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## **PSP in low cost shallow well drilling – The Mpigi experience**

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MPIGI DISTRICT COUNCIL (Uganda) has undertaken work to provide shallow wells (hand augered and hand dug) since 1994. The current Ugandan policy is one of decentralisation and privatisation of rural water source construction. It was into this environment that the “Low Cost Drilling Project” (LCDP) was introduced in 1998 to:

- develop a new low cost drilling technology (the Pounder Rig) which would be suitable drilling shallow wells in sub-Saharan Africa,
- arrange for its availability in Uganda and
- set up small-scale drilling operations through local private contractors.

In order to develop the equipment and stimulate local uptake of the rig within the existing rural water supply sector, a partnership between Mpigi District Local Government, the Directorate of Water Development's (DWD) Water and Environmental Sanitation (WES) Programme and Cranfield University was established in July 1999.

This paper outlines the background to the partnership and discusses the lessons which have been learned regarding the technical capability of the equipment as well as the opportunities and challenges for its future uptake by the Ugandan private sector.

### **Background**

Uganda is a land locked, agricultural country in the heart of East Africa with a population of about 21 million. Mpigi district, which is located in the southern part of the country along the shores of lake Victoria surrounds Kampala city and has a population of 1.1 million people. The rural and peri-urban communities in this district depend on springs, hand-dug or hand-augered wells, gravity flow schemes, boreholes, water holes, lakes and rivers for their water supply. There is considerable potential for shallow wells across most of the district, excluding the western semi-arid area.

Mpigi district was chosen as the location for the initial LCDP operations due to its proximity to the capital, varied hydrogeology and dedicated district staff.

The Water and Environmental Sanitation (WES) Improvement Programme supported by the Government of Uganda, UNICEF, SIDA, AVSI and other NGOs started in 1994. The Programme's intervention has protected springs, constructed hand dug and hand augered wells, gravity flow schemes and rehabilitated boreholes. During its six years of operation, the safe water coverage in Mpigi district has been raised from 8% to 50.5%.

The first year of the three year DFID funded LCDP involved technology development and preliminary testing of the rig. This was undertaken in the UK. The centre of gravity of the project shifted to Uganda in July 1999 with the first in-country field trials. Subsequently, additional funding to enhance the LCDP has been put in by DANIDA.

### **The pounder rig technology**

The Pounder Rig technology is based on the traditional Asian manual method known as ‘sludging’. This uses a lever to reciprocate a steel pipe in a water filled hole. The palm of the hand of one of the operators acts as a valve on the top of the pipe, causing the fluid in the hole to circulate up the pipe, carrying the cuttings to the surface. This method is suitable for the soft alluvial deposits of the Gangetic plain, but not for the weathered rock found in much of sub-Saharan Africa. Thus the sludging method has been modified to include a tungsten carbide button bit at the base to break the rock, high strength carbon steel drill pipes which can withstand the stresses involved with the harder material and a frame to support the drilling operation. Further, the hand has been replaced by a simple leather flap valve.

The maximum diameter that the Pounder Rig is drilling is 100 mm (4”), which requires a well design different to that of the standard Ugandan installation. The U3 (India Mark 3) cylinder has the screen fitted to its base, and uPVC rising main is fitted on to the top. The rising main doubles up as casing with the U3 cylinder and rising main becoming a permanent fixture in the ground. Due to the extractable plunger and footvalve, this type of installation (which is new to Uganda) can still be maintained despite the fact that the whole unit cannot be withdrawn.

### **The Mpigi field trials**

The Mpigi field trials were undertaken by the district crew, already accustomed to hand augering and hand digging. 13 wells were drilled of which seven were used to train the crew and test the rig capability in terms of depth, hard rock and ease of operation. Pumps were installed at six sites, of which five are productive community wells. The trials illustrated that the rig can drill easily in soft formations and can penetrate the laterite commonly found throughout Uganda. Collapse could be prevented by maintaining a minimum head of 3m above the water table in the hole. However, to further increase the rig capability in other formations, temporary casing will be included with the new rigs which will be brought into Uganda in mid 2000.

## Operational experience

In comparison to hand augering, Pounding is quicker in soft formations due to the fact that the cuttings are removed continuously, rather than having to lift out the auger regularly although, in the case of sandy soils, drilling can sometimes be slowed down by particles sticking to the valve.

Further, Pounding can drill formations which cannot be penetrated by the hand auger (laterites and weathered rock). The Pounder rig fits onto the back of a pickup making it easier, and cheaper to transport than the hand auger equipment, which requires a 3 tonne truck. The Pounder rig can be operated by one or two skilled operators and some unskilled labour. This can either be provided by the community itself as community participation, or by the contractor. Installation costs of the Pounder wells are lower than hand dug or hand augered wells due to the use of uPVC rising main which also acts as casing.

However, unlike hand augering or hand digging, Pounding does require water, which may have to be collected from a distant source. In the case of formations with very low permeability, a hand dug well may be the preferred option to an augered or pounded well in order to provide over-night storage. However, in such cases, the Pounder rig could still be used as a tool to prove water prior to digging the well.

In terms of ease of operation, Pounding has a skill requirement comparable to that of hand digging or augering.

In summary, Pounding has many advantages over both hand augering and hand digging and is proving to be a suitable alternative shallow well construction method for Uganda.

## The way forward

### The Private Sector Contractors

The next stage of the project is to get the Pounder rigs firmly into the hands of local Private Sector contractors who can subsequently drill rural water sources on a commercial basis. Several small water sector businesses are already established in Mpigi and Kampala and two contractors will shortly be drilling wells for the district with the Pounder rig. This will illustrate the financial viability of commercial low cost drilling of rural water sources in Uganda. However, a study of private sector water providers has shown that the technology alone is not sufficient to build up effective Private Sector Participation in Low Cost Shallow Well Drilling. The LCDP will therefore be undertaking business training of the contractors in areas such as financial management, entrepreneurship and marketing.

It is envisaged that the combination of availing affordable technology, providing business training and support and triggering the first contracts between the district and contractors will enable these local businesses to make the transition to becoming competitive low cost shallow well drillers.

### The private sector suppliers

The next phase in sustainable availability and wider uptake of the rigs is to bring private sector suppliers such as manufacturers and importers on board. By the time the Project funding comes to an end in June 2001, the rig should be available on the Ugandan market for hire or sale by at least one company. Several local manufacturers and importers are already interested in distributing the rigs.

### Uptake

Despite the fact that the rig is low cost, the low capital base of existing contractors is likely to be an obstacle to uptake. However, this situation could be overcome by suppliers hiring or hire purchasing rigs, or linking contractors to credit institutions.

Utilisation of the private sector in rural water supply in Uganda is still low although the privatisation policy is expected to increase demand in the long term. Further, the capacity of the private sector in rural water supply is still low and will require considerable support if it is to develop fully.

The issue of a sustainable supply of rigs and spares still needs to be addressed fully, and it may be difficult to draw suppliers on board who do not also have a vested interest in drilling themselves. This problem is currently being investigated by the LCDP.

There may be some resistance to change over to the new method, although the project is confident that this threat will diminish as more individuals and institutions are made aware of its technical capability and financial viability.

The LCDP has been working with local consultants in the areas of business development and community aspects since November 1998. Through working with the LCDP, these consultants have recognised a need for continued support to Private Sector Participation in Rural Water Supplies and have subsequently formed an NGO, TEMBA (Technology, Mobilisation and Business Access) to continue with the work started by the LCDP. Ultimately, it will be TEMBA, private enterprises and the project partners who will ensure wider uptake of the rig beyond the departure of the project itself from Uganda.

## Conclusions

The partnership between the Project, Mpigi District Local Government and DWD has enabled the Pounder Rig to be locally tested and developed into a suitable low cost drilling method for Uganda which has many advantages over hand augering and hand digging.

Despite the many threats to uptake of the technology, the rig is on its way to becoming well established in the Ugandan private sector as a result of the broad interest which has been generated by the Project, as well as the business support and technical training which is being provided to prospective local contractors who can serve as role models for other companies entering the market in the future.

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