



HAL
open science

How to build and maintain a water-recycling flotation machine?

Charlène Bouchaud, Margareta Tengberg, Elora Chambraud, Vladimir Dabrowski, Xavier Desormeau, Michel Lemoine

► To cite this version:

Charlène Bouchaud, Margareta Tengberg, Elora Chambraud, Vladimir Dabrowski, Xavier Desormeau, et al.. How to build and maintain a water-recycling flotation machine?. 2024. hal-04577409

HAL Id: hal-04577409

<https://hal.science/hal-04577409v1>

Preprint submitted on 16 May 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution - NonCommercial 4.0 International License

HOW TO BUILD AND MAINTAIN A WATER-RECYCLING FLOTATION MACHINE?

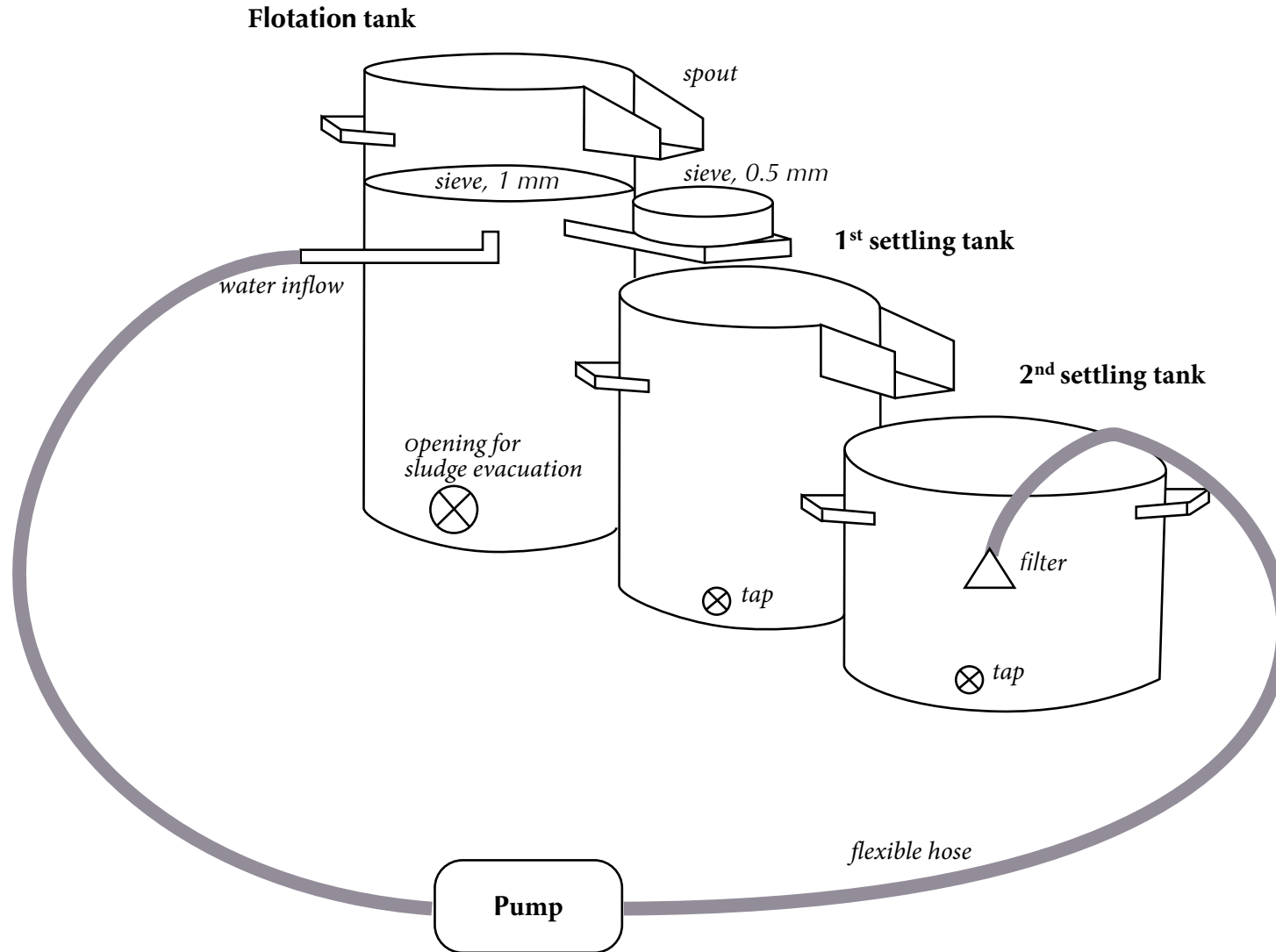
Charlène BOUCHAUD & Margareta TENGBERG
with contributions of Elora CHAMBRAUD, Vladimir DABROWSKI, Xavier
DESORMEAU, Michel LEMOINE

UMR 7209 Archéozoologie, archéobotanique, sociétés, pratiques, environnements
CNRS, MNHN, Paris, France

2024



FLOTATION STATION

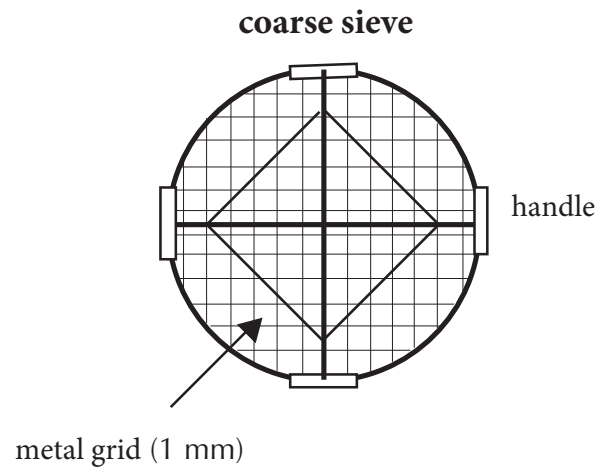
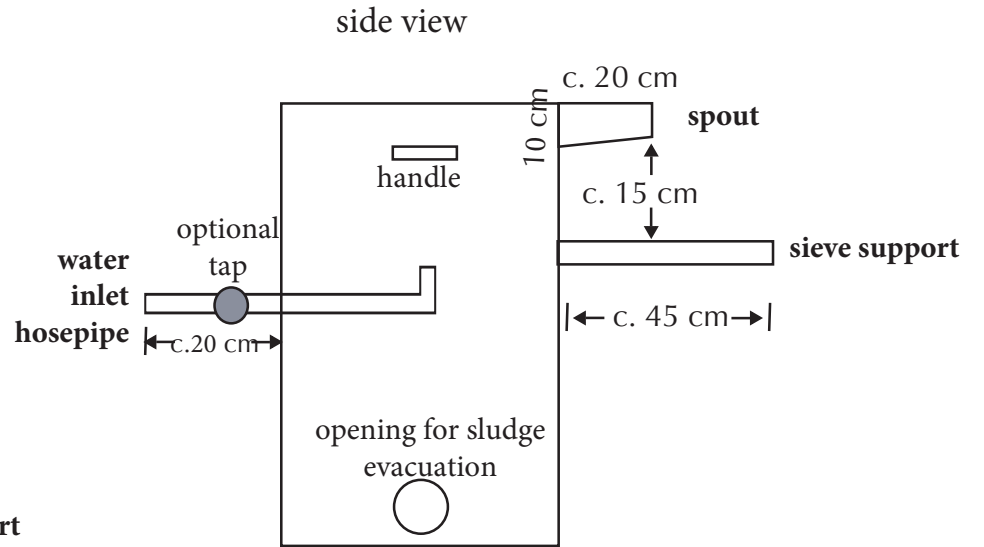
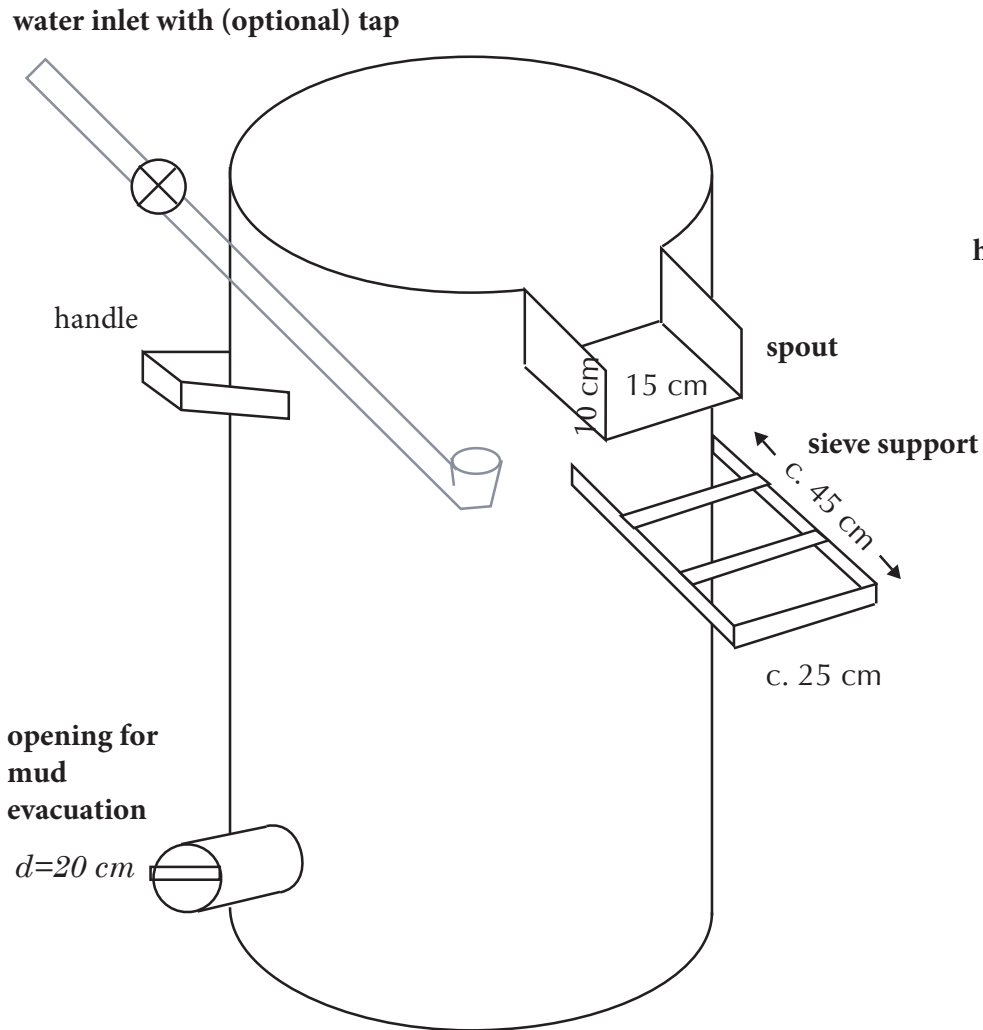


Schematic drawing of a flotation station with water recycling



Flotation station realised by a scrap metal merchant from empty petrol tanks
Tip: Use soft flexible hosepipe (garden hoses) of about 15-20 m.

Flotation tank (=the biggest)



The Flotation tank

Water is introduced into the center of the flotation tank through an inlet that can be optionally opened and closed by a tap. Inside the tank, the end of the pipe is directed upwards, like an inverted showerhead. The diameter of the inlet hosepipe should be chosen in proportion to the plastic flexible tubes (normally standardized if you choose garden hoses) that will be used to connect the flotation tank to a pump. A moveable metallic grid with a mesh of about 1 mm is placed in the interior of the flotation tank, approximately 30 cm below its upper edge. It should be circular in shape and only slightly smaller in diameter to the tank itself so that no material can slip between the wall of the tank and the grid. However, it should also be easy to remove with the help of handles. This grid allows for the recovery of the heavy, non-floating fraction contained in the archaeological sediment such as pottery, stones, animal bones etc.

At its upper edge, the flotation tank has a spout approximately 15 cm large through which water flows into the first of the two settling tanks. Under this spout and fixed to the outer wall of the tank, a rack (sieve support) holds the small sieve in which the floating organic material is recovered. The tank should also be equipped with an outlet at its base through which the mud that accumulates during the flotation process can be removed. This opening has to be easy to open and close, which can be achieved in different ways according to the material available and the skill of the blacksmith.

FLOTATION TANK: DETAILS



Opening for mud evacuation



Removable screen for heavy fraction (microfauna, sherds, beads, etc), mesh 1 mm



Optional tap for water inlet

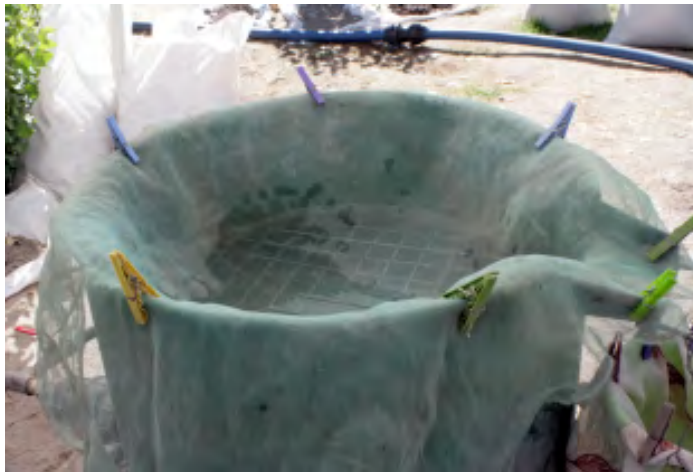


Water inlet metal pipe to flotation tank (without tap) 5

DETAILS OF THE METAL SCREEN



Two type of removable metal grid for heavy fraction
(microfauna, sherds, beads, etc), mesh 1 mm
Potential improvement: reinforce with fixed crossbars

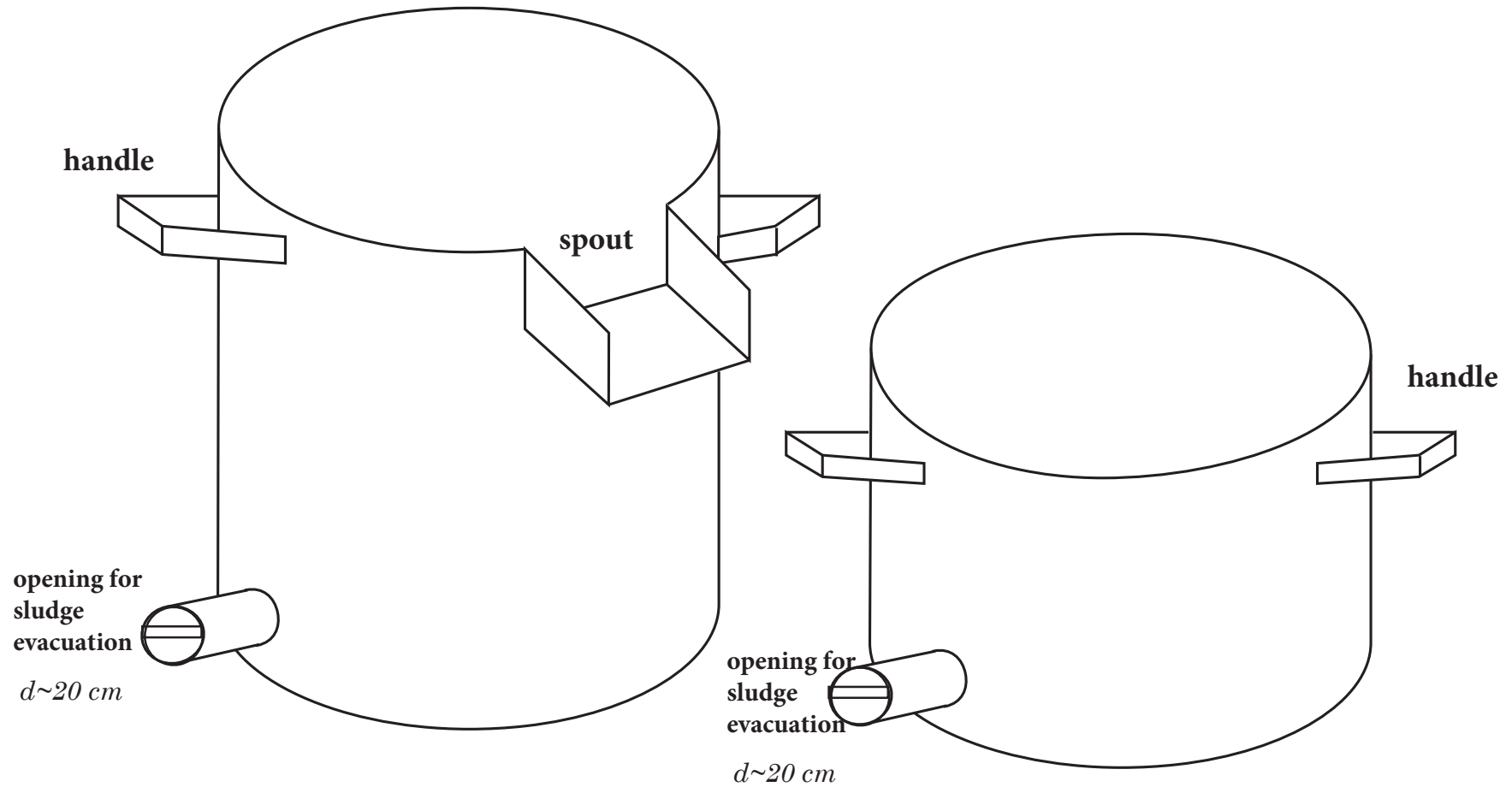


The removable metal grid can be replaced
by a textile with a similar mesh size



Flexible metal grid, which is fixed with the double
metal ring system shown above (center and right)

SETTLING TANKS



1st settling tank

2nd settling tank

The settling Tanks

The two settling tanks (B and C) are less elaborate than the flotation tank. The first settling tank should have a spout that allows water to flow into the third tank. Both need an opening near the base in order to remove the fine soil particles that sink to the bottom. Make sure to have all of the outlets placed on the same side of the tanks (including the flotation tank) so that they empty in the same direction. The dimensions of the two settling tanks need not be very precise. What is important is that the first settling tank fits under the sieve rack of the flotation tank and that the second settling tank fits under the spout of the first. All of the barrels should have handles so that they can be easily moved from one place to another. This is particularly useful as the successive emptying of the flotation tank will cause the accumulation of mud around the flotation station. For this reason, the ideal location for the entire installation is at the edge of a small mound or an elevation where the emptied mud and water can be allowed to flow downhill.

The Sieves

The mesh of the small sieves used to recover plant material should not be larger than 0.5 mm in order to recover even small seeds. Ideally, calibrated soft laboratory sieves should be used. For large-scale flotation, a set of 15-20 sieves is needed. Alternatively, good flour sieves that are available at a low cost in most bazaars can be used as long as the mesh is tight.



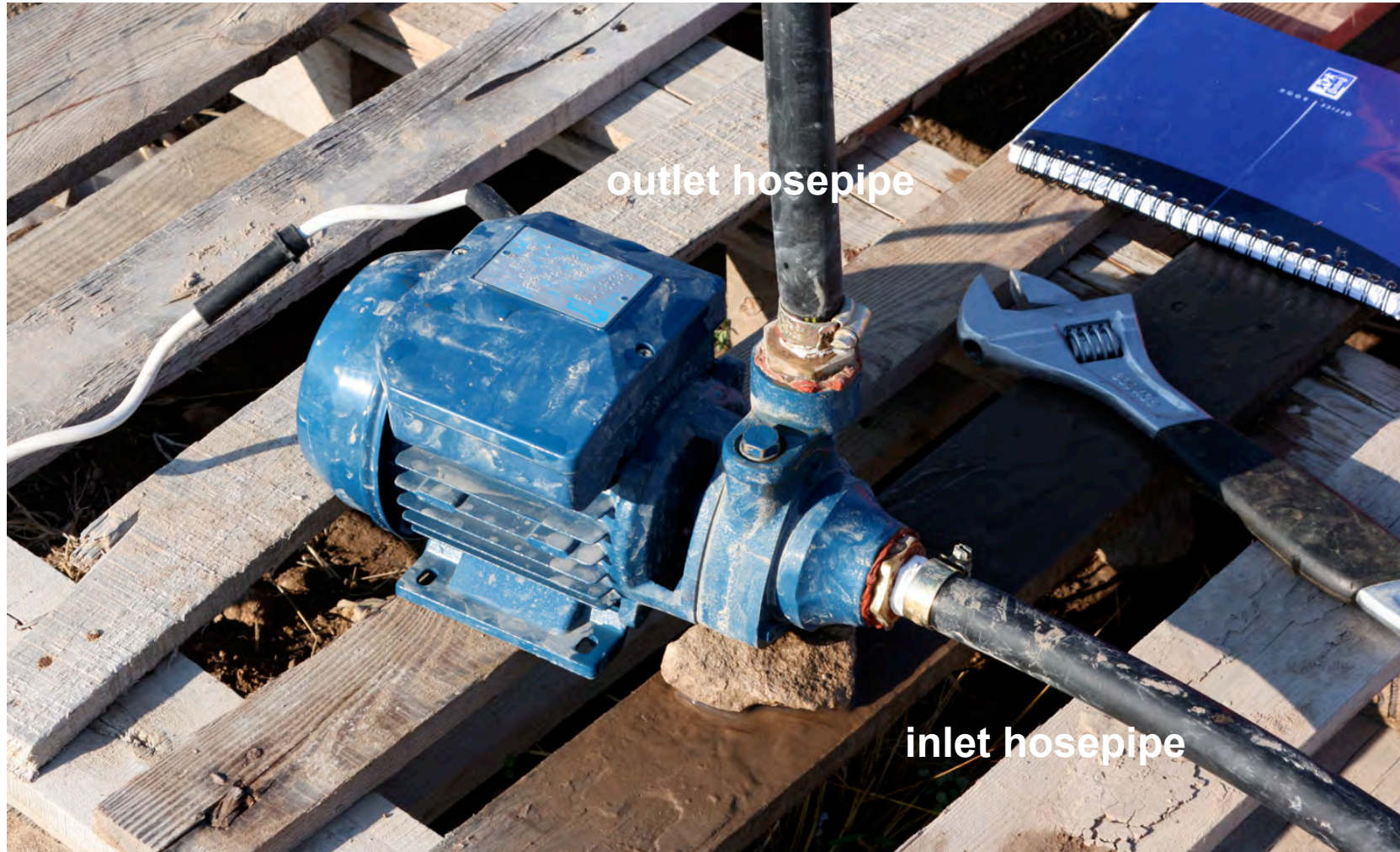
Calibrated flexible laboratory sieve (mesh 0.3 mm) fixed with clothes pegs on a rigid sieve and placed on a rack.

Each soft sieves containing the organic material is assembled into a bundle (use thin climbing rope) and set to dry



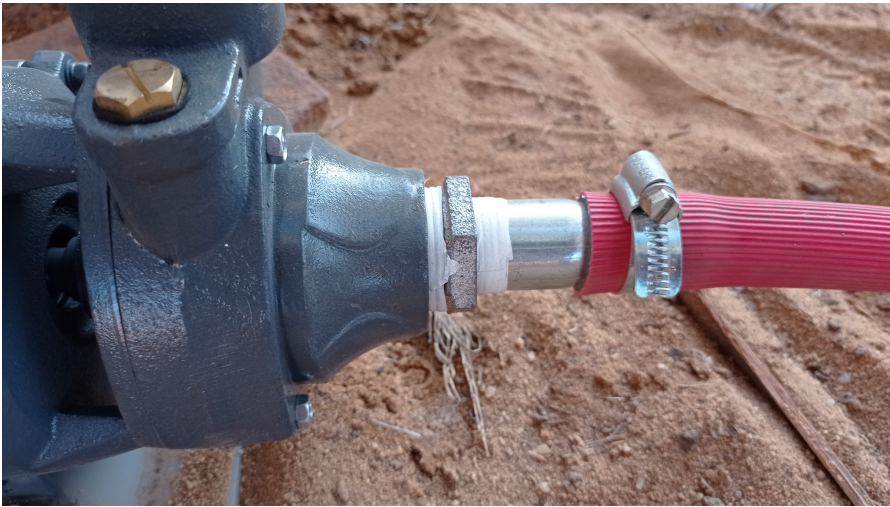
THE PUMP

Low-power electric pump for domestic use (0,5 horsepower; 350-400 W) ; hosepipes are secured by clamping clips ; an adhesive strip (teflon) makes the connections watertight.



Tip: the outlet hosepipe must be kept vertical to prevent it from clamping and preventing the circulation of water

DETAILS OF THE PUMP



DETAILS OF THE FILTER



Filter to be fitted to the outlet hosepipe positioned in the 3rd tank

DETAILS OF THE WATER INLET PIPE



Equipment purchased locally from hardware stores The adhesive strip (teflon) is sometimes not available on site: to be purchased before the fieldwork



tip: put a bottle on the water inlet hosepipe to avoid a geyser

USE OF THE FLOTATION STATION

When the system is working – i.e., when water flows through the three tanks at a regular rhythm – the first sediment sample can be gently poured into the flotation tank (page 3-5). Do not forget, however, to place a small sieve on the rack of the first settling tank (page 7) under the spout before doing so!

It is generally convenient to put 2-3 liters of sediment into the water at a time. The heavy fraction will sink while the light organic fraction will float and flow with the water through the spout and land in the small sieve (page 9). Archaeological items that do not float can be recovered on the grid inside the flotation tank (page 6).

Remember that the sediment will accumulate in the bottom of the flotation tank and has to be emptied regularly (after every 100-150 liters).

To avoid mixing material from different areas or chronological periods, do not float samples from different areas/chronological periods directly one after another. If sediments from a new area/chronological period are to be processed, the whole system should be cleaned out and refilled with new water. By default, the most recent periods should be processed after the oldest ones. Even if several samples from the same area/period are treated one after another, it is a good idea to let the water flow for ten minutes or so in order to purge the system.

TIP FOR MAINTAINING AND CLEANING THE FLOTATION STATION

Each time you use and change the water:

After emptying the flotation station, we recommend manually adding water to the hosepipes/pump (for instance in the filter) until clear water comes out of the water inlet before filling the tanks with water and restarting the pump.

Make sure the system is completely filled with water before switching on the pump.

At the end of the fieldseason:

The hosepipes: After emptying the flotation station, take out the hosepipes. Clean them with water to remove sediment and leave them dry. Remove as much as possible the adhesive strip (teflon) from the hosepipes.

The pump: Put water in the pump to remove any sediment and leave it dry to prevent rusting (at least 1 day). Remove all the connectors (in and out). Remove the adhesive strip residues and clean the pump and the connectors with a metal brush. Carefully pack the pump and the connectors in their original carton and close it tightly. Store it in a dry place.

The opening for sludge evacuation: we recommend cleaning the openings first with a towel, then water to remove as much sediment as possible. You can also put some penetrating oil (such as WD-40).

At the following fieldseason, if the rotor of the pump is blocked, put some penetrating oil (WD-40) in the pump. Manually activate (prime) the rotor using a screwdriver.

To go further:

Hunter, A.A., Gassner, B.R., 1998. Evaluation of the Flote-Tech Machine-Assisted Flotation System. *American Antiquity*. 63, 143–156.

Shelton, C.P., White, C.E., 2010. The Hand-Pump Flotation System: A New Method for Archaeobotanical Recovery. *Journal of Field Archaeology* 35, 316–326.

Williams, D., 1973. Flotation at Sīrāf. *Antiquity* 47, 288–292.

Wright, P.J., 2005. Flotation samples and some paleoethnobotanical implications. *Journal of Archaeological Science* 32, 19–26.

Bucket flotation for archaeobotanical investigations of archaeological dryland sites:
<https://www.youtube.com/watch?v=jVNEAc-82Kc> (bucket flotation)