

# A SCHEDULING PROGRAM TO OPTIMIZE A PANEL LINE



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## INITIATION

KEPPEL FELS IS AN INDUSTRY LEADER IN OIL RIG MANUFACTURE

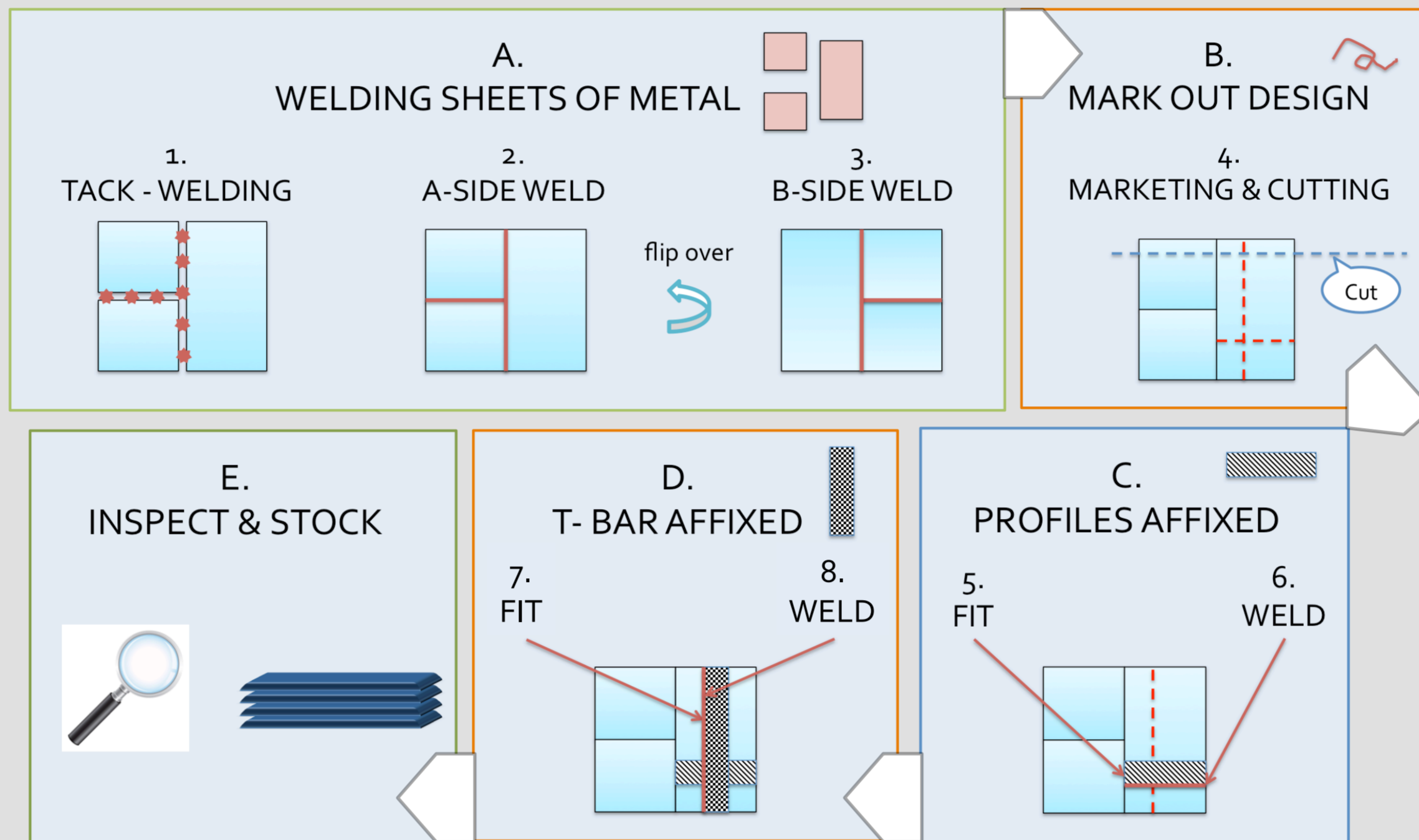
- Keppel FELS is one of the offshore units of the Keppel group.
- It's one of the world's largest producers of **jack-up oil rigs**.
- **HQ** of a network of offshore yard units in South-East and North-East Asia
- Apart from **design** and **building**, they also do **repair** work for these rigs.



## PANEL LINE

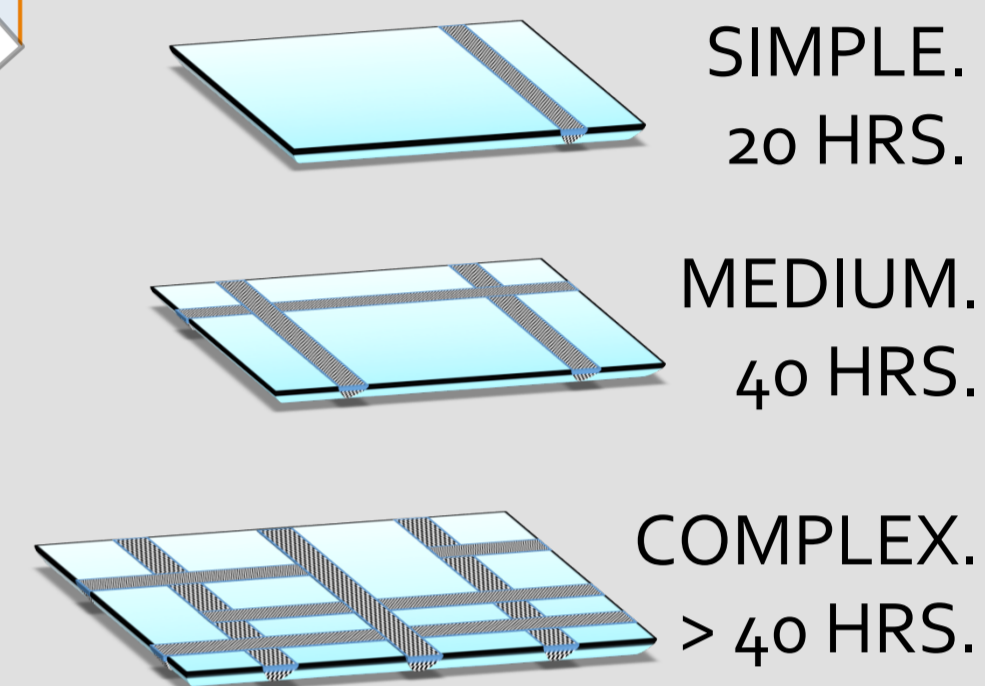
A RIG IS MADE UP OF **BLOCKS** ARE MADE UP OF **PANELS**.

- Panels are manufactured in a factory floor called the **Panel Line Workshop**.
- Here's how:



## COMPLEXITY OF PANELS

THE MORE COMPLEX THE PANEL, THE LONGER IT TAKES TO PROCESS.



## SCHEDULE

LOTS OF PANELS MUST BE FLOWED INTO THE LINE EVERYDAY

## HOW MIGHT WE FIND THE SEQUENCE OF PANELS THAT WOULD MINIMIZE TOTAL MAKE SPAN?

## OBJECTIVES

SAVE PANEL LINE'S TIME BY SCHEDULING PANELS OPTIMALLY

- To create a **scheduling software** for the panel line in order to
  - Reduce panel waiting time
  - Increase resource utilization
  - Minimize takt time for production

Our aim was to create a software that the panel line manager can begin using immediately.

A SOFTWARE WAS CREATED THAT TAKES THE DATA FROM UP TO 14 PANELS, AND CALCULATES THE OPTIMAL SEQUENCE IN WHICH TO FLOW THEM. WE USED MICROSOFT EXCEL.

## INPUT

USERS OF THE SOFTWARE MUST INPUT THIS DATA.

- 1. Manpower Allocation:** By station.
- 2. Process Rates:** Average time a step takes, assuming constant manpower per simulation.
- 3. Panel Specifications:** Lengths, number of T-bars etc.

## OUTPUT

THIS INFORMATION IS RECORDED AT THE END OF EACH RUN.

- 1. Optimal Sequence:** By panel.
- 2. Completion Times:** For each panel, to monitor changes and spot bottlenecks.
- 3. Total Make Span:** Adds up the final processing times.

## ALGORITHM

USING PROCESS RATES, MANPOWER ALLOCATED AND THE PANEL'S DESIGN SPECIFICATIONS, WE PROJECT HOW LONG THE PANEL WILL TAKE AT EACH STAGE. THEN, USE THIS DATA FOR EACH PANEL TO SCHEDULE THEM.

### STAGE 1: SPECIFICATIONS

User inputs the detailed specifications of panels to be scheduled.

Ex: *1 simple, 1 medium and 1 complex panel to be scheduled!*

### STAGE 2: CALCULATIONS

Using standard process rate information, the program calculates how long each panel would take at each station.

Ex: *Panel 1 will take 2 hours to complete tack welding.*

### STAGE 3: PERMUTATIONS

123 132 213 231 312 321

The program runs various permutations of sequences for the panels to minimize total makespan.

Ex: *Panel 1, then Panel 2, then Panel 3 – 35 hours* ❌  
*Panel 2, then Panel 1, then Panel 3 – 30 hours* ✅

### STAGE 4: RESULTS

123 132 213 231 312 321

Program outputs the optimal sequence of panels for the manager to use as a recommendation. Historical data from previous runs of the program are also available for him to refer to and use.

Ex: *Today's result is 2-1-3, but yesterday it was 2-3-1-4.*

## OUTCOME

PROGRAM HAS BEEN COMPLETED AND IS BEING TESTED BY THE COMPANY FOR DEPLOYMENT.