

### WHY MONITOR SETTER TEMPERATURE VARIATION?

- Routine monitoring of temperature variation within and between setters is a powerful tool for checking hatchery maintenance programs.
- Excessive temperature variation within a setter indicates machine malfunction or incorrect machine operation.
- Temperature variation between setters indicates that the machines are not calibrated correctly.



### PROCEDURE FOR MEASURING SETTER TEMPERATURE VARIATION - GENERAL PRINCIPLES

- Setter air temperature variation is monitored by measuring the shell temperature of eggs that have little or no embryonic heat production (infertile eggs or eggs incubated between 2 and 7 days) at different locations within the setter.
- It is important to use the same methodology every time.
- Use the same equipment to measure temperature in all setters and ensure test thermometers are properly calibrated.
- Only test setters that are fully loaded with eggs and in multi-stage machines have balanced sets.
- Wait one day after setting or transfer before measuring temperature.
- Frequency of checking depends on how often problems are found.
  - the more often problems are identified, the more often the setters need to be checked
  - as a minimum, check setters every 3 months; if more than 10% of setters have excessive temperature variation increase the frequency of checks.

## PROCEDURE FOR MEASURING SETTER TEMPERATURE VARIATION

In setters that are easy to work safely inside while the machine is operating, eggshell temperature can be checked using a Braun ThermoScan® ear thermometer with a pre-heated tip.



In setters where it is difficult to access eggs at different locations while the machine is operating, eggshell temperature can be checked using data loggers with an external probe (e.g. Tinytags 4023).

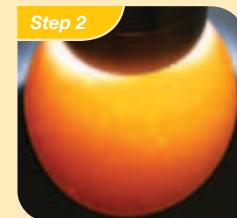
## PROCEDURE FOR USING BRAUN THERMOSCAN

### Step 1:

Check that the measuring tip of the thermometer is clean and has a new plastic cover. (Some older thermometer types may need to be kept at incubation temperature for 30 minutes prior to use).

### Step 2:

Identify an infertile egg in the center of the setter tray being monitored using a flashlight.



### Step 3:

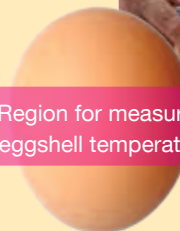
Measure shell temperature at the equator of the egg, making sure the tip of the thermometer is flat against the eggshell surface.



### Step 4:

Record results to machine location.

Region for measuring eggshell temperature



## PROCEDURE FOR USING DATA LOGGERS

**Step 1:**

Ensure that all data logger probes are reading the same temperature before use.

**Step 2:**

Following the manufacturer's instructions, program the data loggers to record the temperature every hour.

**Step 3:**

Identify an infertile egg in the center of the setter tray being monitored using a flashlight.

**Step 4:**

Tape the tip of the data logger probe to the surface of the egg at the equator. Use good quality tape so that the probe tip stays in place.

**Step 5:**

Attach the logger to the setter tray.

**Step 6:**

Record temperatures over a period of at least one day.

**Step 7:**

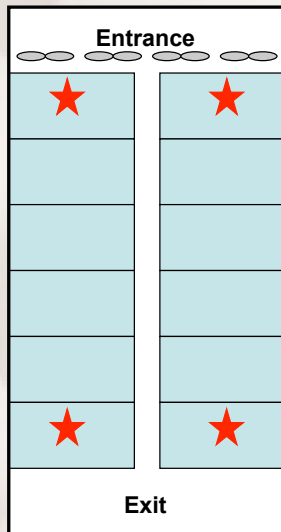
Download data from logger.



## WHERE TO MONITOR TEMPERATURE

- Setter type determines the best locations to measure temperature variation.
- The locations chosen should cover the different areas of the setter.
  - In smaller setters, the 4 different areas of the setter should be monitored.
  - In larger setters with multiple control zones, each zone should be monitored in at least two locations.
- The following diagrams show suggested locations (★) for monitoring temperature.
- In single-stage setters, shell temperatures are checked between 2 and 7 days of incubation.

## MULTI-STAGE TUNNEL

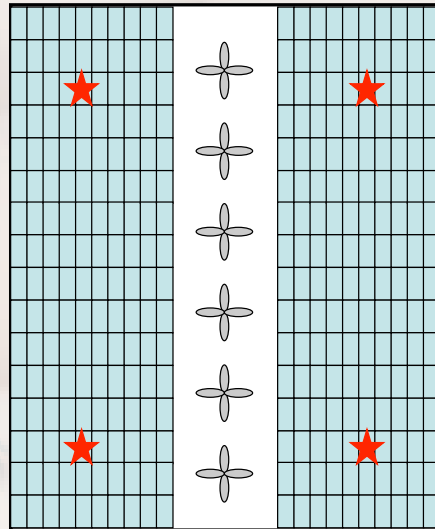


Acceptable eggshell temperature range.

38.2 - 38.3°C  
(100.7 - 101°F)

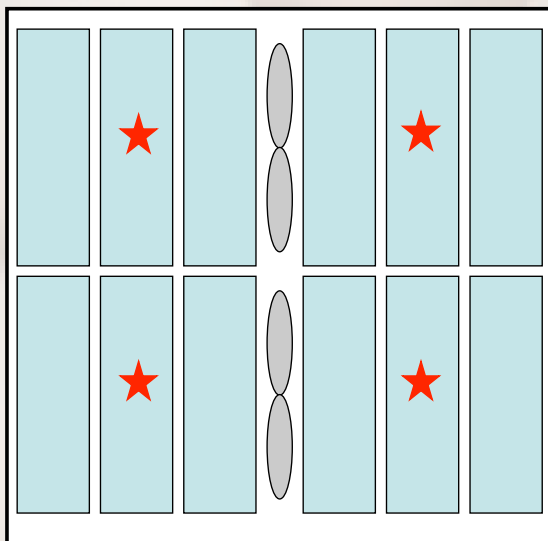
37.1 - 37.3°C  
(98.8 - 99.2°F)

## MULTI-STAGE FIXED RACK WALK-IN



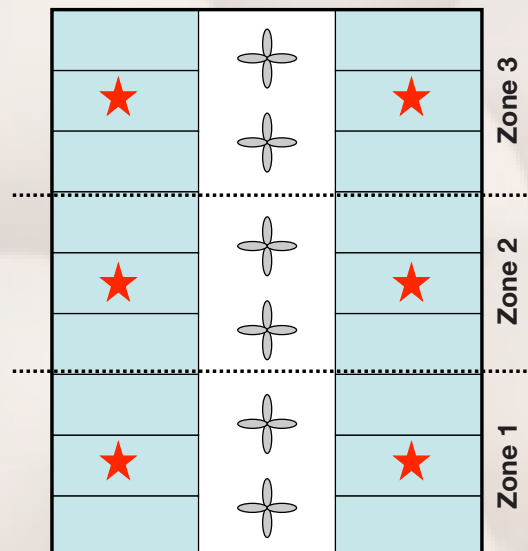
Eggshell temperature should be within +/- 0.1°C (0.2°F) of setter operating temperature.

## MULTI-STAGE TROLLEY CABINET



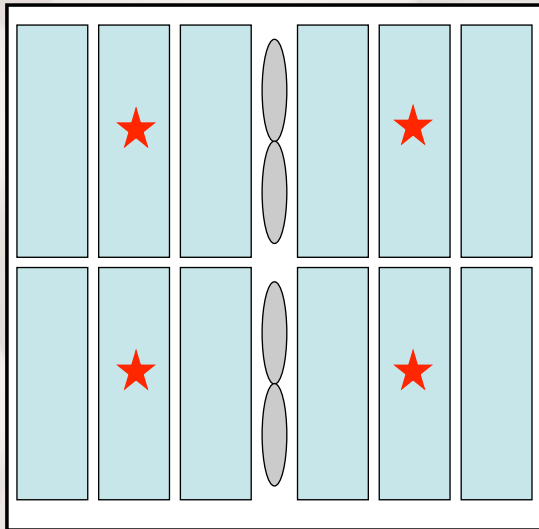
Eggshell temperature should be within +/- 0.1°C (0.2°F) of setter operating temperature.

## MULTI-STAGE TROLLEY WALK-IN



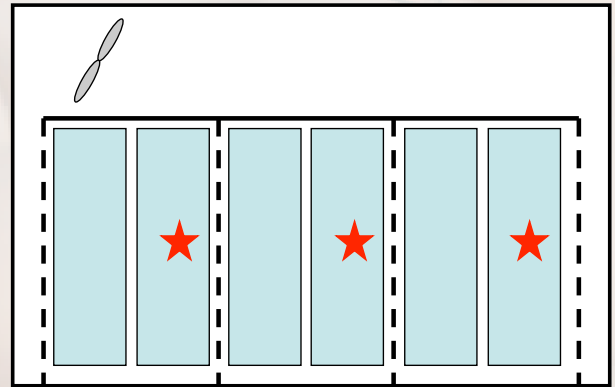
Eggshell temperature should be within +/- 0.1°C (0.2°F) of setter operating temperature.

## SINGLE-STAGE TROLLEY WITH VERTICAL CENTRAL FANS



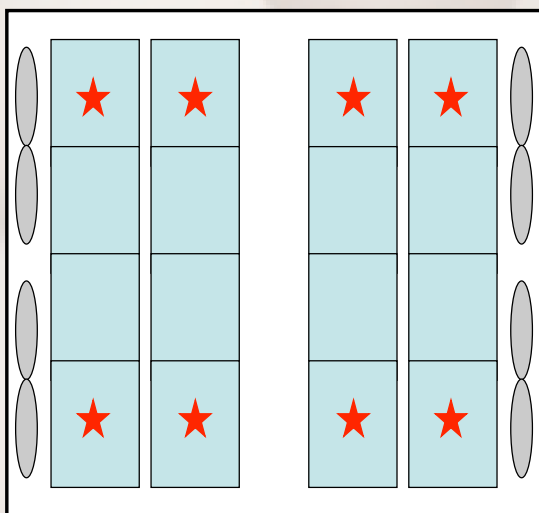
Eggshell temperature should be within  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ) of setter operating temperature and recorded from eggs between 2 and 7 days of incubation.

## SINGLE-STAGE LAMINAR FLOW CABINET



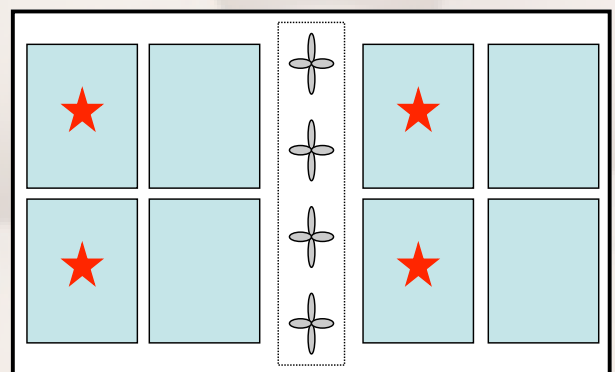
Eggshell temperature should be within  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ) of setter operating temperature and recorded from eggs between 2 and 7 days of incubation.

## SINGLE-STAGE TROLLEY WALK-IN



Eggshell temperature should be within  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ) of setter operating temperature and recorded from eggs between 2 and 7 days of incubation.

## SINGLE-STAGE TROLLEY WITH HORIZONTAL VENTILATION FANS



Eggshell temperature should be within  $\pm 0.1^{\circ}\text{C}$  ( $0.2^{\circ}\text{F}$ ) of setter operating temperature and recorded from eggs between 2 and 7 days of incubation.



## INTERPRETING RESULTS

- Compare shell temperature data between locations within a setter and between setters.
- If the temperature from a location within a setter is outside the acceptable range, then complete a thorough maintenance check on the setter.
- If there are differences between setters, then check setter calibration.

Setter #	Location 1	Location 2	Location 3	Location 4	Action Taken
Set temperature = 37.5°C (99.5°F), Acceptable range = 37.4 - 37.6°C (99.3 – 99.7°F)					
1	37.5°C (99.5°F)	37.5°C (99.5°F)	37.4°C (99.4°F)	37.5°C (99.5°F)	
2	37.5°C (99.5°F)	37.4°C (99.4°F)	37.6°C (99.6°F)	37.6°C (99.7°F)	
3	37.3°C (99.2°F)	37.4°C (99.3°F)	37.3°C (99.2°F)	37.4°C (99.3°F)	Recalibrated
4	37.4°C (99.3°F)	37.5°C (99.5°F)	37.5°C (99.5°F)	37.4°C (99.4°F)	
5	37.6°C (99.6°F)	37.5°C (99.5°F)	37.4°C (99.4°F)	37.5°C (99.5°F)	
6	37.2°C (99.1°F)	37.5°C (99.5°F)	37.4°C (99.4°F)	37.5°C (99.5°F)	Water Leak repaired
7	37.5°C (99.5°F)	37.5°C (99.5°F)	37.4°C (99.4°F)	37.5°C (99.5°F)	
8	37.6°C (99.6°F)	37.5°C (99.5°F)	37.5°C (99.5°F)	37.6°C (99.6°F)	

Example shows 2 setters that were found to be outside the acceptable range and the corrective actions that were taken.

- After completing maintenance and calibration checks, re-check shell temperatures to ensure that all locations are within normal range.
- Keep records of results and maintenance carried out.

## MAINTENANCE ISSUES THAT CAN CAUSE TEMPERATURE VARIATION

- Humidity sprays wetting eggs or floors
- Blocked humidity nozzles
- Temperature sensors out of calibration
- Humidity sensors out of calibration
- Incorrect ventilation fan speeds
- Water cooling or heating solenoids stuck open
- Heater bars not working
- Too much cold air entering the setter
- Ventilation dampers not working correctly



*Thermal camera image of eggs chilled by faulty humidity nozzles*

## MORE INFORMATION

- Ross Tech – Investigating Hatchery Practice
- AVIATECH Hatchery Maintenance
- Others in the Hatchery How To series:

- 01 Measure Egg Water Loss**
- 02 Measure Chick Yield**
- 03 Measure Eggshell Temperature**
- 04 Identify Infertile Eggs & Early Deaths**
- 05 Break Out and Analyze Hatch Debris**