Automating Airport Staff Scheduling

Swissport cut planning time in half, while meeting 95-100% of employee scheduling preferences and saving $1 million per year.

Keeping airplanes in the air takes a full crew on the ground, too. Swissport International AG provides best-in-class airport ground services for some 97 million airline passengers and handles roughly 5.1 million tons of air freight at over 100 cargo warehouses worldwide.

Industry: Transportation
Location: Europe
Use Cases: Automation, Operations, Resource Optimization, Routing, Workforce Scheduling
Website: www.swissport.com

Results

- 92% faster workforce scheduling process
- 95% employee scheduling preferences accounted for
- $1MM cost savings per year

Airport ground handling includes a broad range of passenger and ramp services, all of which can be a challenge to run smoothly. At Zurich airport alone, Swissport employs 2,000 people who do check-in and gate tasks, baggage management, aircraft loading, push-back movements, and much more. And all these people have different work skills, contract types, and shift duties. So, putting together a work schedule for even a single month is complex.

Swissport needed to be able to:

- Generate tasks and build a master schedule of shifts
- Assign daily shifts to employees and generate monthly shift schedules according to operational constraints, labor regulations and individual preferences
- Handle ad-hoc requests for schedule changes, such as when someone is sick
- Dispatch teams in real-time, when and where their skills are needed

Before, the Swissport planning teams created schedules manually, sometimes spending weeks sketching out a plan for the coming month. And it was an ongoing challenge to coordinate continually changing labor requirements with individual work contracts and duty preferences.

Creating Their Own Scheduling Solution, Powered by Gurobi

Swissport teamed up with a research team at nearby Zurich University of Applied Sciences ZHAW. Their goal? Develop scheduling software that is powerful enough to handle Swissport's complex operational planning puzzles. The tool also needed to be general and flexible enough for industries beyond aviation.

They called it Auto-Roster. Unlike most commercial rostering tools, Auto-Roster uses Mixed Integer Linear Programming (MIP), combined with other optimization techniques, including decomposition and relaxation, pre- and post-processing, and a variety of heuristic procedures.

At first, it wasn't clear that Auto-Roster could make it off the ground.

> "Gurobi has consistently brought major performance improvements (often 10-20%) with each new release, which has been of enormous benefit to us."

Bruno Riesen
Vice President Of Business Support, Swissport

> **“Auto-Roster is our indispensable scheduling tool. You’d be hard-pressed to find any alternative tools with similar functionality, flexibility, and—thanks in part to Gurobi—speed.”**
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> **Roman Berner**
> *Optimization Specialist, Swissport*

Its optimization engine has over 60,000 lines of code, with more than 1 million integer variables and 500,000 constraints. With so many things to account for, one of the biggest challenges was to solve the problems in a reasonable time—because MIP models are often too slow to be useful.

“Approaching large-scale, real-world rostering problems with MIP techniques is innovative and challenging, since computation times are typically far beyond any acceptable limits,” said Prof. Andreas Klinkert, Technical Project Leader at ZHAW. “Several times, the project was close to failing due to intractable MIP models.”

During the project, the research team had several mathematical breakthroughs and was finally able to establish computationally tractable MIP model formulations. They also brought in Gurobi Optimization to help speed things up even more. With the Gurobi Optimizer, the Auto-Roster team can now run complex models with millions of variables—all within 20-70 hours.

“For a long time, Gurobi was by far the only MIP solver that could solve our models in a reasonable time, and we suspect that this is still the case now,” said Dr. Peter Fusek, Lead Mathematical Modeling at ZHAW.

More-Efficient Shifts Save Time and Money and Keep Employees Happy

Now, Swissport is using Auto-Roster to plan work schedules across all three international airports in Switzerland—Zurich, Geneva, and Basel—with more rollouts in progress at other airports in Europe.

Already, it’s making a big difference. The Swissport planning team takes about half the time to set shift schedules. They can plan more efficient shifts, with less wasted time and a better match between supply and demand. Their rosters are also more robust, fair, and—above all—flexible. Employees are happy that their scheduling preferences are fulfilled 95-100% of the time.

All told, better planning is saving Swissport more than $1 million a year.