Comparative Analysis of Split vs. No-Split VRP Variants

Fixed Cost / Active Truck (round trip)
€2,700

Fuel Cost / km (net)
€0.32

Truck Capacity
23 tons

Active Fleet
~110 of 120 total

Keywords

VRP • Split Delivery • Fixed-Charge • Route Optimization • Gurobi

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Abstract

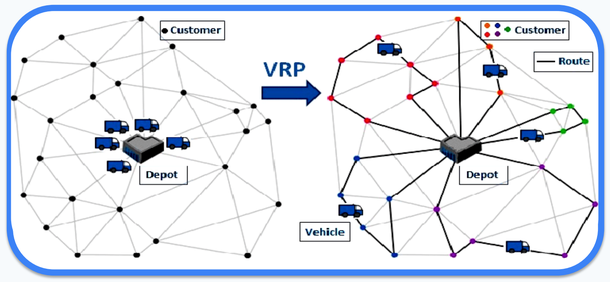
Comparison of three Gurobi VRP programs and outputs: (A) without mixed filo (no split deliveries), (B) with mixed filo (split enabled), and (C) with mixed filo under extra demand. Allowing split deliveries reduces activated trucks and total logistics cost by improving load factors—especially under heavier or skewed demand patterns.

Method

- Fixed-charge, capacitated multi-vehicle VRP (Gurobi MIP)
- Corridor: Istanbul → Kapıkule → Strasbourg → France
- Costs: €2,700 fixed per active truck + €0.32/km fuel
- Capacity: 23,000 kg; Fleet: up to 110 active trucks
- Variants: No-split vs. Split (load variables w_{t,j}; demand balance)
- Constraints: coverage/demand, capacity, flow, start/end, MTZ

Key Results

- Without mixed filo: higher number of trucks & total cost (~24.5k observed)
- With mixed filo: fewer trucks, lower total cost thanks to higher utilization
- Mixed filo + extra demand: strongest relative savings under stress



Data & Assumptions

- Square distance matrix (Google Maps shortest practical truck routes)
- Monthly demands per French city; transit nodes set to zero demand
- Corridor base-legs per used truck included in cost calibration

Conclusions & Recommendations

- Adopt mixed-filo (split) as default weekly planning mode
- Track KPIs: load factor, activated trucks, fixed vs. distance cost
- Maintain sensitivity runs for fuel €/km and capacity scenarios

References & Acknowledgments

- Dantzig & Ramser (1959); Toth & Vigo (2014); Gurobi Manual (2024)

- Thanks to VIP Lojistik Fleet Operations for data & validation

- QR placeholder: GitHub repository link