GUROBI OPTIMIZATION

Optimising Crew Schedules to Improve Operational Efficiency

With Gurobi, Deswik can quickly generate optimal crew allocation plans that save their customers time and money.

Deswik

Deswik is an Australian-owned industrial mathematics software development company. They specialise in solving complex business problems across a wide range of industries, including mining, rail, maritime, energy, and transport logistics.

Location: Australia
Use Cases: Scheduling
Website: deswik.com

Results

- 50% fewer off-duty drivers called in for work
- 8% reduction in the total number of drivers required each day, leading to improved operational efficiency and significant labor cost savings

Each day, rail haulage providers operating in bulk haulage supply chains must make critical decisions that impact the efficiency, cost, and reliability of their operations. Because services vary from day to day, planning teams are faced with complex crew allocation problems that must be solved on a daily basis.

As a provider of industrial mathematics solutions, Deswik, a Deswik company, offers a suite of products that help these providers make better decisions by solving optimisation problems across mining, rail, maritime, energy, and transport logistics sectors.

RACE is Deswik's rail supply chain optimisation software for organisations that operate in bulk rail value chains, including haulage providers, track owners, terminal operators, and primary producers. A bulk rail value chain is one that transports products that are either mined or grown and with demand fluctuating weekly, meaning rail operations do not follow a timetable.

RACE's integrated software modules include:

- **RACE Planner:** Optimises rolling stock schedule, terminal, and vessel operations to maximise system throughput, minimise demurrage, and increase rail fleet efficiency.
- **RACE Crew:** Optimises the allocation of rostered train drivers from multiple depots to operate dynamic train services.
- **RACE Live:** Optimises the real-time planning and management of train services.

With RACE Crew, powered by Gurobi, Deswik helped the operational division of an Australian haulage provider develop robust schedules in a way that cuts costs, enhances efficiency, and improves robustness.

Using Gurobi to power its RACE Crew module, Deswik helped their customer reduce overtime spend by 50%—a substantial cost reduction.

> “With Gurobi, we’ve been able to offer our customers more transparency and control over the crew allocation process. This helps us earn the trust and confidence of users who may not be familiar with the technical details of optimisation.”

Dr. Ben Hollis
RACE & APEX Technical Director, Deswik

Generating Optimal Crew Allocation Plans

Addressing the crew allocation problem requires operational teams to make a number of important decisions, including:

- Which drivers—and from which depots—should be used to crew each leg of each train service
- Which drivers should be paired together for the duration of their shift, as well as which drivers can work on their own

These plans are produced under time pressure, as they must be provided to the train crews each day before a specified deadline.

A good crew allocation plan covers every leg of every train service, but that’s not the only consideration for operational teams. Other important factors include:

- **Limiting the need to call in off-duty drivers:** Drivers may be called in on a rostered day off if required and agreed to by the driver, when demand for drivers exceeds the number rostered for work.
- **Utilising the fewest drivers overall:** Having spare drivers is important for non-driving duties, as backup drivers may be needed in an operational context.
- **Limiting driver swaps:** Excessive swapping results in a brittle plan, which may not work if trains are delayed on the day of operation.
- **Limiting car travel:** This is critical for safety.

Furthermore, failing to produce a robust schedule that can weather train delays, sick drivers, and other unforeseeable risks may result in cancelled services, or a need to call in drivers for overtime—which is both costly and unsustainable.

Generating Fast, Reliable Solutions

Using Gurobi’s multi-objective API, Deswik was able to model their customer’s incredibly complex problem with ease.

The model is solved using Gurobi to produce optimal, timely, and repeatable solutions.

This, combined with automation and the ability for users to configure a hierarchical objective, allows Deswik to quickly demonstrate exactly why a particular solution was chosen. Such benefits would not be possible with a heuristic approach.

Cutting Costs with Better Crew Plans

Using Gurobi to power its RACE Crew module, Deswik helped their customer reduce overtime spend by 50%—a substantial cost reduction.

Optimised plans also show an 8% reduction in the total number of drivers required each day when compared with manually produced plans. This translates into significant savings in labor costs and improved operational efficiency.

Dr. Ben Hollis, RACE & APEX Technical Director at Deswik, highlights the broader impact of these improvements: “With Gurobi, we’ve been able to offer our customers more transparency and control over the crew allocation process. This helps us earn the trust and confidence of users who may not be familiar with the technical details of optimisation.”

Experience Gurobi for Yourself

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- Free benchmarking services
- Free model tuning services
- Free access to our world-class technical guidance and support
- Two free hours of one-on-one consulting services

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