Handpumps can provide a permanent source of unpolluted water which is vital for a healthy developing community. A significant proportion of installations are not in optimum working order, however, and some are broken and inoperable for long periods. One of the major factors contributing to this waste of resources is inadequate or non-existent maintenance.

What is maintenance?

- **Not** carrying out repairs when a pump finally breaks down.
- **Is** periodically inspecting an installation and replacing parts that are worn or show other signs of deterioration. Its aim is to prolong the life of the pump and avoid unexpected breakdowns.

Planned preventative maintenance is an organized system of inspections on a daily, weekly, monthly, and yearly basis, which should maximize the time for which a pump can deliver good drinking water.

A typical schedule is given below but will vary for different pump types.

<table>
<thead>
<tr>
<th>Daily</th>
<th>Weekly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump operation</td>
<td>Lubricate moving parts</td>
</tr>
<tr>
<td>Pump and base cleanliness</td>
<td>Check tightness of nuts and bolts</td>
</tr>
<tr>
<td>Wastewater drainage</td>
<td>Check security of pump on base</td>
</tr>
<tr>
<td>Comments of users</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Monthly</th>
<th>Yearly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check output rate</td>
<td>Remove downhole assembly</td>
</tr>
<tr>
<td>Check for condition of concrete base</td>
<td>Inspect and replace parts where necessary</td>
</tr>
</tbody>
</table>

Whenever remedial actions are required these are to be carried out and records kept at all stages.

This system of work requires proper scheduling, and experience has shown that the organization is just as important as the physical work.
The hand pump is installed for the benefit of the community and it is reasonable to expect some contribution to the installation, as they will want to look after their investment. In the past maintenance has been organized.

A. Community management

All inspections, repairs, renovations and replacements are carried out by members of the community or under the community's direction.

Support to the community can be provided by private enterprise (spares and services) or purchased from a government agency.

Advantages

✓ Fast response to problems
✓ In control of own affairs
✓ Develop pride in own abilities and achievements

Disadvantages

✗ Needs motivated people with appropriate level of skill
✗ May require engineering facilities
✗ Need to hold expensive stock of spares

B. Centrally managed with community involvement (tiered system)

Simple routine inspections of people using the pump, but looking after many handpumps with facilities at the maintenance centre.

Advantages

✓ Community retains reasonable responsibility
✓ Back up for major problems
✓ Pride in maintaining pump

Disadvantages

✗ Community dependent on
✗ Delays awaiting actions
✗ Skilled team needs to be maintained
✗ Expensive vehicles required

While the centrally managed system (C) would seem the easiest to set up, it is the least effective in the long term.

The compromise option (B) with both central and community involvement is perhaps the most common choice.

Totally self-sufficient communities (A) are not widespread, but with the increasing availability of Village Level Officers (VLOs), it is hoped that more such systems will be established.

Increasingly private enterprise is being seen as the channel for the purchase of spares and expertise.

Typical maintenance points

- T bar on handle reduces wear on bearings
- Paint pump annually
- Downhole assembly
  - Remove and check annually, replace worn or broken parts, and reassemble
- Rising main
  - Corrosion or wear of threads
- When well is first constructed, surge pump to remove sand
- Piston valve - Wear
- Piston seal/washer
- Foot valve
- Strainer/screen
- Concrete base and/or
  - Clean daily - Repair
- Cylinder - Wear or

Pivots and rubber
- Stuffing box - Check
- Replace
- Bolts and nuts - Check weekly

- Bolt valves can wear and leak from the 'water hammer'
- Rubber/plastic valves will deteriorate from fatigue

- Leather or rubber seats will wear
- Leather will deteriorate rapidly if allowed to dry
ion to its continued use by the community. This is especially so if the community has initiated the pump in one of three ways:

C. Centrally managed

All work is carried out by a central agency.

Advantages
- Smaller stock of spares required per pump
- Concentration of skills and resources

Disadvantages
- Slow response to remedy breakdowns
- High cost and possibly poor service
- Routine inspections may not be carried out
- No involvement or commitment by the community

The significance of maintenance

When handpumps are to be installed a lot of time is spent considering the type of pump and the installation details, but ease of maintenance is of vital importance as it will influence the effectiveness and life of the pump.

Ease of maintenance should influence choice as much as hydrogeology.
Community involvement

No matter what system of management is adopted, user involvement is vital for the long-term effectiveness of the handpump. The best way to achieve this is by the appointment of a pump caretaker who, after proper training and the supply of a tool kit, will carry out the following duties:

<table>
<thead>
<tr>
<th>The pump caretaker's duties:</th>
<th>The pump caretaker should:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To carry out inspections daily, weekly, monthly</td>
<td>• Be female (if culturally or socially acceptable)</td>
</tr>
<tr>
<td>• To keep records of all checks and work</td>
<td>• Be aged 18-35</td>
</tr>
<tr>
<td>• To monitor pump output rate</td>
<td>• Live close to the pump</td>
</tr>
<tr>
<td>• To keep pump and base clean and clear of refuse</td>
<td>• Be physically fit and active</td>
</tr>
<tr>
<td>• To train people how to use the pump properly</td>
<td>• Be acceptable to the community</td>
</tr>
</tbody>
</table>

In order to emphasize their responsibility, pump caretakers should receive payment.

Physical maintenance

There are so many types of handpump that it is not within the scope of this article to detail specific maintenance points, but it should be noted that whenever parts rub or rotate wear will take place. Lubrication will minimize the wear, but routine inspections will confirm the rate of deterioration and decide when a replacement is required.

All nuts and bolts should be kept tight, as excessive play encourages wear.

Each type of pump will require a different level of maintenance, and one reason for keeping records is to review procedures to check if they are appropriate.

Every handpump should be available for work 100 per cent of the time, but this cannot be achieved by only responding to breakdowns. A strategy of Planned Preventative Maintenance will keep the non-working time to a minimum.

For further information:
UNICEF, India Mark-II handpump installation and maintenance manual.

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