CASE STUDY

COLMAC COIL
Manufacturing Inc.

BUILT FOR MAXIMUM RELIABILITY: HOW COLMAC COIL HYGIENIC AIR HANDLERS PROTECT A BEEF PROCESSING FACILITY

Installer: RC&S

Location: Kansas

Type of System: Beef Processing

Processed Product: High-Protein Frozen Beef (98-99% Lean)

Type of Refrigeration System: Ammonia

Room Temperature:
- **42°F – 45°F (Production)**
- **75°F – 80°F (Cleanup)**

Equipment:
- **HygenAir™ A+H40 Hygienic Air Handler (Qty. 2) 40,000 CFM per unit**
- **Industrial A+Series A+M Air Coolers (Qty. 3)**

Results Delivered:

- Food-safe environment maintained 24/7 with zero product temperature exceedances reported post-commissioning.
- Production runs uninterrupted through defrost. Sequential 3-coil defrost limits capacity loss to just 24 minutes per 3-hour cycle.
- Built so one failure never becomes a shutdown. Four blower motors across two units means any single motor loss retains 75% capacity, no halted production, no triggered sanitation event.
- $75,000 removed from the construction budget. EC motors with built-in variable speed control on exhaust fans and air coolers eliminated the need for a separate VFD starter panel entirely.
- Hygienic air controls with custom programming integrated seamlessly into the facility-wide systems.
- Custom triangular corner diffusers, manufactured to RC&S exact specifications, delivered target airflow with zero louver adjustments required after installation.

Project Overview:

The meat processing facility added a new addition that produces 98–99% lean beef protein, which demands uncompromising temperature control, contamination prevention, and continuous uptime. The production room required a hygienic air handling system capable of maintaining a strict 42–45°F temperature, managing humidity, filtering supply air to food-safe standards, and transitioning daily between production and cleanup modes, all while protecting against the operational and financial consequences of any unplanned downtime.

RC&S engineered and installed a system built around two Colmac Coil HygenAir™ Hygienic Air Handling Units, in addition to Colmac industrial air coolers (evaporators) specified earlier in the project for a cooler. The two-unit strategy, redundant blower motors, sequential defrost, EC motor technology, custom diffusers, hygienic materials, and HygenAir™ Controls combined to deliver a high-performance, hygienic, and resilient solution that's verified to rated capacity during independent commissioning.

Challenges and Project Requirements

1 Meeting strict dual-threshold temperature control in a heat-dense production environment

The production room contains centrifuges, conveyors, motors, and production workers, all generating simultaneous heat, moisture, and particulate loads. Room temperature must be held between 42°F (worker comfort minimum) and 45°F (food safety maximum) with no flexibility. Exceeding 50°F for more than two hours triggers a mandatory full sanitation event and product removal, an event that halts production for hours. The air handling system had to combat all thermal loads while delivering low-velocity air that would not disturb product, equipment, or personnel.

2 Managing dual operational modes, production and cleanup, within a single integrated system

The facility operates two production shifts daily, followed by a 4–5-hour cleanup cycle. During production, units recirculate and condition room air blended with outside air for pressurization, dehumidify to remove process-generated moisture, and reheat supply air to restore its moisture-carrying capacity. During cleanup, units switch to 100% outside air and must deliver 75–80°F supply air, requiring a direct-fired burner capable of heating incoming air on over 300 days per year in Kansas. Both modes demand separate damper configurations, filter staging, and exhaust fan operation, all managed through a single integrated controls platform.

Because cooling the air below its dew point brings supply air to near 100% relative humidity, a reheat coil is essential, it raises the dry-bulb temperature above the wet-bulb, restoring the air's capacity to carry moisture back out of the room.

3 Eliminating single points of failure in a continuous production facility

A single-unit, single-blower design creates unacceptable risk: one motor failure halts the entire system. With no redundancy, room temperature rises, production stops, and a full sanitation cycle is triggered. The facility's production schedule means unplanned shutdowns carry significant financial consequences beyond simply lost production hours.

4 Managing installation complexity and cost for large-capacity air handling equipment

High-capacity hygienic air handlers present logistical challenges that extend far beyond the equipment itself. On this project, ductwork cost alone exceeded the cost of the air handling units. Crane requirements, ductwork sizing, structural load distribution, and the second-floor ductwork routing constraint all scaled with unit size, making the equipment sizing and layout strategy a major cost driver

HYGENAIR™ A+H40 HYGIENIC AIR HANDLERS – BEEF PROCESSING ROOM

Cooling Coils:
Coils designed and manufactured by Colmac Coil to ASME B31.5 as standard. Three coil design provide redundancy through sequential defrost.

EC Exhaust Air Fans:
Direct-drive, variable-speed motors, no external VFDs required. Built-in speed control reduces installation cost and simplifies maintenance.

Custom Supply Air Diffusers:
Triangular corner design with variable louvers, factory preset to RC&S air model specs. Zero in-air adjustments required after installation.

The Solution: Customized HygenAir™

Two-Unit Architecture with Redundant Blower Motors

Rather than a single large unit, RC&S specified two matched HygenAir™ units, each with two direct-drive blower motors, giving the facility four motors total. The two-unit strategy was driven by four converging factors: a single 80,000 CFM unit requires a substantially larger crane; ductwork cost scales exponentially with size; two units distribute structural point loads across the building; and critically, with one unit down the facility sustains limited production, a capability a single-unit system can never provide.

The four-motor architecture provides redundancy, when one of the supply blower motors goes down or needs to be replaced, losing one motor reduces capacity to 75% while a replacement is sourced. A single-motor failure in a conventional single-blower unit halts the system entirely. The facility's maintenance team recognized the advantage immediately when reviewing the cut sheet.

Sequential 3-Coil Defrost for Uninterrupted 24/7 Production

Three cooling coils operate simultaneously in refrigeration during production. A maximum low-suction timer triggers air-defrost on one coil at a time, approximately 8 minutes per coil, while the remaining two coils continue refrigerating. Net capacity loss: just 24 minutes per 3-hour operating period. Production continues at near-full capacity throughout with no production pauses required for defrost.

Custom Triangular Corner Diffusers, Engineering Partnership

The room's second-floor ductwork routing created spatial conflict: standard rectangular diffusers would have blocked most of the usable second-floor area. The installer designed triangular corner diffusers to push ductwork to the outer wall edges. Colmac Coil manufactured them to the installer's specifications, presetting louvers based on RC&S air modeling data.

Upon installation, zero louver adjustments required from a lift, a complete validation of the engineering and the manufacturing precision.

Hygienic Construction, Materials & Serviceability

The HygenAir™ units are built for the washdown realities of food-grade production environments. Interior walls, drain pans, dampers, refrigerant connections, and supply air fan chassis are all stainless steel throughout. Drain pans are fully seal-welded and sloped to eliminate standing water and prevent microbial growth. Incoming air passes through MERV 8 pre-filters before cooling and dehumidification, with MERV 14 final filters on the supply air side protecting air quality to food-safe standards.

The supply air fan chassis includes a motor removal system, a practical feature that makes motor replacement significantly less disruptive in a rooftop installation where heavy component removal would otherwise require a crane or large crew.

Units are shipped in three modular sections, simplifying crane placement, rooftop assembly, and field sealing on projects where access and structural load distribution are constraints.

Hygienic Air Controls Built to the Facility's Specification

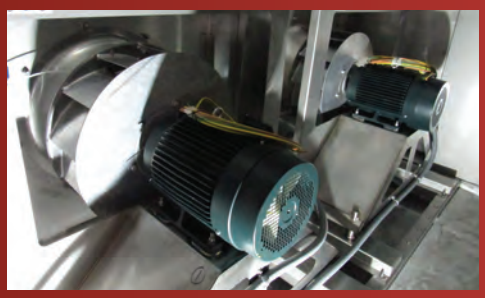
The customer required Allen-Bradley processors and Panel View interfaces, their facility-wide standard. Colmac Coil built fully to this specification with custom programming rather than defaulting to a standard offering. Custom programming covers: sequential defrost logic, dual blower VFD operation, exhaust fan staging, reheat coil sequencing, and burner enable set points.

"We sent our conceptual drawings to Colmac and said: this is what we want, can you make this a reality? They readily said no problem, and did it, and it performed well. They didn't just tell me they don't make something like that."

— Paul Rosenbaum II, Co-President RC&S

HYGENAIR™ A+H40 HYGIENIC AIR HANDLER

– Beef Processing Room



Supply Air Blowers/Fans:
Dual direct-drive blower motors per unit provide redundancy and maintain airflow during motor servicing or replacement.

Snow Hood:
Factory-installed snow hood with bird screen protects the outside air intake from precipitation and debris ingestion

Direct-Fired Burner:
100°F-rise burner with wide turn-down. Enables full cleanup mode from sub-zero winter air to warm summer conditions.

Hygienic Construction & Materials:
The interior features stainless steel construction throughout, including fully seal-welded sloped drain pans that eliminate standing water and prevent microbial growth. The exterior is G235 galvanized steel for long-term corrosion resistance in washdown environments.

Commissioning, Startup & Ongoing Performance

RC&S independently verified all performance parameters post-startup: refrigeration coil capacity at design suction pressures, full combustion analysis on the burner (BTU output, turn-down range, emissions), blower airflow via VFD Hz fine-tuning to match actual duct static pressure, and exhaust fan pressurization confirmed at 5–10% negative during cleanup mode. Units have run reliably post-commissioning. No blower motor failures. Drain pans draining properly. Refrigeration performing to spec. Build quality confirmed on pre-ship factory inspection.

> **"Colmac did not put additional burden on us to solve the issues, or stress related to 'we're not going to get started up on time.' We worked together as partners."**
>
> ***— Paul Rosenbaum II, Co-President RC&S***

Operational Impact

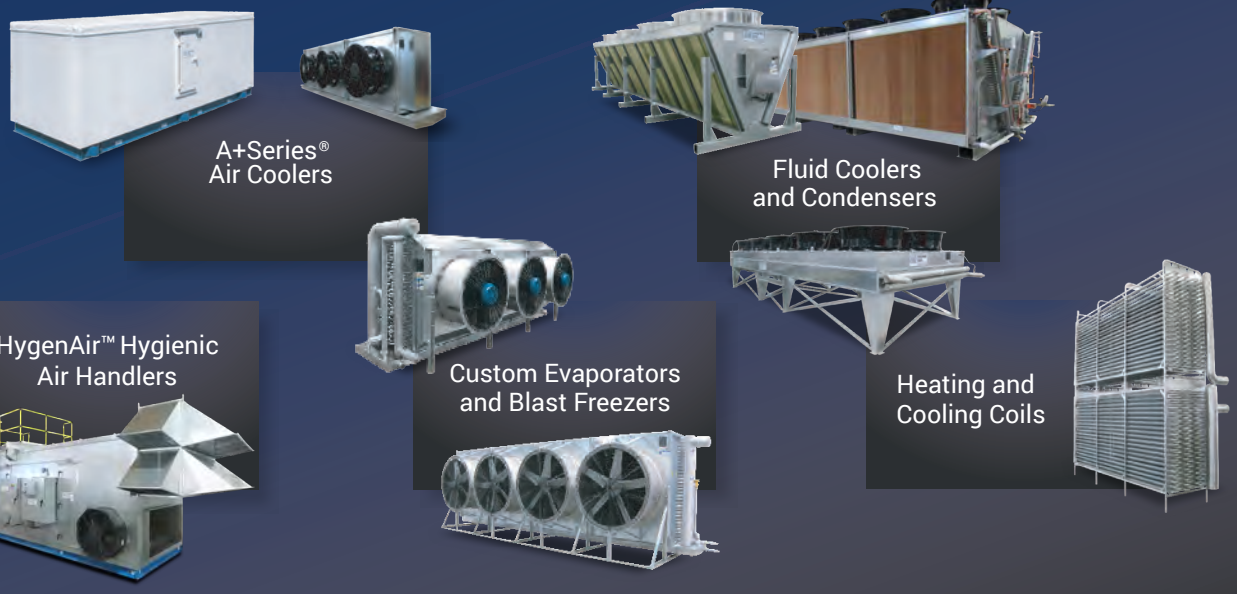
The Kansas facility now operates with a hygienic air handling system engineered for the demands of high-protein beef production, and resilient enough to handle the unexpected. Redundant architecture, sequential defrost, EC motor technology, and a custom engineering partnership between RC&S and Colmac Coil delivered independently verified performance across every operating parameter, from day one.

YOUR FACILITY HAS UNIQUE DEMANDS. WE ENGINEER TO THEM.

Every HygenAir™ system is custom-built to your production environment — temperature thresholds, operational modes, redundancy requirements, and controls integration. Contact the Colmac Coil team to explore what a purpose-built solution looks like for your facility.

QUALITY PRODUCTS FROM COLMAC COIL

COLMAC COIL
Manufacturing Inc.



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