

CASE STUDY

From Pilot to Fleet

National Convenience Store Chain
Automates Floor Cleaning @Scale



Introduction

Convenience stores are a staple of American life, with an estimated one convenience store for every 2,204 people. As development continues at a rapid pace, convenience stores find themselves in fierce competition with not only other c-stores, but grocery chains and restaurants as well.

The need to stand out from the competition is strong, and cleanliness is key here, with 68% of respondents to a Cintas survey indicating that dirty floors would sour their perception of a retail store. This need for clean, coupled with high volume store traffic and ongoing staffing concerns, points to an increasingly practical and obvious solution: automation.

This case study details the collaboration between Pringle Robotics and a large national convenience store chain ("C-Store") to pilot, deploy, and ultimately install a fleet of over 1,200 autonomous floor cleaning robots in all store locations over the course of 2024 and 2025.

The Situation

C-Store prides itself on providing a strong customer experience through store cleanliness, helpful and friendly staff, and a variety of quality products including staples, novelties, and made-fresh-to-order food. With more than 1,200 stores across the country, this large chain takes its commitment to quality seriously. In order to improve the cleanliness of their stores while giving staff more time to interact with customers and keep products stocked and available, the company began testing autonomous robotic floor cleaners in 2023.

C-Store approached Pringle Robotics following unsuccessful pilots with competitor brand units. These earlier trials had failed due to hardware malfunctions, lack of timely support and service, and software issues. C-Store then engaged Pringle Robotics to conduct a 90-day pilot with the autonomous CC1 unit in January of 2024.

The Pilot

The first CC1 was installed with a full workstation setup to allow the unit to automatically charge and refill/dump its water. The unit ran at regularly scheduled times, with other ad-hoc tasks such as cleaning under the drink and food stations being performed intermittently.

Pilot Results

Store feedback was overwhelmingly positive:

- Staff enjoyed gaining additional time for assisting customers, stocking products, and performing other tasks such as cleaning bathrooms.
- Significantly cleaner floors due to increased frequency and consistency of cleaning. The CC1 also performed very well at cleaning up snow, slush and salt during snowy/rainy days.
- Following cleaning by robots, floors dried more quickly and didn't remain as wet compared to manual mopping or manual machines, lowering slip and fall risks.
- Customers expressed appreciation of C-Store's investment in store cleanliness.

About the CC1

The CC1 is a highly versatile multipurpose commercial floor cleaning robot. The 4-in-1 unit sweeps, vacuums, mops, and scrubs, and can be quickly switched to manual mode for easy spot cleaning. Its relatively small size and nimble maneuvering make it ideal for a wide range of spaces, including those furnished with potential obstacles such as retail displays and tables. The unit performs its cleaning tasks completely autonomously, and when paired with its smart workstation, the CC1 will not only self-charge, but self-empty and refill, keeping human involvement to a minimum.



Phase 2

Due to the success of the pilot, C-Store purchased and installed CC1 units in 20 additional stores over the course of 2024 with an eye towards a nationwide rollout once this limited deployment proved successful.

Goals

A corporate-wide push towards greater competitive advantage was at the heart of C-Store's initial interest in autonomous floor cleaning technology. As such, the goals of the larger Phase 2 deployment largely revolved around the elevation of the in-store environment and customer experience.

- **Redirect employee time and labor** towards higher-value activities such as:
 - Keeping inventory stocked
 - Cleaning and maintaining restrooms
 - Interacting with customers and providing helpful and friendly service

- **Position C-Store as an elevated** one-stop shop for gas, high-quality food and products, other necessities, and restrooms:
 - Consistently clean floors via automation aim to heighten the elevated environment
 - Automated floor cleaning will allow employees to focus on the other important elements of supporting this elevated, customer-focused environment

- **Provide C-Store with an impactful ROI** based on:
 - Square footage cleaned
 - Sustainability concerns
 - Reduced slip and fall risk
 - Return on labor (ROL)

Process

Pringle Robotics is unique within the commercial service robot industry due to our operational identity as expert consultants versus "sell it and forget it" suppliers. We never sell a robot and walk away. We ensure that every customer engagement results in expert collaboration, thorough training, and continuous support. And our customer engagements don't end once the paperwork is signed. We set our clients up for success with an industry-leading program of fleet integration, monitoring, and comprehensive support.

Phase 2 of the rollout lasted nearly one year, and consisted of intense collaboration between Pringle Robotics and C-Store. Elements of this collaborative process included:

- Weekly calls between Pringle Robotics sales/customer success teams and C-Store corporate/store management teams to review workflows and metrics and address any issues
- Continuous monitoring of robot performance and health status through Pringle NOC
- Developing detailed SOPs for each store location and corporate
- In-person training of on-site personnel in terms of robot operation and maintenance, and development of detailed training materials
- Creating training materials for C-Store's team of field service technicians so that they can repair the robots under most circumstances

Phase 3

Phase 3 involved the rapid upscaling from 20 robots to more than 1,200 as the units were deployed company-wide.

Process

Due to the extensive scale of this rollout, Pringle Robotics and the C-Store collaborated on a process that would enable C-Store's existing nationwide team of field technicians to conduct a significant portion of the robot installations, with oversight and in-depth guidance from Pringle. This involved:

- Extensive training for C-Store personnel and field technicians regarding installation, maintenance and repairs.
- Development of in-depth SOPs, training manuals, and maintenance checklists each store.
- Detailed videos and 3D blowouts of parts (BOMs) for repair comprehension.
- Pringle Robotics developed its own field technician network with "Pod" home bases in 11 cities across the country, both to meet the needs of this deployment, and to serve a growing national customer base. Each Pod is staffed by a business development manager and at least one certified customer support technician (CST), plus equipped with stocked service vans that can be dispatched to provide onsite maintenance and repair services.
- The Pod teams continue to back up C-Stores for issues that their own field technicians cannot resolve.
- Continuous monitoring of the robots is in place, both remotely and through physical spot checks at stores. Remote monitoring flags robots that haven't run or are generating frequent error messages, prompting proactive outreach. Physical spot checks uncover instances of insufficient maintenance, remedied by additional training of store staff.

Integrations Pringle NOC

Our proprietary Pringle Network Operations Console (PringleNOC) allows facilities teams to monitor, track, and view detailed task reports from all connected robots and third-party assets. This gives robot operators and facility managers vital insight into actual robot usage, robot health and workflow efficiency, ensuring absolute transparency in facility cleaning operations.



Dynamic Collaboration and Problem Solving

As the full deployment was a long-term collaborative process, a good deal of time was spent troubleshooting, making software adjustments, and developing best practices for the robots deployed in each location. Let's take a look at a few of the issues we worked through.

- **Technological Modifications** - Upgrades and customizations were made to the Fleet Management System platform (Pringle NOC) and the robot algorithms to fit C-Store's specific needs. For example, we initiated changes to the CC1's Robot Operating System (ROS) software after discovering that key functionality needed to be adjusted in order for the robots to easily self-dock with their workstations in certain stores.

- **Environmental Adaptations** - With stores across 17 states in various regions of the country, climate and seasonal weather changes create unique cleaning requirements during certain times of the year. We ensured that cleaning maps, tasks, and schedules were tailored to the specific nuances and environments of each store location, and adopted solutions when faced with unique environmental challenges.

In northern climates, we found wintertime salt and snowmelt was being tracked into the stores, causing calcium buildup that could clog the machines. The solution required finding a descaling agent that could be added to the robots' maintenance schedule. In southwestern stores, the desert dust and clay required an increase in maintenance frequency for certain parts to ensure their longevity and the units' optimal operation. These adaptations highlight our commitment to long-term support and problem solving beyond the initial sale and installation.

- **Product Adjustments** - Maintenance issues flagged both remotely and via spot checks led to the discovery that a different type of squeegee attachment was needed for many store locations. The original squeegee, expected to last 2-3 months, was failing prematurely due to a higher than anticipated level of dirt, oil, and food debris on the floors, including oils tracked in from the gas station parking lot. We then sourced a slightly more expensive but longer-lasting squeegee and initiated upgrades to the units, which is expected to save money in the long run while improving performance.

- **Training Personnel** - During Phase 2, our customer success teams worked closely with each store's management and staff teams to build out SOPs for cleaning and robot maintenance and to determine the "chain of responsibility" in terms of robot management. A large and important chunk of time was spent providing C-Store personnel with comprehensive training on robot operation and maintenance, helping store employees scale the new-technology learning curve and ensuring that

they felt supported as they became more comfortable using and maintaining the robots.

During Phase 3, much of the initial robot installation, training and maintenance was transitioned to C-Store's internal network of field service technicians. Based on those technicians' feedback, we expanded training and instructional materials including parts diagrams, step-by-step visual instructions, and videos to ensure a smooth transition.

- **Adapting to Scale** - As the provisioner of replacement parts and consumables for all robots within this massive deployment, we had to quickly adopt a more robust system for tracking part changes and upgrades across different machine models. We developed a system similar to a vehicle history report to ensure accurate repairs and use of proper replacement parts for all units.

Ongoing Results

- **Return on Investment = Return on Labor** - For most of the store locations, one CC1 unit spends an average of 4 hours per day cleaning the floors. At an average speed of 4,000 square feet per hour, the CC1 cleans twice as fast as a human worker. To achieve the same consistency and quality in floor cleaning, a human worker would need to spend 7-8 hours per day exclusively cleaning the floors. At an assumed employee cost of \$20 per hour (inclusive of benefits), having the floors cleaned autonomously results in 4 hours net gain in labor, \$80 saved per day and \$2,400 saved per month in labor. This represents a 200% ROI for each robot deployed.
- **Labor Savings ≠ Job Loss** - One of the most exciting takeaways from this impressive ROI/ROL is that it has not resulted in any staff reductions or job loss. Instead, C-Store is using the labor gains enabled by automation to reinvest employee hours into other tasks and responsibilities that help elevate the store environment and customer experience. With employee hours no longer being spent on floor cleaning, staff is able to spend more time cleaning restrooms, food areas and displays; maintaining product availability through consistent stocking; and interacting with customers in a friendly and helpful manner that encourages repeat business.
- **Safer Floors** - Retail stores need to be keenly aware of preventing slips and falls to not only protect their customers and visitors, but also safeguard their liability. The CC1 units quickly eliminate the presence of any type of floor contaminant by operating both continuously or on an ad-hoc basis, ensuring that spills or dirt aren't left sitting long enough to create a fall hazard. The units also use much less water than traditional methods, and allow the floors to dry much faster after cleaning, resulting in improved safety.
- **More Sustainable Cleaning** - The CC1 unit was recently Smart Drop Certified by The Water Conservancy due to its impressive water savings compared to traditional cleaning methods. In fact, the CC1 requires only 4 gallons of water to clean approximately 20,000 square feet of flooring, an 80% water savings over a traditional mop-and-bucket approach. What's more, the CC1's high-efficiency cleaning technology ensures that only fresh water is used for cleaning, providing a much more hygienic final result.
- **Happier Staff** - Repetitive manual floor cleaning places a large burden on staff and takes them away from other important tasks that are important to C-Store operations. It's physically strenuous, dirty, and must be repeated multiple times per day to keep stores looking their best. Since the completion of the Phase 2 rollout of autonomous floor cleaning robots, staff have reported more job satisfaction and appreciation for having floor cleaning taken off their to-do lists.



Lessons Learned

The length and complexity of the C-Store deployment emphasizes some essential best practices for large-scale rollouts of autonomous floor cleaning units.

- **Robot Maintenance is Vital to Success** - While autonomous floor cleaning units are incredibly efficient and provide impressive labor savings, they are still machines that require regular basic maintenance to operate at their best. Most issues encountered by individual stores during the deployment are due to store staff not following maintenance SOPs and allowing the units to become so dirty/clogged that they stopped performing well.
- **Staff Buy-In Matters** - Ensuring that store management and staff members are well trained on robot operation and maintenance, are willing to tackle the learning curve, and are committed to maintaining the robots is essential to the successful ongoing operation of the units.

What Comes Next?

As C-Store opens more stores, additional robots continue to be ordered and installed. While basic installations, staff training, and day-to-day maintenance have largely been transitioned to C-Store's internal teams, Pringle Robotics continues to support the project through remote monitoring and spot checks, warranty repairs, parts provisioning, and technical support. We are also available to C-Store through paid service plans.

C-Store remains a committed customer, and we look forward to the continued success of our partnership as they aggressively scale their footprint in the coming years. The opportunity to play a part in the company's operational optimization and brand elevation has been rewarding and has allowed us to expand our capabilities in the realm of automation at scale.



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