

Cleaning and Waste Management Facilities at T3

CAG actively tests new technologies and systems to find ways to enhance productivity and efficiency in Changi Airport. In particular, the use of technology improves the speed of cleaning and reduces the reliance on manpower. Together with autonomous systems and smart technology, this enables us to lift the skills level of our workers in the airport.

Currently in use

Food Waste Digester ○ A 1-tonne/day capacity food waste digester was installed by CAG near the Terminal 3 *Kopitiam* food court, where it is convenient for *Kopitiam* and other F&B tenants to share its use.

- *Kopitiam* has four tray return stations in the food court. Cleaners first clear the food waste into dedicated food waste bins. Then they put the trays and crockery into separate bins for washing.
- When the food waste bins are filled, they are wheeled to the food waste digester. ○ Currently, 9 F&B operators, such as *Kopitiam* and *Ramen Champion* at T3 use the food waste digester. An average of 600kg of food waste is processed daily at T3. ○ To-date, CAG has deployed a total of 11 food waste digesters across T1 to T4 and they range from 50kg to 1-tonne/day in capacity. This is made up of 3 1-tonners in T1, T2 and T3. In T4, there are 2 half-tonners and 6 50kg/day digestors.

Centralised Dishwashing Facility ○ There is a newly introduced centralised dishwashing facility situated within the T3 carpark for shared usage by participating F&B outlets.

- It consists of 4 dishwashing lines (3 non-halal and 1 halal), with the capacity to expand to 7 lines to cater to increased demand from F&B outlets across Changi Airport and Jewel.
- This centralised facility allows the outlets to save on manpower deployment to wash dishes and makes better use of the space in individual outlets. The F&B outlets also benefit from time saved as cleaned crockery is collected and dropped off directly at the F&B outlet.

Data Analytics for Toilet Cleaning ○ The Instant Feedback System (IFS) is a small wall-mounted screen at the exit of the toilets, it allows users to give feedback easily so that issues in the toilet can be addressed quickly.

- The screen consists of a first level satisfaction survey using emoticons to solicit satisfaction levels from users. A second level prompt will be initiated for specific feedback when the user selects a frowning/unhappy face, displaying a list of causes for the unhappy washroom experience (e.g. wet floor, smelly toilet etc).
- Information is sent instantaneously to CAG's cleaning staff in charge for immediate rectification. ○ CAG collates the data from the IFS and analyse it to plan for service improvements.

- Outcome-based Contracting with Incentive Reward System** ○ CAG adopts a performance-based reward system for its cleaning contracts, and does not specify manpower requirements in the tenders. ○ Cleaning companies make use of available technology procured by CAG (such as IFS and the e-inspection system) to achieve pre-determined cleaning performance standards, such as time taken to complete ad-hoc cleaning requests, etc.
- On top of the pre-determined cleaning standards, the cleaning contractor's nonperformance will be determined through monthly cleanliness surveys, collation of feedback etc. ○ The contractors will be rewarded with up to 10% more than the stipulated monthly payment sum if they exceed the cleaning standards. On the other hand, if the cleaning standards are not met, deterrents will be imposed on the contractors.

On Trial

- **Smart Bins**
 - CAG is currently testing customised 'fill' sensors in some of its litter bins in T3. The sensors will alert cleaning staff when the bins are full. ○ CAG plans to retrofit 150 litter bins in T4 with these 'fill' sensors for the next stage of the trial.
 - If successful, the deployment of such bins will shift the clearing of the litter bins from a scheduled approach to an on-demand one, freeing up cleaners' time for other tasks.
- **Autonomous Cleaners**
 - The autonomous cleaning equipment (ACE) is a hard floor scrubber which can clean up to 1,600 sqm/hr, or the size of nearly 18 4-room HDB flats. ○ It can avoid obstacles and map new floor areas quickly, to make it more deployable to all the terminals. ○ To ensure safety and security during cleaning operations, the machine is equipped with real-time monitoring and 24/7 remote manning service.
 - To-date, the trial has completed approximately 1,500 cleaning hours and covered 1,500,000 sqm of hard floor (equivalent to about 230 football fields).
- **Power-assisted Janitor Cart**
 - The power-assisted janitor cart is a battery-operated housekeeping cart designed to replace the conventional manual one.
 - The cart is battery-operated (speed of less than 5km/hr) to enhance the mobility of the cleaner. It reduces cleaners' fatigue and enhances performance and productivity.

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