Redesigning the Traffic Management System for Keppel Shipyard

Keppel FELS

NUS National University of Singapore

Department of Industrial and Systems Engineering
System Design Project 2013/2014

1. Problem Description

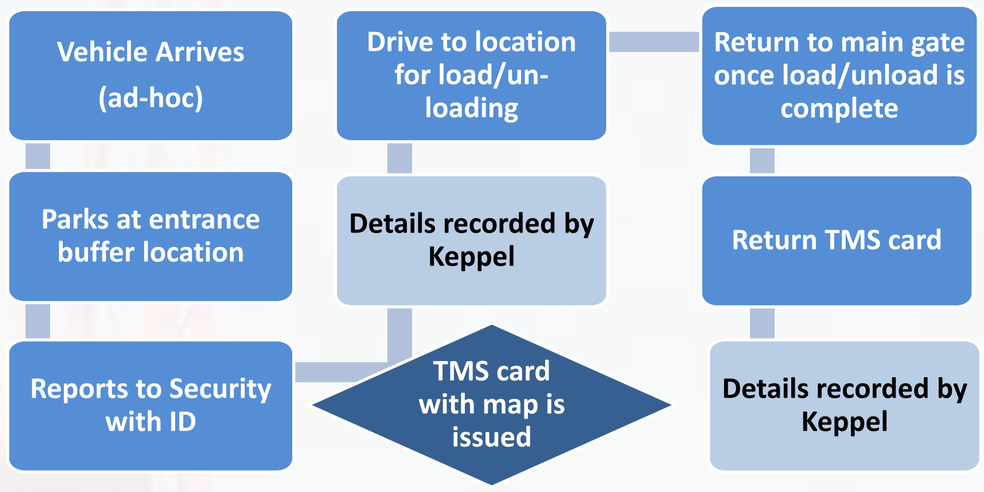
Keppel FELS is facing growing challenges with its Traffic Management System (TMS) in its Singapore shipyard. It handles approximately 260 vehicles each day, a number that is expected to grow due to increasing number of projects. **This has caused traffic congestion leading to resource wastage and operational inefficiencies.**

2. Project Objectives

- Investigate the root causes of traffic congestion
- Identify critical path, peak operating time and location capacities in the shipyard
- Propose effective solutions using systems thinking and simulation methodologies to reduce congestion rate and minimize vehicle turnover time

3. Process Mapping

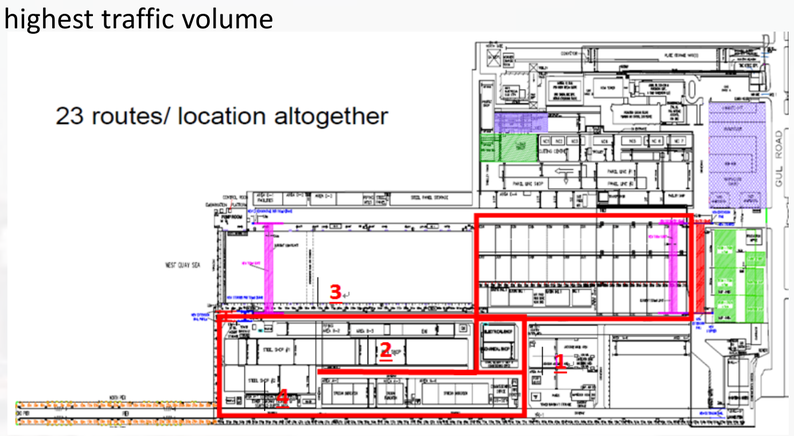
The current TMS has been studied through onsite observations and interviews with key personnel to establish the SOP for vehicles entering the shipyard.



4. Analysis of Current Process

Onsite Observation

- 23 locations → 12 critical locations on 4 different paths with highest traffic volume

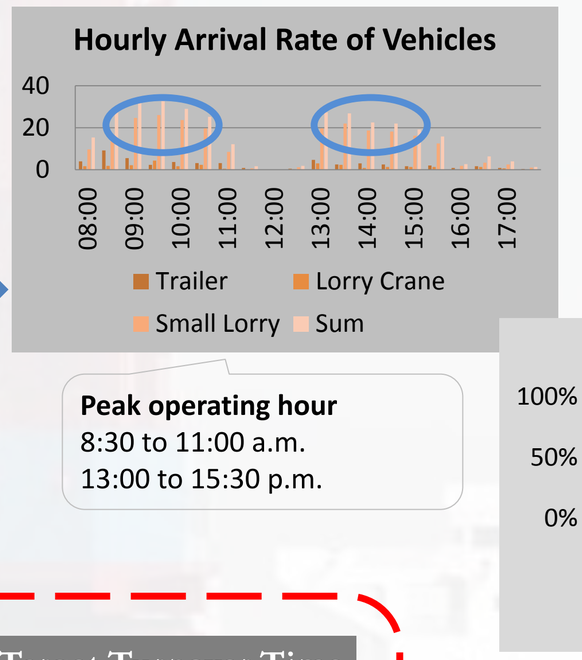


- 3 types of vehicles, different performances

	Trailer	Lorry Crane	Small Lorry
Arrival Rate/hr	4	2.6	26
Turnover Time (hr)	1.59	0.97	0.74
# of Vehicles/mth	261	140	1278
Overtime/mth	65	3	240
Congestion Rate	24.90%	2.10%	18.80%

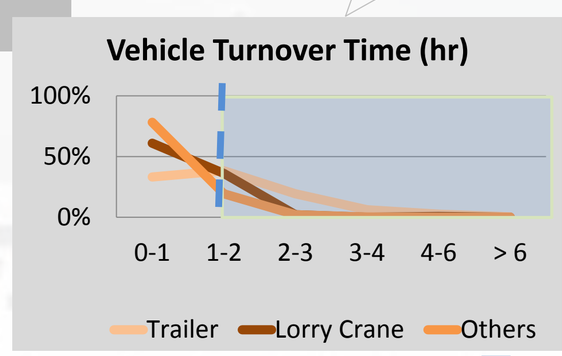
Key Issues Identified

- Lack of communication between Keppel and its contractors
- Manual recording of incoming vehicle data is inefficient
- Uneven distribution of arrival rate
- Operational inefficiency for vehicles going to multiple locations
- Inadequate capacity assigned for trailers at critical locations



Peak operating hour
8:30 to 11:00 a.m.
13:00 to 15:30 p.m.

Long turnover time
Trailers (> 2 hrs): 28%
Lorry Crane (> 2 hr): 39%
Others (> 1 hr): 21%



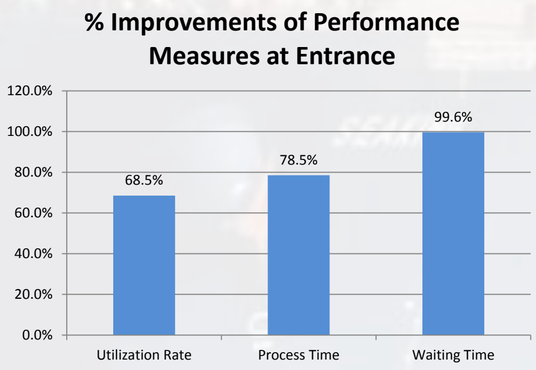
Target Turnover Time

Trailer	120 min
Lorry Crane	120 min
Small Lorry	60 min

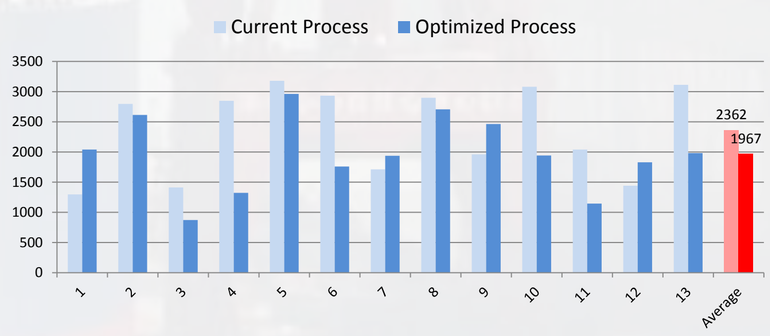
5. Simulation Model

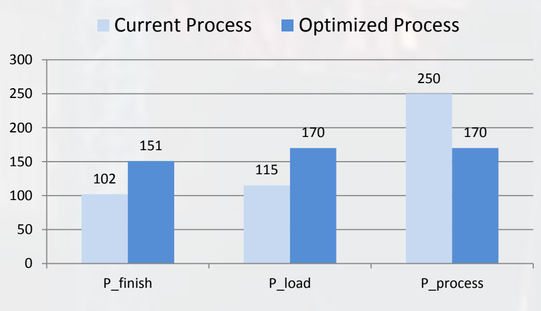
Current Process – Peak Hour
Arrival Rate: $X \sim$ Exp (1/1.25 min)
Simulation Length: 5 hours/day
Replications: 30 days

Optimized Process – Uniform Arrival
Arrival Rate: $X \sim$ Exp (1/1.85 min)
Simulation Length: 5 hours/day
Replications: 30 days



Faster Processing for Registration, Shorter Turnover Time -> Reduced Congestion ☺





6. Recommendations

a) Reassigning Capacities (Zoning)

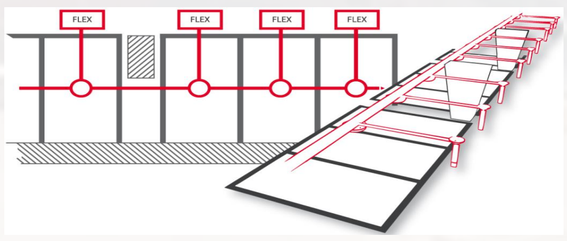
- ✓ Reconsider location proximity and capacity constraints of roads for critical paths
- ✓ Control the total number of trailers in the shipyard
- ✓ Avoid over-concentration of resources at limited locations

Critical Path	Locations	Total Capacity
1	Electrical Shop + Mechanical Shop	2
2	Crane Store + Pipe Shop + Sub-Contractor	4
3	L4 + L5	1
4	L8 + L9 +L10 + L11 + L12	1

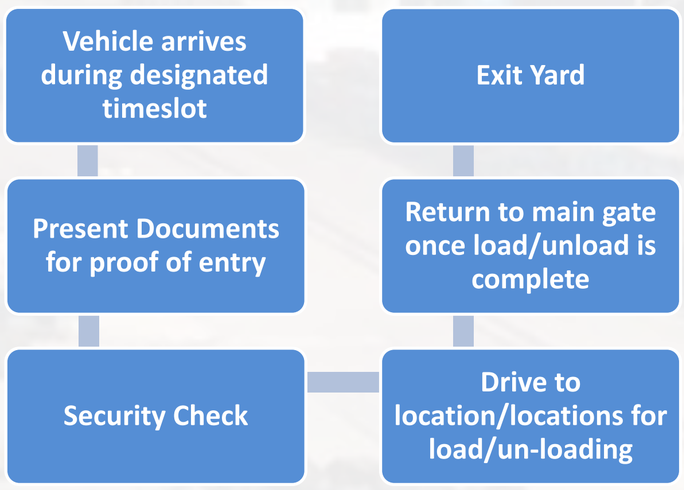
b) Intelligent Booking System (IBS)

A 4-User-Type Online Booking System which includes

- ✓ Advance booking for available slots by Keppel coordinators/contractors
- ✓ Device approval by Crane Section
- ✓ Real-time slots tracking and monitoring by entrance security office
- ✓ Centralized administration console



c) Improved Process Flow



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