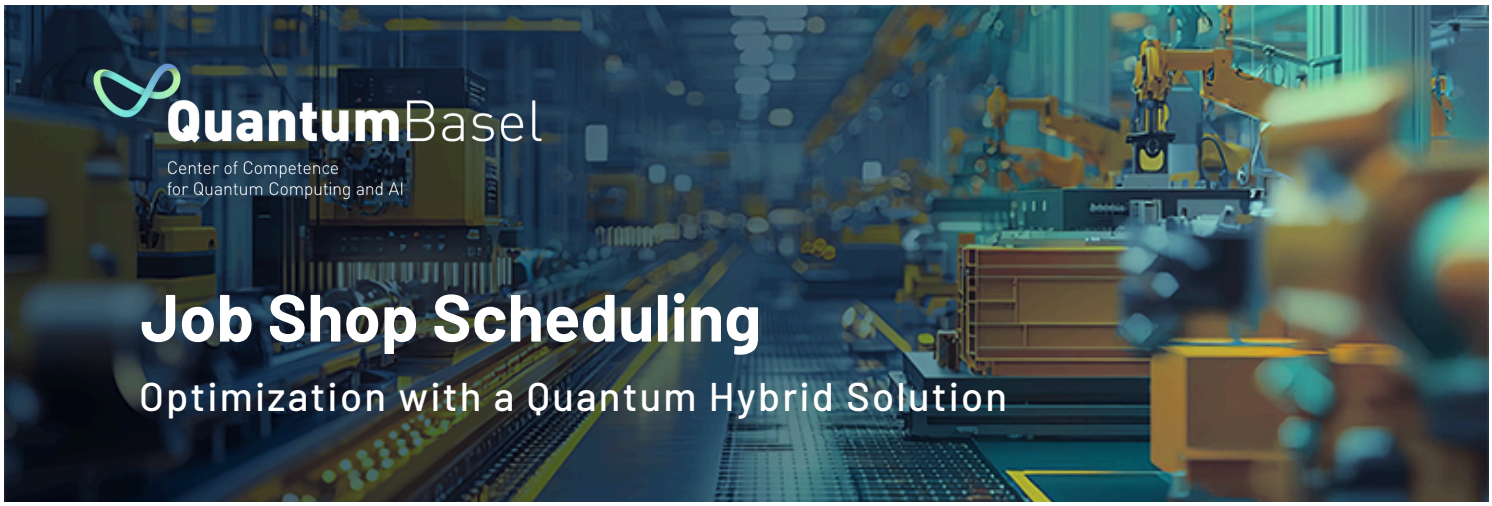

QuantumBasel
Center of Competence
for Quantum Computing and AI

Job Shop Scheduling

Optimization with a Quantum Hybrid Solution

PROBLEM

ACCELERATE PRODUCTION, ENHANCE VALUE

Handling complex and large amounts of data generated in today's production environments is challenging due to **limited scalability**. The data on which improvements are made is static. There is no way to **adapt in real time to changes** in demand, production, or machine availability.

Efficiency may be affected by sub-optimal use of resources, increased production costs and delivery delays.

Make the most of your resources with a dynamic production plan and respond instantly to market changes - ensuring efficiency and resilience in a constantly evolving marketplace. Achieve greater performance and **cost** savings by reducing **bottlenecks**, shortening **lead times**, and optimizing **production cycles** - resulting in lower costs, increased efficiency, and minimized waste.

SOLUTION

QUANTUM HYBRID APPROACH

Dynamic market changes, limited resources, and complex production processes challenge traditional planning methods. A Quantum hybrid solution enables **data-driven optimization of production processes, reducing bottlenecks and shortening lead times.**

By incorporating more variables and constraints with a more intelligent solver, production processes can be made **more efficient** and **downtime** can be **minimized**. The result is an **improved production utilization with reduced costs and less waste**. This helps companies adapt their planning strategies to the increasing complexities of production.

Initial tests show a sigificant **reduction in product makespan**. This eliminates the need for costly weekend or overtime shifts. **The result is a significant reduction in due date violations, closing hour violations and overlap violations.**

BENEFIT

≈ ⅔ REDUCTION IN PRODUCT MAKESPAN	≈ ⅓ LESS CONSTRAINT VIOLATIONS	100% REDUCTION OF CRITICAL ISSUES

The results have showed clear advantages for both classical and quantum optimisation methods - especially the latter. Total makespan has been reduced by ≈ ⅔ with the reference solution, leading to a **significant improvement in overall production efficiency**. Constraint violations have been reduced by ≈ ⅓ and key problems such as machine overlaps, priority conflicts and closing time violations have been **completely eliminated**. The number of late jobs and average tardiness have also been **significantly reduced**. We hope to extend this work in a next step.

Optimized Production Cycles

- Increased Efficiency
- Costs Savings
- Reduced Bottlenecks
- Faster Delivery Times
- Minimized Waste

Read the Use Case:

Pfizer

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Subject: Job Shop Scheduling