
Photo © Medair, Sri Lanka 2005

Bringing water to people in crisis

Rapid well construction using the jetting-drilling technique

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Since 2004 Medair has increasingly been using a modified method of water jetting to provide rapid access to safe water for many vulnerable populations, especially those in crisis situations. Although the method is simple, it does require specialised knowledge in regard to performance and limitations determined by local conditions. So far, Medair has built up experience of jetting in Madagascar, Sudan and Sri Lanka.

What is jetting?

Jetting is a technique that uses a jet of water to flush a pipe through loose soils into an aquifer – an underground bed or layer that yields water. Suitable aquifers consist of unconsolidated sediments such as sand and silt or fine gravel. A permanent casing and screens as well as a hand or motor pump can be installed when the desired drilling depth into the water table has been reached. In theory, it is possible to reach a depth of more than 30 metres.

Medair and BushProof (a technical consulting company) have introduced a modified technique that uses a plastic "self-jetting screen". This screen acts first as a jetting pipe and remains in the ground to then act as a water intake. The other equipment needed is a standard motor pump, plastic pipes and a water tank of approximately 5,000 litres. Alternatively a pit in the ground filled with water can be used as a reservoir.

A few key facts about Medair:

- **£12 million of total expenditure**
- **Operating in 9 countries**
- **2,650,000 beneficiaries**
- **120 expatriate staff**
- **1,600 local staff**
- **1 international headquarters in Switzerland**
- **4 European offices in the UK, the Netherlands, France and Germany**

Setting up a jetted well

In situations that require the highest yields (e.g. in crowded refugee camps), the motor pump used for jetting can act as a suction pump by reversing the flow direction. This can result in a flow of up to 150 litres per minute. Storage tanks or attached tap stands can then be added to serve as a distribution system. This set-up is physically limited to a maximum depth of between eight and nine metres.

It is also possible to install a standard hand pump according to the positive displacement principle. This could be a Canzee pump or an IndiaMark II that is connected to the screen after jetting. This method allows water to be pumped up from greater depths but with fewer yields and is recommended

Jetting can bring widespread benefits

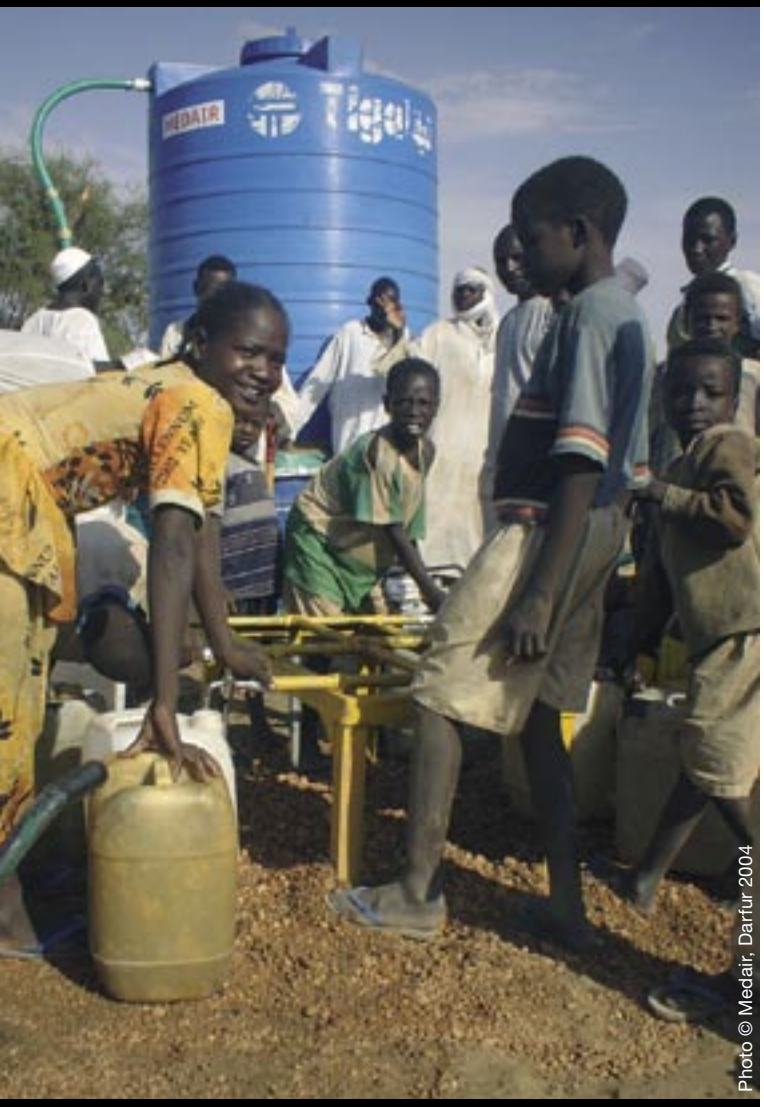

Photo © Medair, Darfur 2004

A comparison between water coming from a jetted well and water coming from a traditional river-bed well

Photo © Medair, Darfur 2004

for use with a normal population density. A hand pump can also replace the motorised system at a later stage as a more sustainable solution once the emergency phase is over and most of the refugees are returning to their homes.

When installing a distribution system it is recommended to provide some means of water disinfection, such as a chlorine solution. This is done for two reasons, first to provide extra safety in case the groundwater table is shallow and potentially contaminated by nearby latrines, second to purify dirty jerry cans that may be used by the beneficiaries.

This step has to be carefully monitored as too much chlorine quickly leads to complaints regarding the taste of the water.

Time requirements

One time-saving effect of jetting is that it requires no separate installation of casings, screens and raising pipes. When jetting in sand or soft materials only, a well can be completed within minutes. In cases where the top layer consists of clay, the time necessary to dig through this layer by hand must also be taken into consideration since jetting does not work in hard clay. A complete installation may therefore take between a half-day and a day. Another determining factor is the time and effort necessary to transport the water required for the jetting process to the site.

Cost comparison

The initial investment needed is for a motor pump plus a tank to transport the water costing approximately $2,000 plus the expense of buying or renting a small truck. The self-jetting screen, materials and labour come to about $250 per well. The installation of a hand pump and platform will then add $500; alternatively the installation of a distribution system will cost between $1,000 and $5,000, depending on its size.

Hand drilling, e.g. with a Vonder Rig, or well-digging as alternative simple technologies will be in a similar price range, but will take significantly more time to complete an installation. Another simple technology is sludging, but due to lack of internal experience, we have no figures for time and costs. Machine drilling (rotary or percussion) will typically take between one and three days; expenses range between $5,000 and $10,000.

Jetting: the right method for me?

The alternative technologies mentioned above have to be considered in areas where water for jetting cannot be provided or where soil is unfavourable for jetting. Unfavourable conditions could be hard rock formations or coarse gravel layers where the jetted water dissipates and is lost.

However in suitable terrain, jetting is rapid, cheap and likely to be faster than the other methods. One jetted well can typically serve several thousands of people.

Storage enables sustainable supply

3 Case studies from the field:

Sudan, West Darfur

In 2004, West Darfur, Sudan and the area of Chad across the border saw an increasing humanitarian crisis with many internally displaced people fleeing their homes to find safety in larger villages and towns. People that did not find refuge in the homes of relatives stayed in makeshift camps. Either way the existing water facilities were overstretched resulting in long queues. As a result, many people resorted to collecting water from contaminated traditional sources that included unprotected traditional wells and scoop holes in the riverbeds.

The displaced population is vulnerable and outbreaks of diarrhoea, hepatitis E and other diseases have been reported from some camps. In such a situation, plenty of safe water is essential to avoid the spread of water-borne diseases. Yet the scale of the crisis and sheer numbers of affected people poses a big challenge to NGOs to find quick solutions.

Medair used jetting technology to rapidly install numerous water points. Jetting new water intakes worked particularly well around wadis (dry riverbeds) that have favourable underground conditions of mainly sand and fine silt. The activities are ongoing and, so far, 30 jetted wells with attached distribution systems have been installed.

Local community participation in project delivery

Sri Lanka

The December 26th earthquake measuring 9.0 on the Richter scale caused massive tidal waves, which brought widespread devastation throughout South-east Asia.

In Sri Lanka, many people lost their homes and gathered in small, improvised camps without proper water and sanitation facilities. In the Ampara district, on the east coast, Medair identified a number of these camps and jetted 10 wells, together with a distribution system. These set-ups helped the population in the first weeks after the emergency. They were then removed, ready for use elsewhere, when people started to move back to their home village.

Madagascar

In 2004 the Elita and Gafilo cyclones hit the northeast coast of Madagascar, flooding whole areas, contaminating a high number of open wells and therefore leaving very little drinking water for the population. Medair and BushProof provided jetting assistance in the Maintirano and Maroantsetra regions, through a large-scale well construction project. More than 150 wells were jetted and equipped with Canzee hand pumps at a rate of 50 per week. Given the normal population density (i.e. no crowded groups of people), it was decided to install hand pumps rather than distribution systems as in Sudan.

This project has further potential for scaling up, since a large number of people in Madagascar live in zones where the soil formation is suitable for jetting and where there has been no access to drinking water. Jetting can provide these people with access to clean water within a reasonable time frame and at a cost that is well below other types of village-level water infrastructure.

Photo © Medair, Madagascar 2005

Pump in use following successful jetting process

ABOUT THE AUTHOR

A chemical engineer by profession, Jürgen Matheis has worked for 10 years in the chemical industry in the field of process, drinking and waste-water treatment. Following this, Jürgen worked 2.5 years in South Sudan and Kenya as a field water and sanitation engineer for Medair. Since 2003, he has been working at Medair's headquarters in Switzerland as a Desk Officer for Uganda and as a Water and Sanitation Advisor.

ABOUT THE ORGANISATION

Medair is a non-governmental organisation, whose mission is to respond to the suffering of victims of war and disaster situations (especially those that have been forgotten) through different types of emergency relief and rehabilitation projects. In the field, 112 full-time expatriates and 1,600 local employees help those who are most vulnerable. 33 people support them from the Swiss international headquarters and national offices in Germany, France, United Kingdom and Holland. Founded in 1988, the organisation has obtained the ISO 9001 certification at a worldwide level for its quality management system.

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