

9.0 PREPARE FOR PRODUCTION, PROCUREMENT AND DISTRIBUTION OF PRODUCTS

Tasks:

- Set up production of vessels or procure vessels
- Set up production of disinfectant bottles, caps and labeling or procure a source
- Set up production of disinfectant or procure a source of supply
- Set up distribution system for products
- List the activities and desired outputs (quantities)



9.1 Set up production of vessels or procure vessels

If the project plans to sell a specially-designed vessel, the options available (as of August 2000) are:

- CDC vessel (Africa): Purchase from Megapak, Johannesburg, South Africa. Contact gtpage@nampak.co.za.
- CDC vessel (Bolivia): Purchase from PROSIN, Telephone 591-2-782498, Fax 591-2-782400. Contact Yale@mail.zuper.net or prosin@ceibo.entelnet.bo
- CEPIS vessel (Peru): Purchase from PBEX S.A., Los Calderos 120, Urb. Vulcano, Ate., Lima Peru, 51-1-348-3835, 51-1-348-0278

- Ecuador vessel: Purchase from Plasticos Ecuatorianos.
Contact alarconf@gye.satnet.net or katty@gye.satnet.net
- Oxfam vessel: Contact: psherlock@oxfam.org.uk

If the project plans to manufacture a special vessel in a country without current production, the project needs to obtain molds for making the vessel, spigot and lid (estimated cost for 3 molds was \$100,000). The first step is to identify a factory that will have the capability to manufacture the vessels and to determine the machinery they use. Most blow-molding machines produced after 1990 are capable of producing the special vessel, but the molds will need to be made to suit the particular machine that will be used. After molds are made, they are shipped to the factory, installed and tested. If a project chooses this option, it should request technical assistance from CDC (safewater@cdc.gov).

If, instead of a specially-designed vessel, inexpensive, locally-produced or locally-acquired jerry cans are selected as the vessel of choice, then the use of these containers can be promoted. Alternatively, the containers can be purchased by the project and distributed to target areas.

9.2 Set up production of disinfectant bottles, caps and labeling or procure a source

If the project plans to manufacture a unique bottle for disinfectant, this will require a mold for the bottle and one for the cap. The mold used to make a small bottle in Bolivia cost \$8000. Often a mold can be designed locally so a locally available cap, such as for a soda bottle, will fit the bottle, eliminating the need for a new mold for the cap.

If the project plans to use a locally available bottle, make arrangements with the manufacturer to procure a supply (and re-supplies) of the bottle. One potential problem with this approach is that the local producer might not be able to keep up with demand. This happened in Madagascar.

Labels for the bottle should be carefully designed as a part of planning for education and promotion. Options for applying labels to the bottles include:

- silk-screening the labels directly onto the bottles, or
- printing a paper label and gluing paper labels onto the bottles

Explore the options available locally. Decide how the bottles will be labeled and what tasks to contract out to local printers. If the labels will be printed on paper and applied to the bottles, be sure to test the paper and glue before large quantities are produced.

9.3 Set up production of disinfectant or procure a source of supply

Obtain the necessary equipment and set up for hypochlorite production (see Figure 11). The manufacturer of the hypochlorite generator will provide detailed information on the use of their equipment.

Below are four different hypochlorite generators with information for contacting the manufacturers.

AquaChlor
Equipment and
Systems Engineering
Miami, Fla. USA
Jotoma1@shadow.net
Telephone (305) 378-4101

Sanilec
Exceltec International Corp.
Sugar Land, Texas USA
Exceltec@sanilec.com
<http://www.sanilec.com>
Telephone (281) 240-6770

Clorid
Av. Gonzalez-Suarez 4-121
y Octavio Diaz
Cuenca, Ecuador
[http:// www.clorid.com](http://www.clorid.com)
clarid@cue.satnet.net
Telephone 593-7-801652

Dip Cell
Magneto-Chemie B.V.
Calandstraat 109
3125 B.A. Schiedam
Netherlands
Telephone: 31-10-262-0788
31-10-262-0201

Figure 11: Requirements for installation and operation of hypochlorite generators

Hypochlorite generator

- information on operation and maintenance from the manufacturer
- space
- a room exclusively for installation and operation of the equipment
- cement floor at least 2 x 2 meters
- ventilation – windows opposite each other for circulation and for release of hydrogen gas
- locking door

Electrical source 110-220 volts, 20 amps from battery or solar cell

Water source

- piped preferable; well is acceptable
- close to equipment
- clear (filter if turbid)

Salt source Store in room in covered plastic container, away from walls, windows and floor

Operators At least two, trained to operate and maintain equipment, bottle disinfectant, keep records, follow distribution procedures

Materials

- three 100 (or 200) liter barrels with lids. Cut 15 cm circular hole in one lid. Place plastic spigots 5 cm from bottom in 2 places.
- wooden benches to hold barrels
- chairs
- table for labeling bottles
- plastic bottles (250 ml recommended)
- preprinted labels or silk-screened bottles
- storage space for bottles, supplies
- sodium hydroxide (alkalizing agent to extend shelf life of sodium hypochlorite solution)
- measuring device that tests concentration of sodium

Figure 12 lists steps for producing hypochlorite solution on a routine basis. Before routine production can begin, however, a critical step is trial production. Trial production includes producing a batch of solution, assessing the chlorine concentration of the solution produced, and making adjustments in the manufacturing procedure as needed. This process must continue until batches of solution with the desired concentration of chlorine are produced reliably. Trial production may take one or several days, and requires the assistance of an experienced person.

The steps of trial production are:

- Follow the procedure for production of hypochlorite solution. (Refer to Figure 12, steps 1 through 10.)
- After the machine has operated the prescribed number of hours, determine concentration of chlorine produced (see Annex C).
- If the concentration is less than 0.5%, this result is likely to be explained by one of three factors that determine hypochlorite concentration: salt concentration, time of machine operation, and current flowing into the solution. Make adjustments to at least one of these factors to obtain the desired concentration of 0.5% - 1.0%.
 - Increase the time of operation of the machine in increments of 1 hour until desired concentration is reached
 - Increase the concentration of salt by 10% (e.g., if 3 kg is used initially, then use an additional 0.3 kg).
 - Check the amperage produced by the machine (most machines have digital or graphic indicators of amperage). If amperage is less than the level recommended in the operation manual for the machine, contact the manufacturer for recommended adjustments.
- When optimal time of machine operation and salt concentration is determined, this procedure should be recorded and used for each production cycle.
- Test concentration of hypochlorite after each round of production so adjustments can be made as necessary. (See Annex C.)

Figure 12: Procedure for Production of Hypochlorite Solution (manufacturer will provide detailed information)

STEPS

1. Mix completely 3 kg salt in 100 liters water in a barrel (or 6 kg in 200 liters)
2. Cover with lid with hole
3. Place cell in solution
4. Connect cable of cell to rectifier
5. Connect rectifier to power source (wall outlet or battery)
6. Turn on rectifier – set for 12 hours
7. Make sure amperage does not exceed 20 – check hourly. If amps increase, turn down amperage on rectifier
8. When finished, immediately remove cell from solution
9. Remove lid with hole and replace with lid with no hole
10. Place cell in container with fresh water after use
11. Test concentration of finished product (see Annex)
12. Maintain register of each production: date, time on, time off, kg salt, liters of water, final concentration, number of bottles filled, operator name

Maintenance

Clean cell in 5% solution of acetic acid (vinegar) at least once a week by submerging cell in vinegar for 1 hour

Safety precautions

- Fuse (circuit breaker)
- Goggles, gloves, and apron for operators
- No smoking around equipment
- Barrels and spigots should be polyethylene as metal parts will corrode rapidly

To enhance shelf life of bleach

Add NaOH to finished solution, aiming for pH of 11 to 12
If no pH meter available, add 60 gm NaOH/100 liters of disinfectant

Packaging bleach

Plastic 250 ml bottles, opaque, with 2.5 to 10 ml cap.
Add label with dosing instructions in pictures
Store bottles in cool place away from sunlight, out of reach of children

Determine local shelf life and discard bleach not sold 3 months before expiration

After successful trial production is accomplished, test the disinfectant in local water to determine the necessary dose. The dose will depend on the turbidity of the water.

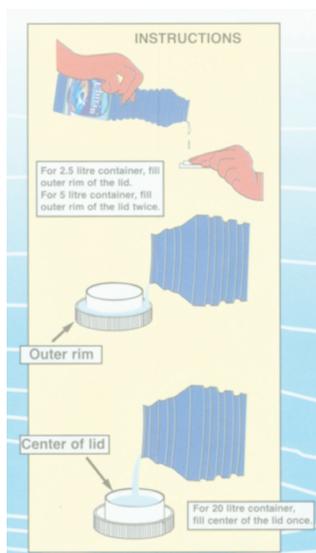
The procedure is as follows:

- Fill vessel with local water (it is best to use the type of vessel recommended by project)
- Add $\frac{1}{2}$ to 1 capful of solution to the water
- Agitate the container and let it sit for 30 minutes
- Test treated water for free chlorine concentration
- If concentration is between 0.5 and 2 mg/liter, dosage is adequate
- If concentration is less than 0.5 mg/liter, add disinfectant solution. Double the previous dose (e.g., if it was $\frac{1}{2}$ capful, add another $\frac{1}{2}$ capful). Keep adding these same increments of solution until target concentration of chlorine is reached.
- If concentration is greater than 2.0 mg/L, then start process over, beginning with $\frac{1}{2}$ the initial test dose in a vessel of fresh, untreated water.
- Continue reducing dose until target concentration is reached.

State the correct dose in educational materials including on the label for the bottle. The best dose is one that can be measured with the cap of the disinfectant bottle (so that everyone has the same measuring device), is simple, and can be used in as many locally available containers of different sizes as possible.

In Zambia, for example, the disinfectant bottle had a cap with a central cup and a surrounding rim. The instructions said to measure the correct amount of disinfectant to treat a 2.5 liter water vessel by filling the outside rim of the cap once. To treat 5 liters, fill the outside rim 2 times; for 20 liters, fill the central cup.

In Madagascar, the instructions were to use $\frac{1}{2}$ capful to treat 10 liters of water and to use one whole capful



for 20 liters. One problem faced there was that disinfectant was shipped to a cyclone-affected disaster area where the only available water source was turbid river water. The dose recommended for the relatively clear water in the capital city was not adequate for the turbid river water at the disaster site. The dose had to be adjusted for the local water and educational material altered to reflect this change.

Train staff at each production site. Training should include operation and maintenance of the equipment that produces disinfectant, safety precautions, measurement of hypochlorite concentration, product safety, record keeping and reporting. (See Annex C.)

9.4 Set up distribution system for products

In section 7.0, the project planned for behavior change, using strategies such as community mobilization, promotion, and education. Materials included items to be displayed at points of sale and materials to explain use of the products to families at house-to-house visits and community meetings.

In section 8.0, the project planned pricing of the products and a system for cost recovery.

Next, to set up the distribution system, as described in section 6.0, identify and contact specific retailers, government health centers or other health facilities, and other organizations that will sell the products (e.g., neighborhood health committees). Plan the network of distribution (how products will be transported to sellers, how health centers and other sellers will be re-supplied) and flow of money. For example, list the exact procedures for sellers to turn in revenues and receive a commission for vessels or disinfectant sold.

Finally, the project will need to train health center staff, neighborhood health committees and agents, commercial retailers, service club participants and NGO representatives who will be involved in the sale of water storage vessels and disinfectant solution. (See sections 10.4 and 10.9 on planning and implementing training for staff.)

9.5 List the activities and the desired outputs (quantities)

List the activities including a statement of the quantities that the project plans to achieve. These should be the main activities and level of effort required to achieve of the objectives specified in step 2.0. For example, see Figure 13.

Figure 13: Production and Distribution Activities to Lead to Achievement of the Objectives

<p>To achieve the following objectives:</p> <ol style="list-style-type: none">1. Increasing access to the intervention (products)<ol style="list-style-type: none">1.1 Sell 20,000 bottles of disinfectant in first 3 months1.2 Sell 1,000 water storage vessels in first 3 months <p>The project will implement the following activities:</p> <ol style="list-style-type: none">1. Place disinfectant and vessels in 60 retail shops and demonstrate consistent supply2. Place disinfectant or vessels in 10 health facilities3. Train 30 community-based distributors (such as community volunteers)4. Produce 1500 liters of solution per month5. Produce 100% of batches of solution with free chlorine > 0.4%6. Review sales records.
