The Volanta - Afripump: a cost-effective sustainable handpump

(No spare parts needed, user maintenance & low cost operation)

Technical Data

Water depth (meters)	10	30	50	80
Volume (liters/min)	22	20	17	12
(m3/hour)	1.3	1.2	1.0	0,7

Rising Main	PVC 70/80 mm, threaded or glued socket connections
Rods	Stainless steel 9 mm with M10 rolled-on threaded connection
Centralizers	Self lubricating, high impact Teflon centralizers
Main bearings	UCP 206 J – 30 mm. heavy duty bearings, maintenance free
Cylinder	Stainless steel A4, 53 / 57 - 1000 mm
Piston	Hydro lock; 38 cm long, no rubber seals, maintenance free
Handle	24 x 1100, with T-piece, counterweight & extension option
Stroke	18 cm maximal
Depth Range	1 – 100 m. with bottom support below 40 m.

*Every year in Africa alone, an estimated twenty thousand hand pumps are abandoned. Studies indicate that the actual lifetime of a standard donor handpump is only about 3 to 5 years due to **"lack of spare parts".** When these handpumps are replaced by similar pumps, the community soon finds itself again without safe water. Donors refer to these problem as the "the handpump crisis".*

*This also creates **a huge capital loss of millions of dollars per country per year** (average cost of a donor sponsored borehole with a handpump is about 10.000 US$). More and more, governments and the international donor community start to realize that the Millennium goals (to increase coverage and bridge the gap with 50 % by the year 2015) will never be achieved in this way and a new approach is urgently needed.*
*This document describes the "Volanta–Afripump", or in short: The **"Afripump" a spare parts free handpump**, which is in fact a modification of the proven Volanta handpump, but with a handle in stead of a flywheel.*

This new spare part free model has been awarded with a price for best cost-effective technological innovation on the recent 5th RWSN Forum in Accra, Ghana in November 2006, organized by the World Bank and SKAT.
It was therefore recommended that African countries should introduce this new technology as soon as possible.

The handpump problem

Each year, donors and governments spend millions of dollars to replace abandoned handpumps in rural communities. However, also these new handpumps will be abandoned within 3 to 5 years and soon new funding is needed to replace them. More and more, donors and governments start to realize that this handpump cycle needs to be solved; ***funding is not unlimited and could also better be used for other and more sustainable projects.***

Evaluations pointed out that pumping rods and PVC pipes break, bearings wear out, galvanized pipes rust and last but not least, the cylinder has regular problems with the wearing out of rubber piston seals and leaking footvalves. To make matters worse, for such cylinder repairs, all pipes must be taken out of the borehole which requires special tools and trained mechanics.

The functioning of a handpump is therefore dependent on spare parts and skilled expertise, but both are often not available. Therefore, handpumps are regular out of order and it may take weeks or months before repairs; finally, in a few years the handpump is abandoned and people have to go back to their traditional and unsafe water sources.

Water projects often train and help communities in the beginning to take care of the maintenance and donate spare parts for a while. However, donor organizations are moving out with time and users become responsibility for repairs, often when repairs become more complicated.

***Fig 1. Typical abandoned handpump**, abandoned within 3 years due to missing spare parts.*

In recent years, many governments standardized the types of handpumps and tried to set up various distribution systems for handpump spare parts through the private sector. However, it became clear that the private sector was not interested in selling handpump spare parts, because it is not a profitable activity on itself. A sustainable functioning spare part supply for handpump became therefore an illusion and the problems remained.

***The actual situation is alarming**: most handpumps are still abandoned within 5 years and so far there is still no adequate solution to make community handpumps sustainable. Governments and donors in developing countries continue to invest millions of dollars every year to replace abandoned handpumps. Therefore little funding is left to increase the coverage of rural water supply, as is required to fulfill the millennium targets in 2015.*
*In fact, if it wasn't for those ongoing and expensive rehabilitation projects, in most African countries the coverage of rural water supply is only going down with time. This is clearly a highly undesirable situation that needs a firm solution. In other words, **there is a high need for a reliable and simple to maintain handpump that is also not dependent on spare parts.***

*Fig. 2. The Afripump with a **locally made** blue box in South Angola, on a rehabilitated borehole.*

Introducing the Afripump
The Afripump is in fact not a completely new handpump, but a modification of the famous Volanta flywheel handpump, developed by Jansen Venneboer B.V. in the Netherlands. The Jansen Venneboer's Volanta handpump has a proven record since 1985 and is without any doubts the world most reliable handpump. It is not unusual to find a Volanta handpump that is functioning for more than 10 years without any maintenance. However, it was considered by some donors as rather expensive and not simple enough to be maintained by a rural community due to the flywheel arrangement with a pressure box.

Therefore the Afripump was designed as a simpler and cheaper alternative for the Volanta.

Maintenance aspects
The sub-surface part of the Volanta was already maintenance free. By changing the flywheel for a handle and integrating the T-piece in the stand, Jansen Venneboer designed a new handpump that needs no spare parts anymore. The new Afripump has no parts that need to be replaced to keep the pump going. This solves the main handpump operation problems for good.

Fig.3. The Afripump is a modified Volanta pump.
Over 10.000 Volanta are providing drinking water in many African countries since 1985. The Afripump is more simple and cheaper and has a handle in stead of a flywheel and is spare parts free.

The sub-surface components of both pumps are made of strong Boode PVC pipes (Ø 70/80 mm) with glued connections. The stainless steel pumping system is connected to stainless steel rod with threaded connections and lowered inside these PVC pipes to fit in a conical shaped seating. The strong heavy duty bearings do not wear out and have a predicted lifetime of 25+ years.

*Fig. 4. The **heavy duty bearings** of the Afripump handle are maintenance free with a 25+ year lifetime.*

Maintenance is limited to cleaning of the pump and platform, checking nuts & bolts, applying paint were necessary. All these simple activities can be done by local people with local available materials and require no special tools, equipment or training.

The Pumping System

The pumping system (pipes, rods & cylinder) of the Afripump is the same as the Volanta and is therefore also highly reliable and maintenance free.
The piston is 33 cm long and has no rubber seals, but works with a hydro-lock; pumping is therefore efficient and light and the piston is 100 % maintenance free.

Afripump installation options

There are basically two situations to use the Afripump:
1. to replace an abandoned handpump (rehabilitation)
2. to make a new water point in a new borehole

1. Rehabilitation of an abandoned handpump

To replace an old abandoned handpump with an Afripump is easy. After removing the old pump, a small elevated cement base is made for the 4 new anchor bolts to fix the Afripump. This elevated new base also avoids that spill water enters into the borehole. The small new base is made on top of the old base, see fig. 5.
After drying out of the cement, the blue box is fixed on the new anchor bolts and the PVC rising main (with glued sockets in this case) is lowered into the borehole casing with the security rope, no special tools or tripod is needed.
The rising main PVC pipes hang on a conical flange, see also fig. 5. A small T-piece that will guide the water into the sprout is fixed on the flange with 4 bolts. After the BPS is lowered into the rising main and the handle is attached to the rods, the Afripump is ready to use, one man can do the job.

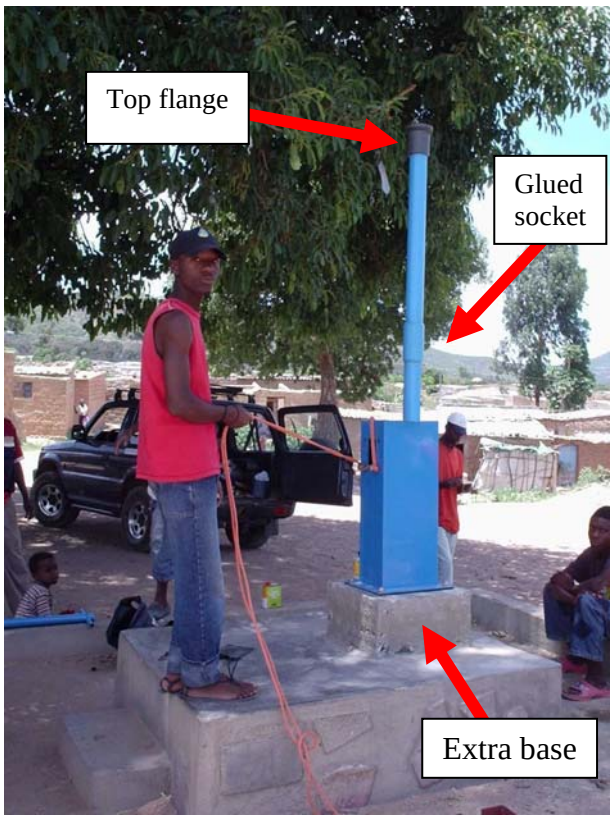

***Fig. 5. Easy installation** by one mechanic without special tools, note the security rope and the elevated cement base to fix the Afripump on the platform of the old abandoned handpump.*

In this case, the Afripump PVC pipes are threaded for fast and easy installation and come with a Boode filter screen and gravel pack if required. After installation of the PVC pipes, gravel pack and isolation, the cement base is completed with the 4 anchor bolts and the rest of the installation is the same as in option 1.

2. Making a new water point

The Afripump offers even more advantages in case of a new borehole. In fact, the installation becomes simpler, because the lower part of the rising main of the Afripump can also serve as casing of the borehole. Elimination of the expensive PVC borehole casing substantially lowers total costs and also logistics become simpler.

Deep water levels are not a problem anymore

Most standard handpumps fail to pump water from groundwater levels deeper than 40 m, or deliver only very small quantities of water and break down due to the extra weight of the water in the PVC pipes.
The new Afripump has no problem with deep water levels due to the special piston and quality materials. In case of rehabilitation below 50 m it is advised that the PVC pipes continue to the bottom of the well to support the weight of the rising mains (bottom support).
Optional is an extendable handle with a counter weight to compensate for the extra weight of the water and rods in the rising main.

***Fig. 6. Installation in a 130 m deep borehole** with a water level of 90 m deep; the PVC pipes continue until the bottom of the borehole.*

Operation & Maintenance (O&M)

Many studies show that a community handpump is best managed by one person only, who supervises the fetching of water and who organizes the maintenance and cleaning of the water point. The supervisor is usually appointed by the community and has an agreement with the local authorities to supervise the public water point for a small fee per month or per bucket of water. This extra income keeps the supervisor motivated for the job.
However, with many breakdowns and no spare parts, the sustainability of this service is problematic. Supervisors are often desperate looking for assistance to repair their pump, in order not to loose their additional income, while users are not happy with the unreliable service and become reluctant to pay.

Studies show that once a handpump is abandoned, it is difficult to re-establish the trust & motivation of the community and the supervisor to start all over again with the same type of pump.

Communities, supervisors and Governments are therefore happy with the new and reliable Afripump. With the Afripump sustainable community water supply becomes possible for a minimal contribution of the users.

Micro Credits & public-private water service

Because of its reliability and low cost operation, the new Afripump is especially suitable to be used to set up a commercial viable and sustainable water service. In case no other funding is available, a community or a supervisor can ask for a micro credit to replace an abandoned handpump by an Afripump and repay the loan with the selling of the water, which is explained by the following example:

Studies show that families in rural communities will agree to pay 1 to 3 US$ per month for a reliable water supply. One handpump can serve 25 to 50 families that need 125 to 250 buckets of 20 litres/day, which equals 3 to 6 hours of pumping. These families can raise a salary of 25 to 50 US$ per month for the supervisor, the remaining revenues will be sufficient to pay back the loan fully in 3 to 5 years.

Fig.7 Afripump = sustainable water supply *with a supervisor who collects users contributions to pay for his service and the depreciation of the pump.*

Governments welcome these local public–private arrangements and part-time water jobs. At the same time, a sustainable water supply in the community will increase overall well being and stimulate a stable economy, which will in turn create more financial income to sustain financially these water service.

Fig.8 Partial local production is possible; *a local metal workshop in Angola welcomes the extra business and can produce many Afripump parts.*

Local production

Local production of handpumps is always a welcomed option and increases ownership and the sustainability of the supply. Due to the use of many standard materials, like for instance a 3 mm metal plate for the blue box, the Afripump can be made from direct available materials.
Local production does not need a new factory or large investments, the Afripump is so simple that it can be made easily by a local metal workshop (see fig. 8). However, to make local production economical viable, a regular demand of at least 300 pumps per year should be guaranteed. Jansen Venneboer B.V. as a long term experience with helping to set up local production of handpumps in Africa.

How to start with the Afripump?

The Afripump can be ordered in any quantity directly from Jansen Venneboer B.V. in the Netherlands or from local representatives in Kenya, Tanzania, Mozambique, Angola, Namibia, Cameroon, Ivory Coast, Ghana, Burkina and Niger. Just indicate the number of pumps and average installation depth and you will receive directly a quotation, including shipping.

Dealer enquiries for other countries are welcomed. Training and advice on rural community water projects as well as local production of the Afripump is also available upon request.

For more information, contact:

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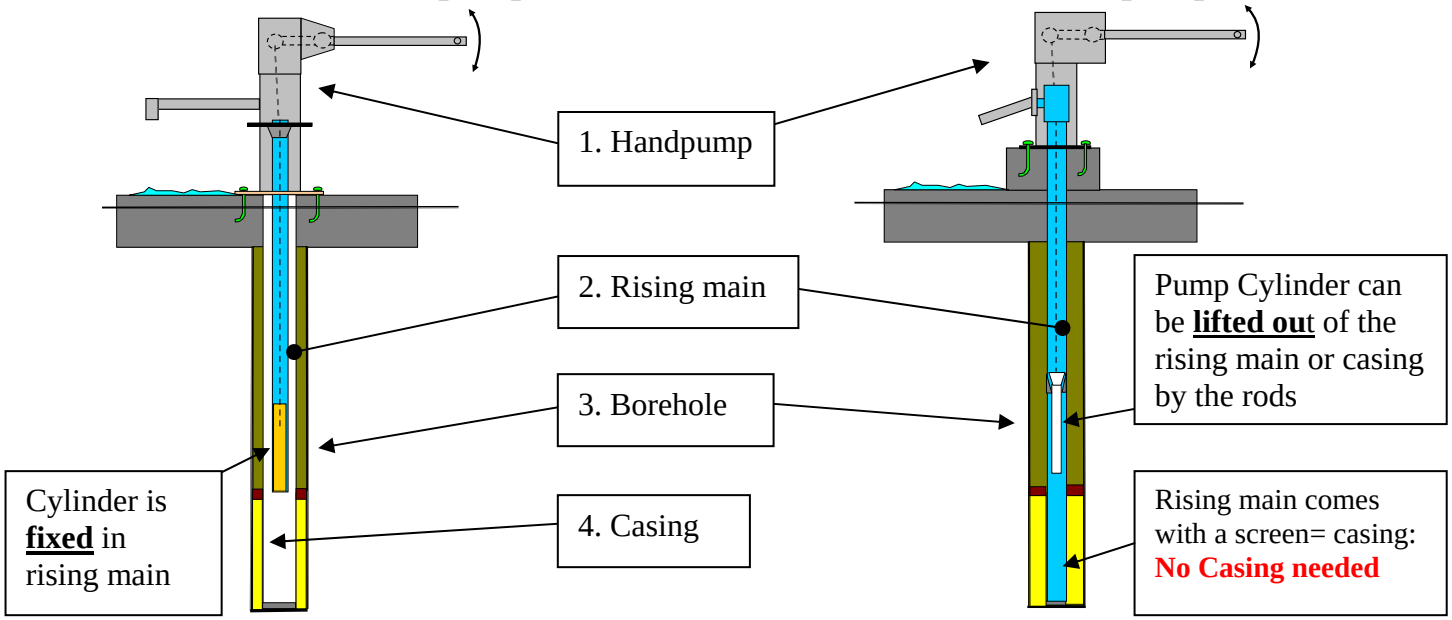
Standard "old" handpump

The new Afripump



Cost evaluation for a new waterpoint in a 70 m borehole, pump installation at 30 m

A. Standard handpump + borehole casing	B. Afripump, no borehole casing needed
1. Standard handpump ……..... 900,-	1. Afripump (local price)…….1.450,-
2. Rising main 30 m. ……..……..500,-	2. Rising main / casing 70 m. … 1.150,-
3. Drilling 6" (70 x $70/m) .....…4.900,-	3. Drilling 6" (70 x $70/m) ....…4.900,-
4. Borehole casing (70 x $30,-) ….2.100,-	***4. Borehole casing …….....0,-***
Total cost of water point $ 8.400,-	Total cost of water point $ 7.500,-
Lifetime << 5 years	Lifetime >> 25 years
Depreciation per year …..... $ 1.680,-	**Depreciation per year .....<< $ 300,-**
Investment per family >> $ 65,- / year	**Investment per family = << $ 12,- / year**
(based on 25 families per pump)	(based on 25 families per pump)
Sustainability aspects	***Sustainability aspects***
1. Pump last only 3 – 5 years	*1. Pump last >> 25 years*
*2. **Many spares needed** >> not reliable*	*2. **No spare parts needed** >> reliable*
3. Spare parts not locally available	*3. Maintenance materials locally available*
4. Many breakdowns >> costly operation	*4. No breakdown >> low cost operation*
5. Complicated installation	*5. Simple installation*
6. Expensive borehole casing needed	***6. No borehole casing needed***
7. Cylinder cannot be taken out	*7. Complete cylinder can be taken out*
8. Limited depth range << 40 m.	***8. No depth restriction up to 100 m.***
9. Airlift cleaning of borehole complicated	*9. Easy cleaning of borehole with airlift*
10. Spill water can enter in the borehole	*10. Spill water cannot enter in the borehole*

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