2. Major requirements for effective hatchery production

In order to provide practical and effective technical guidance for shrimp hatchery management, it is first necessary to review the basic requirements for an effective hatchery production system. The following are the most important requirements:

- essential infrastructure;
- facility maintenance;
- inlet water quality and treatment;
- wastewater treatment;
- maintenance of biosecurity;
- development of Standard Operating Procedures (SOPs);
- consideration of the Hazard Analysis Critical Control Point (HACCP) approach;
- responsible use of chemicals; and
- assessment of health status of stocks through laboratory testing.

These components are discussed in detail in the sections that follow.

2.1 INFRASTRUCTURE

Hatcheries should be designed (or modified, in the case of existing hatcheries) to ensure good biosecurity, efficiency and cost-effectiveness and should implement Standard Operating Procedures (SOPs) in order to maintain productivity of large numbers of high quality postlarvae (PL). The infrastructure requirements for successful biosecurity and management of the hatchery operation will be discussed in the relevant sections of this document.

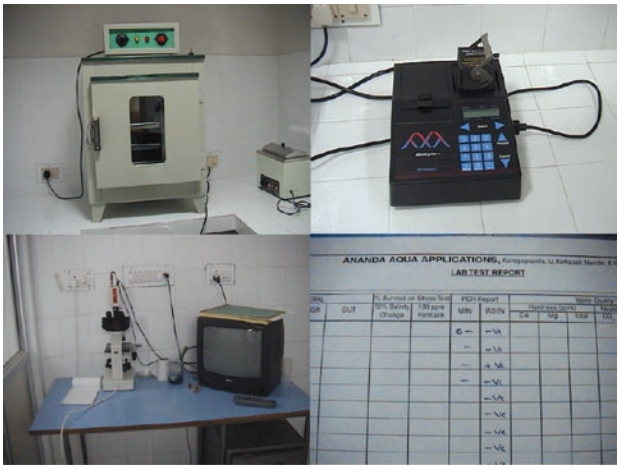
Many of the existing hatcheries now have infrastructural problems such as:

- inappropriate tank siting or design leading to high energy waste and high chance of contamination;
- low degree of design flexibility (so that they are difficult to modify); and
- unavailability of operating system security (i.e. a lack of alarms for water, air etc.).

A well-designed shrimp hatchery will consist of separate facilities for quarantine, maturation, spawning, hatching, larval and PL rearing, indoor and outdoor algal culture (where applicable), hatching of *Artemia* and feed preparation. Larger hatcheries may have separate units within each of these categories that should be run like mini-hatcheries for reasons of biosecurity. This should include attempts to stock the entire hatchery (or at least the individual units) as quickly as possible in order to reduce problems with internal contamination.

Additionally there will be supporting infrastructure for the handling of water (facilities for abstraction, filtration, storage, disinfection, aeration, conditioning and distribution), laboratories for disease diagnosis/bacteriology, as well as areas for maintenance, packing of nauplii and PL, offices, storerooms and staff living quarters and facilities.

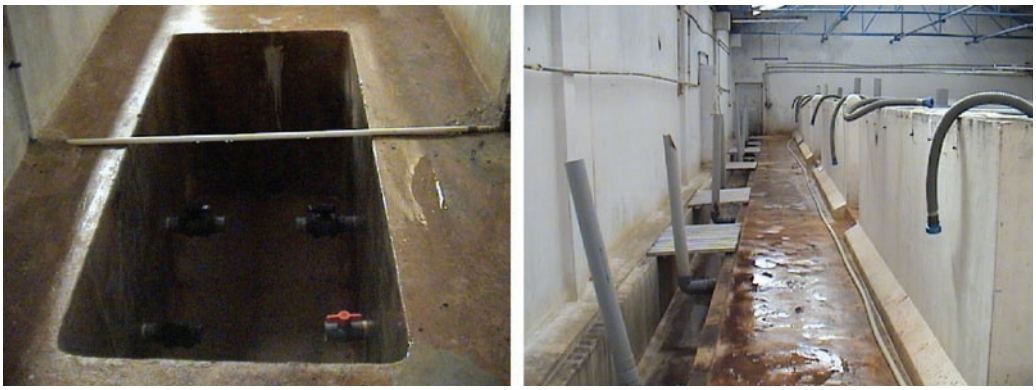
The physical separation or isolation of the different production facilities is a feature of good hatchery design and should be incorporated into the construction of new hatcheries. In existing hatcheries with no physical separation between facilities, effective isolation may also be achieved through the construction of barriers and the implementation of process and product flow controls. If possible the hatchery facility should have a wall or fence around its periphery with enough height to stop the entrance



Some hatcheries have good laboratory facilities for polymerase chain reaction (PCR) diagnostics, water quality and microbiology, although day-to-day management system may not reflect the existence of such facilities

of animals and unauthorized persons. This will reduce the risk of pathogen introduction by this route, as well as increase overall security. Each operational unit should have sufficient area and perimeter to permit free passage and convenient working conditions.

The quarantine of all broodstock to be introduced into the hatchery is an essential biosecurity measure. Before introduction into the production system, the broodstock must be held in quarantine and screened for subclinical viral infections (i.e. by PCR). Many hatcheries in India are now equipped with their own PCR machines, while the others should collect and send samples to reputable external laboratories. Broodstock infected with serious untreatable diseases should be immediately destroyed and only animals negative for important pathogens



Harvest basin (below, left) is shared for four larval-rearing tanks (LRTs) and a drainage canal collects wastewater from several LRTs (below, right) before discharging into the main drainage line. This weak design is common in most hatcheries throughout the world and should be corrected by constructing a separate harvest basin for each tank before its wastewater flows into the drainage canal. This increases initial cost and requires more floor area for a hatchery but reduces the risk of disease being spread from infected tanks

such as white spot syndrome virus (WSSV) and monodon baculovirus (MBV) should be transferred to the maturation unit.

Harvest basins should not be installed in main drainage lines, as they may cause cross-contamination through water from one culture tank to the larvae being harvested. There should be a separate harvest basin/area for each culture tank before its connection to the main drainage canal. The elevation of the main drainage level should be lower than subdrainage carrying wastewater from each culture tank so that the wastewater cannot flow back and cause contamination.

2.2 FACILITY MAINTENANCE

It is not enough to have a well-built or well-modified hatchery facility. To achieve consistent production of high quality larvae, the production facilities must be maintained in optimal condition. Currently facility maintenance is not standardized in Indian hatcheries and is often quite rudimentary.