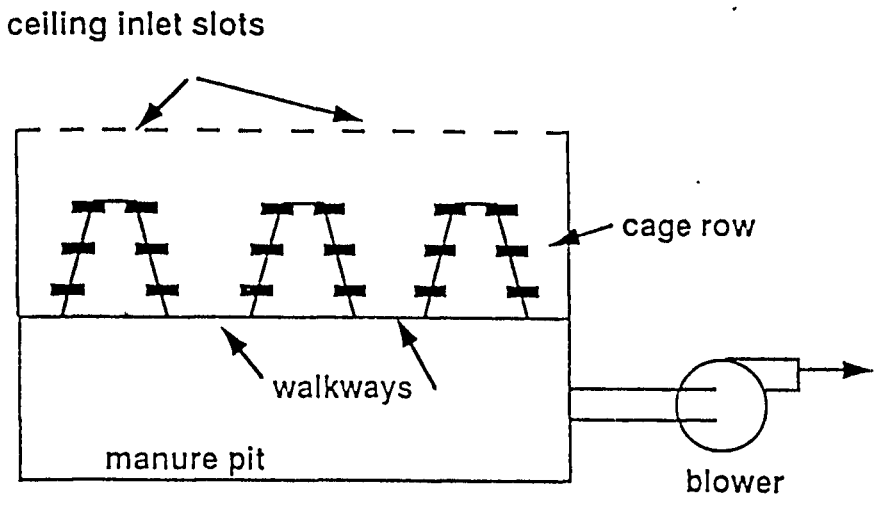
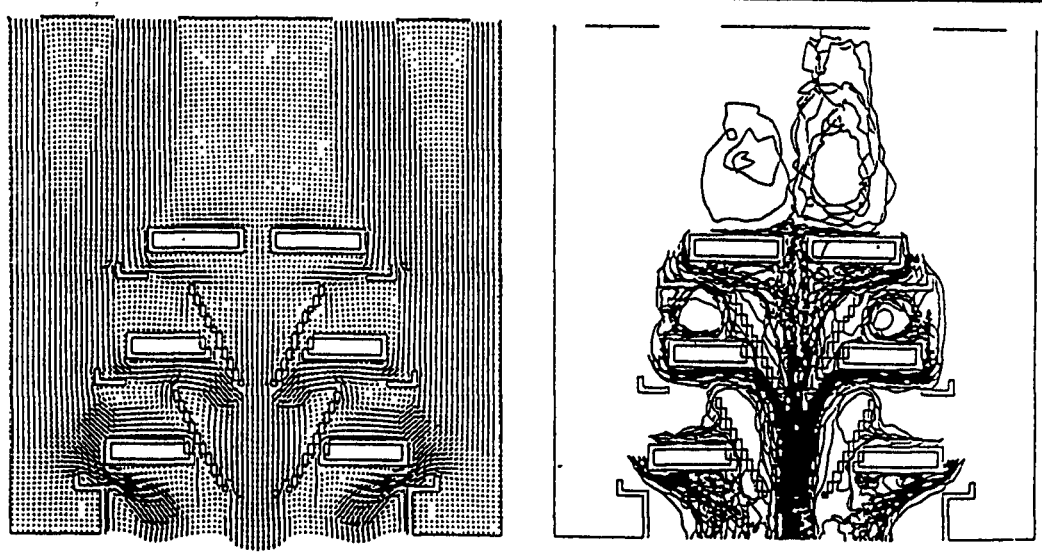


Figure 1. 1/5 scale model ventilation system cross-section.



Predicted Airflow Patterns Random Particle Tracks

Figure 2. Airflow patterns and random particle tracks for multiple slotted ceiling inlet system.

Poultry Science Capital Region Veterinary Science

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Entomology Food Science

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POULTRY ENVIRONMENTAL CONTROL RESEARCH AT PENN STATE

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An environmental control strategy is important for livestock production.

Several factors need to be considered to ensure that a healthy environment exists for the animals to perform optimally.

Different control capabilities exist for a given production house. Systems can range from natural ventilation to computer-controlled mechanical systems.

In any case, the objective is to control, as best as possible, the animal's environment. This means that the air in the production house contains minimal contaminants (dust and gaseous) and is at a temperature conducive to optimal livestock performance.

Recent research at Penn State University has focused on the distribution of air and temperature throughout poultry production buildings. Even though average air exchanges and house temperatures may be adequate, some regions within the facility may contain stagnant, contaminated air or temperature deviations.

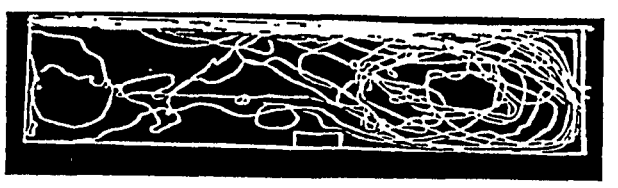
This implies that some of the birds may not experience adequate air quality or environmental temperature. Subsequently, some of the animals may perform poorly. Traditional techniques for planning environmental control schemes typically focus on average air temperature and average air exchanges per animal. New engineering techniques allow for analysis of air flow and air contaminant levels throughout a building, including visualization of air and contaminant patterns around cages.

Maghirang and Manbeck (1993) and Worley and Manbeck (1993) demonstrated such a technique in the analysis of poultry production buildings. Utilizing FLUENT, a fluid dynamics computer modeling program, it was shown that engineers could predict air flow patterns and contaminant concentration levels quite reliably.

The production building prototype under consideration by Maghirang and Manbeck (1993) was a 10-meter (32.8-foot) wide, 2.5-meter (8.2-foot) high floor-managed system, and was ventilated by side-wall exhaust fans and

(Turn to Page C8)

Observed:



Predicted:

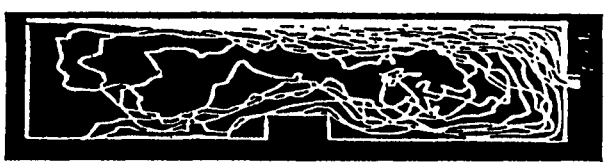


Figure 3. Trajectories of bubbles injected at the inlet of flow system.