

Onsite Hypochlorous Acid in Broiler Production

Feed conversion, mortality and house ammonia: what the research shows, what it does not, and what it costs. Written for broiler growers, integrator live-production managers and poultry veterinarians. October 2026, revision 1.

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What this paper claims, and what it does not

An EcoloxTech system is a device that produces a hypochlorous acid solution on site. It is regulated by the EPA as a device, and we make no efficacy claims for it or for the solution it produces.

This paper reports published research on hypochlorous acid and electrolyzed water in broiler production, including effects on feed conversion, mortality and house ammonia, as findings under each study's own conditions, attributed to the researchers who produced them. They are not claims that any EcoloxTech system will improve feed conversion, reduce mortality or lower ammonia on a particular farm, and nothing here is a claim to prevent or treat disease in birds. Flock-health decisions belong to the integrator's veterinarian.

Documented disinfection claims come from HOCl-AS200 (EPA Reg. No. 101112-1) used according to its label, and from nowhere else. Cost figures are labelled by source, with their assumptions shown.

Executive summary

Growers and live-production managers ask three questions about hypochlorous acid in broiler houses: does it improve feed conversion, does it lower mortality, and does it reduce house ammonia. The published research answers them unevenly, and this paper reports it that way.

Outcome	What the research and EcoloxTech's own trial show	Strength of evidence
Water-line hygiene	At 0.3 mg/L, hypochlorous acid in broiler drinking water cut planktonic bacteria by more than 99.9% and significantly reduced biofilm on the pipe walls	Strong: controlled trial, consistent with earlier field work
Feed conversion ratio	Earlier trials at 0.3–1.0 mg/L reported improved production performance; a 2025 controlled trial at 0.3 mg/L found no difference (feed–gain 1.81 in both groups); a Pilgrim's Pride grower using EcoloxTech ranked 1st, 3rd and 1st on cost in its three settlements since installation	Mixed: not established
Mortality	A German field trial on two commercial farms found lower mortality, and spraying hatching eggs reduced first-two-week losses; a second farm study and the 2025 trial found no significant difference	Mixed: direction favorable, not consistent
Ammonia emissions from exhaust air	Hypochlorous acid at 80 ppm sprayed outside the exhaust fans removed 82% of ammonia, against 57% for plain water, in a 2025 broiler-house field study	Good: one well-designed field study with a water control

Outcome	What the research and EcoloxTech's own trial show	Strength of evidence
Ammonia inside the house	EcoloxTech's own trial misting 30 ppm inside an occupied broiler house reported a 75% reduction after each burst and 60% averaged over the day; a lab study that sprayed litter at 200 mg/L found ammonia rose, by adding moisture	Promising: one unpublished in-house trial, EcoloxTech data

The common thread in the first two is the water line. Broiler drinking water passes through warm plastic lines and nipple drinkers where biofilm and bacteria build up, and the studies that report performance and mortality effects treated the drinking water continuously at low concentrations. Onsite generation makes that practical: a generator produces solution at a set concentration on the farm, and a dosing pump meters it into the line.

Ammonia splits in two. At the exhaust fans, an inexpensive spray system using hypochlorous acid at about 80 ppm substantially reduced the ammonia, dust and odor leaving a broiler house in a peer-reviewed field study, which matters for neighbors and permits. Inside the house, EcoloxTech's own trial of a 30 ppm fine mist with birds present measured a 75% reduction; that is promising, unpublished, and worth testing on your own farm, while heavy spraying that wets the litter can make ammonia worse.

On cost, a four-house farm would cover the generator, salt, power and testing — about \$4,300 a year in the illustrative model — with a feed-conversion change smaller than one point (0.01). That is a statement of how small an effect pays back, not a claim that any farm will see it.

The operational problem in broiler houses

A broiler house is a water system, a ventilation system and a litter bed wrapped around a flock, and most of what goes wrong starts in one of the three.

Area	What happens	Why it matters
Water lines	Warm, low-flow plastic lines, vitamins, electrolytes and vaccines in the water feed biofilm between and during flocks	Biofilm harbors bacteria, clogs nipples and regulators, and changes what birds actually drink
Drinkers and litter	Leaking or mis-set nipples wet the litter beneath them	Wet litter caking drives ammonia release, footpad lesions and condemnations
Ventilation	Ammonia and moisture are removed by moving air, which costs fuel in cold weather	The cheapest air is the air not moved, so winter ventilation is where ammonia builds
Between flocks	Cleanout, house wash and line flush in a short downtime window	Whatever survives the downtime meets the next placement of day-old chicks
Hatchery and placement	Eggshell contamination and chick quality set the first week	First-week mortality is a large share of whole-flock losses

In contract production, the integrator owns the birds and the feed, and the grower is paid on how the flock's feed conversion, livability and weight compare with other growers settling at the same time. Small differences in feed conversion and mortality therefore move both the integrator's feed bill and the grower's check. That is why these two outcomes, and ammonia's effect on them, are what growers ask about first.

What the research shows on feed conversion

The clearest feed-conversion evidence comes from trials that added slightly acidic electrolyzed water — a hypochlorous acid solution at pH around 5.5–6.5 — to broiler drinking water continuously at very low concentrations. A 2025 review of drinking-water technologies for poultry summarizes this work: continuous addition to water lines at 0.3 mg/L available chlorine [improved feed conversion and daily gain](#), with no adverse effects on meat or bird health reported. A 2025 study in pigs, reviewing the same literature, describes two 2020 broiler trials in which [0.3, 0.5, 0.7 and 1.0 mg/L in drinking water improved production performance](#), reduced abnormal behaviors and lowered intestinal *E. coli*.

The most recent controlled trial points the other way on feed conversion. Li et al., at China Agricultural University, gave 480 broilers tap water or hypochlorous acid water at 0.3 mg/L for 42 days ([Poultry Science, 2025](#)). The water itself changed sharply: planktonic bacteria along the line fell by more than 99.9%, and biofilm biomass on the pipe walls fell significantly. But the feed–gain ratio was 1.81 in both groups, with no significant difference, and the authors conclude that hypochlorous acid water had neither an adverse nor a beneficial effect on production metrics under normal conditions. The same trial found lower markers of oxidative stress in the treated birds, a physiological finding rather than a performance one.

The Li trial also measured how fast the active chlorine decays at drinking-water strength: from 0.3 mg/L to zero within 9–10 hours in sealed, dark containers, and within 3–4 hours when open and exposed to light. That supports continuous dosing into the line rather than batch-mixing a tank in the morning.

A Pilgrim's Pride grower using EcoloxTech

One commercial broiler farm growing for Pilgrim's Pride — the same farm where the ammonia misting trial below was run — has shared its settlement results. The farm and the other growers are not named. In contract production every grower settling in the same window receives the same chicks and feed, so a farm's results against others in its settlement are a fair comparison, and it is the measure integrators themselves use.

EcoloxTech systems were installed on the farm on September 11, 2023, and from then on hypochlorous acid was used both in the drinking water and in the in-house misting described in the ammonia section. Because both ran together, the results below reflect the combined program; they cannot show which use contributed what. The settlements since installation:

Settlement	Flock	Farm feed conversion	Simple average of farms settling	Farm's rank on cost per pound
Before installation	Flock before September 2023, as reported by the grower	1.81	not available	not available

Settlement	Flock	Farm feed conversion	Simple average of farms settling	Farm's rank on cost per pound
October 2023	Placed September 1, so the system ran from about day 10; 47.7 days, 7.02 lb	1.68	about 1.70 (18 farms)	1st of 18
March 2024	49 days, 6.56 lb	1.74	about 1.80 (20 farms)	3rd of 20
May 2024	48 days, 6.65 lb	1.71	about 1.77 (20 farms)	1st of 20

The October flock stands out on growth. Its birds were the heaviest in the settlement at 7.02 lb, gaining 0.147 lb a day when no other farm exceeded 0.141, and heavier birds normally convert feed worse. The three flocks closest to it in age and weight, at 6.65–6.83 lb and about 48 days, converted at 1.71–1.72 against this farm's 1.68.

In the May 2024 settlement, the fairest comparison is with farms that had the same house type and the same bird density and were not using hypochlorous acid. Four farms in the settlement matched on both, and none of them used hypochlorous acid in this flock:

May 2024 settlement	This farm, using EcoloxTech	Closest match, no HOCl	Average of the four matched farms, no HOCl
House type and density	CLSA, 1.11	CLSA, 1.11	CLSA, 1.11
Flock age	48.0 days	50.0 days	49.6 days
Average weight	6.65 lb	6.64 lb	6.42 lb
Average daily gain	0.138 lb	0.133 lb	0.129 lb
Feed conversion	1.71	1.71	1.77
Livability	95.2%	91.9%	92.8%
Cost per lb (feed and chicks)	\$0.2027	\$0.2042	\$0.2105

The March 2024 sheet does not show bird density for every farm, so that settlement is compared with the whole group only.

The comparison is more nuanced than a ranking. The closest-matched farm converted feed exactly as well, 1.71 against 1.71, although its birds were two days older, which usually worsens feed conversion. Where this farm pulled ahead was livability, 95.2% against 91.9%, and growth: its birds reached the same weight two days sooner. Against the average of all four matched farms the gap is wider: feed conversion 0.06 better, livability 2.3 points higher, and cost about \$0.008 per lb lower, roughly \$4,600 on this flock's 589,000 lb.

The grower reports feed conversion of 1.81 in the flock before installation, against an average of 1.71 across the three flocks since — an improvement of about 0.10. Since installation the farm has ranked 1st, 3rd and 1st on cost against the other growers in its settlement, with consistently strong growth and, where it can be matched, higher livability, a pattern consistent with the published field studies that found lower mortality.

Two cautions belong with that figure. Feed conversion moves with season, bird weight and the feed and chicks in each settlement, so a single before-flock figure without its settlement average cannot show how much of the change came from hypochlorous acid; the settlement averages in the table themselves ranged from about 1.70 to 1.80. And this is one farm. The settlement sheet for the before-flock, with its group average and the farm's rank, would settle the first question.

Three points matter in reading these results:

- **The concentrations are tiny.** The trials dosed well under 1 mg/L, far below the strength used for surface sanitation. The likely mechanism is cleaner water and less bacterial load reaching the gut, not anything the chemical does to the bird directly.
- **Not all "electrolyzed water" is hypochlorous acid.** Studies of alkaline "ionized" or "electrolyzed reduced" water also report feed-conversion effects, but those products contain no hypochlorous acid and are not the same intervention. They are excluded here.
- **Replication is thin.** Most of the feed-conversion work comes from controlled pen trials in a small number of research groups. Commercial-scale replication across seasons, genetics and integrator programs is limited.

The honest summary: the effect of low-level hypochlorous acid in drinking water on water-line hygiene is well established; its effect on feed conversion is not. Earlier trials reported improvements, and the most recent controlled trial found none. A farm that wants to know should measure it, house against house, over several flocks.

What the research shows on mortality

The evidence on mortality is mixed: two farm studies and a hatching-egg trial point toward fewer losses, and a 2025 controlled trial found no difference.

Study	Setting and intervention	Finding
Field trial, Germany: Bügener et al., <i>Benefits of neutral electrolyzed oxidizing water as a drinking water additive for broiler chickens</i> , Poultry Science, 2014	Two broiler farms, three rearing periods each; electrolyzed oxidizing water added to drinking water against a control group	Total bacterial counts and <i>E. coli</i> in drinking water fell, and mortality was lower in the treated groups
Farm study, Technical University of Munich (thesis record)	One farm with two identical houses over three fattening periods; electrochemically activated water in drinking water in one house	Drinking-water quality improved; mortality was nearly the same in both houses, with a downward tendency in the treated house; birds in the treated house were significantly heavier at the end of all three periods
Controlled trial, Li et al., <i>Poultry Science</i> , 2025 (doi)	480 broilers over 42 days; hypochlorous acid water at 0.3 mg/L against tap water, in cages	No significant difference in mortality between groups
Hatching-egg trial, Fassenko et al., 2009 (abstract)	Hatching eggs sprayed with acidic electrolyzed oxidizing water before incubation; chicks grown to 39 days	Eggshell microbial load fell with no effect on hatchability or chick quality, and mortality in the first two weeks was significantly lower

The consistent element is microbial load at a point the bird depends on: the water it drinks and the shell it hatches from. The same German research group also reported that a 3% neutral electrolyzed water additive [kept *Campylobacter* out of drinking-water samples](#) on two naturally colonized farms, while control water tested positive.

What these studies do not show is a guaranteed reduction on any farm. Mortality is driven by chick quality, brooding, ventilation, disease pressure and genetics, and the field studies are few and small. They support a trial, measured against your own records, not a promise.

What the research shows on ammonia

Ammonia is two questions, and the research answers them differently. Sprayed into the exhaust air leaving a broiler house, hypochlorous acid has cut ammonia emissions by about 82% in a 2025 field study. Sprayed onto litter inside the house, electrolyzed water raised ammonia in a lab study, by wetting the litter. The first is an emissions and odor tool for farms with neighbors or permit limits; the second is not a way to lower the ammonia birds breathe.

Study	What was tested	Finding
Luo et al., South China Agricultural University, <i>Poultry Science</i> , 2025 (doi)	An ammonia removal blocking system outside a broiler house: hypochlorous acid at 80 ppm sprayed between the exhaust fans and a nylon net placed 3.5 m downwind, field-tested over 3 days against no spray and plain water	Ammonia removal of 82% with hypochlorous acid, against 42% with no spray and 57% with plain water; dust removal 77% and airborne microorganism removal 86%. In a lab chamber, 80 ppm reached 92% removal. Installed cost about \$1,900 and operating cost about \$590 a year, of which hypochlorous acid was \$136
Zheng et al., 2016 (ASABE abstract)	Slightly acidic electrolyzed water at 70 mg/L sprayed at a windbreak wall downwind of a layer house's exhaust fans	Removed 13.2% of ammonia against 8.8% for plain water, not statistically significant. The 2025 design, with optimized net placement, performed far better

Study	What was tested	Finding
Chai et al., Iowa State, 2017 (ASABE abstract)	Acidic electrolyzed water at 200 mg/L free chlorine sprayed onto hen-house litter, lab scale	Dust fell sharply, but ammonia emissions from every spray treatment were higher than the untreated control, because spraying added moisture to the litter

EcoloxTech's own measurement: fine mist in an occupied house

EcoloxTech misted generated hypochlorous acid at 30 ppm as a fine mist in the broiler houses of the Pilgrim's Pride grower described in the feed-conversion section, during the same flocks and with the birds present, and measured a 75% reduction in house ammonia after misting. The mist ran in short bursts of 2–3 minutes every 3 hours. The reduction held for about an hour and a half, after which ammonia began to rise again until the next burst. The 3-hour interval is a deliberate trade-off: misting more often would keep ammonia down longer, but would risk wetting the litter, which is what drives ammonia up in the first place.

Across the day, the reported average reduction was 60%, lower than the 75% after each burst because ammonia keeps coming off the litter and climbs back between cycles. No visible litter wetting was reported with the 3-hour spacing. These are EcoloxTech's own reported results; they have not been peer-reviewed or independently validated. They are, however, the only results we know of that measured lower ammonia inside an occupied broiler house rather than in the exhaust air.

Misting inside an occupied house needs safeguards that an exhaust-side system does not:

- **Interlocks, not just a timer.** Tie the controller to ventilation, relative humidity and equipment-failure alarms, and suspend misting when humidity, visible deposition or litter checks show a risk of wet litter.
- **Mist the air, not the birds.** Nozzles above the occupied zone, distributing into moving air, away from feed, litter, electrical equipment and ammonia sensors.
- **Watch the reaction products.** Hypochlorous acid reacts with ammonia, and depending on conditions can form chloramines or other chlorine-containing gases. Keep workers out of the mist plume and monitor chlorine or total oxidants during initial validation.

- **Get sign-off first.** The integrator's veterinarian and a qualified agricultural or industrial-hygiene professional should approve the application, and the solution used should be authorized for that use.

Two differences from the Iowa State lab study may explain the opposite result. The concentration was far lower, 30 ppm against 200 mg/L, and the solution went into the air as a fine mist rather than onto the litter as a wetting spray, so it added much less water to the litter. On bird safety, the 2025 exhaust-air study cites earlier animal work in which fogging with hypochlorous acid at 250 ppm for 8 hours a day over two weeks produced no significant changes in blood parameters or lung function; misting at 30 ppm is well below that.

The ammonia readings were taken by EcoloxTech during routine operation of the farm. A dedicated untreated control house, logged monitor data and litter-moisture measurements are not part of this paper, and the results should be read as EcoloxTech's field observations. A farm that wants to test the approach should measure its house against a house with a logging ammonia monitor, as set out in the implementation section.

The chemistry explains both results. In exhaust air, hypochlorous acid reacts with ammonia and can oxidize it to nitrogen gas, and the spray also captures the dust that carries ammonia and odor; the 2025 study found lower nitrogen compounds in the hypochlorous acid catch water than in plain water, consistent with that. Inside the house, ammonia comes from microbial breakdown of uric acid in litter, and its release rises with litter moisture, pH and temperature. A wetting spray onto litter adds moisture, and that outweighs the chemistry; a low-concentration fine mist into the air adds far less, which is the likely reason EcoloxTech's own in-house measurement went the other way.

Three practical conclusions follow. For **emissions and odor** — neighbors, permit conditions, tunnel-fan plumes — an exhaust-side spray system using hypochlorous acid at around 80 ppm is supported by peer-reviewed field data, and onsite generation supplies the solution at a fraction of the purchased cost; plain water alone removed 57% in the same study, and hypochlorous acid added about 25 points on top. For **in-house ammonia**, EcoloxTech's own trial of a 30 ppm fine mist with birds present — 2–3 minute bursts every 3 hours — is promising, and is best tested house against house on your own farm with ammonia logged continuously and litter moisture checked weekly. And whatever is applied inside, avoid **wetting the litter**: heavy spraying onto litter raised ammonia in the lab, and ventilation, drinker management and litter amendments remain the foundation.

Where it is used on a farm, and the rules that apply

A generator on a broiler farm feeds five jobs. The drinking-water line is the one tied to the research above; the rest are routine biosecurity.

Use	How	Notes
Drinking-water lines during the flock	A dosing pump meters generated solution into the line at a low, constant residual set by the integrator's water program	Dose continuously: at 0.3 mg/L the residual decays to zero within hours. Check it at the end of the line, not at the pump; stop dosing before water vaccination as the vaccine instructions require, and check compatibility with vitamins and electrolytes
Water-line cleaning between flocks	Lines flushed and held with a stronger solution, then flushed again before placement	Biofilm removal needs contact time; flush to drinking strength before chicks arrive
Exhaust-air ammonia and odor	Solution at about 80 ppm sprayed between the tunnel fans and a net screen outside the house	The 2025 field study placed the net 3.5 m from the fans to protect ventilation, ran spray in 25-minute cycles at peak emission hours, and pressure-washed the net about every 20 days
House and equipment sanitation	Sprayed or fogged after cleanout and washing	Only after soil is removed; let litter or floor dry before placement
Biosecurity points	Foot dips, vehicle and tool spray, entry rooms	Replace dips often; organic load exhausts them
Hatchery and hatching eggs	Egg spray before setting, hatchery surfaces and trays	The hatching-egg study above used acidic electrolyzed water; follow the hatchery's own program

The rules depend on what the solution is used for and what is said about it:

- **EPA.** The generator is regulated as a device, and its solution carries no claims. Registered claims come only from HOCl-AS200 used to its label, and only for the sites and organisms the label lists. Confirm any livestock or drinking-water use against the label and with your regulatory adviser before relying on it.
- **FDA.** A product claimed to improve animal performance or to prevent or treat disease can be treated as an animal drug. That is why this paper reports research findings and makes no performance or health claims, and why an integrator's program should be written the same way.
- **The integrator.** Water programs, vaccination timing and biosecurity rules are set by the integrator and its veterinarian. Onsite generation fits inside that program; it does not replace it.
- **Worker safety.** OSHA hazard communication applies on the farm as anywhere: safety data sheets, labeled containers and training, simplified by having no concentrate to dilute.

Cost analysis: how small an effect pays back

On an illustrative four-house farm, onsite treatment of drinking water costs about \$4,300 a year, and a feed-conversion change of 0.0073 — under one point — would cover it. Because the research does not establish an effect size for any particular farm, this section is a break-even model, not a forecast. Every input is an assumption to replace with your own figures.

Input	Assumption
Farm	4 houses × 25,000 birds, 6 flocks a year = 600,000 birds a year
Market weight and feed conversion	6.5 lb at 1.80
Feed cost to the integrator	\$0.15 per lb
Water use	About 2.5 gallons (9.5 litres) per bird per flock, roughly 1.8 times feed by weight
Dosing	Generated solution metered into the line at about 1 part in 100, so about 57,000 litres of solution a year
Production cost	\$0.03 per litre, the midpoint of EcoloxTech's "low cents per litre"

Annual cost	Amount
EcoloxTech 300 generator, \$9,999 list over 5 years	\$2,000
Four dosing pumps, about \$500 each over 5 years	\$400
Solution production, 57,000 litres at \$0.03	\$1,710
Residual test strips, weekly per house	\$170
Total	about \$4,300

What a given change would be worth on the same farm:

Change, if achieved	Annual value	Against \$4,300 cost
Feed conversion 0.005 better	\$2,925 in feed	Does not pay back alone
Feed conversion 0.01 better	\$5,850 in feed	Pays back
Feed conversion 0.02 better	\$11,700 in feed	Pays back about 2.7 times

Change, if achieved	Annual value	Against \$4,300 cost
Mortality 0.1 percentage point lower	600 more birds, about 3,900 lb more live weight	Adds to whichever feed figure applies

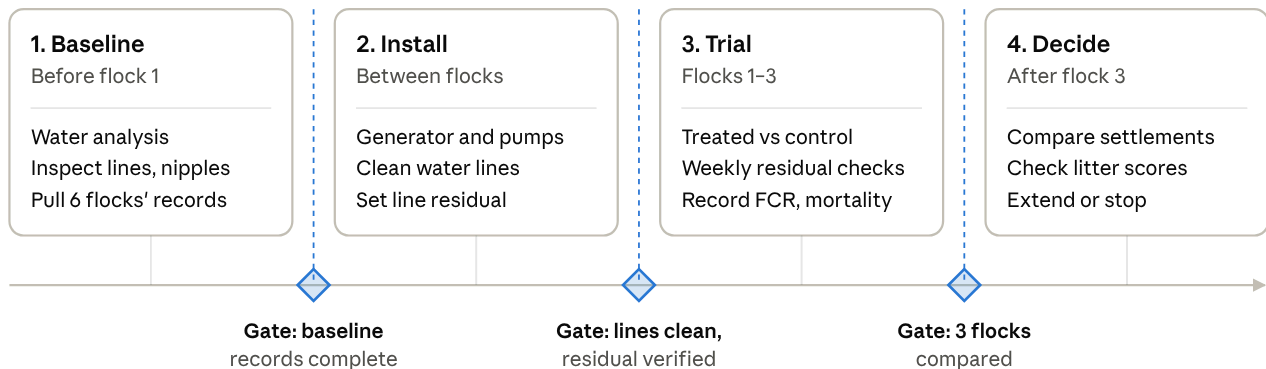
Two things to note. In contract production the feed saving lands with the integrator, while the grower benefits through settlement ranking on feed conversion and livability, so the business case is usually made jointly. And the generator also supplies line cleaning between flocks, house sanitation and biosecurity solution, which displaces purchased products not counted here.

Implementation

The research supports a trial, not an assumption. The cleanest test is house against house on the same farm, with the same chicks, feed and management, over at least three flocks.

Trial it house against house before deciding

Diamonds are decision points with the integrator



Implementation · 4 phases over about three flocks, 3 decision points

Agree the measures with the integrator before the first placement: feed conversion, livability, average weight, condemnations, footpad scores and litter moisture, taken from settlement sheets and the integrator's own records rather than from the supplier. Hold the end-of-line residual steady and log it weekly; a trial with drifting dosing tells you nothing. Then compare, and decide with the numbers, whichever way they fall.

What onsite generation does not fix

- **Ammonia.** Exhaust-side spraying reduces the ammonia leaving the house, not the ammonia birds breathe, and the in-house mist result is a single unpublished trial. Ventilation, litter moisture and amendments remain the foundation, and wetting the litter can raise ammonia.
- **Drinker management.** Line pressure, nipple height and leaks decide litter moisture far more than water chemistry does.
- **Cleanout.** Hypochlorous acid is an oxidizer; organic soil consumes it. Wash before you sanitize.
- **Disease programs.** Vaccination, coccidiosis control and veterinary treatment stay with the integrator and its veterinarian. Nothing in this paper is a claim to prevent or treat disease.
- **Brooding and chick quality.** First-week losses depend on hatchery, transport and brooding conditions before anything in the water line.
- **A guaranteed result.** The research reports effects under each study's conditions. Your farm's result is unknown until you measure it.

Questions to ask any supplier

Ask these of us, and of anyone selling a water or house treatment for broilers:

1. Which product carries registered claims, for which uses, and what is its EPA registration number?
2. Which performance or mortality figures come from controlled trials, which from field studies, and which from the supplier's own customers?
3. Do the studies use the same chemistry and concentration you are proposing for our water lines?
4. What residual should we hold at the end of the line, and how do we verify it?
5. How does dosing interact with water vaccination, vitamins, electrolytes and acidifiers?
6. What does the product do to ammonia, and what is the evidence?
7. What happens to water treatment when the equipment is down?
8. Will you support a house-against-house trial over several flocks, with results shared either way?

Sources

The cost figures are an illustrative break-even model; replace every input with your own before using it. Research is reported under each study's own conditions and is not a claim for any EcoloxTech system. This paper is not legal, regulatory or veterinary advice.

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