



UPS Logistics Optimization using SQL

Route, Warehouse & Delivery Performance Analysis

Business Objectives

Reduce Delivery Delays

Improve Delivery Reliability

Optimize Route Efficiency

Enhance Operational Visibility



Dataset Overview



01

Orders

Order details and delivery timelines

02

Routes

Distance, travel time, and traffic delay data

03

Warehouses

Processing and dispatch information

04

Delivery Agents

Agent speed, shifts, and on-time performance

05

Shipment Tracking

Checkpoint-level delay information

Data Cleaning & Preparation

Key Data Preparation Steps

- Removed duplicate order records
- Validated delivery date consistency
- Standardized date formats
- Handled missing traffic delay values

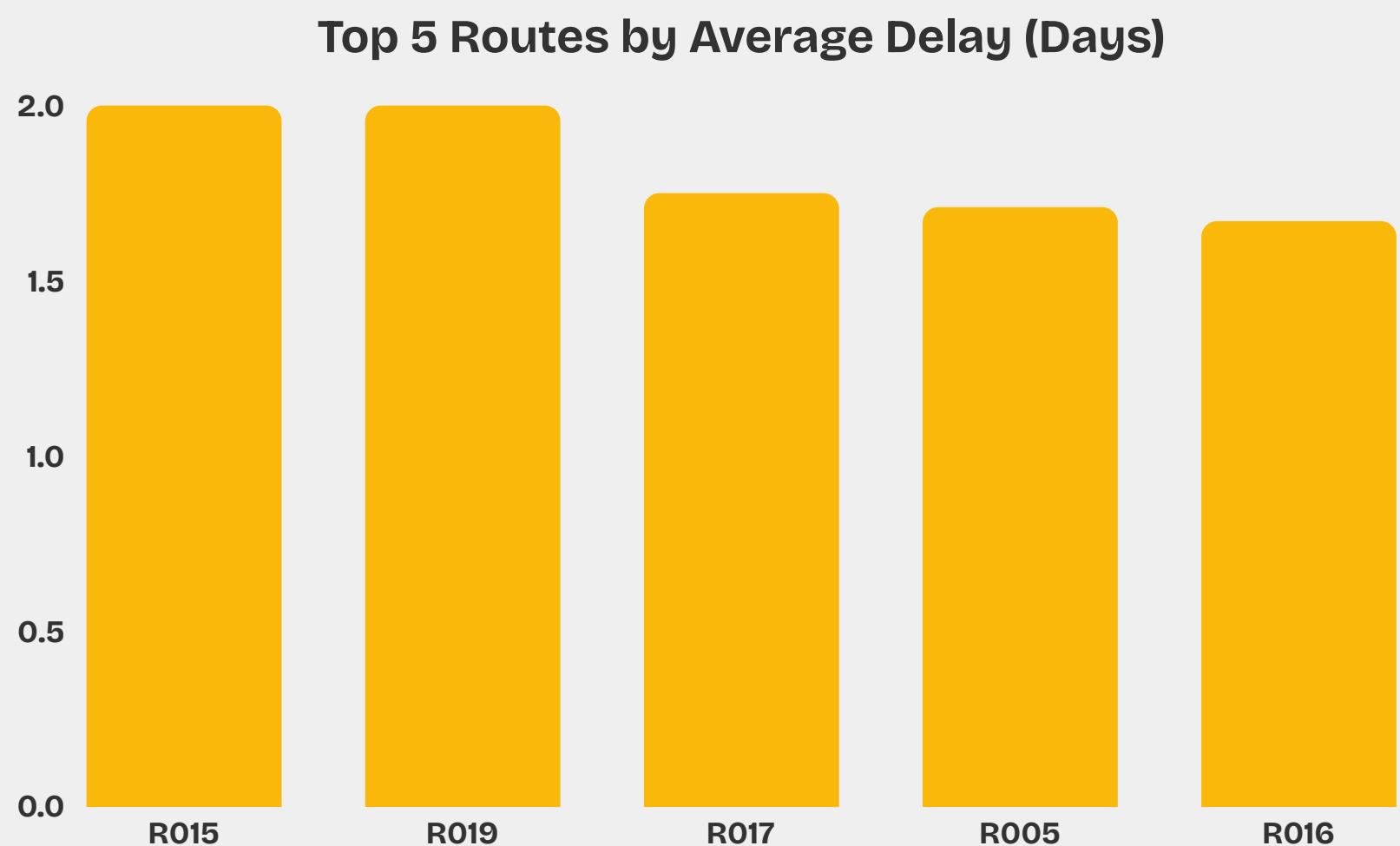
```
DELETE FROM orders
WHERE Order_ID NOT IN (
    SELECT MIN(Order_ID)
    FROM orders
    GROUP BY Order_ID
);
```

Delivery Delay Analysis

Average Delay
~1.8 Days

Highest Avg Delay
~2 Days

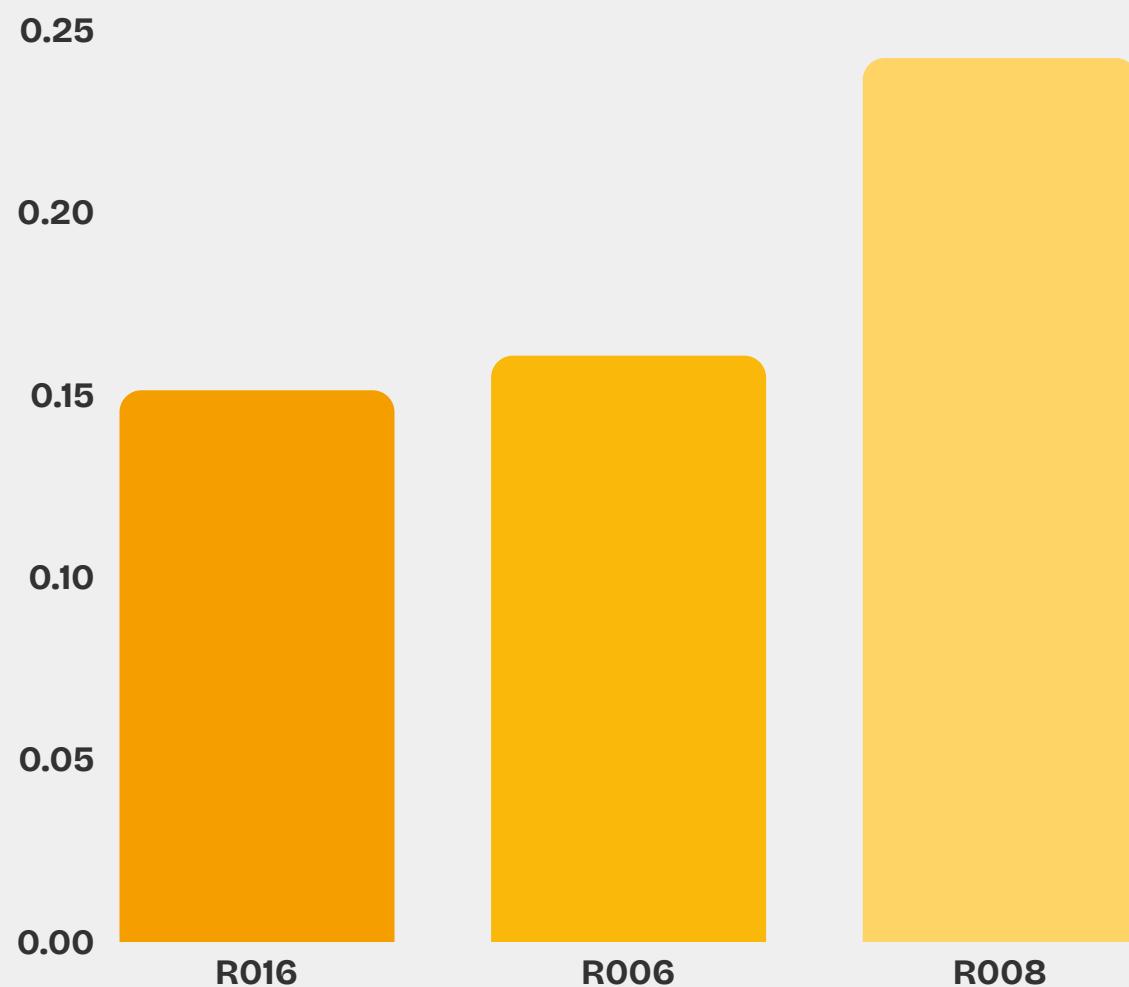
```
SELECT
    Route_ID,
    ROUND(
        AVG(DATEDIFF(Actual_Delivery_Date, Expected_Delivery_Date)),
        2
    ) AS Avg_Delay_Days
FROM orders
WHERE Actual_Delivery_Date > Expected_Delivery_Date
GROUP BY Route_ID
ORDER BY Avg_Delay_Days DESC
LIMIT 10;
```



- Delivery delays are concentrated in a small number of routes
- Routes **R015** and **R019** show the highest average delay (**~2 days**)

Route Optimization & Efficiency Analysis

Worst 3 Routes by Efficiency Ratio

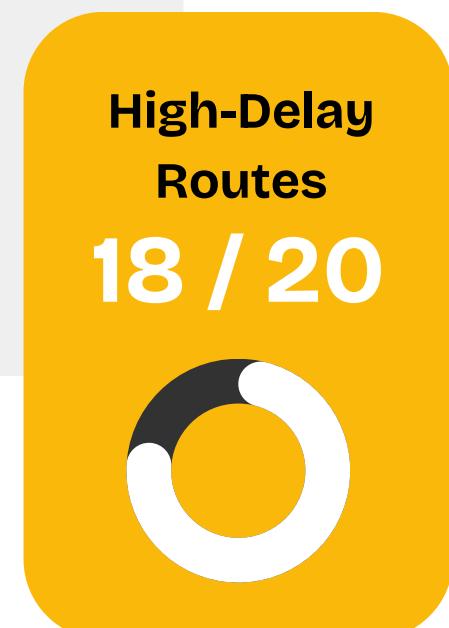


Efficiency Ratio (Distance / Time)

These 3 routes combine low efficiency with high delivery delays

Delayed Shipments

~50 – 55%



Key Insights

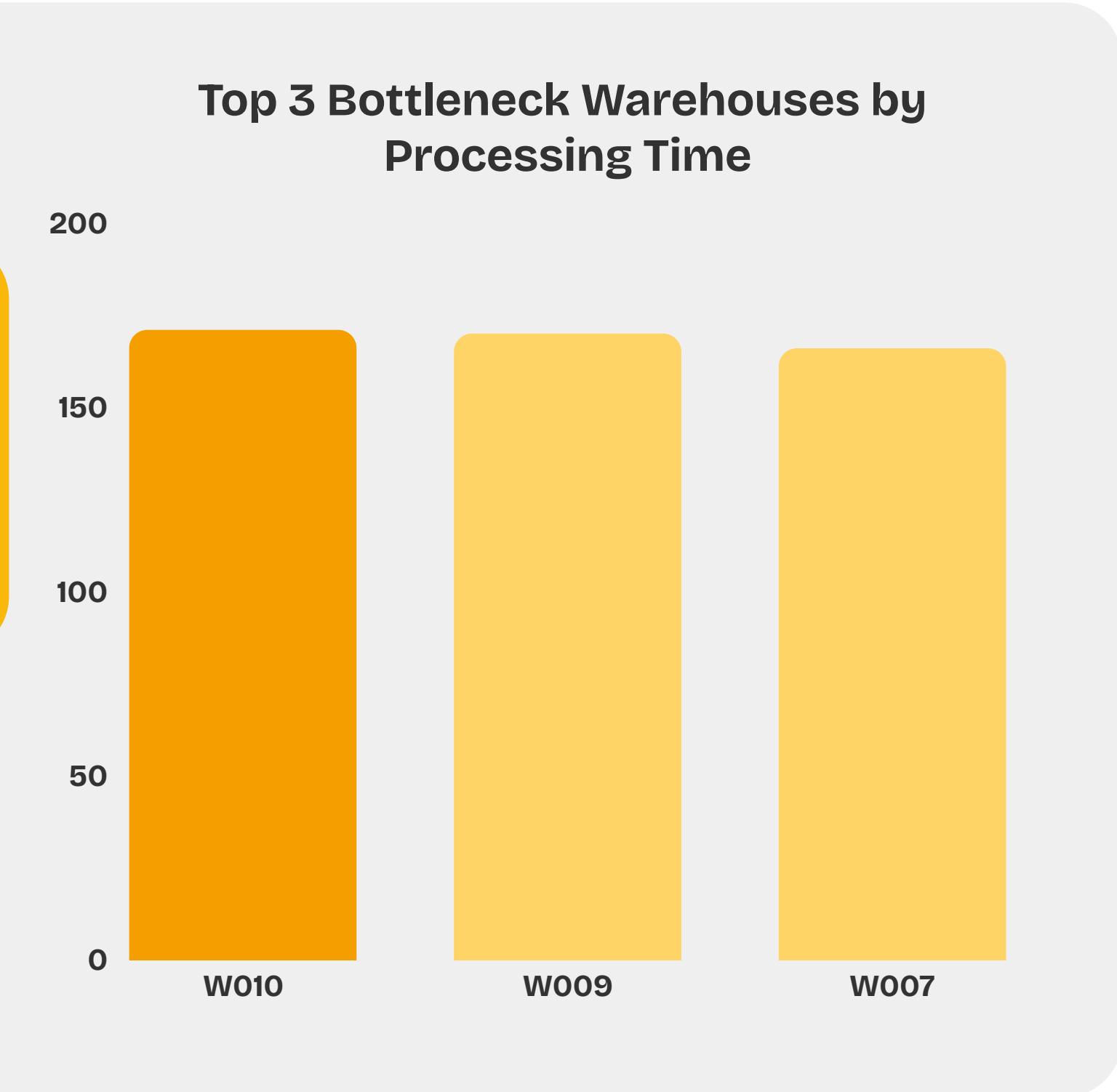
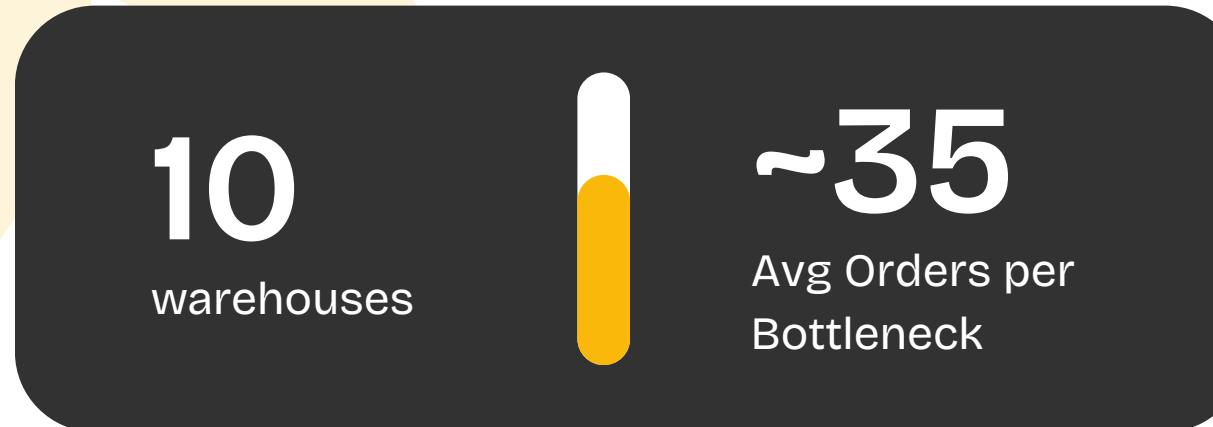
- Low efficiency routes indicate congestion or suboptimal routing
- A small set of routes drives a large share of delivery delays
- Targeted optimization of these routes can yield outsized performance gains

Warehouse Bottleneck Analysis

Identifying warehouses with the highest processing delays contributing to delivery bottlenecks.

Key Insights

- 30% of warehouses drive the majority of processing delays
- High order volume intensifies bottleneck impact
- Focused optimization offers the highest performance return



Warehouse Reliability & Ranking

Comparing warehouse performance based on on-time delivery rates.

Key Insights

- Significant variation exists in on-time performance across warehouses
- High processing-time warehouses consistently rank lower in delivery reliability
- Improving warehouse efficiency directly improves on-time delivery metrics

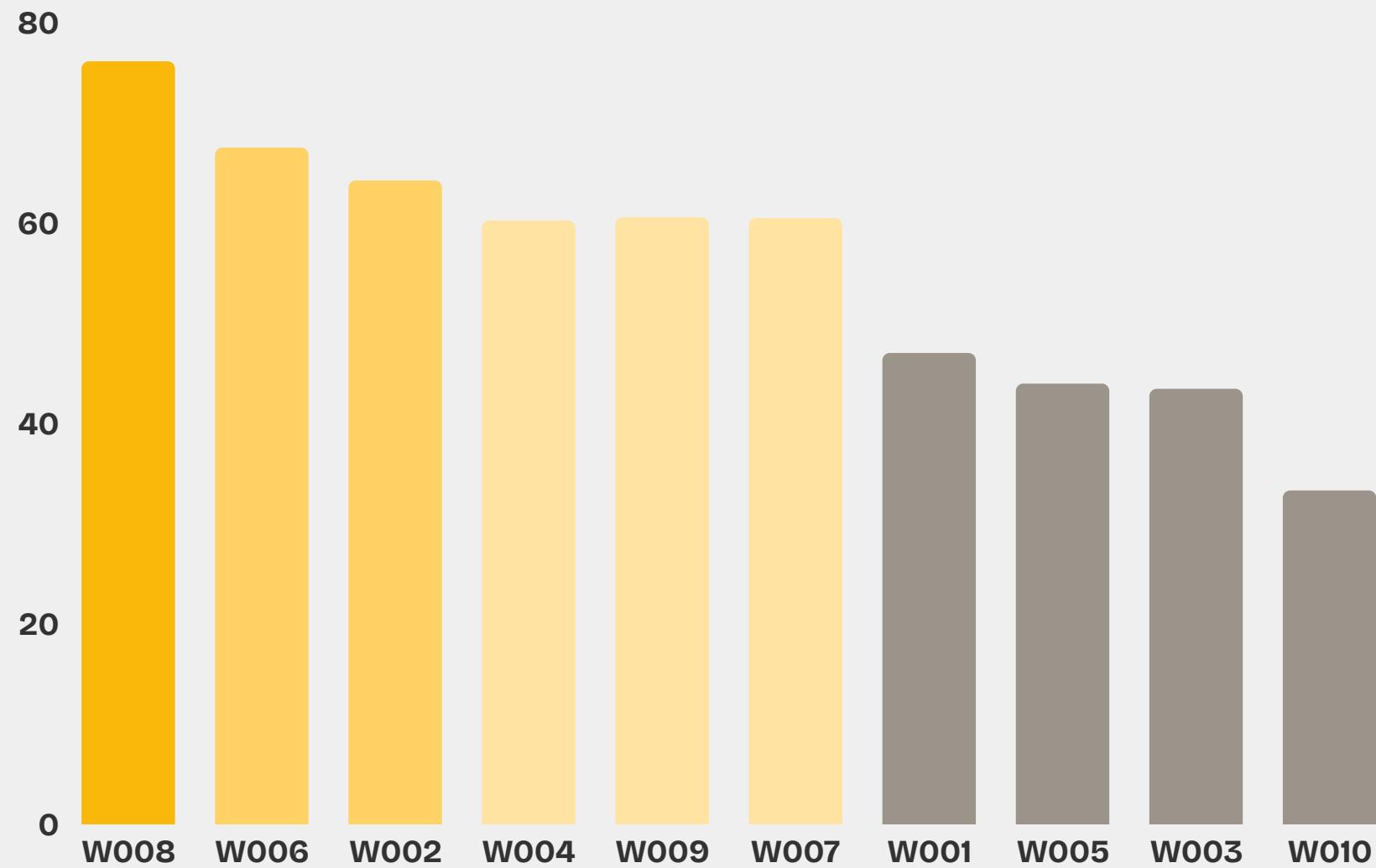
Best Performing Warehouse

W008 (76%)

Lowest On-Time Rate

W010 (33%)

On-Time Delivery Percentage (%)



Delivery Agent Performance Analysis

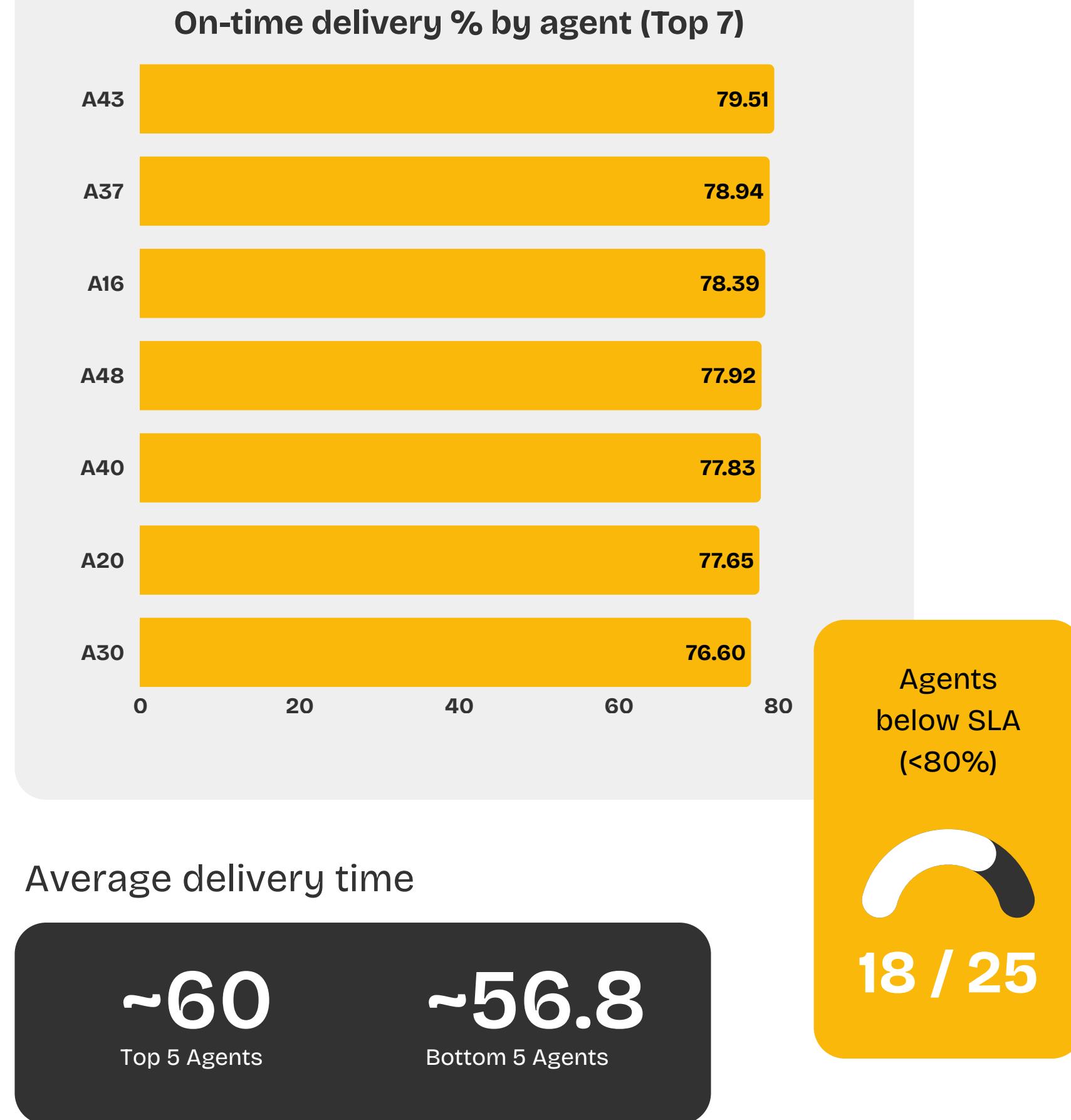
Comparing delivery agent performance based on on-time delivery rates

Key Insights

- Top agents consistently maintain ~76–80% on-time delivery
- Performance differences between top agents are marginal
- These agents can be used as benchmarks for training

Lowest On-Time %

~70% (A010)



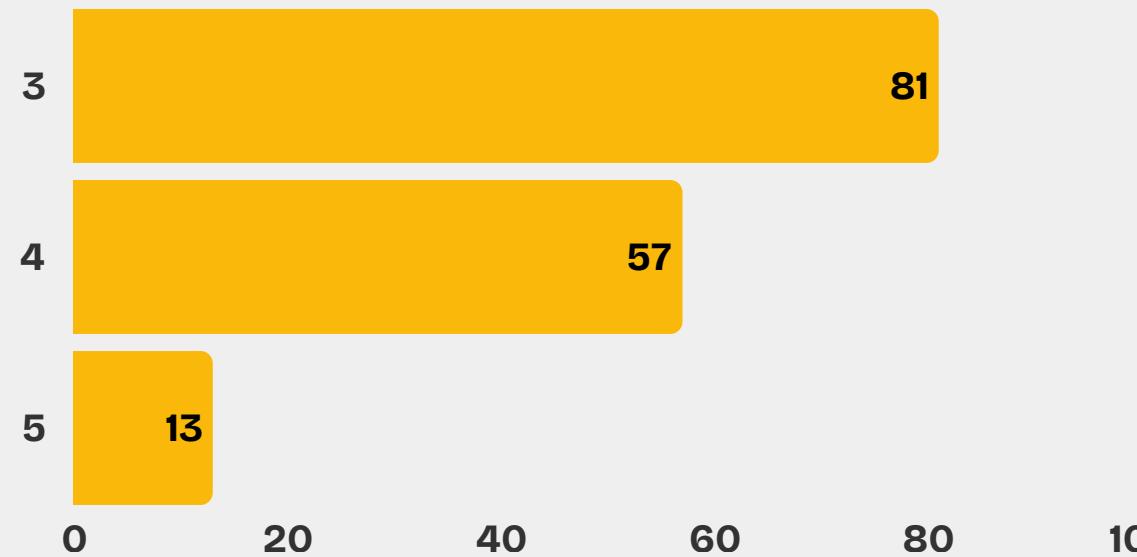
Shipment Tracking Analytics

Most delayed orders are concentrated at intermediate checkpoints, indicating operational bottlenecks.

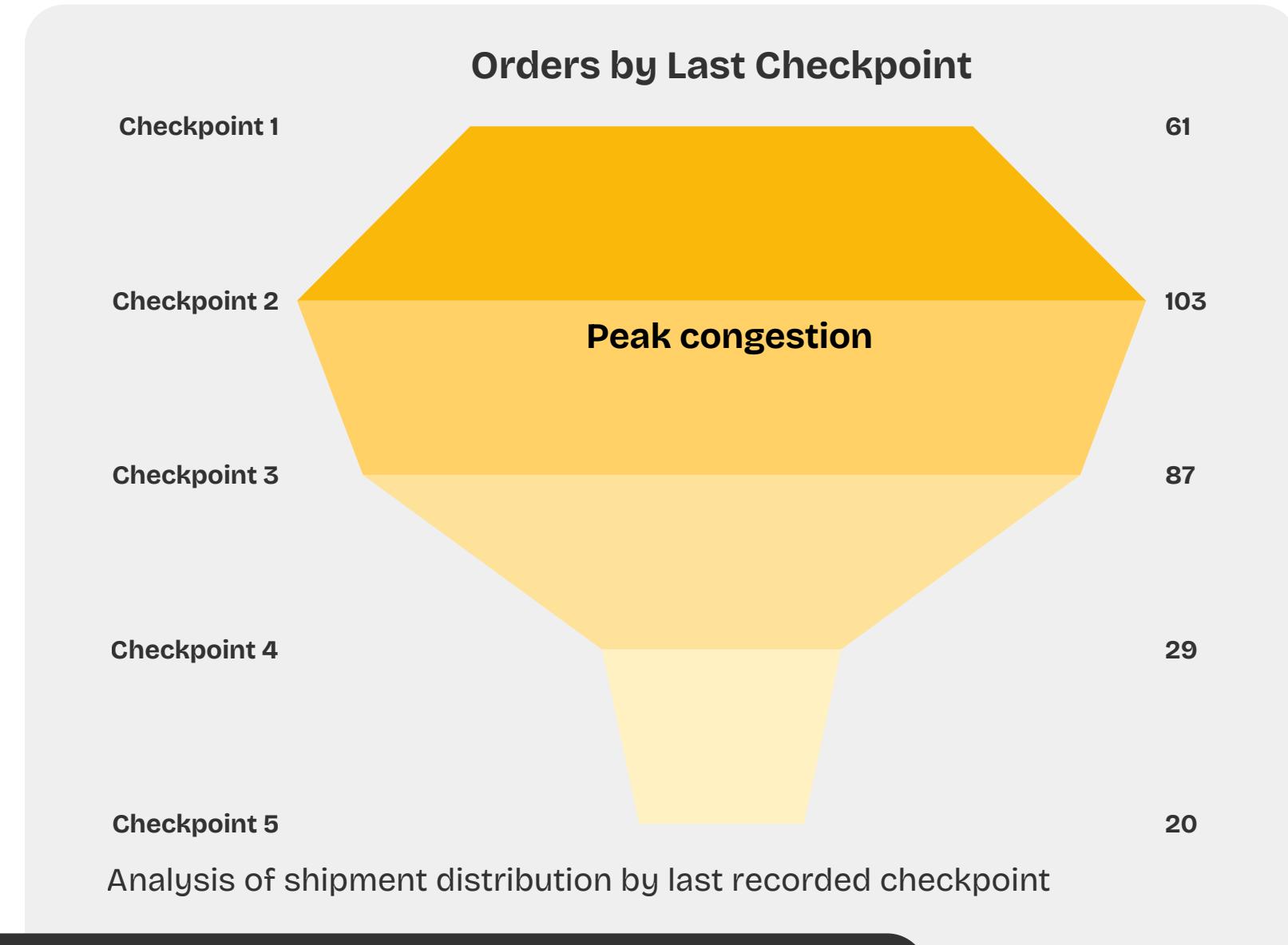
Key Insights

- Majority of orders are stalled at Checkpoint 2 and Checkpoint 3
- Delays are concentrated at intermediate checkpoints
- Indicates hub and transit-level operational bottlenecks

⚠️ High-Risk Orders



Orders by Last Checkpoint



247

Traffic

263

Weather

272

Sorting delay

Worst Performing Region
South Jenniferfurt
2.0 days avg delay

Average Delivery Delay by Region (Top 5)



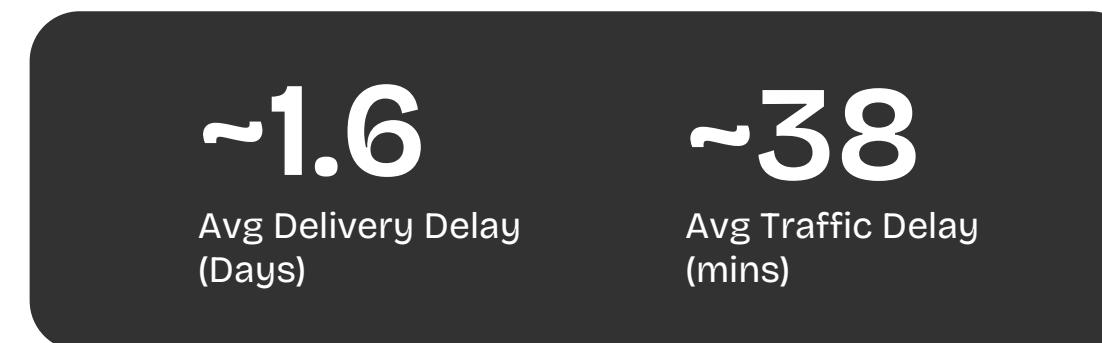
Advanced KPI Summary

Executive-level delivery performance indicators

Key Insights

- Overall on-time delivery rate is 56%, below SLA expectations
- Delivery delays vary significantly across regions
- Traffic and operational delays are major contributors

Average delivery time



SLA Target: 80%

Insights to Action

Key Problem Signals

Regional Delays

- South Jenniferfurt
- Lake Oscarfurt

Traffic Bottlenecks

- Route R014
- Peak congestion routes

SLA Breach

- On-Time Rate: **56%**
- SLA Target: **80%**

Recommended Actions

Optimize Hubs

- Staffing
- Sorting capacity

Reroute Traffic

- Dynamic routing
- Alternate paths

SLA Monitoring

- Daily tracking
- Auto alerts

Preventive Controls

- Weather buffers
- Ops readiness

Expected Impact

↑ +10–15%
On-Time Rate

↓ Regional variance
Delay Reduction

↑ SLA compliance
Customer Satisfaction

Conclusion: Targeted operational interventions directly address the root causes of delivery delays.



Thank You

This analysis demonstrates how data-driven insights
can improve delivery performance and SLA compliance.