

Last-Mile Distribution Network Optimization Online Retailer



Supply Chains



Transportation

Overview

Ozon is one of the largest online retailers in Eastern Europe, with overall sales around \$5 billion in 2019. The company is growing year by year by expanding delivery zones, launching new services, etc. For example, Ozon's turnover increased by 93% in 2019 and 115% in the first quarter of 2020. Therefore, the company needs to optimize its infrastructure.

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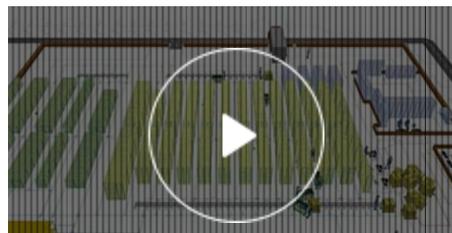
DC's to the customer's addresses, pick-up lockers, or pick-up points where the customers collected them. To maintain a high service level and deliver goods on time, it was necessary to set up a new distribution network and minimize the distance from DC's to final destinations at the same time.

The company opted for AnyLogic as simulation software with distribution network optimization capabilities to solve this problem. This technology allowed Ozon to visualize the transportation network of Moscow and the Moscow region and test hypotheses before putting ideas into action in the real world. The simulation was also supposed to help Ozon understand how to distribute delivery zones between new and already existing DC's, so that the centers would work effectively with no down time.

Solution

In Ozon, a placed order is sent to one of its fulfillment centers (in-house packing warehouses) where storekeepers receive goods from suppliers, assemble them in parcels, and pack them. Then the parcels are delivered to DC's where they are distributed among couriers. Couriers, in turn, deliver parcels within their delivery areas directly to the customers, pick-up lockers, or pick-up points. Each DC operates within a specific delivery area.

The company decided to develop models of each order processing stage to reflect the whole process in detail. However, in this



recorded in IT systems, so the engineers could obtain the data they needed, including:

- The time a courier spends in a DC.
- The time a courier spends on the journey from a DC to a certain delivery area.
- The delivery time distribution in delivery areas.
- The delivery points distribution within each delivery area.
- The distribution of the time a courier spends travelling from customer to customer in each delivery area.

Based on this data, the engineers developed the simulation model. They considered the following limitations to capture the real system more precisely:

- 98% of orders must be delivered on time.
- During peak seasons, the utilization rate of DC measures up to 95%, but the workload should be equally and proportionally distributed in the system.
- Within different delivery areas orders are distributed unevenly over time and days of the week.
- Couriers have certain work schedules.

To set the logic of the model, the engineers applied the AnyLogic [Process Modeling Library](#). Through flow diagrams, it helped capture the system's dynamics and interconnections between its elements.

What's more, it was essential to reflect the distribution network delivery routes in the model. For this purpose, the team used the [GIS map](#) to locate distribution centers in Moscow and the Moscow region and their

different “what-if” scenarios in which they could vary the system’s parameters. These parameters included the number of all placed orders, on-time delivery rate, the number of couriers sent to a delivery area, and the courier’s travel time in general. The team sought to distribute delivery areas between DC’s in such a way as to minimize the number of DC’s, yet maintain a high service level. In addition, they collected the statistics for each DC, both on its efficiency and its couriers’ delivery time.



Last-mile distribution network model

Result

As a result, the team developed a simulation model for the last-mile delivery network reflecting distribution centers and their corresponding delivery areas, pick-up lockers, and points. They used the model to test out various scenarios. Then, considering the service level and costs, the team determined the optimal location of the DC’s and their delivery areas.

The engineers used the Process Modeling Library and the AnyLogic GIS map capabilities to set up the logic of the logistics system processes and visualize them. The simulation model and the output data helped the team to conclude that to strike a balance between KPI’s it was necessary to close three DC’s and open 11 other DC’s by the end of 2020.

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