

Problem Statement/Title: To develop an automated system to collect and process crockery to facilitate downstream centralised dishwashing

Desired Outcomes:

To enhance the productivity of the current system for the collection and processing of crockery to facilitate downstream centralised dishwashing. It should be able to:

- a. receive trays with crockery and cutlery from patrons,
- b. separate food remnants from crockery and cutlery,
- c. sort and stack the different crockery and cutlery to be ready for both on-site and off-site centralised dishwashing (CDW) machine,
- d. and to further automate the loading of sorted & stacked crockery and cutlery into an onsite CDW machine.

Background of Problem:

There are currently different designs of Automated Tray Return System (ATRS) deployed in our hawker centre. However, manpower is still required for the processing of crockery to facilitate downstream centralised dishwashing.

The pictures below show the current work processes at a hawker centre with one of the ATRS designs (*steps 1 – 4*) and on-site Centralised Dishwashing (CDW) machine (*step 6*).



The current work process still requires manpower to facilitate the following operations:

- As depicted in step 5, 2 cleaners are required per shift (*each shift is 8 hours and there are 2 shifts per day*) to separate food remnants from the crockery and cutlery, sort and stack the crockery and cutlery to be ready for centralised dishwashing. Centralised dishwashing is done either on-site or off-site.
- As depicted in step 6, for on-site centralised dishwashing, half of a cleaner's time is required each shift (*each shift is 8 hours and there are 2 shifts per day*) to manually transfer and load the soiled crockery and cutlery into the dish washer.

- Currently, there is a lack of solutions in the market to integrate the ATRS with on-site CDW, mainly because the CDW readily available in the market have specific receiving mode. Thus, this gap is addressed with manual labour.

The proposed solution(s) should automate the entire process with minimal human intervention from the receiving of trays of crockery from patrons to the conveyance of crockery into the CDW.

The end users of the proposed solution(s)/product(s) include cleaning Contractors appointed by NEA and/ or local associations of hawker centres.

Technical Requirements:

Proposers are to propose solutions for **(A)**, and **(A)+(B)**:

Solution (A): Automated System which comprises the following:

- receive trays with crockery and cutlery from patrons
- separate food remnants from crockery and cutlery,
- sort and stack crockery and cutlery to be ready for both on-site and off-site CDW machine

Solution (B): Automated conveyance and arrangement of sorted and stacked crockery and cutlery into the on-site CDW machine.

For the implementation of only solution **(A)**, it is meant for hawker centres with **off-site** centralised dishwashing.

For the implementation of both solutions **(A)+(B)**, it is meant to be implemented at hawker centres with **on-site** centralised dishwashing.

Requirements for solution (A) (unless specified otherwise)

The proposed solutions should meet the following requirements:

- Solution should be self-activated and be able to collect each food tray holding soiled crockery and cutlery (average 7 pieces including breakable glasses) and be able to sort, separate crockery and cutlery, collect food waste and stacked/stored the crockery and cutlery to be ready for both on-site and off-site CDW. It should be able to receive crockery that are stacked together.
- The system transporting the tray and soiled crockery and cutlery shall be automatically activated upon placing the tray on the system. There should be no manual activation mechanisms which patrons have to interact with to activate the transport system, e.g. buttons, switches, etc.
- Solution [A], when in operation to receive non-halal trays, shall not be able to accept halal trays and vice versa.

- d. The time a patron places the tray and soiled crockery and cutlery on the solution until the next patron in the queue places the tray and soiled crockery, shall take no longer than 5 seconds. Solution should not jam up when one or more trays are placed on the solution's transport system or when trays are placed one after another on the solution's transport system.
- e. Solution should be intuitive (e.g. elderly) and not intimidating to users approaching with a food tray piled with soiled crockery/cutlery.
- f. The electrical supply load for both solutions **(A)+(B)** must not exceed 15 Amp single phase.
- g. Size should not exceed 1 metre wide by 2 metres deep by 1.8 metres high. Full equipment (without crockery load) to weigh less than 300kg. [For solution **(A)**]
- h. Solution should be functional in wet (food remnants such as soup, sauces) environment.
- i. Solution should be able to sort crockery and cutlery of different sizes.
- j. There should be minimal maintenance needed for the solution.
- k. Solution should ensure effective removal of food remnants with minimal food spillage. The temporary containment of food waste should be pest-proof with odour control measures in place.
- l. Solution should be able to operate 16-18 hours/day.
- m. Solution should demonstrate cost effectiveness and manpower productivity improvement compared to current process.
- n. Solution should comply with the prevailing Codes and regulations for electrical equipment and be sealed effectively from its operating environment with IP65 or higher.

Requirements for Solution (B) (*unless specified otherwise*)

The proposed solution is for integration with on-site CDW, should meet the following requirements:

- a. The solution should be capable of transporting the sorted soiled crockery and cutlery from solution **(A)** to the conveyance line leading directly into the on-site centralised dish washing machines. Solution (B) should work seamlessly with solution (A) and the on-site CDW to prevent any bottleneck in the end-to-end process.
- b. The electrical supply load for both solutions **(A)+(B)** must not exceed 15 Amp single phase.

- c. Size should not exceed 1 metre wide by 2 metres deep by 1.8 metres high. Full equipment (without crockery load) to weigh less than 300kg. [For Solution **(B)**]
- d. The solution should be functional in wet (food remnants such as soup, sauces) environment as it will be transporting the soiled crockery and cutlery.
- e. There should be minimal maintenance needed for the solution.
- f. Solution should be able to operate 16-18 hours/day.
- g. Solution should demonstrate cost effectiveness and manpower productivity improvement compared to current process.
- h. The proposed solution is to comply with the prevailing Codes and regulations for electrical equipment and be sealed effectively from its operating environment with IP65 or higher.

Solutions that are not preferred:

1. Solution uses specially designed and fabricated materials which are not commonly available in the market.
2. Solution that is unable to accept and process breakable crockery is not preferred.
3. Solution that operates with specially designed crockery/cutlery.
4. Solution with exposed moving parts that are sharp or may cause injuries to the users.
5. Solution that emits high noise levels during operation – reference to prevailing regulations and codes.
6. Solution that is not pest-proof e.g. exposure of food remnants to birds and rats.

Timeframe for development of proposed solution/product

After start of project (About 5 months' project cycle)

1. Completion of both working prototypes **(A)+(B)** ready for trial 3 months after the start of project
2. Trial of the working prototype for 1 month
3. Completion of fully functional end product for pilot deployment 5 months after the start of project

Requirements of prototype

- The prototype should fulfil the technical requirements as stated above.
- Upon completion of prototype for trial, innovator is required to provide the below additional requirements. The cost of the below requirement will be borne by NEA.

System Frontage

- a) Design, fabricate and install the system frontage (*to submit proposed design for approval*)
- b) All instruction on the frontage should be in pictorial form
- c) Supply and install racks at the frontage for the return of non-standard and/or fragile crockery (e.g. claypot, hot plate)
- d) Supply and install a digital screen above the system (solution A), to show the number of trays which was returned for the day. The digital screen shall also be able to play videos, audio messages, display messages for tray return and announcements when a patron wins a prize for returning their tray.

Monetary Dispensing Machine

- a) Supply and install a monetary dispensing machine. The monetary dispensing machine dispense a tray deposit, (e.g. 50 cents coin) upon the return of each tray. The dispensing machine shall be located on the right side of the tray return opening.

Procurement Need of Agency:

Expected commercial price for purchasing such proposed solution(s) are estimated at \$60k per unit for solution **(A)** and \$90K for solutions **(A)+(B)**

If proven successfully, proposed solutions can be deployed in hawker centres.

Market Potential for proposed solution/product

The solution could be adopted by operators or premises owners in the F&B sector (e.g. food courts) throughout the country.