

Hatchery Design and Technology, 2005

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Hatchery design is changing worldwide to meet current and future demands. Hatcheries designed and built today are expected to perform to higher standards in the following areas:

- a. Prevention of salmonella and campylobacter spread between hatches
- b. Improved labor efficiency
- c. Efficient energy costs
- d. Animal welfare requirements
- e. Incubation for field performance
- f. Hatchery design and management based on effective critical control points.

Today hatcheries are viewed as a key step in a food production chain. The hatchery as a food plant standard requires hatchery design that allows for effective critical control point management.

The first step is in the layout of the hatchery. A single stage hatchery layout is the easiest way to design a hatchery where the product moves from eggs to chicks without cross trafficking. The hatchery is simply a rectangle where the eggs are brought in one end and chicks are sent to the farm from the opposite end.

Eggs are considered dirty until they are fumigated. All eggs are fumigated before entering the egg holding area of the hatchery. All equipment and hatchery associates operate in either an egg or a chick handling loop. All equipment is used, washed and sanitized in this loop. Personnel entering the hatchery can shower in at their appropriate work area. There are two break rooms to prevent cross contamination by hatchery personnel.

The loop concept of personnel and equipment movement is the most labor efficient design. There is no extra labor and time involved in simply moving around the hatchery.

Airflow is also a critical element in designing a hatchery. Airflow must be designed to prevent the establishment, spread, and cross contamination of aspergillosis, salmonella, and campylobacter. To accomplish this there must be no return air and the air must not circulate between the machines. To do this, the incubation equipment must be sealed. Air intake and exhaust must be via a plenum.

Equipment sanitation must be part of the process for the hatchery to function efficiently and maintain food plant standards. All trolleys, trays, and baskets are washed before reuse. To do this cost effectively, the wash systems must be designed to be effective and efficiently utilized.

Single stage incubation is designed for sanitation and incubation quality. In single stage incubation, the incubators and hatchers can be washed and heat disinfected after every cycle.

In a hatchery designed for sanitation, the tops of the machines are isolated from the dirty production area. Since there is no contamination of the mechanical area on the top of the machines, there is no need for sanitation in this area. This not only prevents contamination and spread of pathogens, but it also saves in labor costs.

A fixed transfer system allows for candling at transfer. Candling has two advantages. It prevents contamination of chicks by contaminated eggs. Automatic harvest of chicks requires candling to minimize contamination of the chicks. Candling also improves airflow in the hatcher. The improved airflow through the eggs more uniformly removes the embryo heat. This provides a better incubation environment and better chick quality.

The fixed transfer system is done in a separate transfer area. Airflow can be designed to prevent this process from introducing contamination into clean areas of the hatchery.

Incubation of the yield breed that is used in production today requires incubation equipment designed to meet the needs of the yield embryo. Multistage incubation cannot by definition meet the needs of the embryo for optimum field performance. In multistage incubation, the embryo temperature varies from 98.5 degrees F to 103.5 degrees F. The embryo sacrifices growth for survival when the incubation environment does not meet their needs. In single stage incubation, the embryo temperature goal is

100 degrees F throughout the entire incubation cycle. Incubation for performance also requires control of weight loss, the carbon dioxide and relative humidity in the environment. This type of control is not possible with multistage incubation.

Incubation equipment that is designed to provide for the embryo needs without being dependent on the building structure shifts the cost of the project from the building to the equipment and the interior function of the hatchery. With equipment that is designed to provide for the embryo needs, energy is not used to condition the air in the building around the machines. Only the air that directly enters the machines is conditioned for the machines. With this concept, the total cost of the project does not increase and the daily operational costs are minimized. Investment in the interior function of the building, i.e. automation and incubation equipment, provides returns in chick performance and chicks per man hour.

Animal welfare concerns from the standpoint of the embryo and the chick will continue to determine process requirements. Current animal welfare standards in use worldwide are:

- a. Embryo temperatures
- b. Rectal temperatures of chicks
- c. Drop heights on lines
- d. The number of chicks that each counter can process per hour
- e. Cull bird handling
- f. The number of chicks per square centimeter in transport boxes

Food safety concerns, animal welfare concerns, labor costs and availability, and the yield embryo are all driving a dramatic shift in hatchery design. The hatchery design that has dominated the US market for the past 30 years was effective and efficient for the old standards and genetics. With changing consumer expectations and genetic changes in the embryo, the timing is right to rethink the hatchery design to meet the needs of the next 30 years.