

Development of a state-of-the-art Personal Hygiene Ante Room Utilising AI and UV

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Project description

The project was initiated to address increasing demands for improved hygiene compliance in meat processing environments, driven by both regulatory changes and the long-term impacts of the COVID-19 pandemic. The core goal was to implement an AI-enhanced, automated Personal Hygiene Ante Room within the Northern Co-operative Meat Company's (NCMC) new Retail Ready Facility. This space aimed to ensure stringent hygiene practices by reducing manual contact, integrating advanced monitoring technologies, and collecting compliance data in real time. Built around the principles of touch-free hygiene, automation, and intelligent compliance monitoring, the ante room features a suite of cutting-edge equipment — including sensor-activated handwashing stations, automated boot scrubbers, UV-C surface sanitation, and turnstile-controlled access. During the project, an advanced AI module was developed and trialled to observe hygiene behaviours such as handwashing technique, PPE adherence, and foreign object detection, feeding data into a real-time QA dashboard.

While the AI system was ultimately decommissioned due to commercial decision specific to the site, the physical infrastructure continues to operate and delivers measurable improvements in workflow efficiency, hygiene consistency, and entry compliance. The room also supports staff training by reinforcing best practices and providing a well-designed, easy-to-follow hygiene process at shift entry points.

This initiative provides a scalable model that can be adopted or adapted by other processors seeking to modernise hygiene systems. It demonstrates how smart facility design, supported by technology, can help the red meat industry meet rising expectations, reduce risk, and future-proof operations through proactive quality assurance.

Project content

This project followed a structured, phased approach to ensure the successful delivery of a state-of-the-art ante room that met both compliance expectations and operational needs. The focus was on combining thoughtful facility design with proven hygiene technologies and emerging AI capabilities.

The project was delivered in six key stages:

1. Internal Engagement & Concept Development

Initial awareness sessions and design workshops were conducted within NCMC to explore hygiene risks and opportunities. Early input from site teams helped shape a concept tailored to the facility's operational flow and staff behaviour.

2. Design Finalisation & Stakeholder Review

A preferred layout was developed in consultation with AMPC and site leadership, ensuring the ante room would promote intuitive staff movement, minimise congestion, and align with COVID-safe principles. Emphasis was placed on separating entry and exit pathways and embedding hygiene checkpoints into natural traffic flow.

3. Equipment Procurement & Installation

Leading suppliers were engaged to deliver key hygiene infrastructure, including:

- Sensor-activated handwash stations with built-in drying
- Automated boot scrubbers for sidewalls and soles
- UV-C lighting systems for overnight sanitisation
- Heated drying racks and hands-free turnstile access

All equipment was installed and tested for operational reliability.

4. AI Monitoring System Deployment

To trial automated compliance tracking, Lumachain installed a network of high-resolution cameras and servers to observe hygiene behaviours at key points in the ante room, including:

- Handwashing technique (soap usage, time, drying)
- PPE adherence (hairnets, beard nets)
- Foreign object detection (rings, watches, etc.)

5. AI Model Training & QA Integration

The AI system was trained on annotated datasets to recognise compliant vs. non-compliant behaviours. Results were displayed via a dashboard for real-time QA oversight. This allowed for monitoring without manual observation, with the intention of supporting training and continuous improvement.

6. Reporting & Project Rescoping

As the project evolved, several originally planned features — such as thermal scanning and facial recognition — were removed due to shifting COVID relevance and implementation challenges.

Project outcomes

The project successfully delivered a fully operational, high-efficiency Personal Hygiene Ante Room, achieving its core objectives: reducing manual contact, improving hygiene compliance, and setting a new benchmark for ante rooms through automation and smart design.

Infrastructure outcomes included:

- Commissioning of a purpose-built ante room equipped with:
 - Sensor-activated handwashing stations with integrated drying
 - Automated boot scrubbers and heated boot drying racks
 - UV-C sanitisation lighting for overnight disinfection
 - Hands-free sanitiser stations and turnstile-controlled access

These systems were fully installed and operated in line with the implementation plan, supporting a hygienic, efficient, and COVID-safe staff entry process. The layout was specifically designed to improve flow, minimise congestion, and encourage consistent hygiene behaviours during shift transitions.

Technology outcomes:

An AI-powered monitoring system was developed and trialed to assess key hygiene behaviours, including:

- Handwashing compliance – tracking soap use, wash and dry duration
- PPE adherence – verifying presence and correct use of hairnets and beard nets
- Foreign object detection – identifying non-compliant items such as rings and watches

The system was operational and successful at identifying compliant and non-compliant events that would then be delivered via a dashboard for production and QA teams. Although ultimately decommissioned due to commercial decisions at the site, the AI trial provided critical insights into the future role of digital compliance tools in processing environments.

Objective alignment:

Most project objectives were successfully delivered, including:

- Establishment of a best-practice, automated hygiene entry facility
- Demonstration of behavioural monitoring using AI and computer vision
- Generation of compliance data to support QA and training
- Engagement with AMPC and the wider industry through reporting and forums

Some objectives including facial recognition and temperature scanning were removed from scope due to the reduced relevance of COVID-specific measures. These changes were managed collaboratively and did not impact the core success of the project.

Benefit for industry

This project serves as a pivotal reference point for innovation in hygiene management within red meat processing. It demonstrates how a well-designed entry ante room, underpinned by automation and behaviour-based monitoring, can improve compliance, efficiency, and safety.

Key benefits for the industry include:

- Proven blueprint for facility design:
The ante room layout and system integration provide a scalable model that can be replicated across other sites. This includes strategic guidance on traffic flow, spacing, and hygiene touchpoints.
- Insight into AI's future role:
The trial highlighted the capabilities and limitations of computer vision in real-world processing environments. While commercial viability was limited at this site, the system's ability to detect non-compliance offers a valuable foundation for future digital QA enhancements, 100% inspection, and training mechanisms.
- Data-backed hygiene insights:
By collecting and analysing compliance behaviour, the project supports a shift from observational monitoring to measurable, reportable hygiene data — a key enabler for training and continuous improvement.
- Strategic recommendations for future deployment, including:
 - Ensuring early integration of new systems into existing QA platforms
 - Conducting commercial feasibility assessments prior to AI implementation
 - Addressing ethical and cultural considerations of workplace monitoring
 - Establishing governance protocols for data privacy and system use

The infrastructure, outputs, and insights produced through this project form a practical and strategic asset for the Australian meat processing industry. It not only meets current hygiene expectations but also lays the groundwork for future advancements in food safety, operational integrity, and digital QA.