

# IMPROVEMENT OF WORKFLOW, PROCESSES AND CONDITIONS IN CENTRAL KITCHEN OF CHANGI PRISON COMPLEX

**Team Members:** Gerald Ng Chi Siong | Koh Chong Keng | Lee Joon Fai | Ma Zhuoyuan | Yang Xiaozhou

**Advisors:** Prof. Tang Loon Ching, Assoc. Prof. Aaron Chia Eng Seng (NUS) | Ms. Waida Jumaat, Mr. Khairull Danial Ramlan (SCORE)

**ABSTRACT:** This project aims to minimise low-skilled jobs involved and improve work processes in the Central Kitchen of Changi Prison Complex. It begins with the analysis of current processes of kitchen operations through lean management methodologies, and it concludes with recommendations to meet the proposed objectives.

COMPANY BACKGROUND	PROBLEM DESCRIPTION	OBJECTIVES
Singapore Corporation of Rehabilitative Enterprises (SCORE) is a statutory board under the Ministry of Home Affairs (MHA) which aims to <b>rehabilitate and reintegrate</b> offenders as contributing members of society. Part of this is achieved by <b>equipping offenders with relevant employable skills</b> .	SCORE operates a Central Kitchen in Changi Prison Complex that prepares around 23,000 meals daily. SCORE wants to <b>minimise the number of inmates allocated to low-skilled jobs</b> and <b>improve the process efficiency and productivity</b> , particularly in the dishing and warewash sections.	<ol style="list-style-type: none"> <li><b>Reduce manpower</b> at dishing and warewash sections by 20%.</li> <li><b>Streamline work processes</b> at dishing and warewash sections via lean management methodologies.</li> </ol>

### DISHING SECTION ANALYSIS

#### Root Cause Analysis

- ❖ Many non-essential tasks
- ❖ Unmotivated inmates
- ❖ Tools not specialized for tasks

	TRAY	RICE	VEG	MEAT	GRAVY	CAP
C/O	131s	9s	105s	125s	144s	126s
Uptime	97%	98%	97%	97%	96%	97%
Defect Rate		61%	37%		41%	

**Value Stream Map**

- ❖ High defect rate
- ❖ Large variation in station lead time

### DISHING SECTION PROCESS MAP

#### Process Map

- ❖ Uncoordinated changeovers
- ❖ Different changeover durations
- ❖ Non-value-added (NVA) actions present

### RECOMMENDATIONS

- Conveyor & Tray-feeding Machine:** Dish trays are moved along the line by a motorised, food-safe roller/conveyor at constant pace. Empty trays are fed to the line by a tray-feeding machine. Manual override is possible.
- Coordinated Changeovers:** Periodically, the line is paused and all stations execute changeover simultaneously. Food container size is also adjusted to suit the changeover interval.

Improved Work Process	Reduced Manpower
<ul style="list-style-type: none"> <li>❖ Streamlines dishing process</li> <li>❖ Consistent pace minimises rushing, hence improves portioning and reduces spillage</li> <li>❖ Reduces the need for line cleaning as food debris falls between rollers</li> </ul>	<ul style="list-style-type: none"> <li>❖ Reduced by three, as indicated above</li> <li>❖ Tray feeding taken over by automatic feeding machine</li> <li>❖ Constant rice top-up replaced by coordinated changeover</li> <li>❖ No need for stacking trays before loading into warmer</li> </ul>

### WAREWASH SECTION ANALYSIS

#### Root Cause Analysis

- ❖ Ineffective pre-wash procedure
- ❖ No fixed standard of cleanliness

#### Process Map

- ❖ Non-value added actions exist at pre-wash section
- ❖ Inefficient sorting process

### RECOMMENDATIONS

- Sort Trays by Colour:** Trays and covers are sorted by color before they are sent for pre-washing.
- Basket-by-Basket Pre-Wash:** Trays and covers are slotted into dishwashing basket before pre-wash, ensuring the effectiveness of pre-wash.
- Redesigned Pre-Wash Basin:** A more ergonomic design of the pre-wash basin allows the worker to simply slide basket through water with low resistance.

Improved Work Process	Reduced Manpower
<ul style="list-style-type: none"> <li>❖ Holding trays and covers in baskets error proofs pre-wash process of food residue removal</li> <li>❖ Simplifies tray collection</li> </ul>	<ul style="list-style-type: none"> <li>❖ Reduced by two at collection section as trays will have been pre-sorted by colour and base/cover.</li> <li>❖ Reduces by one at warmer washing/tray unloading section</li> </ul>

### FUTURE WORK

- ❖ Validation and cost-benefit analysis of recommendations
- ❖ Optimisation of dishing section layout
- ❖ Analysis of design of trays and covers