Department of Industrial and Systems Engineering — *System Design Project*

Optimisation of Allocation and Scheduling in The Blasting Halls

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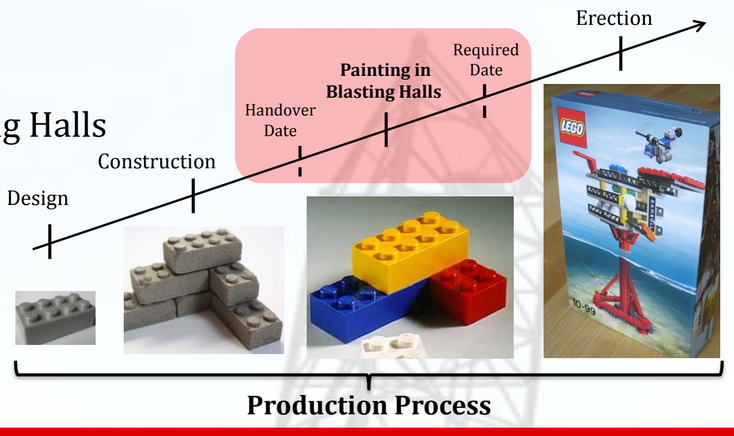
Phase I: Problem & Objective

Scope

Block Painting Process in Blasting Halls

Problem

Manual planning and scheduling of blocks into blasting halls



Objectives

1) Leverage on Excel VBA to Optimize Planning Process
2) Provide Feasible Planning Scheme

Where we are	→ Efficiency / Effectiveness →	Where we want to be
1. Manual Process 2. Qualitative 3. Uncertainty 4. No tracking of Performance Indicators		1. Automated Process 2. Qualitative & Quantitative 3. Account for Uncertainty 4. Tracking of Performance Indicators

Phase II: Methodology

Allocation Process Map

✓On-site Observations of Process

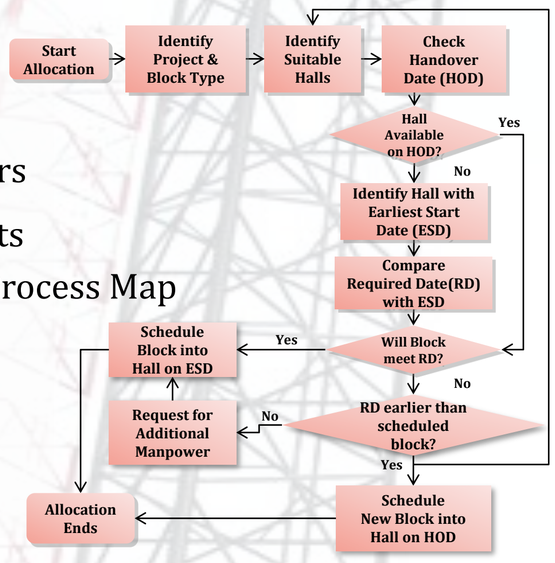
✓Interviews with Painting Supervisors

↳ Planning criteria and constraints summarised in the Allocation Process Map

Heuristic Approach

✓Experience-based Technique

✓Feasible solution obtained in minimal time



Model Analysis

Feasibility Check

Meet Requirements
1. Start after Handover Date
2. Go into Suitable Hall
3. Finish before Required Date

If fail Feasibility Check

Make necessary modification
1. Manual Allocation
2. Modification of Duration or Required Date

Improvement

Reduce: Hall Idling Time
Increase: Average Difference between Finished Date and Required Date
Simplify: Allocation and Scheduling Process

Operation Platform

Excel Visual Basic for Applications (VBA) platform

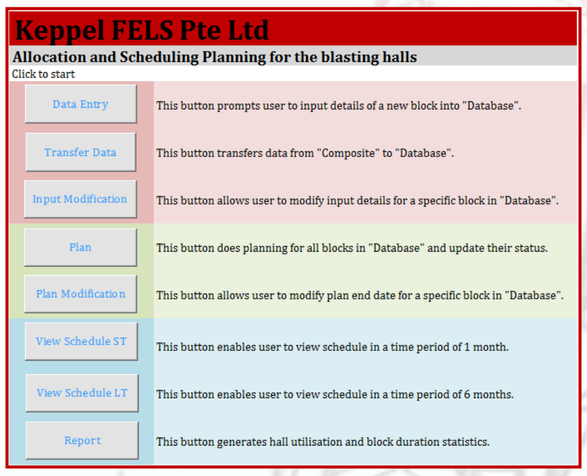
✓User-friendly

✓Compatible with existing planning process

➡ Automate Planning Process

Phase III: Implementation

User Functions



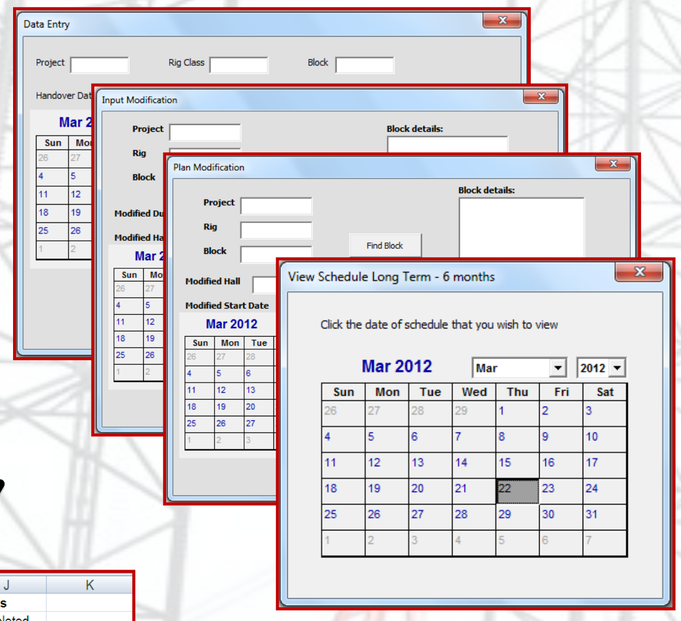
Keppel FELS Pte Ltd

Allocation and Scheduling Planning for the blasting halls

Click to start

Data Entry	This button prompts user to input details of a new block into "Database".
Transfer Data	This button transfers data from "Composite" to "Database".
Input Modification	This button allows user to modify input details for a specific block in "Database".
Plan	This button does planning for all blocks in "Database" and update their status.
Plan Modification	This button allows user to modify plan end date for a specific block in "Database".
View Schedule ST	This button enables user to view schedule in a time period of 1 month.
View Schedule LT	This button enables user to view schedule in a time period of 6 months.
Report	This button generates hall utilisation and block duration statistics.

User Interface

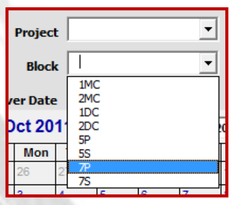


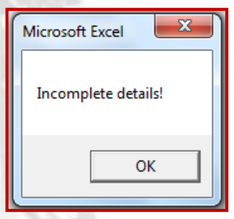
Poka-yoke Features (Mistake-Proofing)

A Japanese concept oriented to finding and correcting problems as close to the source as possible.

✓ Include controls/features e.g. dropdown lists and alerts to prevent or diminish error occurrence

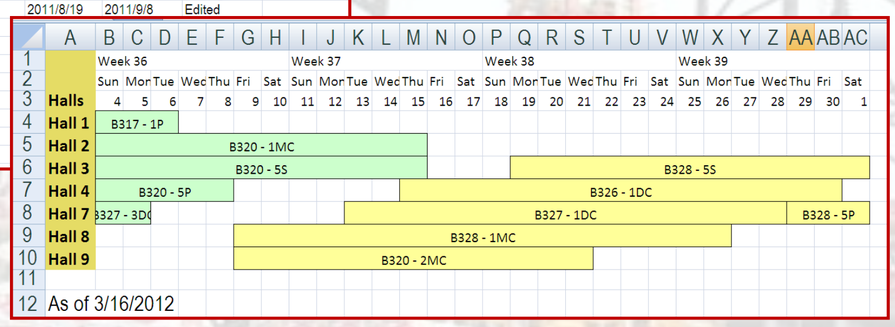
✓ Simple and inexpensive inspection at the end of each successive operation to determine or correct defects at the source





Planning Input and Output

	Rig	Block	Duration	Handover Date	Required Date	Hall	Start	End	Status
2	B	1P	16	22/08/2011	2011/9/12	1	2011/8/22	2011/9/6	Completed
3	B	1MC	18	29/08/2011	2011/9/12	2	2011/8/29	2011/9/15	Milestone Not Met!
4	B	5S	23	24/08/2011	2011/9/12	3	2011/8/24	2011/9/15	Milestone Not Met!
5	B	5S	23	19/09/2011	2011/10/13	3	2011/9/19	2011/10/11	Completed
6	B	3DC	18	2011/1/9	2011/9/19	4	2011/8/1	2011/8/18	In Progress
7	B	5P	21	2011/1/9	2011/9/23	4	2011/8/19	2011/9/8	Edited
8	B	1DC	16	15/09/2011	2011/10/12	4			
9	B	1DC	16	2011/10/10	2011/11/8	4			
10	B	3DC	18	2011/2/9	2011/9/19	7			
11	B	3DC	18	4/9/2011	9/23/2011	7			
12	B	1DC	16	13/09/2011	2011/10/11	7			
13	B	5P	21	21/09/2011	2011/10/15	7			
14	B	7P	17	15/08/2011	2011/9/2	8			
15	B	1MC	18	2011/9/9	2011/9/21	8			



Validation

Modes of Validation	Remarks	Results
Test Cases	Inputted specific test cases to check for the accuracy of specific outputs	✓
What-if Analysis	Carried out what-if analysis to test the robustness of the program	✓
Comparison with Historical Data	Inputted historical data to compare the level of consistency	✓
Feedback from Company	Continuous communication with industry supervisors for feedback	✓
Program Result Analysis	Inputted historical data to analyse the amount of improvement from past schedules	✓

Phase IV: Future Direction

Objectives

1) Leverage on Excel VBA to Optimize Planning Process
2) Provide Feasible Planning Scheme

Contributions

1) Increase in Planning Efficiency and Accuracy
2) Reduction in Planning Lead Time
3) Simplification of the Planning Process

Additional Function : Data Tracking and Report Generating Process

Future Direction

✓ Use as a prototype for future development

✓ Explore other approaches to achieve improved solution

✓ Improve planning accuracy as planning lead time increases