

CASE STUDY

Maximising crew utilisation using optimisation in rail haulage operations

RACE

Sector
Bulk Commodity Rail

Module
Crew

The Customer

The customer is the operational division of a large rail operator on the Australian east coast. Each day the Crew Planning Team is responsible for allocating rostered on train crew, who sign on at a range of depots, to tomorrow's scheduled train services.

The Challenges

The customer is tasked with creating shifts for rostered on train crew signing on at multiple depots, meticulously assigning each driver to portions of a range of train services while obeying roster and shift construction rules such as maximum car travel within a shift or maximum shift duration.

Before partnering with the Polymathian team at Deswik, the customer used incumbent software to manually construct shifts that heavily relied on the experience and skill of the planner. Given the complexity of the shift construction process and the multitude of rules and constraints that had to be considered, this manual planning process left the customer with a labour-intensive sub-optimal process.

About RACE Crew

RACE Crew is a mathematical optimisation tool for maximising rail crew efficiency by allocating rostered on rail crew at multiple depots to crew train services.



Minimise Overtime

>50% reduction of RDO drivers



Maximised Crew Utilisation

Improved rostered crew utilisation by ~8%



Compare Scenarios

Rapidly compare optimisation scenarios





This sub-optimality translated into elevated costs through overtime payments incurred by calling in drivers on short notice on their rostered days off to meet demand to avoid train cancellations.

The customer worked with the Polymathian team to implement a solution that could improve planning efficiency, maximise crew utilisation, minimise vehicle travel time (and so improve safety), and improve robustness.

The Solution

After consulting with the customer and understanding the requirements for an automated process that could optimise crew allocation, the RACE Crew module was implemented to automatically generate an optimal allocation of rostered on train crew to scheduled train services.

Designed as a hybrid planning solution, the

customer can mix and match manual planning with optimised planning. Part of the solution can be constructed manually (to accommodate training requirements for example) and the remainder of the solution can be created by an optimiser. Since the RACE Crew module offers control over optimisation goals, the customer can tailor the optimisation process to minimise vehicle travel, maximise footplate time, and reduce overtime, effectively addressing key safety concerns. As a result, the customer can now generate a complete and mathematically optimised set of crew schedules for rostered on train crew using an automated solver that runs in minutes.

To alleviate any data entry issues, the RACE Crew module was integrated with existing internal software to automatically ingest key input data and publish solutions.





The Benefits

The RACE Crew module complements other RACE products the customer already uses across its operations. With two designated teams in different locations working exclusively with the RACE Crew module to generate solutions for different geographies, the customer has seen tangible benefits and impacts in the following areas:

Minimised overtime work

The customer has seen a >50% reduction of RDO drivers (drivers called in on their rostered days off) compared to manual planning, reducing costs while improving the well-being of workers. This was achieved by better matching drivers who are rostered on to compatible portions of train services.

Maximised crew utilisation

The total number of drivers required each day was reduced by ~8% compared to manual planning using the RACE Crew module, as reported by the customer. This implies that additional drivers can be made available on short notice, while increasing the overall efficiency of the operation, and that rostered on drivers with specific sign on times are now better matched to portions of train services.

Flexible scenario planning

The RACE Crew module enables the customer to generate solutions using a combination of manual planning and optimisation, enabling a rapid comparison of scenarios and their KPIs.

Optimal Planning Decisions

The Crew module provides mathematically optimal answers for questions such as:

- How can I create an optimal plan for all train crew while obeying roster and shift construction rules?
- How do I maintain EBA compliance?
- How can I improve my crew utilisation to mitigate business risk and reduce cost?
- How can I avoid drivers being called to work on their rostered days off?
- How can I optimise for specific goals, such as maximising footplate, minimising car travel, minimising overtime and minimising lift up and lay back?
- How do I develop a schedule for trainees included in the plan?
- How can I create a plan that simultaneously solves for both driver to shift type assignment (does a driver work paired with another, or work on their own) as well as driver to train service allocation?