



OPERATIONS RESEARCH IN CONCRETE DISTRIBUTION: A EUROPEAN PERFORMANCE BENCHMARK

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Operations Research

Progress Computer & Algorithms (1990 to 2015)

2k
Computer

1.4m
Algorithms

2.8bn
Combined

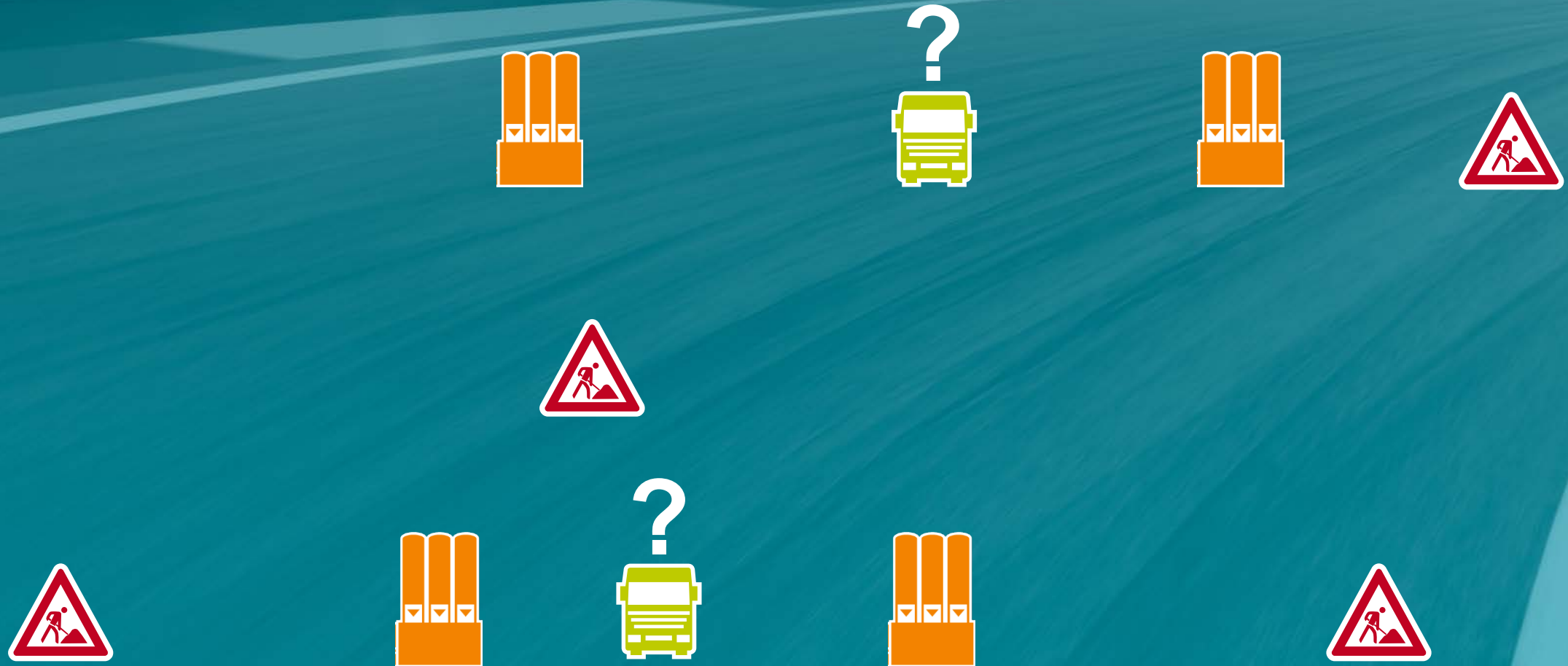
Time to solve a
planning model*

100  **1**
Years Sec.

*Using Linear Programming Algorithms

Vehicle Routing Problem

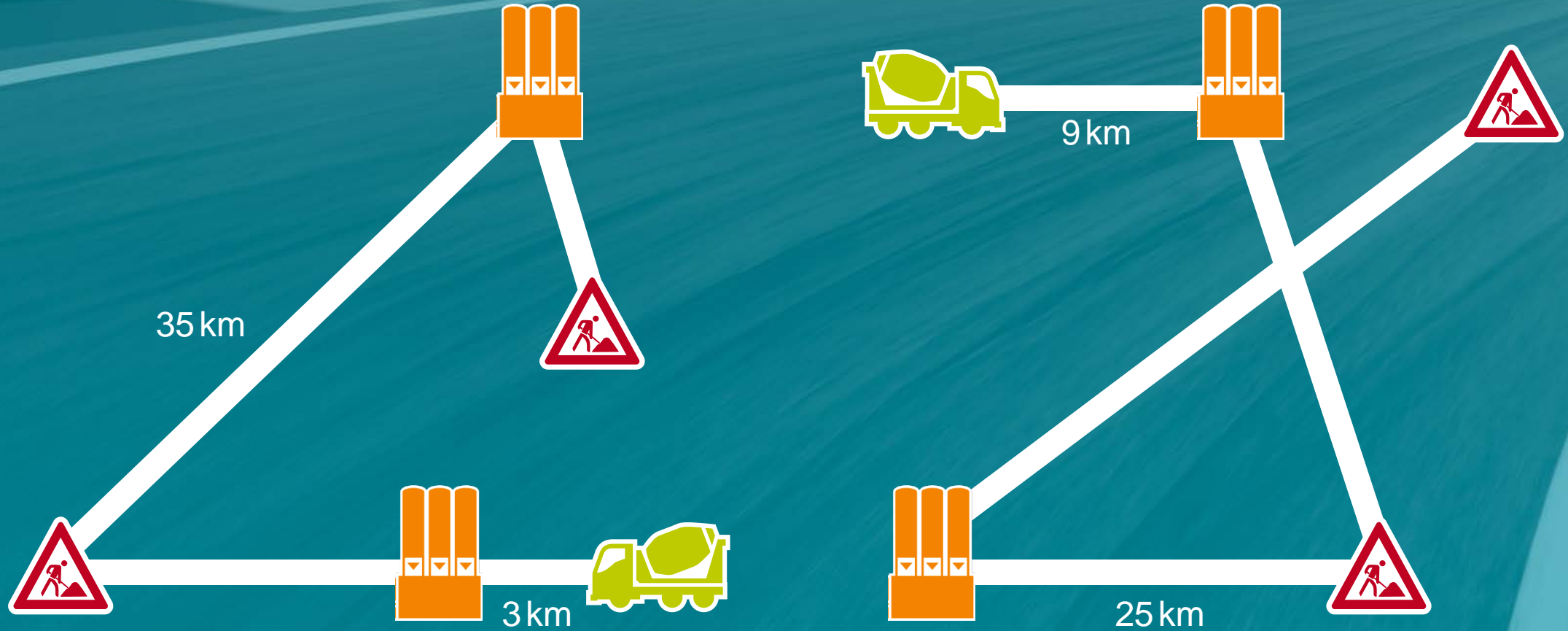
2 Trucks, 4 Plants, 4 Orders



Vehicle Routing Problem

“Choose the closest follow-up job”

72 km
Empty Travel



Vehicle Routing Problem

Mathematical Optimization

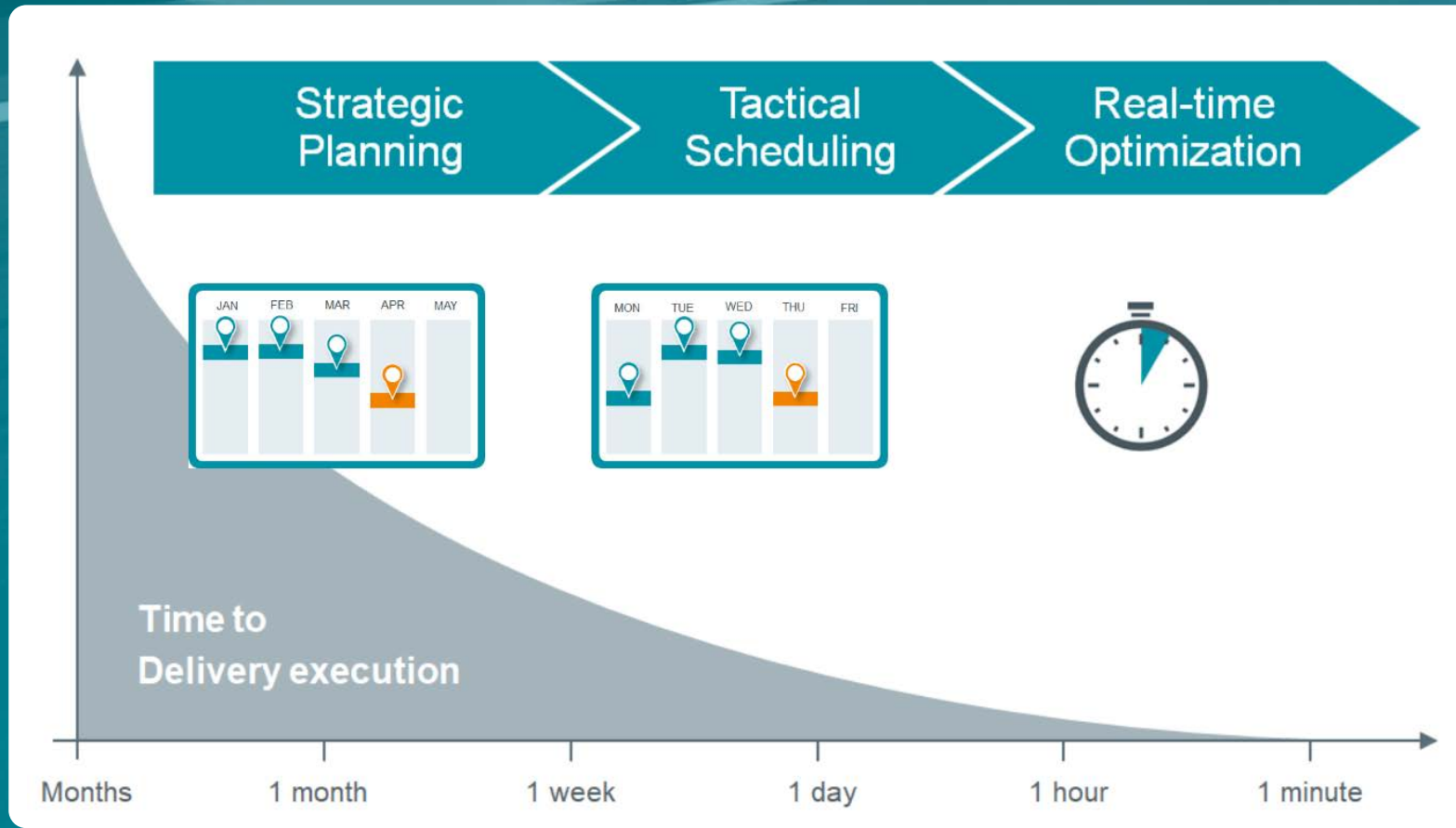
31 km
Empty Travel
- 56%



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Ready-Mix Logistics

Time to Delivery Execution



Benchmark Data

GERMANY

8



68



109
150



Alternative
Plant
Delivery



BELGIUM

4



107



104
139



Alternative
Plant
Delivery



POLAND

7



70



80
165



Alternative
Plant
Delivery



UK

7



133



65
80

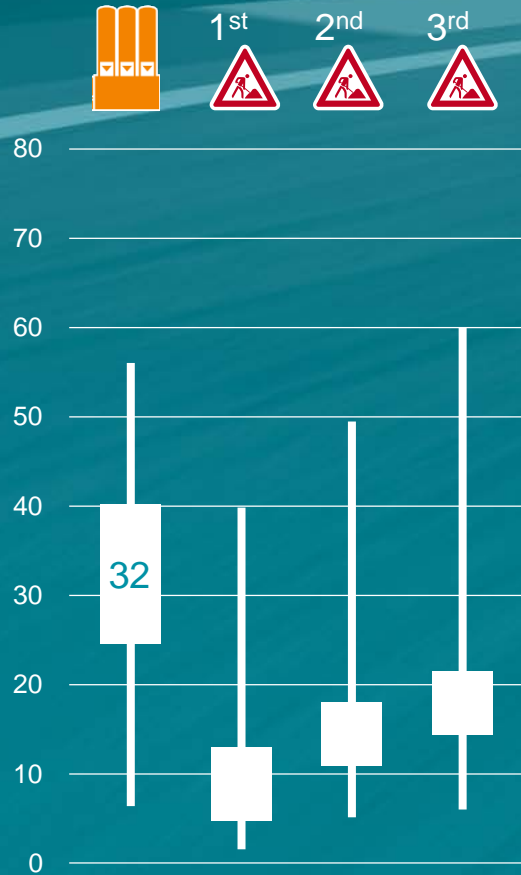


Alternative
Plant
Delivery

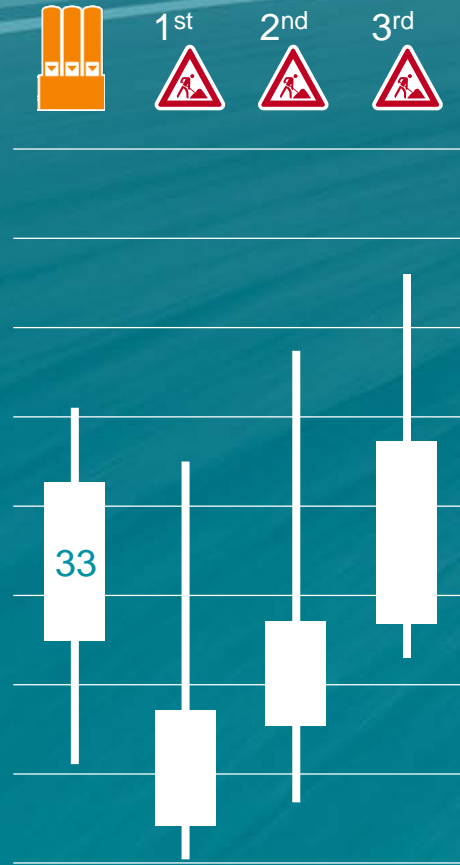


Distribution Network

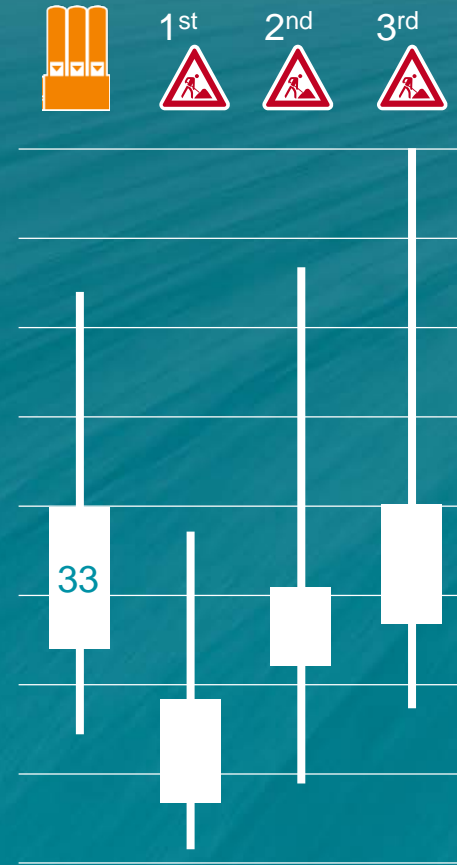
GERMANY



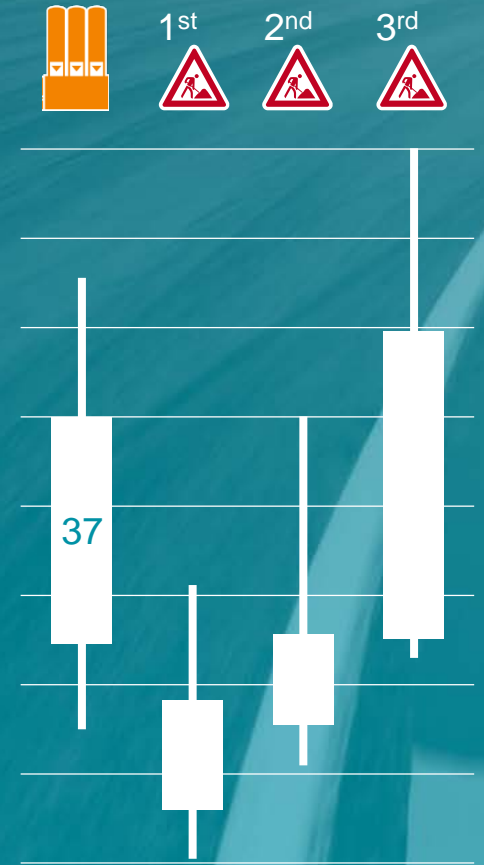
BELGIUM



POLAND



UK



Data Preparation

Manual Plans



Manual KPIs



Optimization
Results & KPIs

Comparison Manual vs OR

Example

GERMANY	DAY 1		DAY 2		DAY 3		DAY 4	
	MAN	OR	MAN	OR	MAN	OR	MAN	OR
# Trucks	44	41	40	38	36	35	46	40
Delivered Quantity	854m ³		1,114m ³		873m ³		1,155m ³	
Total km	2,837	2,623	3,318	3,301	2,623	2,710	4,489	3,767
Loaded Ratio	46%	50%	48%	51%	48%	50%	49%	49%
Saved km	214		17		–		722	
... in %	7.5%		<1%		–		16.1%	
On-Time	95%	95%	87%	94%	86%	92%	84%	84%

Benchmark Results

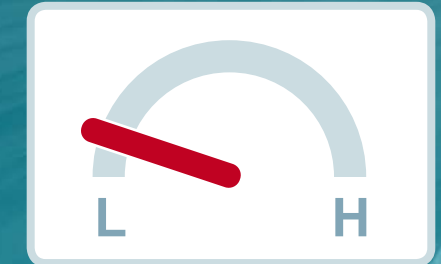
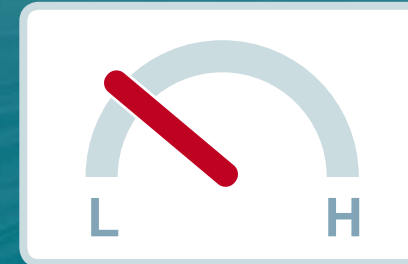
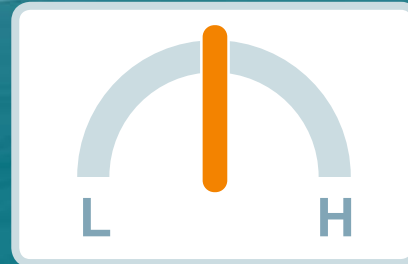
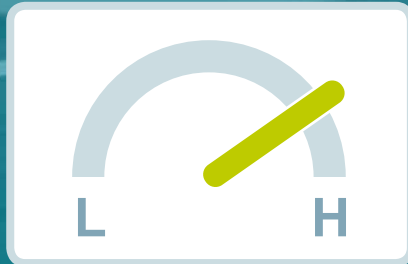
GERMANY

BELGIUM

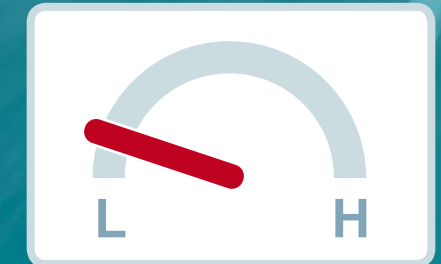
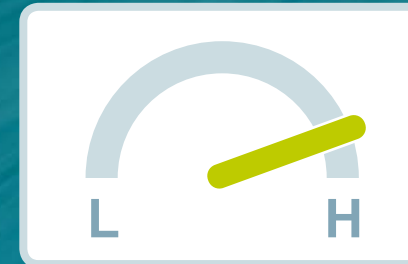
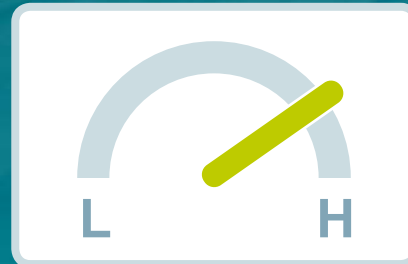
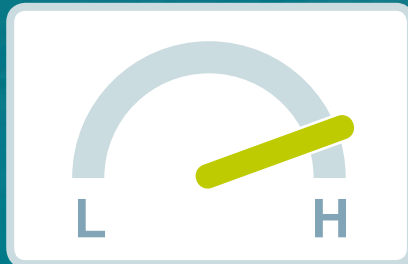
POLAND

UK

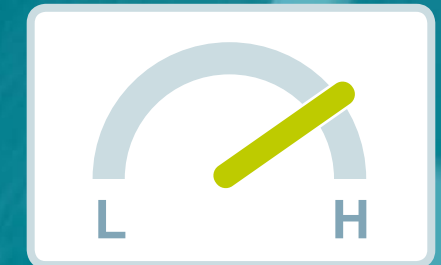
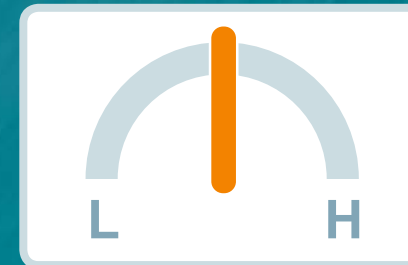
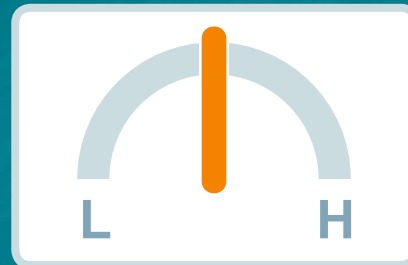
Trucks saved



Empty kilometers



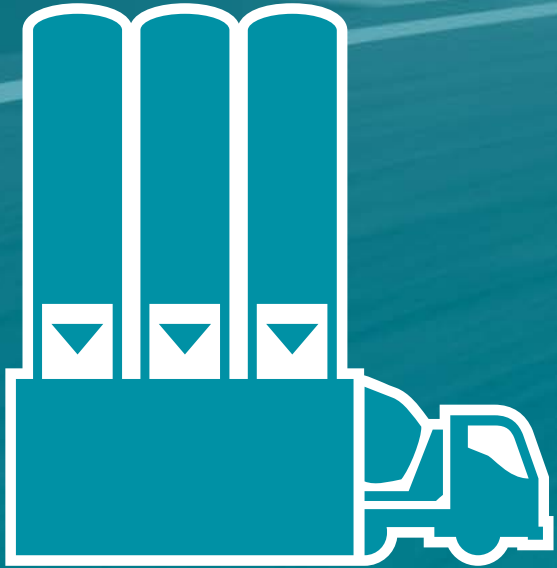
On-time performance*



*relative

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Conclusion



- + Alternative plant delivery
- + Short distances between plants

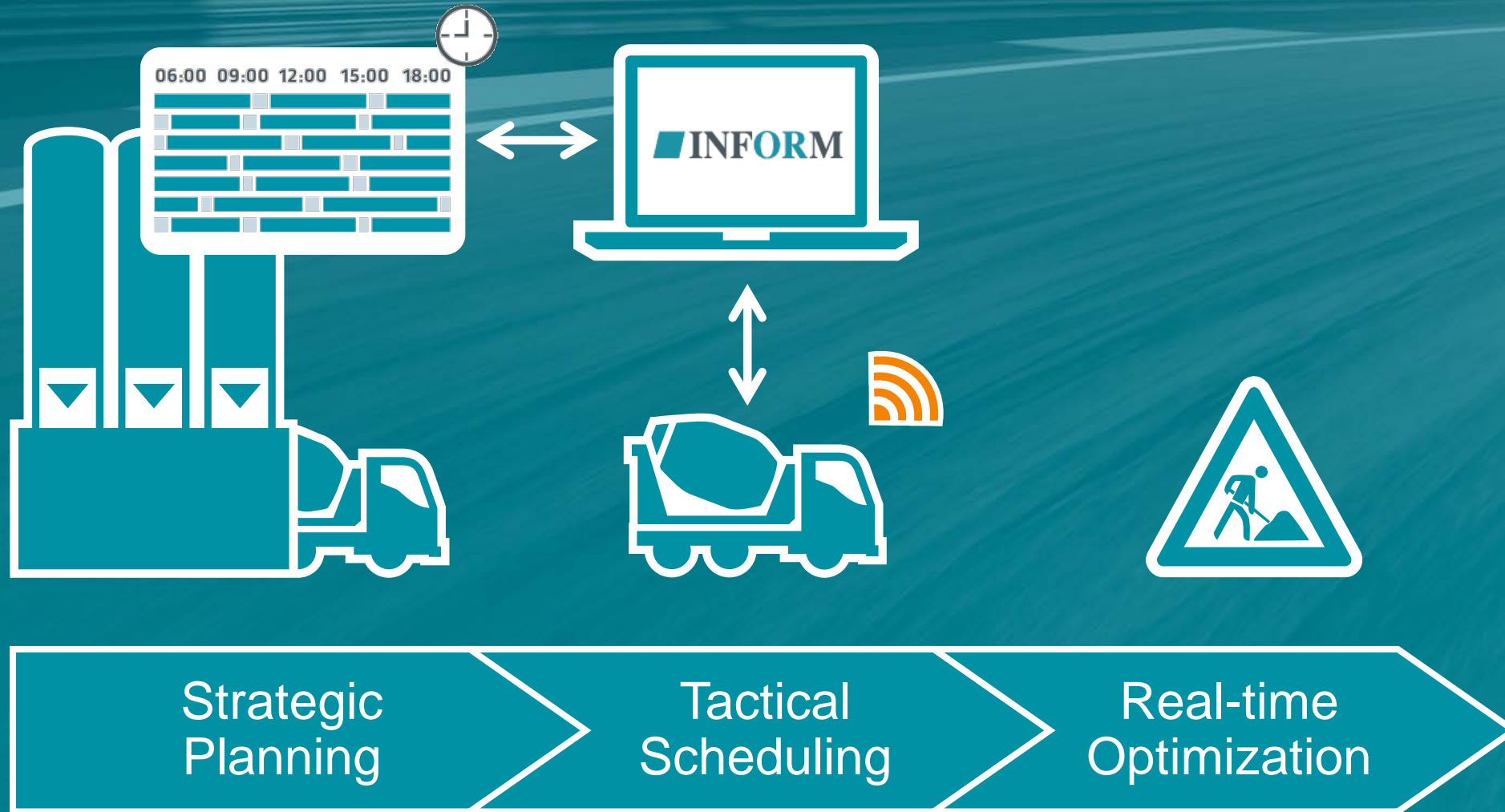


- + Heterogeneous truck fleet



- + Short distances to customer sites

Keep in Mind...





**THANK YOU
FOR YOUR ATTENTION!**

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