

**Problem Statement [B]: To develop a self-cleaning toilet to enhance productivity of cleaners and improve toilet cleanliness for users**

**Desired Outcomes:**

Public toilets are subject to high usage. A solution is required to improve the cleanliness of public toilets and raise the productivity of the cleaners, which is able to assist premises owners and cleaning contractors in ensuring that toilets can be self-cleaned and toilet supplies are refilled. The proposed solution should provide an easy to maintain, autonomous self-cleaning system to clean and sanitise toilets. The outcome of the solution should lead to improved cleaning and maintenance efficiency, higher cleanliness level, better user satisfaction, and lesser reliance on manpower.

**Background of Problem:**

Despite having toilet cleaners to clean public toilets (e.g. food centres, coffee shops, bus terminals etc.) the level of cleanliness is often impaired by improper toilet usage by users (e.g. strewing of toilet papers on floors, urinating on floor). Presently, toilet cleaners are being deployed and toilets are being cleaned according to a deployment plan and cleaning programme respectively. Instead of deploying manpower and cleaning toilets based on fixed plan and programme, a proposed solution is required to facilitate a self-toilet cleaning system that can be activated upon reaching a number of uses and/ or scheduled basis.

Although toilet facilities are being inspected regularly, fault calls are commonly received for toilet breakdowns (e.g. WC flushing components failure, WC chokage, pipe leakage). A proposed solution is required to alert the facilities maintenance contractor immediately when breakdowns are detected and, thus, reduce toilet downtime.

The autonomous self-cleaning system that is provided should have the following characteristics (not exhaustive):-

- (a) facilitate ease of washing, cleaning and drying toilets
- (b) remove odour
- (c) water-saving
- (d) reduce manpower required for toilet cleaning
- (e) ease of system maintenance and parts replacement (if faulty)

End users of the proposed solution include public toilet owners, managing agents, cleaning contractors.

A trial project on toilet monitoring system was previously carried out in some food centre toilets. It was mainly designed to count the number of toilet users and detect ammonia level in toilets. A SMS alarm would be sent to cleaners when the ammonia level exceeded allowable level. Manual call points were also installed for users to alert cleaners when additional attention was required.

However, there were some limitations to the system as listed below: -

- (a) The smell sensor triggered an SMS to alert the cleaner whenever someone just passed motion, i.e. when the toilet was the smelliest. It resulted in the alarm being

triggered and activated the cleaner for that instance instead of overall toilet smell which lingers after the foul air has cleared.

(b) The smell sensors did not work effectively in toilets where there were oscillating fans or exhaust fans in operation.

(c) The manual call points were easily abused by users.

(d) There were miscounts of visitor count.

(e) The system could not generate analytical report (with findings) and did not allow users to export the data for analysis.

#### **Technical Requirements:**

1. The proposed solution should function in a wet environment in public toilets.

2. (a) Automated self-cleaning equipment used must be able to operate in wet environment.

(b) The total power consumption of equipment(s) used does not exceed power supply allowable in the premise and cause a power trip. QP/LEW is to certify the installation of the system is safe for the purpose of the trial.

(c) The equipment installed in toilets do not intrude the privacy of toilet users.

3. Cleaning standard has to comply with SS 499:2002 (2015) Cleaning Service Industry – Cleaning Performance for Commercial Premises.

4. (a) The proposed solution will facilitate self-cleaning (washing & drying) based on number of users & schedule and, replenishment of toilet cleaning supplies/inventory and toilet parts repairs/ replacement.

(b) It should be able to reduce manpower, increase toilet cleanliness standard (e.g higher Happy Toilet Rating, higher user satisfaction), reduce downtime during toilet repair works, and is reliable, easy to maintain and water-saving.

(c) The system will be able to collate data on toilet usage and breakdown etc., analyse and translate such data into reports and findings.

(d) It provides data on web based dashboard to allow users to access remotely on smartphone, iPad and PC etc.

(e) It allows integration with other systems when required.

(f) It allows system upgrade to the latest operating system etc.

(g) It is protected from cyberattack, hacking and unauthorised access etc.

**Timeframe for development of proposed solution/product**

1. Completion of working prototype ready for evaluation 6 months after the start of project.
2. Completion of full functional end product ready for pilot deployment 10 months after the start of project.
3. Provide regular updates on progress of prototype and end product.
4. Conduct trial run of prototype and end product at selected site.
5. Provide reports and findings on data collated during trial.
6. Provide Cost Benefit Analysis of proposed solution.
7. Conduct presentations to the Management, FM and cleaning contractors/partners on the outcome of the trial.

**Requirements of prototype**

Prototype should minimally comply with the points listed under Technical Requirements.

**Costing and Procurement**

Procurement budget for engaging of proposed solution is estimated at \$130,000 for two toilets.

If proven successfully, proposed solution can be deployed in all public toilets.

**Market Potential for proposed solution/product**

Proposed solution could be adopted by building owners, managing agents, toilet cleaning contractors and FM contractors in the cleaning and FM industries.