

Abstract

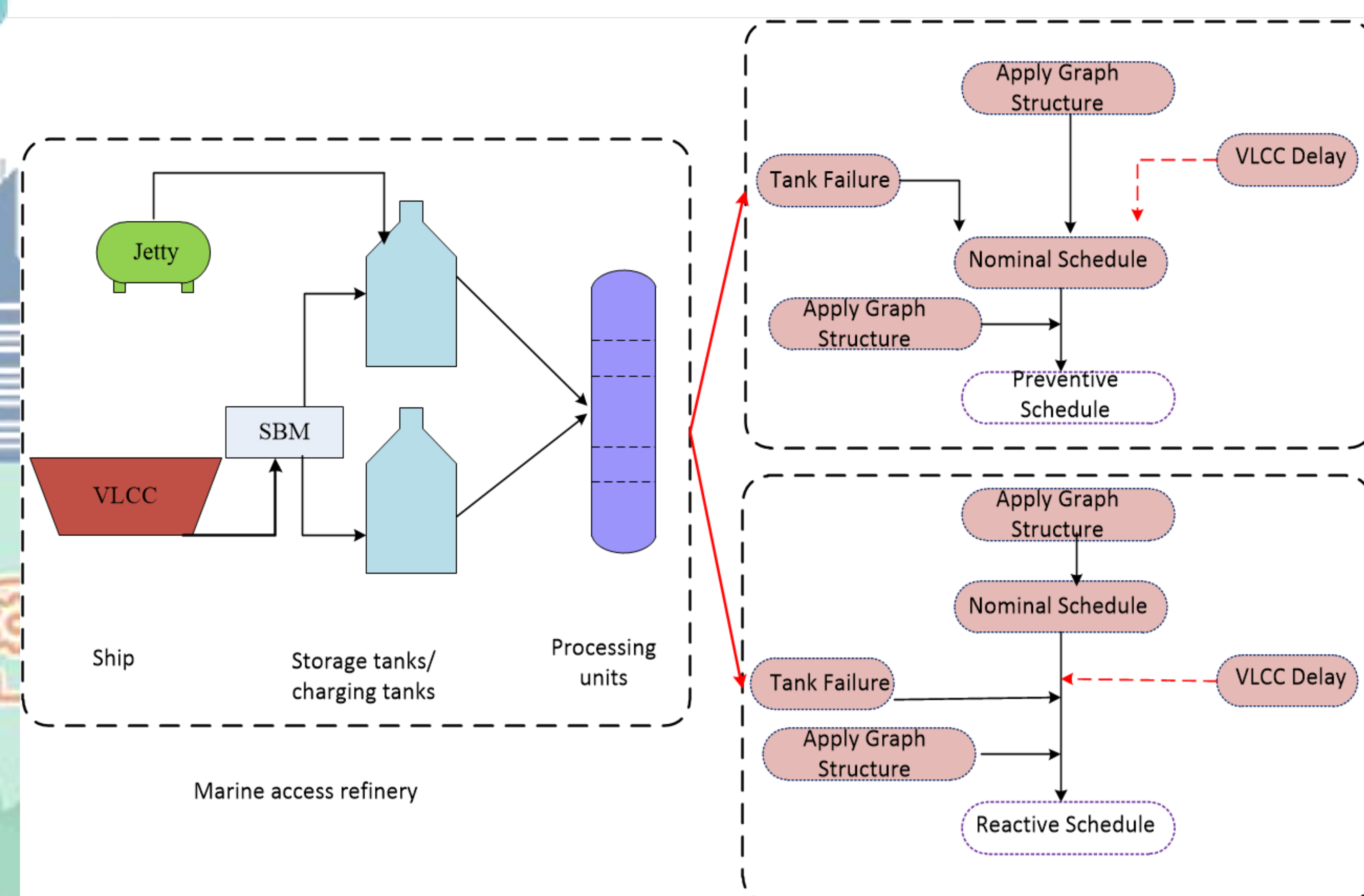
The marine access refineries which supply nearly 15% of the global energy requirement constantly encounter the uncertainties such as unit unavailability, demand and ships arrival delay. This uncertainties can disrupt the normal process in the refinery and a new approach is developed to handle these uncertainties. A new approach is developed to handle the unit unavailability uncertainty for both preventive as well as reactive schedule.

Introduction

- The objective is to increase the total profit as well as reduce the fluctuation in the CDU processing rate while satisfying the uncertainty.
- Two types of approaches are developed in which tank maintenance is taken in to consideration.
- The preventive approach incorporates the uncertainty before generating the schedule whereas the reactive approach can be used in which a unknown tank failure takes place.
- The scheduling of a marine access refinery is generated using the developed approach in which the tank unavailability is included.

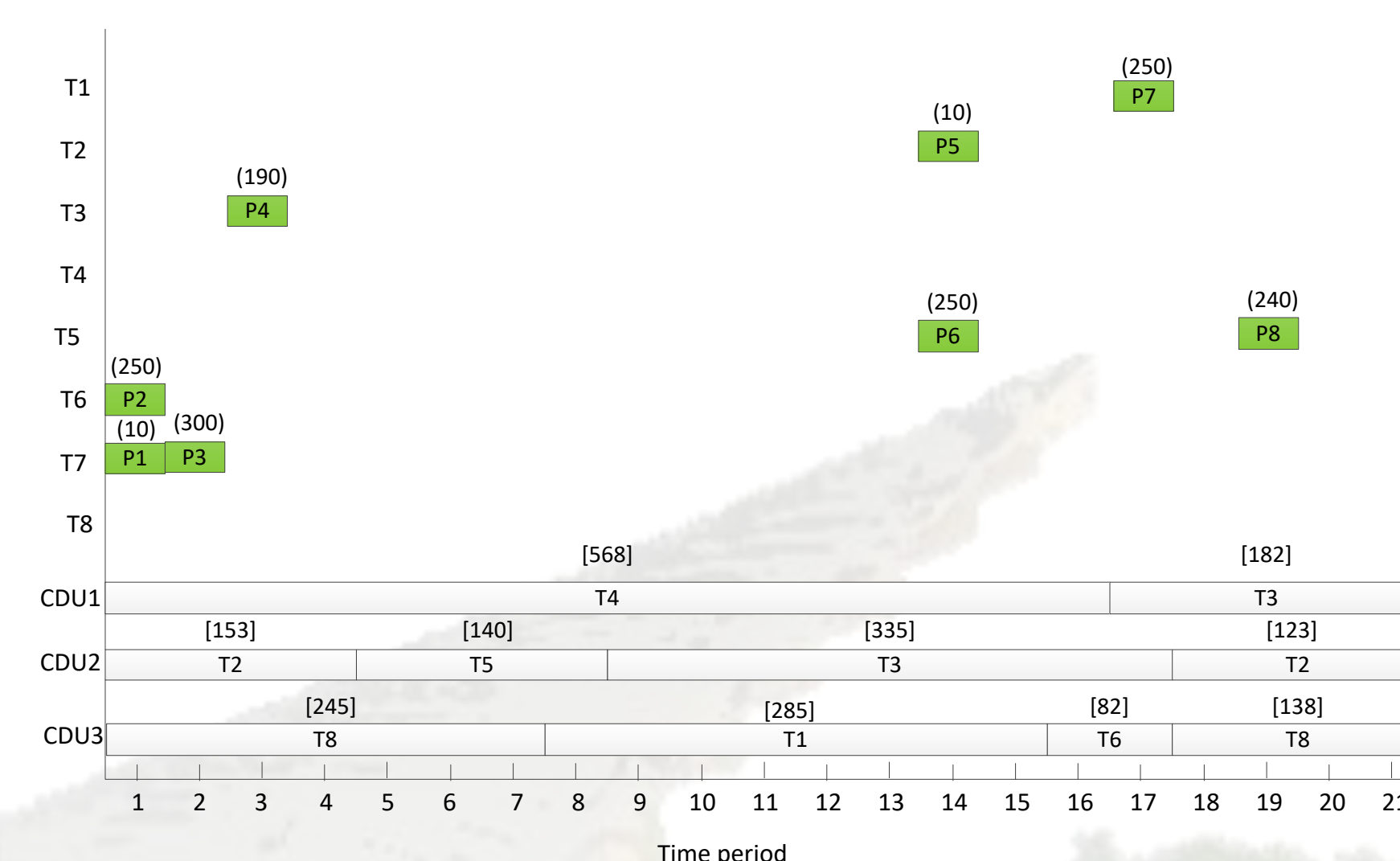
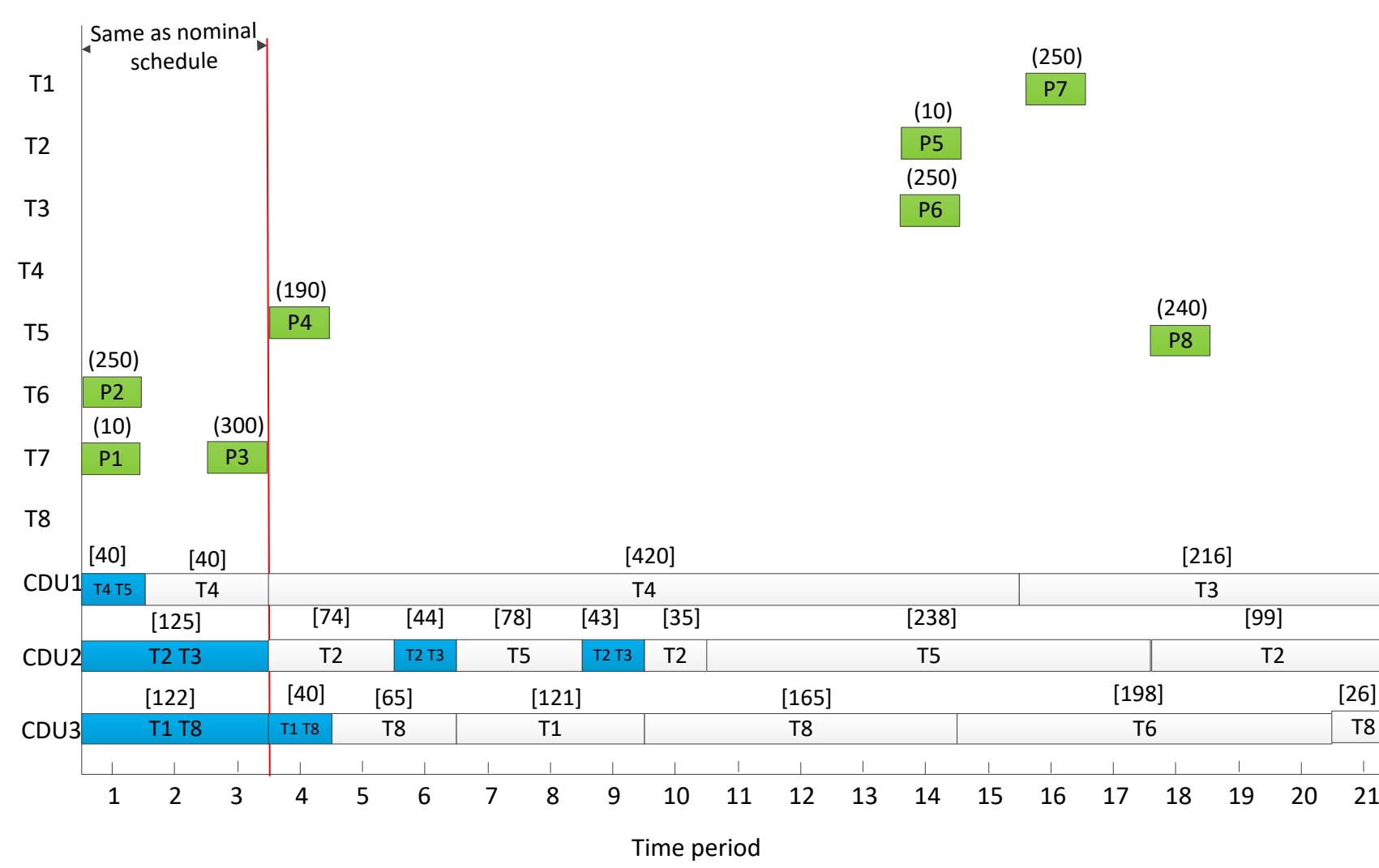
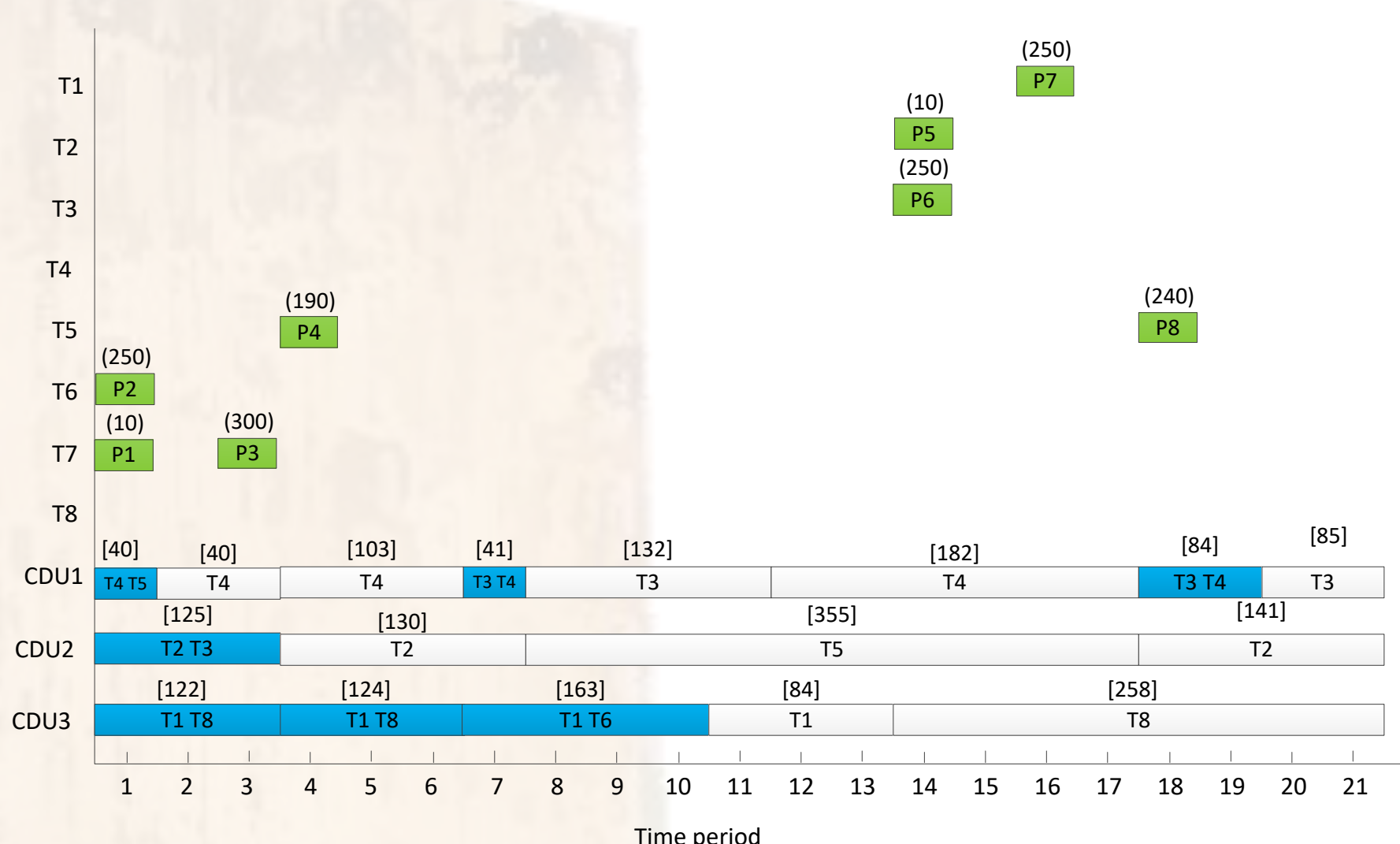
Method

The structure adapted genetic algorithm (SAGA) is used to develop the preventive as well as reactive approach. The operations are translated with the graph structure. The sparse representation enables the use of lower number of variables in one time period. The additional constraints are added to handle the uncertainty compared to the nominal approach.



Result

The refinery under consideration has eight tank, three CDU and three VLCCs. The time horizon for the refinery is 168 hour (21 period) in which Tank 1 is under maintenance for 16 hour (2 period). The Gantt chart is as follows for both the approaches.



The reactive approach incorporate the uncertainty after 3rd period and the preventive approach from the 1st period.

Profit: The profit in reactive schedule is more than preventive schedule as the later is over constrained.

Applicability: Preventive approach is better. Reactive may not be feasible sometimes due to the operability constraint.

Computational time: Reactive schedule takes less time compared to preventive schedule.

Conclusions

The plant operator can choose from preventive and reactive approach according to the data available.

The multi-objective solutions provide the plant operator a better flexibility to choose a schedule which is most suitable according to plant condition.

Industrial Significance

The developed approach can be used to any marine access refinery. The approach can be extended to any plant to generate an optimal schedule and to handle maintenance.

Technology Readiness Level: Given a plant data, the developed approach can be used to provide an optimal schedule for a marine access refinery.

References

- Panda, D., & Ramteke, M. (2018). Reactive scheduling of crude oil using structure adapted genetic algorithm under multiple uncertainties. *Computers & Chemical Engineering*, 116, 333-351.
- Panda, D. and Ramteke, M., 2019. Preventive crude oil scheduling under demand uncertainty using structure adapted genetic algorithm. *Applied Energy*, 235, pp.68-82.

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