In-Situ Chlorination for the farm to table MECE concept

Our technology is a complete game changer for the produce/protein handling business.

1. Farm Use of technology The US is creating a powerful, phased compliance mandate that makes in-situ chlorination essentially mandatory for large portions of the fresh produce supply chain.

2. Trucking use of technology The trucking and cold-chain sector has a disinfection problem that is structurally identical to the farm's pre-harvest water problem — but with additional friction layers that make in-situ generation even more compelling.

3. Restaurant use of the technology The restaurant case is deceptively simple but commercially powerful because it converts an ongoing operating cost into a one-time capital purchase with a sub-12-month payback at almost every establishment size.

Farm Disinfection:

The US is creating a powerful, phased compliance mandate that makes in-situ chlorination essentially mandatory for large portions of the fresh produce supply chain.

The FSMA Pre-Harvest Agricultural Water Rule is the core driver. After years of delays following the 2011 Food Safety Modernization Act, FDA finalized the rule and implementation is now actively underway in three tiers:

- **April 2025** — Large farms (>$500K annual produce sales) were required to comply with pre-harvest agricultural water quality provisions. These farms must now conduct water assessments, identify microbial hazards, and where hazards exist, apply mitigation treatments — documented and auditable.
- **April 2026** — Small farms ($250K–$500K) came under the same obligation. FDA inspection assignments were already issued in August 2025, meaning auditors are actively in the field.
- **April 2027** — Very small farms ($25K–$250K) come into scope.

The rule doesn't mandate any specific treatment method, but it mandates a *documented, validated outcome* — water meeting specific microbial standards at the point of crop contact. In-situ HOCl generation is widely recognized as the most cost-effective, field-deployable way to meet that standard, particularly for farms using surface water or recycled irrigation water where pathogen load is variable.

The Foreign Supplier Verification Program (FSVP) extends FSMA equivalence to imported produce. Any Mexican, Chilean, Guatemalan, or Peruvian farm supplying fresh produce to a US retailer or distributor must now demonstrate the same water quality standards. This is a massive international compliance driver — the US is effectively exporting its water treatment mandate to every farm in its supply chain regardless of geography.

The Produce Safety Rule (PSR), the companion regulation, governs post-harvest agricultural water — wash water, dump tank water, and flume water in packing facilities. This has been enforced since 2018 for large operations and is already creating significant demand for continuous in-situ chlorination in packing house settings, where bulk hypochlorite delivery and storage is expensive, logistically complex, and creates chemical handling liability.

Why in-situ specifically wins against alternatives:

Bulk sodium hypochlorite degrades rapidly — losing 50% efficacy within 60–90 days — which creates compliance documentation headaches (the concentration at time of use may differ from the certificate of analysis). Calcium hypochlorite tablets require handling and dosing accuracy. Chlorine gas is essentially out of the question at farm scale due to hazmat classification. In-situ

generation from salt produces HOCl at consistent, measurable concentrations at the exact point of use, with a simple paper trail — a log of runtime, salt consumption, and water flow rate is sufficient for FDA audit purposes.

The AMR angle is emerging as a secondary regulatory driver. FDA's 2024 Antimicrobial Resistance Action Plan specifically identifies agricultural chemical biocide use as a concern. Quaternary ammonium compounds, which are widely used in produce packing sanitation, are under increasing scrutiny for cross-resistance effects. HOCl from electrolysis does not select for resistant bacteria — a distinction FDA is beginning to formally recognize and which will likely appear in future PSR guidance updates.

The practical bottom line for MagWater is that the compliance window isn't coming — it's here. Large farms are already in scope, small farms just entered scope in April 2026, and FDA is actively inspecting. The market isn't a future opportunity requiring education; it's an active compliance crisis requiring a solution, and the $5,000 portable MECE unit running on a garden hose or solar panel is precisely what tens of thousands of farms need right now.

Vegetable, proteins transport and processing:

The trucking and cold-chain sector has a disinfection problem that is structurally identical to the farm's pre-harvest water problem — but with additional friction layers that make in-situ generation even more compelling.

The core contamination risk in food transport

Every refrigerated trailer, produce van, and cold-chain distribution truck that carries fresh produce, raw protein, or ready-to-eat food is a potential cross-contamination vector between loads. A trailer that carried raw chicken on Monday and romaine lettuce on Tuesday is a documented pathway for Salmonella and Listeria transfer — and FDA's Reportable Food Registry data shows that transport environment contamination is an underreported but real contributor to outbreak chains. The FDA Food Safety Modernization Act's Sanitary Transportation Rule (21 CFR Part 1, Subpart O), was finalized in 2016 and now actively enforced, requires shippers and carriers to document sanitation procedures between incompatible loads.

Why chemical sanitizers fail at the truck level

Bulk chemical sanitizers — sodium hypochlorite, quaternary ammonium compounds, peracetic acid — create four specific problems in the trucking context that have no good solution under the current paradigm:

Hazmat classification at border crossings. A truck carrying concentrated sodium hypochlorite or peracetic acid across the US–Mexico or US–Canada border is carrying a regulated hazardous material. That requires placarding, documentation, and in some cases prior notification — adding

cost, time, and compliance exposure on every crossing. Produce trucks cross those borders hundreds of times a year.

Degradation in transit. Sodium hypochlorite loses roughly half its active chlorine within 60–90 days even in ideal storage. A drum sitting in a trailer through temperature swings from Texas to Minnesota degrades faster. The concentration the driver uses on Tuesday may be materially weaker than what the label says — creating both a food safety gap and a compliance documentation problem.

Space and weight. A drum of chemical sanitizer takes up cargo space, adds weight, and requires a separate handling protocol. Drivers under pressure to turn loads quickly skip steps.

Driver complexity and non-compliance. Proper chemical sanitation requires measuring, diluting, applying at correct contact time, rinsing, and documenting. Studies consistently show that under real operating conditions — tired drivers, tight schedules, inadequate facilities at drop points — these steps are abbreviated or skipped entirely.

The garden hose-scale in-situ solution

The MECE portable unit running on 12V auxiliary power or a small solar panel with a garden hose input eliminates every one of these problems simultaneously.

Salt and water are not hazardous materials. No placarding, no border documentation, no chemical handling certification required. The driver carries a bag of salt — available at any truck stop — and connects to the nearest water source. The unit generates HOCl at the point of use, at consistent concentration, on demand. There is no degradation problem because nothing is stored. Contact time for HOCl on surfaces is 5–20 seconds, compatible with realistic driver time constraints between loads. The log of salt consumption and runtime constitutes an auditable sanitation record.

For refrigerated trailer interiors specifically, the unit can be connected to the trailer's existing water inlet or a portable garden hose connection at any loading dock, produce wash station, or truck stop with water access. The HOCl solution is sprayed on cargo surfaces, pallets, bins, and floor drains — then the trailer is ready for the next load. No rinse required at food-contact concentrations, no PPE required for the driver, no chemical storage on board.

The protein-produce cross-contamination scenario specifically

This is the highest-risk load sequence in the cold chain and the one FDA's Sanitary Transportation Rule most directly targets. Raw poultry and ground beef carry Salmonella, Campylobacter, and E. coli O157:H7 at detectable levels even in compliant processing environments. Fresh leafy greens and ready-to-eat produce have essentially zero margin for these pathogens. A single contamination event at parts-per-billion concentrations can cause a recall. The trailer interior after a protein load is a documented risk environment, and the current standard of practice — a driver with a bucket

of diluted quat and a mop — is inadequate both microbiologically and from a compliance documentation standpoint.

In-situ HOCl generation addresses this specifically because HOCl at 50–200 ppm achieves a 5-log reduction of Salmonella on stainless steel and plastic surfaces in under 30 seconds. That is the validated kill rate needed to satisfy FDA's Sanitary Transportation Rule documentation requirements, and it can be achieved with a garden hose, a salt tablet, and a portable MECE cell running off the truck's auxiliary power.

Distribution centers as the volume multiplier

Beyond individual trucks, the approximately 3,000 major refrigerated distribution centers in North America — operated by Walmart, Amazon Fresh, Sysco, US Foods, C&S Wholesale, and similar — sanitize dock areas, loading bays, pallet storage zones, and cold room interiors continuously. These facilities currently use fixed chemical dosing systems or manual chemical application. A fixed small-to-medium MECE system integrated into the facility's water supply, with portable units for dock-level spot sanitation, replaces chemical procurement, storage, and hazmat compliance across the entire facility. For a Sysco or US Foods distribution center processing thousands of pallets per day, the cost reduction from eliminating chemical procurement alone justifies the system within months.

The regulatory pressure building behind this

The Sanitary Transportation Rule is currently enforced but under-resourced at the inspection level — FDA has acknowledged that transportation sanitation is an area where compliance is assumed rather than verified in most cases. That is changing. The 2024 National Strategy on Foodborne Illness Prevention explicitly identified cold-chain transportation as an enforcement gap, and FDA's FY2026 budget request included additional inspector capacity specifically for transport sanitation audits. The direction of travel is toward mandatory documented sanitation between incompatible loads with validated method requirements — which means the window for voluntary adoption before mandatory compliance pressure arrives is narrow and closing.

The MagWater value proposition in this segment is not that in-situ chlorination is better than chemical sanitation in some marginal sense. It is that in-situ generation from a portable garden-hose-scale unit is the only method that simultaneously eliminates hazmat classification, eliminates degradation risk, eliminates driver complexity, generates a simple audit trail, and achieves validated pathogen kill at contact times realistic for commercial trucking operations. Nothing else does all five.

Restaurant use in-situ chlorination:

The restaurant case is deceptively simple but commercially powerful because it converts an ongoing operating cost into a one-time capital purchase with a sub-12-month payback at almost every establishment size.

What restaurants currently spend on sanitation chemicals

A typical quick-service restaurant spends $1,500–$4,000 per year on chemical sanitizers — quaternary ammonium compounds for surface sanitation, chlorine tablets for three-compartment sinks, peracetic acid for produce wash, and specialty cleaners for cooking equipment. A full-service or casual dining establishment with higher throughput and more complex prep operations spends $3,000–$8,000 annually. Institutional foodservice — hospital cafeterias, university dining halls, hotel kitchens — runs $10,000–$30,000 per year depending on volume. Against those figures, a $5,000 purchase or $100/month lease competing directly with annual chemical spend is an immediate, obvious economic win for the operator.

What HOCl replaces across the restaurant

The transformative commercial insight is that a single HOCl-generating unit replaces multiple separate chemical product categories simultaneously. Quat sanitizer for surface wiping. Chlorine solution for the three-compartment sink sanitizing step. Produce wash solution for leafy greens and herbs. Floor and drain sanitizer. Restroom surface disinfectant. A restaurant currently buying five separate chemical products from a Sysco or US Foods chemical program, each with its own dilution protocol, each requiring staff training and compliance documentation, replaces all five with one system and one input — salt and water.

The labor dimension is underappreciated. QSR and casual dining staff mismeasure sanitizer concentrations routinely — test strip data from third-party food safety audits consistently shows that 30–40% of sanitizer solutions in active restaurant use are outside the effective concentration range, either too dilute to kill pathogens or too concentrated to be safe on food-contact surfaces. In-situ HOCl generation at a fixed concentration eliminates this entirely. The solution coming out of the unit is always at the right concentration. No measuring, no diluting, no test strip required. Staff compliance goes to effectively 100% because there is nothing to measure or mix.

The food safety regulatory environment driving adoption

Every US food service establishment operating under FSMA's Preventive Controls for Human Food rule is required to maintain a documented food safety plan with validated sanitation procedures as Preventive Controls. HOCl from electrolysis is FDA-recognized as a generally regarded as safe antimicrobial at concentrations up to 200 ppm for food-contact surface sanitation

and produce washing — no additional approval required, no special registration, no state-by-state variance needed. The documentation requirement is simple: log runtime, salt consumption, and water flow. That log constitutes the validated sanitation record for an FDA inspection.

Environmental Health Officers conducting routine local health department inspections are already familiar with HOCl as an approved sanitizer. In several major city health departments — New York, Los Angeles, Chicago — HOCl systems have been specifically noted in inspection reports as compliant alternatives to chemical sanitizer programs. This reduces the inspection friction to near zero.

The AMR argument is becoming a first-order concern at the restaurant level

The FDA and CDC have both identified quat-based sanitizers as contributors to antimicrobial resistance in food service environments. Cross-resistance between quaternary ammonium compounds and clinically relevant antibiotics — particularly in Listeria monocytogenes and Salmonella strains — is documented in peer-reviewed literature and has been raised explicitly in FDA's 2024 AMR Action Plan. For chain restaurant operators managing reputational and legal exposure, a shift away from quats toward HOCl is increasingly defensible as a proactive risk management decision, not just a cost-saving measure.

Ghost kitchens and food trucks as the fastest-conversion segment

Ghost kitchens — delivery-only operations running out of shared commercial kitchen spaces — are the fastest-growing segment of US foodservice, expanding at roughly 15% annually. They operate under tight margin constraints, limited storage space, and high regulatory scrutiny because they lack the brand visibility that creates compliance pressure. A portable $5,000 unit or $100/month lease is perfectly sized for a ghost kitchen operation with 200–500 square feet of prep space. There is no room for chemical storage drums, no purchasing infrastructure for chemical procurement, and no dedicated facilities manager to manage a chemical compliance program. Salt, water, and a countertop MECE unit is the entire sanitation infrastructure.

Food trucks are structurally identical — 92,000+ operating in the US as of 2025, growing at 17% year over year, crossing state and sometimes national borders, with no ability to carry regulated chemical concentrates and no space for anything beyond minimal supplies. The garden-hose-scale MECE unit is the only sanitation solution that fits the physical and operational reality of a food truck without compromise.

The franchise chain opportunity is the volume multiplier

A single corporate-level agreement with a franchise chain converts instantly into hundreds or thousands of units. If McDonald's, Chipotle, or Yum Brands adopts a $100/month HOCl lease program as their standard sanitation protocol — driven by cost savings, AMR liability reduction, and ESG chemical reduction commitments — that is 5,000–40,000 locations implementing the

same system from one B2B agreement. The sales cycle is long, 12–24 months at minimum, but the payoff is transformative. One franchise agreement at scale dwarfs the entire independent restaurant segment in revenue terms.

The strategic sequencing therefore is: independent restaurants and ghost kitchens first, because they convert quickly on economics alone; use those case studies and documented inspection compliance records to approach regional chains; use regional chain data to approach national franchise corporate procurement. The HOCl system sells itself at every level on cost, simplicity, and compliance — the franchise conversation simply requires a different buyer and a longer timeline.