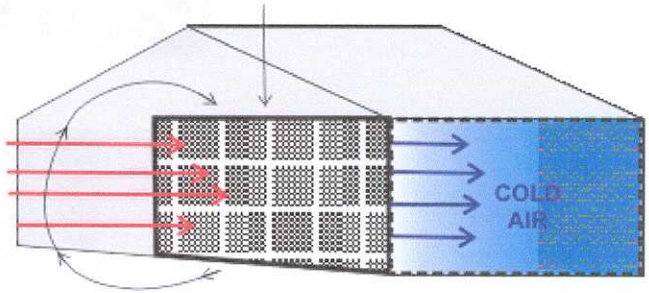
Understanding
EVAPORATIVE COOLING SYSTEMS

How do Cool Pads work?

Water is pumped into channels along the top of the pad, flows through the pad, is caught at the bottom and recirculated



The air drawn through the pad can contain dust, chemicals and microbes, almost all of which will be filtered out by the water and drawn down into the sump. This contaminated water provides a perfect mix for the potential growth of micro-organisms which must be properly managed to prevent potential problems from developing.

WHAT YOU NEED TO KNOW ABOUT COOL PADS:

* The installation and maintenance of cool pads is costly
* A reliable supply of good clean water is required
* Pad maintenance takes about 1 hour per day per shed
* Daily control of flow and quality of water is critical (flow:pH:hardness)
* Blocked jets, bleaching and scaling of pads, dust and microbes (viruses, bacteria, fungi and moulds) are almost certain to produce a major health hazard as the water is continuously recirculating
* Constant expensive disinfection of the water is therefore required

Evaporative cooling systems - PADS - Spin Discs - Fogging/Misting, are most effective when the temperature and humidity are lowest. In evaporative cooling heat is absorbed by the water as it evaporates - thus cooling the air.

Evaporative cooling is best suited to hot and dry environments where humidity is less than 30%. As humidity rises the efficiency falls.

Efficiency declines with rising relative humidity.

For example: Ambient temperature 30°C. Shed 1450M². Cool pads in use.

Relative humidity 40%	Efficiency decline to 58%
Relative humidity 45%	Efficiency decline to 50%
Relative humidity 20%	Efficiency decline to 70%
Relative humidity 80%	Efficiency decline to 15%

Thus cold air output is very restricted.

An examination of the official Meteorological data shows that high relative humidity always exists in Malaysia.

Source: Director General Meteorological Services - Malaysia

LOCATION	MONTH	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Kuala Lumpur	A	25.90	26.30	26.60	26.80	27.00	26.70	26.40	26.40	26.20	26.20	25.90	25.80
	B	31.90	32.80	33.00	32.80	32.70	32.30	31.90	32.00	31.80	31.70	31.20	31.20
	C	82.60	81.20	82.40	84.90	84.30	83.90	83.40	83.10	84.60	85.50	86.90	85.70
	D	98.60	98.20	98.40	98.40	98.20	98.10	97.80	97.90	98.30	98.70	98.90	98.90
Ipoh	A	26.40	26.80	27.20	27.20	27.20	27.10	26.80	26.70	26.40	26.20	26.00	26.00
	B	32.70	33.70	33.90	33.50	33.20	32.90	32.70	32.60	32.30	32.00	31.70	31.80
	C	77.20	79.80	78.20	82.30	82.40	80.10	80.80	79.60	79.80	81.20	85.50	83.20
	D	96.60	96.20	96.40	97.20	97.00	96.90	96.70	97.00	97.20	97.80	98.20	97.70
Johore Baru	A	25.10	25.30	25.70	25.90	26.10	25.70	25.40	25.50	25.50	25.50	25.20	25.10
	B	31.10	31.30	32.30	32.30	32.10	31.50	30.90	31.00	31.20	31.40	30.80	30.50
	C	84.30	84.10	85.20	88.00	87.50	87.90	87.90	87.60	87.70	87.80	89.50	87.60
	D	99.00	99.00	99.10	99.20	99.20	99.30	99.50	99.30	99.30	99.20	99.30	99.20

A = T °C 24 hour mean ***B = T °C Daily max. mean*** ***C = RH% 24 hour mean*** ***D = RH% Daily max. mean***

Example (Ipoh): Temperature - June 27.0-32.9°C range
Relative humidity - June 80%-96.9%

Thus at 30°C 1 cubic metre of air contains 30 grams of water when saturated, therefore at 30°C at 85% R.H. 1 cubic metre of air is saturated by 25.5g of water. This means that each cubic metre of air can only absorb 4.5 grams more before it is saturated.

In order to cool air, water must evaporate - heat being used to evaporate. Typical cool pad equipment - in these conditions - will only have a "cold air output" of between 5% and 7%. Vast increases in fan output will improve the position to some degree.

Against this the birds are producing 35,000 cubic metres of hot wet (saturated) air for every 5,000 chickens. This injects 44,000 grams of water/hour and this further reduces the efficiency of the cooling system - even to 10% and lower when pads are not properly serviced. and the underlying problem of heat stress is still present.

Thus the **Selectolyte programme** is still required to offset the heat stress which still exists.

Increasing the rate of airflow over the birds assists to a minor degree.

Other Factors affecting cool pad efficiency

- Air leaks around the walls will raise the internal temperature by 1 ^{O}C 0 2 ^{O}C (or more)
- If the **entire** pad is not wet - hot air will pass through.
- Cool air entering cannot move between crowded birds (remember rules for taking temperature - ground level amongst the birds).
- Dirty pads will reduce airflow by 20%-30% thus decreasing the wind-chill effect by 50%.

To summarise:

Efficiency Rating

In warm and humid conditions when the temperature is less than 20^{O}C

Evaporative cooling is most effective.

In hot and dry conditions e.g. above 30^{O}C and relative humidity less than 30%.

Evaporative cooling systems – PADS – Spin Discs – Fogging/Misting, are most effective when the temperature and humidity are lowest. In evaporative cooling heat is absorbed by the water as it evaporates – thus cooling the air.

In hot and humid conditions e.g. above 30^{O}C and relative humidity greater than 30%

The effect of higher temperatures rises rapidly with increasing humidity evaporative cooling systems become less effective.

In all conditions, shed location and structural factors are vitally important for profitable broiler production.

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