

“As part of our production improvement research, we discovered Digital Annealer and its strength in solving combinatorial optimization problems.”

Kazuyuki Niwa
Executive Officer
Fujitsu IT Products Limited



Boosting manufacturing efficiency with Digital Annealer

At a glance

Country: Japan
Industry: Technology
Founded: 1935
Website: fujitsu.com

Challenge

For Fujitsu employees, gathering parts at its manufacturing facilities could be a long and frustrating task. Inefficient shelving and vast amounts of components made it time-consuming to find the right parts. Fujitsu wanted to make the process simpler and more efficient.

Solution

FUJITSU Digital Annealer uses a digital circuit design inspired by quantum phenomena, a new technology that can solve complex combinatorial optimization problems, to display maps on tablets for the shortest route, making it easy for workers to collect parts.

Benefit

- Dramatic reduction in time to gather parts
- Visual interface easily understood
- Entire solution designed and deployed in a matter of months
- Better understanding of workflow means that parts can be placed close to where they are most often needed
- Employees no longer need vast experience to gather parts

Customer

Fujitsu is a leading global technology company, offering a full range of technology products, solutions and services. Approximately 132,000 Fujitsu people support customers in more than 100 countries, using their experience and the power of IT to shape the future of society.

Products and Services

■ FUJITSU Digital Annealer



Introducing efficiency

Fujitsu IT Products Limited is a key manufacturer of Fujitsu's computer systems, storage systems, medium to large servers such as mainframes, UNIX servers, Mission-Critical IA servers and supercomputers. Since its establishment in 2002, production techniques have evolved with the integration of manufacturing organizations that improve customer satisfaction in pursuit of Quality, Cost, and Delivery (QCD) for a large variety and small quantity production.

Today, manufacturing facilities are required to constantly produce high quality products efficiently. Due to diversifying market needs, it is important to produce a wide variety of products in low volume. This means that Fujitsu is always researching better ways to raise production levels. One main area of focus has been to find and implement the optimized routes for collecting parts inside its factories and warehouses.

Previously, the parts listed on each delivery ticket did not have the order of part shelves included, and because the shelves with the parts themselves were not in alphabetical order, it was not easy for workers to systematically collect parts. For workers with very little experience, if they could not find the shelves with the parts, they would spend a lot of time wandering around the warehouse looking for them, and therefore take a lot of time to collect the necessary parts.

To understand the scale of the task at hand, consider the traveling salesman problem example. A salesman needs to visit several cities and must find which route offers the shortest total distance, visiting each city only once. In the case of 30 cities, the total number of possible routes is over 2.65×10^{32} and runs into billions. Similarly, within Fujitsu's network of factories and warehouses, there are near infinite ways to route parts and components. The company wanted to find the most efficient way and turned to its own Digital Annealer.

Quantum-inspired optimization

FUJITSU Digital Annealer uses a digital circuit design inspired by quantum phenomena, a new technology that can solve complex combinatorial optimization problems that classical computers cannot solve in a reasonable amount of time. It is an alternative to quantum computing technology, which is at present both very expensive and difficult to run. The Digital Annealer focuses on rapidly solving complex combinatorial optimization problems without the added complications and costs typically associated with quantum computing methods.

Warehouse employees now leverage Digital Annealer technology to increase efficiency. Warehouse operations are first given delivery requests for parts from each of the production lines. After the requests are received, a list of the parts is generated. Workers collect the parts listed on the ticket from the warehouse shelves and deliver. On the delivery ticket, the name of the part and the shelf number for where it is stored are described. With the introduction of Digital Annealer, the system displays maps on tablets for the shortest route, making it easy for workers to collect parts.

"From warehouse selection to consultations, it took just a few months to introduce the Digital Annealer into operations," explains Kenji Miyata, Director, Department of General Manufacturing and Technology, Fujitsu IT Products Limited. "We decided to use the Digital Annealer Cloud Service to support our original system of tickets. It was not confusing and went quite smoothly."

Speed and simplicity

"As expected, being able to visualize routes was key. To pick up parts, you would go here and there inside the warehouse. But now it has become a one-stroke sketch. Confirming that with our own eyes was a wonderful thing," according to Executive Officer Kazuyuki Niwa.

The new system is simple to use, and the information for delivery, along with the placement of parts to be sent out, means the Digital Annealer provides the most efficient system for anyone to understand and navigate. With the achievement of an improved flow, it is also possible to consider the optimum position of each part. Parts are placed on shelves close to where they are most often needed on the production line. With just one change, the route is shortened which results in a more efficient workflow.

According to Miyata, "It is projected that the traveling distance for gathering parts will decrease by 20% each month. In addition, changing the location of the shelves could lead to a 45% reduction."

Executive Officer Niwa concludes, "The system was rolled out and trialed at one warehouse first. Once we saw the results, we thought we could expand this to other warehouses. We now expect to benefit from other production improvements resulting from the implementation of Digital Annealer, such as warehouse employee shift optimization and the ordering process for products."

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