Case Study - Layout Design & Industrial Engineering Study for DG Set Engine Assembly Plant

Project Background

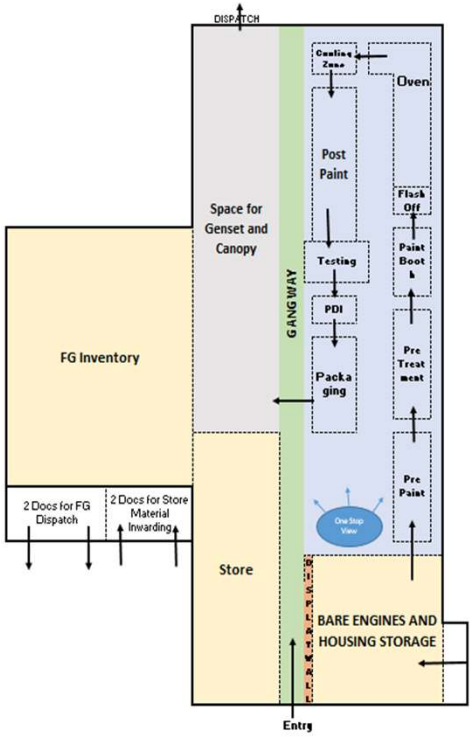
- Objective
  - Shifting of assembly to a new location
  - New Shop floor Layout Designing
  - Production Capacity ramp-up
  - Work measurement using PMTS of all the assembly activity
- Challenges
  - Layout designing with incorporating multiple parameters
  - Multi-model Balancing of the assembly lines

Approach

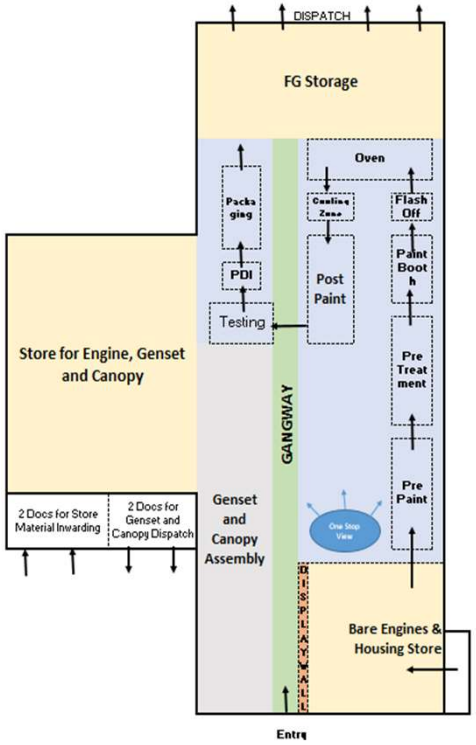
- Existing facility go through and understanding process flow
- Bottleneck Identification
- Data Collection for Work Measurement
- Data Collection for layout design
- Layout Options Preparation and Discussion
- Layout Marking on shop floor
- Elemental Details Preparation
- Preliminary Analysis Report Preparation

Layout options & Comparisons

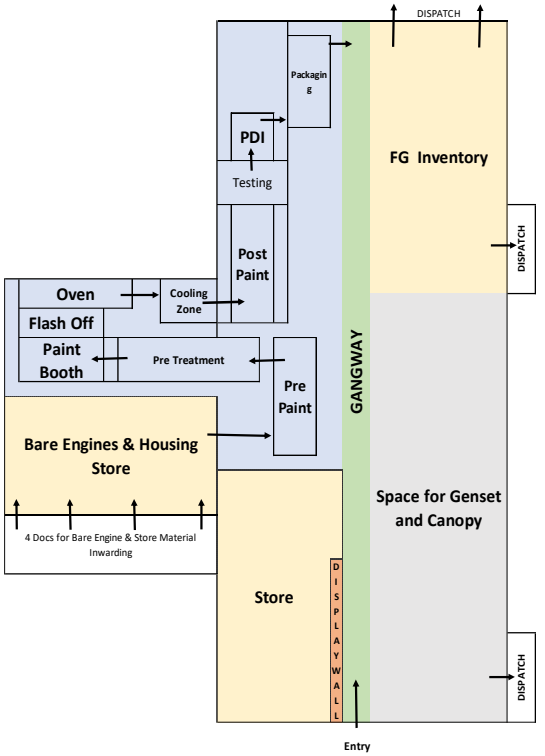
Option - 1



Option - 2



Option - 3

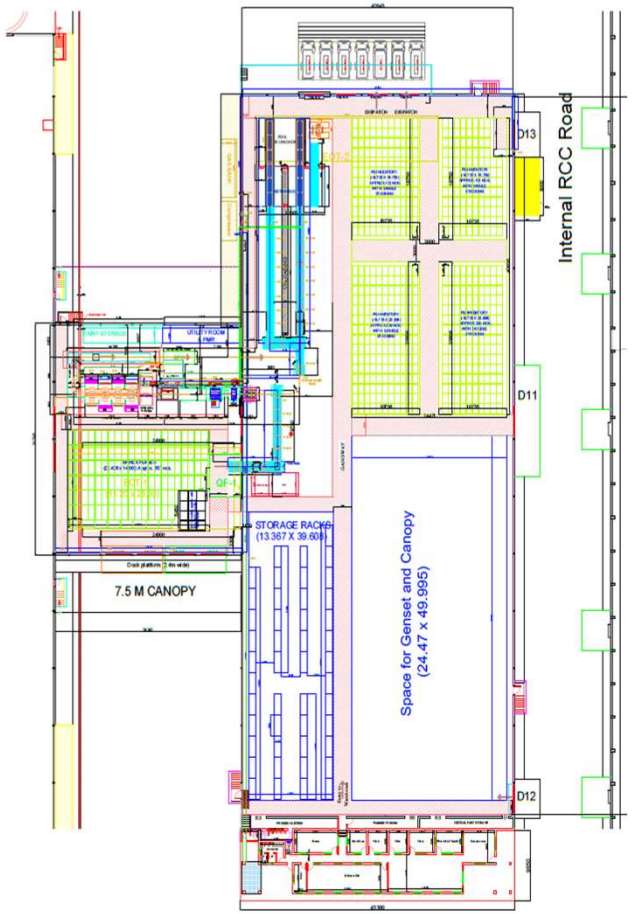


Layout Options & Comparisons

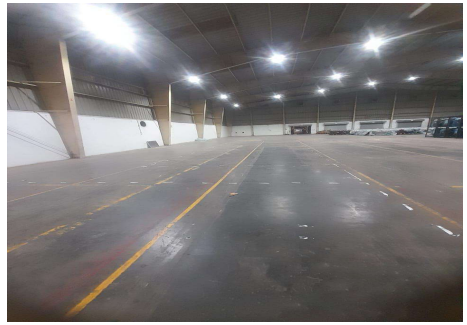
Comparative Parameters		Option 1		Option 2		Option 3	
		Scale	Remarks	Scale	Remarks	Scale	Remarks
Space	FG Storage Space	4	Adequate space available for >1000 Nos FG with stacking of 2	2	Space is not enough to accommodate the 1000 Nos even with stacking of 3	3	Will be suitable for around 1000 engines with restricted space for movement for handling
	Bare Engine Storage	4	Adequate space available for >500 Nos of FG with stacking of 2	5	Adequate space available for >500 Nos of FG with stacking of 2	4	Adequate space available for 500 Nos of FG
	Genset Line	3	Enough space will be available for Genset and Canopy Line	3	Enough space will be available for Genset and Canopy Line	4	Comparative to Option 1 & 2 more space will be available
	Store	3	Chances of congestions when both engine and genset line are operationalise	5	Ample space will be available for central store for both lines	5	Ample space will be available for central store for both lines
Line	Direction	5	Unidirectional	4	Zig Zag line flow	5	Unidirectional
	Length of Chain	3	chain distance may increase by few meters comparative to existing one for processing engine through paint shop	2	Chain length will be largest compared to other two options	5	Shortest chain distance for processing engine through paint shop
Safety	Paint Shop	2	Paint shop in large warehouse may cause damage to whole shop in case of fire	2	Paint shop in large warehouse may cause damage to whole shop in case of fire	5	Paint shop in small warehouse may protect large warehouse in case of fire
	Gangway	5	While making engine movement to FG no major activity of crossing gangway	2	May cause hazard to safety during transferring of engines from post paint to testing	5	while making engine movement to FG no need to cross gangway
Flow	Material Movement	4	Descent material movement from store to line without any obstruction	3	Descent material movement from store to line without any obstruction	4	Descent material movement from store to line without any obstruction
	Storage Location & Movement of Material In warding/Dispatch	4	- Dispatch of FG will be smooth from Small warehouse. - Also material in warding will be smooth through the small warehouse docs	4	- Dispatch of FG will be smooth from Small warehouse. - Also material in warding will be smooth through the small warehouse docs	5	- Small warehouse docs will be use for only in warding - Large warehouse docs will be use for dispatching material thus no conflicts in the docs
Other	Ambience	4	Good if paint shop area is separated with wall from other process	4	Good if paint shop area is separated with wall from other process	4	Paint shop area is separated with wall from other process
Score		41		36		49	

Final CAD Layout

- **Safety** – Paint Shop at Corner may protect remaining plant in case of fire
- **FG Inventory** – Dedicated space for FG inventory
- **Space** – Adequate space for genset and canopy line
- **Material Receipt & Dispatch** – Smooth Material Receipt from South and Dispatch from north side of large warehouse
- **Aesthetic View –**
  - Product Gallery at entry followed by assembly line



Adobe Acrobat Document



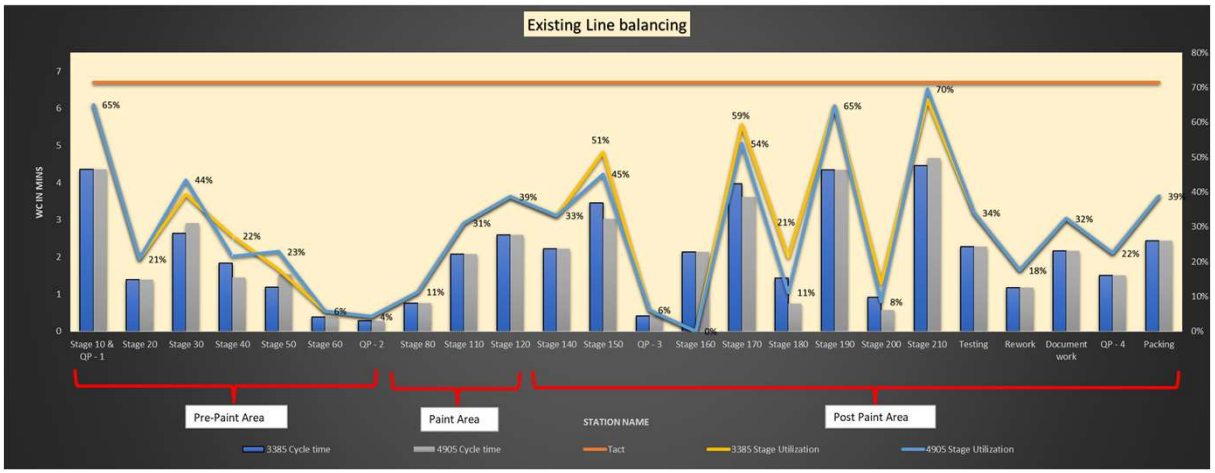
Layout Marking on Shop floor

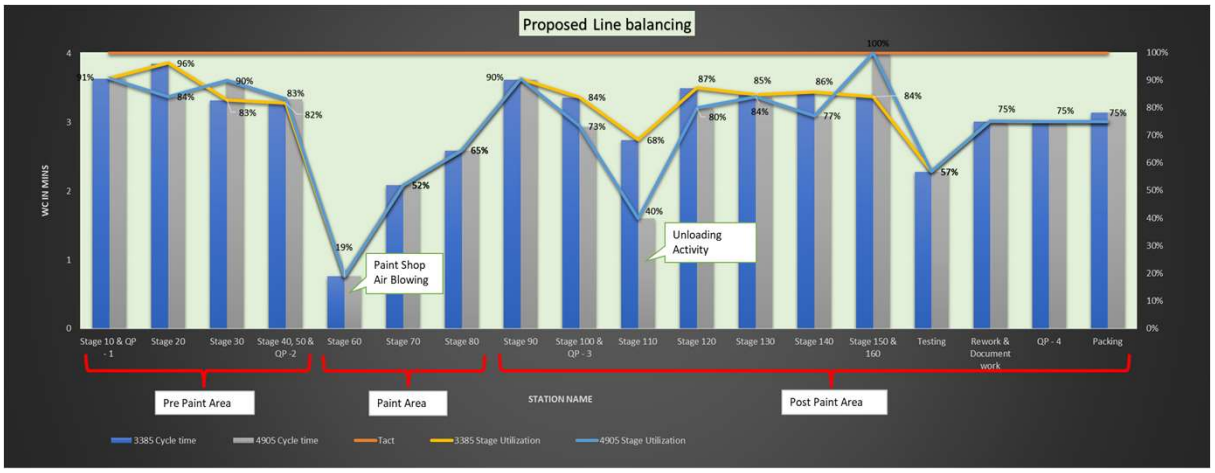
Paint Shop Construction Picture

Comparison - Existing vs Proposed

Parameters	Existing	Proposed
Total Shift Time (Hrs)	12 Hrs.	8.5 Hrs.
Total Available time to work (Min.) (excluding Lunch & Break time)	670	465
Production per shift (Nos.)	100	116
Tact time (Mins)	6.7	4.01
Deployed Manpower (Nos.) (Direct + Indirect)	59	50
Overall Utilization w.r.to Direct MP(%)	35%	77%
Unit per Man (Direct + Indirect MP)	1.20	2.32
Manpower Reduction	-	48%
Productivity Improvement	-	93%

Existing vs Proposed Line Balancing





- **Existing** –
  - Under-utilized Manpower
  - Production at 6.7 min Takt
  - Uneven Line Balancing

- **Proposed** –
  - Increased Manpower Utilization
  - Production at 4.01 min Takt
  - Stations and Activities are merged for Line Balancing

Recommendations

- Use of Powered Conveyors to
  - Elevate manpower utilisation by eliminating manpower dependencies
  - Smooth Engine Movement on conveyor without Manpower Interruption
- To further increase in production,
  - Increase in length of oven is recommended
  - Automation for coolant and water filling in radiator to reduce cycle time

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