The Siwil pipe-lifting device

by Sibanda Zanamwe and Willem van Harderwijk

A portable, easy to use device could make local maintenance of Bushpumps a reality.

SINCE INDEPENDENCE Zimbabwe has been committed to improving the living conditions of people in the communal areas. One of the areas that was neglected by the previous rulers of the country was accessibility to potable water for the communities in the former Tribal Trust Lands. A programme to establish the needs and the best strategy to improve that situation was therefore undertaken, and a National Masterplan for Water was produced in 1985.

The strategy laid down in that document is the Integrated Interministerial Approach. This mouthful means that provision of water should not be seen as an isolated activity, but as one of the many activities needed to improve the health situation of the population in the communal lands, and as a result should not be implemented by a single ministry. The approach also foresaw a role for the programme in establishing more decentralized planning and implementation and a defined role for community mobilization and participation.

For the vast majority of people living in the communal lands the technology of choice, determined first and foremost by financial limitations, is boreholes on deep wells fitted with locally produced 'Bushpumps'. Out of a total of 40 000 needed, an estimated 15 000 have been realized so far. To maintain the growing number of supplies, a three tiered maintenance system was developed as part of the strategy of the NMW by the District Development Fund, a department of the Ministry of Local Government and one of the implementors of the Integrated Programme.

The three tiers are:

- *A waterpoint committee* This includes a pump caretaker trained for 'routine' maintenance, which is the maintenance of the superstructure of the pump (greasing and tightening of bolts) and of the fenced-in direct surroundings, including the standard concrete clothes-washing facility, cattle trough, spillway, and wastewater drain.
- *The pumpminder* A person selected from the area in which he will work, trained and equipped by DDF, who looks after all the maintenance needs of the 50 to 60 pumps in his area. His means of transport is a bicycle. The pumpminder is called upon by the community in the case of a breakdown and has access to a DDF spare parts depot.
- *The District Maintenance Team* A group of two or three people who are trained and equipped to help the pumpminder fix difficult breakdowns and supervise a group of pumpminders. The DMT has access to a truck, a tripod, and a winch.

This system has been in development since 1987. The final goal is to have the pumpminder in a position where he can maintain the pumps independently of the DMT. This would result in a significant cost-reduction over the earlier transport-intensive system, whereby the DMT had to perform all maintenance duties.

From the start of the three tiered system it became evident that the pumpminders would still have to rely on some input from the DMT, because he could not lift the underground pipes and rods from the deeper boreholes without a tripod and winch. This in turn could not be carried by bicycle. To overcome this limitation plans were made, and implementation had started, to erect so-called 'permanent sheerlegs': a steel or wooden pole construction of 3.5 to 4 metres high at each deep waterpoint. . Each pumpminder was to be given a winch or block and tackle, to be hooked to the structure to pull the pipes out of the borehole.

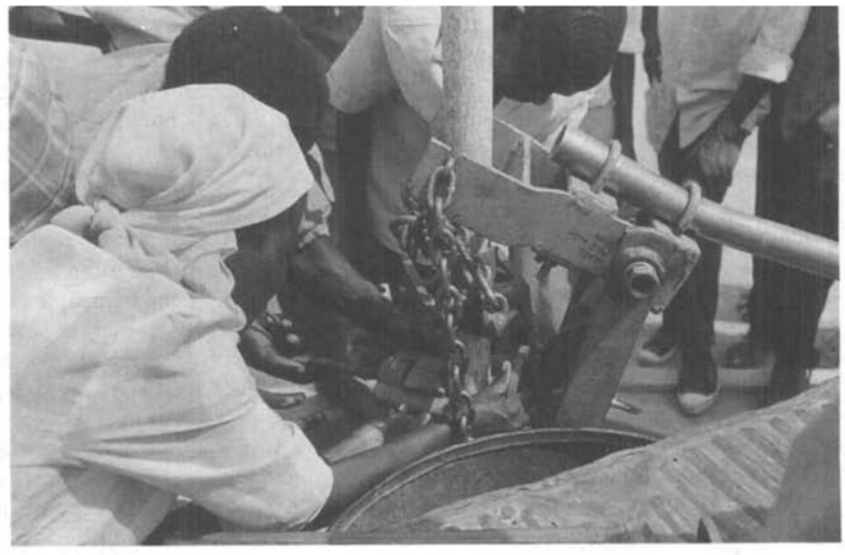
This was a possible solution, but erecting the permanent sheerlegs on the majority of boreholes in the country and providing imported block and tackle sets to all the pumpminders would have been rather expensive. The block and tackle would have been inefficient anyway, as the community would have had to collect them in scotchcarts.

Early 1990

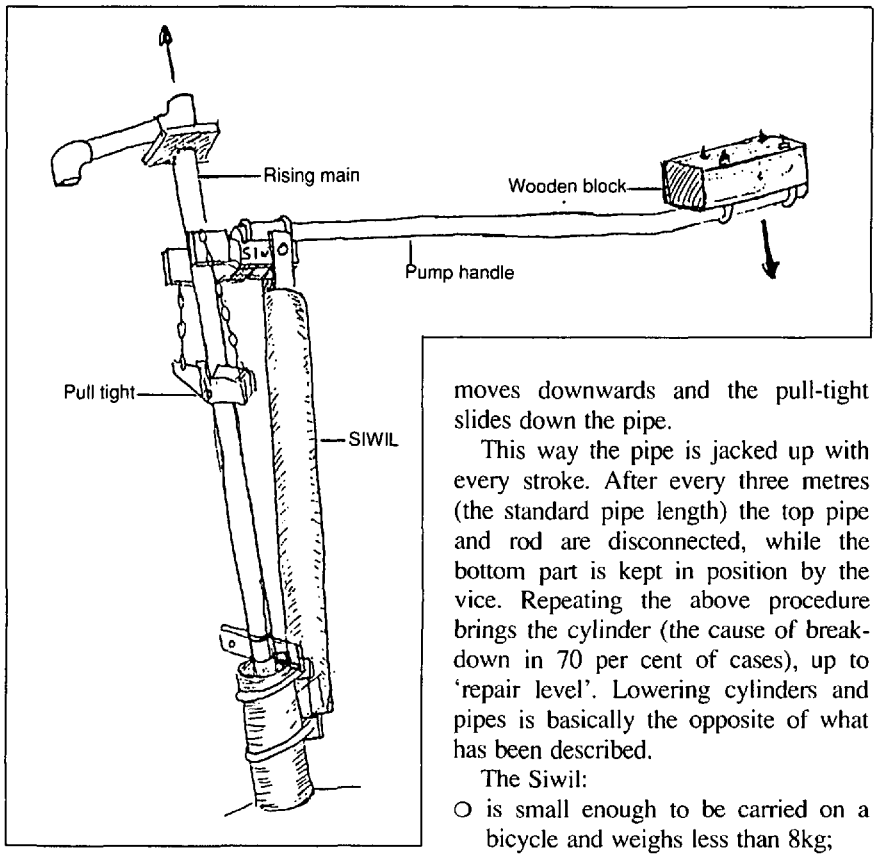
In Masvingo Province, one of the areas where tall trees are scarce and deep boreholes and ideas are plenty, the erection of the sheerlegs had hardly begun. Here it was decided to forgo the permanent sheerlegs, and to work instead on a more practical and less expensive solution.

The SIWIL was born. (And named after its two developers — SIbanda and WILlem!)

Those familiar with the Bushpump know what a robust structure it is. So what would be needed to turn this water-lifting and pipe-lifting device into a pipe-lowering one? The most characteristic and permanent feature of the Bushpump is the hard wooden block which functions as the hinge-point, and to which both the handle and the pumprod are connected. The wooden



Left: Hooking up the Siwil. Right: Raising a length of pipe.



block has proved over decades to be a simple, low cost, and locally available solution to transform muscle power into water pumping power, but the wooden block is right in the way if you want to pull the pipes out of the borehole.

Making use of the same hinge-point in the pumpstand, the same pump handle, and the tools already in the pumpminder's standard outfit, the SIWIL overcomes the obstruction of the wooden block.

Operation

The pumprod is disconnected from the wooden block, then the wooden block and pump handle are disconnected from the stand. The SIWIL is connected to the other side of the handle, leaving the wooden block as a counterweight, attached and placed in the same hinge-point of the pumpstand (see above).

The outlet part is disconnected from the casing cover and lifted by connecting it, via a chain (part of SIWIL) to the SIWIL, which is kept in its lowest position by raising the pump handle to its highest position).

The rising main is now exposed, and a pipe vice is placed just above the casing to hold the pipe in position. The pull-tight is placed above the pipe vice and connect to the SIWIL (again in the lowest position) via the chain. By lowering the pump handle, the SIWIL pulls up the pipe. After every stroke the pipe vice is lowered to the position just above the casing and tightened. When the handle is moved upwards, the SIWIL moves downwards and the pull-tight slides down the pipe.

This way the pipe is jacked up with every stroke. After every three metres (the standard pipe length) the top pipe and rod are disconnected, while the bottom part is kept in position by the vice. Repeating the above procedure brings the cylinder (the cause of breakdown in 70 per cent of cases), up to 'repair level'. Lowering cylinders and pipes is basically the opposite of what has been described.

The Siwil:

- is small enough to be carried on a bicycle and weighs less than 8kg;
- is inexpensive compared to other standard pumpminder equipment;
- does not require a permanent shareleg structure;
- enables the pumpminder to operate independent from the DMT, thereby reducing the transport cost of the maintenance system;
- works on all existing Bushpump modifications;
- is produced locally without any foreign components;
- is easy and safe to operate by two to three people;
- is quick to use compared with a block and tackle;
- reduces the pipe weight by a factor of 10 to 12 (depending on handle length). (500kg of pipe and rod is reduced to a handle pull-power of less than 50kg or 500N);
- opens the way for more prevention-oriented maintenance by the pumpminder (he always has the SIWIL with him); and
- makes community-based maintenance a much more feasible solution financially.

The Siwil has, through the DDF, been introduced into all the provinces in the country. Some small modifications have been made, mainly to overcome the poor quality of the locally available steel. An experimental community-based maintenance system is being tested and has been received by the local communities with great enthusiasm. With that the SIWIL proves to be not just another tool, but a tool that helps to maximize communities' self-determination.

Update

Since this article was first written a pilot project in two wards of Chivi District was undertaken, and it resulted, through village-level training workshops and toolsets, in 150 pumpusers becoming Bushpump mechanics — 60 per cent of them women. Another, further reaching effect of the project has been that it inspired new discussions in Zimbabwe about pump maintenance. Community-based maintenance is now, even in government circles, considered a feasible option. ●

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