwe for fields smaller than 10ha.

An **Injection pump fertigator** is used for pivots as well as large scale drip and microjet projects.

It involves a separate non pressurised 5000l tank with a mixer where the fertilizer solution is added and then a small high pressure dosing pump injects the solution directly into the mainline at a set rate. It allows for an even distribution of fertilizer and there is no pressure loss in the main line but is the most expensive option hence why it is used on larger fields or in greenhouse projects requiring precision.

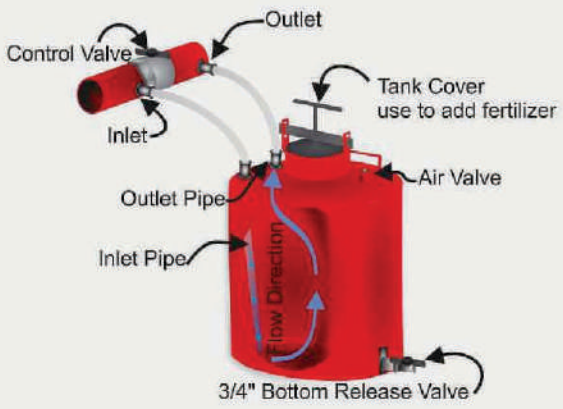
Apart from fertilizers some chemicals such as insecticides and herbicides can be applied again on advice from you agronomist.

Fertigatiors	Pressure Loss	Max Area
60l Fertilizer Tank	0.1 Bar	4ha
5000l Injector Pump	0	60ha

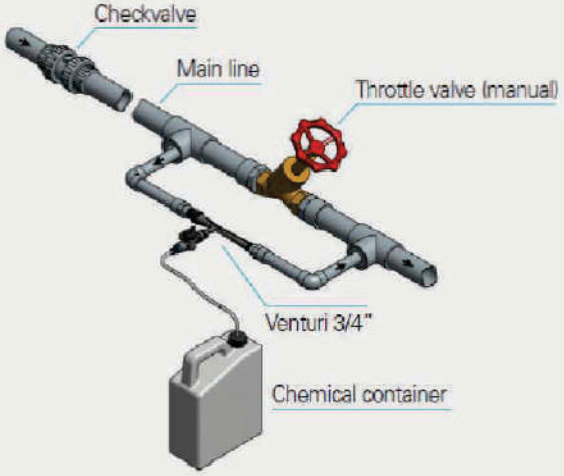
FILTRATION & FERTIGATION

Our mobile trailer mounter Fertigation and Chemigation unit for centre pivots made in our workshop.

FERTILIZER TANK



VENTURI

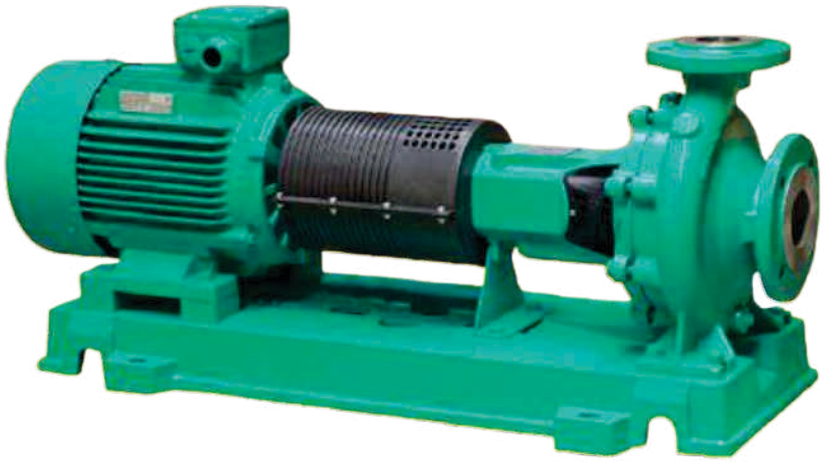


Our Pump range consists of submersible and booster pumps that can be powered by either ZESA, Generator or Solar depending on the controller selected. We stock a full range of pumps from 200w up to 30kw and then import to order anything bigger.

We use Aquastrong, DAB, Wilo and CRI pumps which are all reputable global brands which between them allow us to cater for any requirement.

We have a dedicated Technical Team that can give you support for any pumps we sell and can be contacted on our Technical Support Line +263785875119

WE HAVE A WORKSHOP, SPARES AND TESTING FACILITIES TO REPAIR ALL THE PUMPS WE SELL.



AQUASTRONG wilo CRI C.R.I. PUMPS Pumping trust. Worldwide.

TYPES OF PUMP

SUBMERSIBLE PUMPS

We have 34 different submersible pumps, 27 being 4” diameter pumps for normal boreholes and 7 being 6” dia high flow pumps for 180mm casing and larger boreholes.

The reason we have so many pumps is to allow you to get the most efficient pump for your specific system.

Submersible pumps can also be placed in tanks or dams but must go inside a bull horn flow sleeve or a floating platform with flow sleeve. We manufacture both to onsite specifications.

They are the best performing pumps when coupled to solar so it is recommended when using solar to always use a submersible where physically possible.

BOOSTER PUMPS

We have 3 small automatic and VSD booster pumps for domestic applications and 7 small irrigation pumps from 0.75kw up to 15kw. For anything larger we use big End Suction Pumps which we then pair to an appropriate electric motor.

Booster pumps are best for domestic application with frequent stop/starts and also for large scale lower pressure irrigation pumping from a tank or dam off Zesa.

**Please find Booster selection chart on pg20*

SUBMERSIBLE PUMP RANGE

WHY WE STOCK MANY DIFFERENT SUBMERSIBLE PUMP MODELS:

For each motor size we have between 3 and 5 different flow and pressure rated pump models. The differing performance of these pumps can be related to that of a vehicle gearbox.

A very high-pressure but low-flow pump with many close-fitting impellers can be compared to driving in first gear. This pump will allow you to draw small flows of water from very deep boreholes without having to use much power. Then on the other side of the range you will have a low-pressure, high-flow pump which has only a few open impellers, similar to driving in 5th gear. These will allow you to draw huge volumes for irrigation out of shallow boreholes or open water sources.

Eg a 0.75kw motor can have a high pressure pump which can do 1000l/h to 103meters or a high flow pump that can do 5000l/h to 29m head and use the same power. A one size fits all hardware pump will do 1000l to 75m head or 5000l to a 8m head.

WHY ITS IMPORTANT TO HAVE A SPECIALLY SELECTED SUBMERSIBLE PUMP FOR YOUR BOREHOLE:

A specially selected pump running at its maximum efficiency point (MEP) is likely to need a smaller motor and over its lifespan:

- Will have lower power costs up to 3 times the purchase cost of the pump itself as compared to using a “one size fits all” pump found in most hardware stores.
- A smaller motor requires smaller, less expensive cable
- On solar you can get more water daily and better cloudy day pumping with the same panel array compared to using the “one size fits all” type.
- Will last much longer as the bearings, bushes, impellers etc will be under less stress and the borehole is less likely to run dry and cause the motor to burn out.

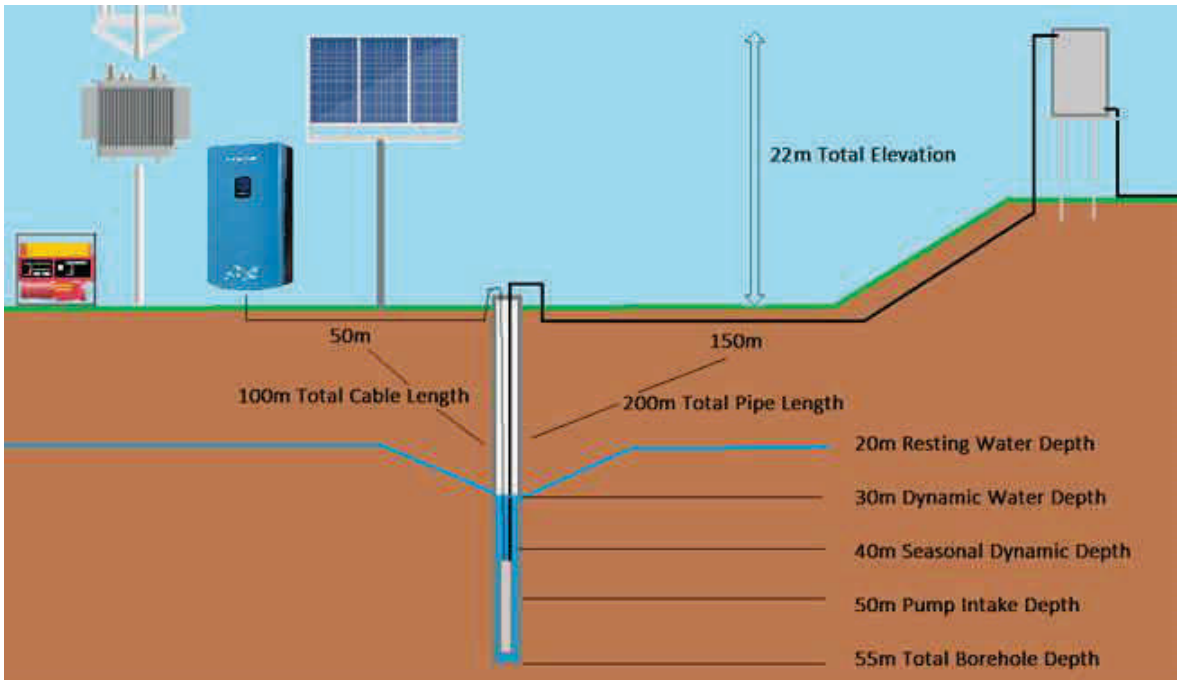
Due to these factors, our experienced sales and technical team calculate a number of factors to get the complete pumping system pump rather than inaccurately estimating what horsepower the pump will be.

SUBMERSIBLE PUMP SELECTION

HOW TO SELECT A SUBMERSIBLE PUMP SYSTEM AS PER ABOVE PAGES DON'T WORRY WE CAN DO THIS SELECTION FOR YOU!

1) Find the Yield and Dynamic (Pumped) water level of the borehole from a 6-hour pump test or from previous records
2) Calculate Sustainable Borehole Yield, which is 65% of the Yield if on ZESA or 75% if on Solar.
3) Add an extra 10m or so to the Dynamic (Pumped) Water Level to allow for seasonal drop
4) Select the pipe using the chart below which will give you the percent friction, multiply this by total length to get total pipe friction.
5) Add the estimated water depth with the calculated pipe friction and the elevation from borehole to the tank to get the total pressure requirement.
6) From this you can then select a pump from the chart below.
7) After selecting the pump you can select the cable size required given the total distance from power source to the pump.

Diagram:



SUBMERSIBLE PUMP SELECTION CHART

SUBMERSIBLE PUMPS

Is the edge of recommended operating limits | Zesa maximum efficiency point
Solar Maximum efficiency point and edge of Zesa Limit | Past Recom. Limits

Flow in m3/h:																					
Pump Model:	0	0.5	1	1.3	1.5	2	2.5	3	4	5	6	8	10	15	20	25	30	40	50	60	70
DC Solar 0.2kw	70	50	25																		
1/13 0.37kw	78	65	45	37																	
1/19 0.55kw	118	100	75	57																	
1/26 0.75kw	161	135	103	72																	
1/38 1.1kw	235	195	145	100																	
2/9 0.37kw	64				58	52	44	35													
2/12 0.55kw	85				77	69	60	47													
2/15 0.75kw	106				96	86	75	59													
2/21 1.1kw	149				135	119	108	82													
2/28 1.5kw	198				180	159	143	110													
2/37 2.2kw	260				230	195	180	136													
4/09 0.75kw	71							61	50	40	25										
4/14 1.1kw	99							85	70	55	35										
4/18 1.5kw	128							110	90	65	45										
4/24 2.2kw	170							146	120	90	60										
4/32 3kw	227							195	165	125	80										
8/12 1.5kw	76										57	50	30	6							
8/17 2.2kw	108										81	70	40	9							
8/23 3kw	146										109	90	50	12							
8/41 5.5kw	267										200	165	95	21							
16/12 3kw	66												50	41	28	8					
16/21 5.5kw	116												90	71	48	14					
6" SS17/13 7.5kw	142													114	77	50					
6" SS17/26 15kw	284													227	160	100					
6" SS30/08 7.5kw	92															70	61	33			
6" SS30/16 15kw	182															135	122	65			
6" SS60/04 7.5kw	56																		36	31	22
6" SS60/06 11kw	84																		55	47	32
6" SS60/08 15kw	112																		76	63	45

SELECTION CONTINUED

CABLE SELECTION CHART

Cable size in mm2

Cable Selection in max m	2.5	4	6	10	16
0.37kw 1ph 220v	200	320	480		
0.55kw 1ph 220v	130	220	320		
0.75kw 1ph 220v	100	170	250		
1.1kw 1ph 220v	70	120	180		
1.5kw 1ph 220v	60	90	130	230	
2.2kw 1ph 220v		60	90	150	230
3kw 3ph 380v	190	310	460		
5.5kw 3ph 380v	110	170	260	440	
7.5kw 3ph 380v		130	200	340	
15kw 3ph 380v			100	170	270

For Cable Selection:

Find out motor size and cable length and then find max allowable length
Eg if 100m and 1,1kw use 4mm2

For Pipe Selection:

Work out flow in m3/h, establish if your pipe is for which application:
in a borehole use red
0-500m in length use green
over 500m in length use blue
then select next higher number EG.
If pipe is 200m & flow = 3m3/h use 40mm

PIPE SELECTION CHART

Figures are flow in m3/h

Meters Friction/100m			
Pipe Size	1.5	3	5
25	0.6	0.8	1.1
32	1.3	1.9	2.4
40	2.3	3.4	4.5
50	4.2	6.2	8
63	8	11	14
75	12	17	23
90	21	29	39
110	35	50	66
160	100	140	185

SUBMERSIBLE SELECTION EXAMPLE:

- A Borehole is yield tested to 40m3/h & on solar the sustainable yield will be 75% = 3m3/h
- The dynamic water level is 30m so add 10m to give 40m
- Elevation to the tank is 22m.
- Piping is 200m long, 50m in BH & 150cm on the surface with the chart 40mm to be selected for both at 3m3/h. so friction is 7m ad 2.5m (5% x 50) is in the Borehole and 4.5m (3% x 150) is on the surface.

Total Head = 40m water depth + 22m Elevation + 7m friction = 69m Total

BOOSTER PUMPS SELECTION CHART

Booster Pump — is the edge of recommended operating limits — Zesa maximum efficiency point
Flow in m3/h: — Past Recommended Limits and will cause motor to overload

Pump Model:	0	0.5	1	1.3	1.5	2	2.5	3	4	5	6	9	12	15	20	25	30	40	50	60	75	100	140
Byo Pump 0.37kw Auto	30	23	18	14	11																		
Smart 3/45 0.75kw VSD	45	43	42	41	40	38	33	30	20	8													
Ecm 158 0.75kw	33		32	31	31	31	30	28	26	24	20												
25/160a 1.5kw Pop Up	48				47	46	45	44	42	39	35	10											
Smart 8/55 1.5kw VSD	55					50	48	46	43	40	37	27	16	9									
EGm1/a 0.75kw Drip	20							18	17	16	15	12	10	6									
EST32-160 3kw	35										34	33	31	35	28	20	15						
EST40-200 7.5kw	55													53	50	48	45	38	26				
EST50-250 15kw	68																65	63	61	58	49		
EST65-250 30kw	76																			75	73	65	54

MEASURES TO FURTHER PROTECT THE PUMP

CABLE SELECTION:

If your cable size is too small, you will encounter voltage drop where the motor receives a much lower voltage. This results in the motor drawing more amperage & power, increasing running costs and it makes the motor overheat. This may be minor at first and the motor will run fine but eventually the constant overheating will stress the ceramic seal and eventually it will disintegrate and allow water into the motor and it will burn out after a few weeks, if not sooner.

DRY RUN PROTECTION:

Our Full Protection DOL, VSD's and Solar Pump Inverters are all fitted with amperage detection dry run protection. As the borehole runs out of water it starts to pump air, which is easier, so the pump draws less power the controller detects this and turns the pump off. For boreholes where the risk of running dry is high a Stainless-Steel Borehole Float Switch can be installed. This slim mechanical switch will drop when the water drops below it and will turn off the pump. We do not use probes as they often cover with lime/iron and give inaccurate readings. ▶

Surge Protector

Stainless steel Borehole Switch

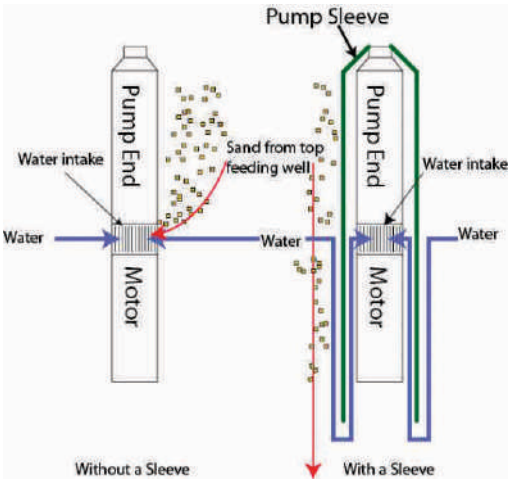
SURGE/LIGHTNING PROTECTION:

Zimbabwe has poor quality power which with lightning strikes can result in motors burning coupled out. We recommend the fitting of a surge protector which will also cut power when it is single phasing or outside the acceptable range. It will restart when power is back after a 1-minute delay.

SAND/MUD ENTERING THE PUMP:

Submersibles can pump a light amount of sand without much long-term damage, however if the content of sand goes too high or mud and pebbles fall into the borehole it can get the pump locked. All our controllers will turn off the pump to prevent the motor burning out on a locked pump. The constant pumping of debris will wear out the impellers, therefore in a high debris borehole a flow sleeve with a screen at the bottom is advised to be installed to prevent debris from entering the pump.

Sand/Mud Entering the Pump:



SOLAR PUMPS

We have vast experience with Solar Pumps having installed our first system over 10 years ago and since then have installed over 3000 solar pumps throughout Zimbabwe so have been able to fine-tune our products so that our complete system gives guaranteed high performance.

TYPES OF SOLAR PUMPS:

We use both traditional AC pumps with an inverter to run off solar panels and Direct DC pumps with special DC motors as both have benefits for certain cases.

For very small pumps, 36v DC pumps are used which only require a single solar panel and are very efficient for such a small size. For small pumps, 300w 36v (1 panel) and 750w,110v (3 panel) DC pumps are used which are very efficient and allow you to run with a small number of panels and they are not expensive. From 1.1kw and above we use normal AC pumps with a solar pump inverter. These are very reliable systems and allow use of both solar and AC power input. We also offer a 2.2kw 220v 3ph DC motor which is highly efficient and works well in cloudy weather, these are used in ultra-deep, low-flow boreholes and in water supply systems where water demand is constant. They couple to normal AC pumps 1.1, 1.5 and 2.2Kw in size.

We also offer a 2.2kw 220v 3ph DC motor which is highly efficient and works well in cloudy weather, these are used in ultra-deep, low-flow boreholes and in water supply systems where water demand is constant. They couple to normal AC pumps 1.1, 1.5 and 2.2Kw in size.

SOLAR INVERTER BRANDS:

Hober is our premium range which is an IP65 rated enclosure that has a custom made, easy to use screen with all the necessary protection mechanism and seamless hybrid functionality with a unit that can pre-start generators. We have installed over 2000 of these units throughout Zimbabwe including a 75kw installation. Should they be affected by a surge they have 3 separate boards that can be replaced separately and are held in stock.

Aquastrong has a great value for money inverter that is a normal VSD with some customisation and in a waterproof enclosure, this inverter is able to run both AC and DC motors.

HOBER

AQUASTRONG

SOLAR PUMP SELECTION AND SIZING

DAILY FLOW:

As an approximation, you should expect an average daily flow that equates to the same as 6 hours of full pumping. The pump should run for 8 hours, 4 at maximum speed and 4 at approx. half speed. So with our example of a 3000l an hour pump expect 18 000l a day.

PANEL ARRAY SIZING:

For panel array you should put 65% morepanel power then the pumps power except in boreholes deeper than 75m where 100% more is recommended. So for a 1.1kw you should put 1.1x 1.65 = 1815w of panels if shallower than 75m and 2200w if deeper.

PUMP SELECTION:

When selecting a solar pump, one should select a pump that makes a higher head and less flow then when selecting a ZESA pump, this allows it to still make the required pressure when pumping at half speed – see grey column in pump selection above. If this is not done and or panel size is too small, it will result in “dead pumping” where the pump is on and running but not generating enough pressure to get water out the borehole and into the tank and will burn out.

SHADING CONSIDERATIONS:

Shading of panels by trees and buildings has a bigger than expected effect on panel performance so site selection is critical, shading on the east of the panels when the inverter is starting up can cause it to turn on and then off repeatedly until the sun is past the shade. If unavoidable then the pumps timer must be set so that it starts up later in the day e.g 8.30am once the sun is clear.

THEFT PROOFING:

Theft of solar panels is a major issue, to this we have special rails with both internal anti-counter theft clips and external clamps with a special torque pattern socket. This makes removal of the panels a difficult process, in high risk sites we can make single pole stands 5m high to put panels out of reach.

SANDY BOREHOLE MITIGATION:

A solar pump takes 1 minute to reach top this can cause it to jam easier than an speed, immediate start up of an electric pump that often kicks out the debris. On installation, if you are noticing sand/debris being pumped out you should take additional precautions, our technical team can guide you through these.

SOLAR PANEL FRAMES

The Solar Panel Frame is now an important part of the solar pump system. This is particularly relevant with theft becoming the biggest threat to a solar pumping project and the huge reduction in the price of panels which has made the frame an increasingly large proportion of solar pumping system cost. We offer two frame types:

GALVANISED SOLAR STRUT FRAME:

The galvanised solar strut frame is made of specially designed sections for use as solar frames. These frames are used where there is good security or for large systems which are located inside an electric fence. It is well priced, designed to take high winds, has special anti-theft clips and is quick to install.

5M SINGLE POLE SOLAR FRAME:

This frame offers maximum protection against theft as well as vandalism from animals. A single large diameter pole is anchored in a concrete base. This frame requires pre-installation of $1m^3$ of concrete for the base and the steel materials are expensive so costs a lot more as well as requiring two installation trips.

SOLAR PUMP KITS

WE HAVE FOUR SOLAR PUMP KITS:

1) SMALL DOMESTIC KIT CONSISTING OF:

- 36V 200W DC Pump with 2 Pump options
- DC Controller & DC Isolator
- 1 x Solar Panel 600w on a 4m high pole
- Either 5000l/day at 40m or 20 000l/day to 12m
- Suitable for a household or irrigating close to a river.

2) DOMESTIC/ SMALL IRRIGATION PUMP CONSISTING OF:

- 0.75kw (1HP) AC Pump & Motor with 4 Pump options
- Hybrid Solar Inverter & Dc Isolator
- 3 x Solar Panel 600w
- From 5000l/day at 100m to 35 000l/day to 25m.

3) 1HA IRRIGATION PUMP CONSISTING OF:

- 1.5kw (2hp) Ac Pump & Motor with 5 Pump options
- Hybrid Solar Inverter & Dc Isolator
- 3600W of Solar Panels on a 3m frame
- From 20 000l/day at 100m to 75 000l/day to 25m

4) COMMERCIAL IRRIGATION PUMP CONSISTING OF:

- 7.5kw (10hp) AC Pump & Motor with 3 Pump options
- Hybrid Solar Inverter & DC Combiner Box
- 14 500W of Solar Panels on a 3m frame
- From 130 000l/day to 100m to 400 000l/day to 25m.

SOLAR PANELS:
600W bifacial

SOLAR INVERTERS:		
370W 36 VDC	750W AC Hober	110V DC AQUASTRONG
3.7 Kw AC Hober	2.2Kw AC & DC Aquastrong	
15Kv 380v AC Hober	7.5 Kw 380v AC Hober	37Kw 380v AC Hober

We also offer Ip65 DC Isolators, Combiner Boxes, MC 4 Connectors and Solar cable.

PUMP CONTROLLERS

For ZESA pumps we offer 2 Types of controllers made by Aquastrong to cover all requirements:

*We recommend the use of a Surge protector before these controllers.

FULL PROTECTION DOL ELECTRIC CONTROLLERS:

These are DOL (Direct online) starters which mean they go directly to full speed on starting up, drawing over 3 times the amount of power to start as compared to when running normally.

They come with an LCD display screen displaying voltage and amps and any errors are shown with a description of the error e.g. Motor overload, rather than a confusing error code number. This makes performance monitoring and fault finding very simple. The sealed cases are IP54 rated which prevents insect, water and dust damage which are the main causes of faults along with surge damage.

On 1phase we have a basic model that monitors amperage and voltage to protect from dry running, overloading and turns the pumps off when quality of power is poor. Then in both 1ph and 3ph we also have a model that performs the same task but also has terminals for float, borehole and pressure switches to turn the pump on and off automatically.

DOL Starter

VARIABLE SPEED DRIVES (VSD):

VSD's perform a variety of functions including the same motor protection and terminal inputs as the starters listed above. VSD's slowly ramp up the speed of the motor on start up so there is no spike in power so are suitable when using a generator or solar battery system.

VSD's, with a pressure transducer (sensor) connected can maintain a constant set pressure by changing the motor speed up or down depending on the flow rate which keeps the pressure at a required constant. The motor speed can also be adjusted manually to a fixed figure.

Both of these functions see a huge reduction in power consumption which can lead to the power saving being way more than the cost of the VSD. The slow start up allows much bigger pumps to run off much smaller generators and is much gentler on the pipes resulting in fewer leaks.

PUMP ACCESSORIES

There are certain items that are needed in conjunction with the pumps to ensure smooth operation. We stock all other items required for your pumping system:

CABLE

ROPE

BASE PLATE

LOCKABLE TOP

PRESSURE CONTROLLER

PRESSURE GAUGE

PRESSURE TANK

FLOAT SWITCH

SPECIALLY MANUFACTURED ITEMS

Our workshop can manufacture a range of items required for pumping systems and are made to order to specifically suit the project requirements:

PUMP BASES

PIPE WORK

FLOATING PLATFORMS

BULL HORNS

TANKS AND STANDS

We stock 1000, 2000 and 5000l Tanks. We also offer 10 000l Jojo tanks, for projects. We make 3,4 and 6m high stands for all tank sizes which are bolted together onsite and therefore do not take up much space when being transported.

VALVES

BALL VALVES

Ball valves are used as isolation valves, the low friction balls that don't require threaded spindles like the old style gate valves give a much longer life. They can also be easily checked if open or not by the position of the handle. We stock ½" up to 4".

PVC Plain ball valve

PVC Threaded ball valve

Ball valve chrome

HDPE Ball Valve

NON RETURN VALVES

Prevent any back flow of water so are used after every pump and along long pipelines as well as foot valves used at the end of suction pipes. Threaded fittings come from ½" to 4" and Wafer valves start at 4" up to 10".

Foot Valve

Spring Non-return

Wafer

GATE & BUTTERFLY VALVES

Are used for large bore Isolation and come in sizes 4" up to 10". Nowdays with VSD's with a slow start up there is little need for Gate Valves. **Water meters** record flows and are useful performance monitoring systems and come in ½" up to 8.

Gate valve

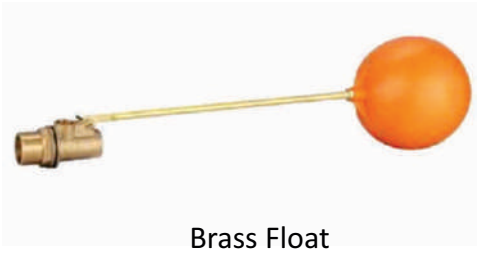
Butterfly valve

Water meter

VALVES

FLOAT VALVES

Are installed in tanks to prevent overflow, the Jooste Float is a special float that does not need any back pressure so are good for gravity systems such as cattle troughs. They come in 1, 1 1/4 and 1 ½" sizes. **Bibcock taps** are used for domestic applications and come in ½ and ¾" sizes.



Brass Float

Jooste Float

Bibcock Tap

AIR VALVES

Air Valves are used in long pipelines and irrigation systems to remove air when pressurised and let air in when under vacuum and in this way protect the pipeline. We offer 1" and 2" sizes.

PRESSURE REDUCING VALVES (PRV'S)

Are used in irrigation systems at the start of a block to reduce the pressure to a suitable range for the drip or Microjet system. This prevents bursts and allows an even application of water throughout the field and not only at the closest block. They come in 2, 3 and 4".

TURF HYDRANTS

Turf Hydrants are used in residential irrigation to connect hose pipes in a discreet manner and come in ¾".

PIPES & FITTINGS

HDPE COMPRESSION FITTINGS

We offer Compression fittings in all sizes from 20mm up to 110mm. These fittings are quick to install and require no glue so the system can be used instantly. It can be dismantled after installation similar to a union and can take a lot of tension especially in a borehole application.

Male adaptor

Coupling

Elbow

Tee

Reducing Coupling

End plug

Male Elbow

Flange Adaptor

HDPE & LDPE POLY PIPE

Poly pipe is becoming increasingly popular due to its durability, quick installation, being UV resistant, its ability to bend slightly and requires joins only every 100m.

We stock both LDPE and HDPE. HDPE we stock from 20mm up to 110mm in class 6 and class 10 as well as class 16 in 40mm and 50mm. HDPE is used for almost any piping requirement. LDPE is in 15mm, 20mm and 25mm class 3 and is used for irrigation purposes such as drip lead out pipe, microjet, Irristand and pop up sprinkler conveyance pipe.

PIPES & FITTINGS

LDPE INSERT FITTINGS

These low cost fittings are used for micro and sprinkler irrigation projects in conjunction with a hose clamp. Insert fittings come in 15, 20 & 25mm sizes. Insert Adaptors are a low cost method of connecting from the manifold pipe to LDPE without the need of a tee or saddle.


Male adaptor


Tee


End cap


Insert adaptor


Elbow


Reducing Coupling

DRAG HOSE & FITTINGS

We only use thick walled Dragline hose which is custom made for irrigation purposes and will have a long lifespan. We do both 20mm and 25mm. When using the hosepipe on a daily basis the best long term solution for connecting to taps and sprinkler stands is the Geka System which is a brass clamp and rubber that is quick to couple and decouple and is highly durable. We stock hose clamps ranging from 10mm up to 4 inch in size.


Click fittings


Hose clamp


Geka Hose connector


Geka threaded connector


Dragline Hose


Hose pipe

SADDLE CLAMP

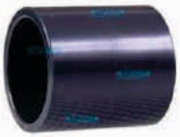
Saddles are the best way to join smaller pipes onto a main line. They are quick to install and represent the best value for money as opposed to using a tee. We stock from 25mm up to 250mm and in various thread sizes, we stock larger thread sizes which may mean you need a reducer.

PIPES & FITTINGS

These glued fittings connect to PVC pipes, they are much cheaper than compression fittings but need a few hours to dry. They come in sizes 20mm up to 250mm, traditionally PVC is better for large bore pipelines 75mm and above.

Male adaptor

Female adaptor



Coupling

Reducer

Tee

Threaded Tee

45 Degree Elbow

End cap

Elbow

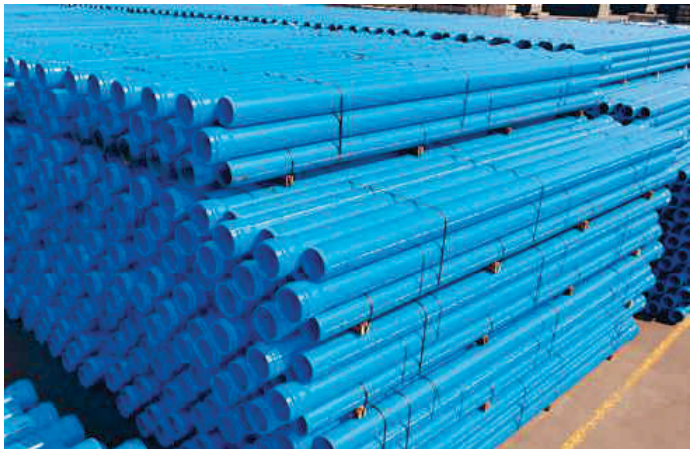
Threaded Elbow

Solvent Cement

Lubricant soap

PVC PIPES

These 6m lengths are perfect for large diameter long length pipelines and also for plumbing jobs where you do not want to take 100m of poly. They are not UV resistant so are suited to be buried or can be painted if above ground.



THREADED FITTINGS

We stock from 1/4 to 2" in a special aqualock PVC material and from 2.5 - 4" in galvanised.

Elbow

Male-Female Elbow

Swage Nipple

Endcap

Reducing bush

Reducing socket

Tee

Socket

Union

Barrel Nipple

Rising pipe

Screw on Flange

Weld on Flange

Threaded tape

STEEL FITTINGS

VJ COUPLINGS

These are adjustable fittings that can be tightened or loosened to fit the pipe you have, they don't require glue so can be used instantly. They come in a flange adaptor and plain repair couplings and are perfect for large bore piping. Sizes are 110,160, 200, 250 and 315mm.

Coupling

Adaptor

JIS FITTINGS

These fittings are mainly used in-house when welding steel pipe manifolds.

Elbow

Tee

Eccentric Reducer

Concentric Reducer

CAMLOCK

When wanting to connect and disconnect piping regularly with ease these are the correct fittings. They come in 2,3 and 4inch sizes and are threaded on one side. Made of Nylon and Aluminium they can withstand continuos use

Male

Coupling

CATTLE TROUGHS & TAP APRONS

We have shuttering to manufacture reinforced cast concrete drinking troughs that can withstand over 1000 head a day without cracking. We construct Tap aprons with sanitary soak aways for rural and urban settings.

FORSTER IRRIGATION

WATER SPECIALISTS.

CONTACT DETAILS

Address: 23 Josiah Chinamano Rd, Belmont, Bulawayo, Zimbabwe.

E-mail: sales1@forsterirrigation.com

Phone/Whasapp: +263782314403 or LL: +263292277704