Quantum Computing for Manufacturing:
Industry 4.0 and Beyond

According to Gartner, 36% of manufacturing CIOs whose enterprises had recently experienced some time of disruption say that operating cost competitiveness has fallen behind. As these CIOs think about upleveling their digital strategy in the world of Industry 4.0, quantum computing technology is a mission-critical part of any CIO's toolkit, especially when it comes to reducing costs and overhead.

There is a broad array of opportunity areas for quantum computing within the manufacturing industry, ranging from chemistry and materials science, to automotive and mobility, to supply chain optimization and logistics, and more. Inefficiencies continue to exist across value chains in these areas, but there is an enormous opportunity to find new and innovative approaches to optimize these inefficiencies to gain a competitive edge.

Forward-thinking manufacturing, logistics, and mobility businesses have an opportunity to secure a first-mover advantage today by starting to explore specific problems that can benefit from quantum computing. In effect, they can get a head start on their quantum journey by identifying relevant quantum use cases now and get to quantum solutions faster. As a result, these early adopters can accelerate time-to-value and realize business benefits much earlier, such as faster and smarter decision-making, enhanced risk management, lower operational costs, and more revenue.

The nascent business opportunities in quantum coupled with the rapidly changing market demands of Industry 4.0 has created a fertile environment where innovators who quickly adapt and execute will be primed to capture competitive advantages and future-proof their business for years to come.

Quantum Use Cases in Manufacturing, Logistics, and Mobility

Quantum computing, specifically the kind that uses quantum annealing approaches, is best fit to deliver optimal solutions to combinatorial optimization problems with large numbers of variables and constraints. These problem characteristics are at the core of many complex business problems. Below are a few examples of optimization applications in manufacturing and logistics that are well-suited to a quantum-hybrid approach:

- Multi-car paint shop optimization: What is the best way to optimize the paint shop to minimize color switching and reduce waste?
- Traffic routing and mobility: How can you find optimal routing patterns for large-scale traffic problems in order to streamline traffic flow, reduce congestion and environmental damage, and improve quality of life?
- Employee scheduling: How can you efficiently allocate resources and schedule employees given constraints such as skills and time zones?

Many more applicable use cases exist across a vast problem space, such as airline routing, airport planning/scheduling, railway routing, electric car charging station optimization, port scheduling/planning, and ship loading.

Use Case Spotlight: Route Optimization

DENSO Corporation is the leading supplier of advanced automotive technology, systems, and components for most of the world's major automakers. DENSO recently completed proof-of-concept work aimed at optimizing control of Automated Guided Vehicles (AGVs) on their factory floors. These robotic transports move materials around the factory using automated guidance systems. Using the D-Wave quantum computer, DENSO narrowed down and ranked the optimal number of paths AGVs could take around the factory. Then, they focused on reducing traffic congestion across the ecosystem.

The results were significant: researchers were able to produce solutions that reduced the amount of time each AGV spent waiting for a clear route to open up by an average of 15%, even when focusing on safety over speed. In addition to this, DENSO has expanded their quantum use cases and applications to address traffic optimization across multimodal transportation systems in order to streamline traffic flow.

D-Wave Launch: The on-board to quantum computing program

If you are ready to get started but not sure how, the D-Wave Launch program has been designed to help enterprises go from problem discovery through production implementation.

- Identify the problem best suited to quantum
- Get your team trained and start the development process
- Move your application into test and ready for production
- Get your application up and running to deliver benefit to your business

Sign Up Now To Get Started: www.dwavesys.com/d-wave-launch