Smart Logistics: Data Driven Efficiency & Sustainability

HOLCIM MAQER VENTURES

The Challenge

Ready to reshape industries? Join Holcim's challenge and pioneer the reduction of empty truck trips with data. Use in- and external data to uncover efficiencies, smarter pricing, CO2 reductions & collaboration to lift sustainability in transportation!

We are seeking innovative minds to unlock hidden opportunities within and beyond our logistics operations. This challenge calls for ingenious solutions that harness the potential of data analytics to:

- Reduce empty truck trips both internal and cross-industry: Reimagine the logistics landscape and identify synergy and collaboration opportunities between our operations but also with other industries. Use data-driven insights to come up with ideas that minimize empty trips, reduce costs, and maximize resource utilization.
- Lead the Green Revolution: Holcim is committed to reducing CO2 emissions and your innovation could be the key. Develop forward-thinking solutions that lower the environmental impact of transportation demonstrating industry leadership.
- Supercharge negotiation power: Empower Holcim to negotiate optimized rates by leveraging data-driven intelligence. Craft strategies that align with market dynamics and operational realities to strike win-win deals with transport partners.

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General Discussion of the Business Segments

The three relevant business segments for this challenge are: Cement, Aggregates, and Ready-Mixed Concrete.

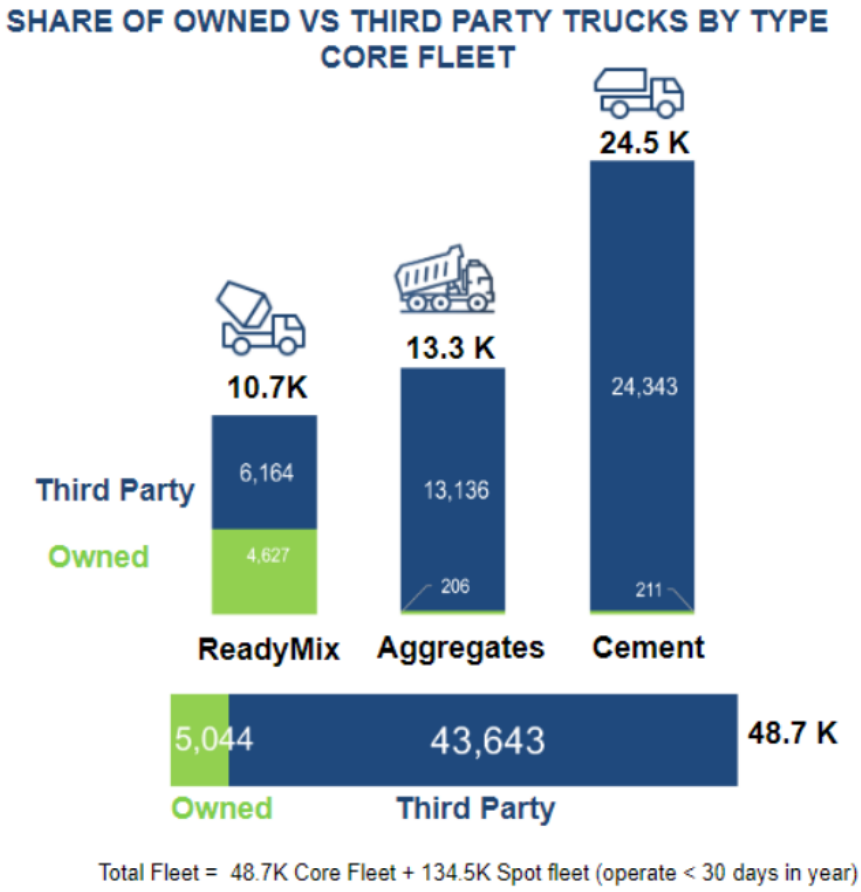
Cement: Cement, the fundamental building block of construction, is a binding material used in Ready-Mix Concrete production. In order to produce Cement, we combine raw materials such as limestone, clay and others into cement. In a nutshell this happens through three main processes: grinding, heating, and blending. In developed markets the main customers of Cement are Ready-Mix Concrete producers. Cement is one of the three main ingredients to produce concrete and therefore is transported as a bulk material in silo trucks. In emerging markets Cement is mainly sold via wholesalers and therefore is packed 25 or 50kg bags and transported with flatbed trucks.

Aggregates: Aggregates, the foundation of any construction project, are the essential elements that provide strength and stability to structures and are a second main ingredient for Ready-Mixed Concrete. We source, process and produce aggregates from natural resources like crushed stone, sand and gravel. The materials are crushed and graded to meet specific engineering requirements. The end result is an array of aggregate products (in different sizes) that are transported by truck, rail, or ship to Ready-Mix Concrete producers or construction sites, supporting the construction of roads, bridges and buildings.

Ready-Mixed Concrete: Ready-Mix Concrete is a pre-mixed construction material that consists of a precise combination of cement, aggregates (such as sand, gravel, or crushed stone), water, and sometimes additives. It is produced at a batching plant and delivered to construction sites in specialized trucks, so called drum mixers. Ready-Mix Concrete is ready to use upon arrival, eliminating the need for on-site mixing and ensuring consistent quality and strength for construction projects. It is a non-storable product.

Holcim Supply Chain - Key Figures

Holcim operates a fleet that is composed of own and third party trucks (2023 view)



In the first half of 2023, globally more than 250 mio tons of product have been shipped, of which 220 have been shipped with trucks.

Detailed Data Description

There are data sets provided for two markets: Argentina and Mexico. For each of the market the data covers January - July 2023.

Datasets provided for this challenge are only for Cement business. Cement business is divided into bulk cement and bag cement which is mainly packed in 25 and 50 kg bags. Out of the two product types, backhauling opportunities are most commonly identified for bag transports due to the truck type. The reason is that the trailer used to transport bulk material is very specific for the construction industry and a few others. It can also happen that some materials can leave residuals in the trailer which can later on affect the quality of the cement. Therefore the main focus to find backhauling opportunities will be bag cement which is transported with flatbed trucks.

Constraints on the backhauling trip: only dry products. It can be palletized products and also bulk materials that can be transported in flatbed trailers with rails. The opportunities don't necessarily need to be 100% backhauling. It means that the volume of the return trips doesn't have to match 100% with the volume of the forward trips. For example Holcim can have a route that transports 10,000 tons per month and match it with a backhauling opportunity for 70% of the return trips with 7,000 tons.

a) Outbound

This outbound table presents details regarding transportation activities from Holcim plants to customers and own warehouses. It encompasses information like the source plants, client information, vehicle specifics, distances, and associated freight costs and parameters to estimate CO2 emissions.

Column Name	Description
Date	The date on which the outbound transportation occurred Format: DD/MM/YYYY
Plant	A unique identifier assigned to each source plant
Plant Name	The name of the source plant
Plant Latitude	The latitude of the source plant
Plant Longitude	The longitude of the source plant
Client Code	A unique identifier assigned to each client
Client Latitude	The latitude of the client
Client Longitude	The longitude of the client

Transportation Number	A unique identifier assigned to each outbound transportation
Route ID	A unique identifier assigned to each transportation route
Route	The specific route taken for the transportation
City	The city where the client is located
Product Type	The type of product being transported
Type of Vehicle	The category or type of vehicle used for transportation
Vehicle Number	A unique identifier assigned to each vehicle
Vehicle Capacity [tons]	The maximum amount (in tons) that the truck can carry
Volume Transported [tons]	The actual amount (in tons) of product delivered by the truck
Freight Cost Per Ton [$/ton]	The cost (in $) incurred to transport one ton of product
Distance [km]	The distance (in kilometers) between the source plant and the client's location
Emission Factor [kg CO2/ton/km]	The amount of CO2 (in kilograms) emitted per ton per kilometer considering empty return.
Emission Factor with Backhauling [kg CO2/ton/km]	The amount of CO2 (in kilograms) emitted per ton per kilometer when the backhauling is taken into consideration
Emission Factor Loading/Unloading [kg CO2/ton]	The amount of CO2 (in kilograms) emitted per ton of product during the loading or unloading process

b) Inbound

This inbound table provides the details of all raw material movements that come to Holcim plants and then later are used in the process of producing cement. It highlights the origins of the materials and destination plants, along with transportation identifiers, materials being transported, vehicle types, and distances covered, routes taken, and associated costs.

Column Name	**Description**
Date	The date when the backhauling route occurred Format: DD/MM/YYYY
Origin Code	A unique identifier for the origin (material source) of the backhauling route
Origin	The name of the the origin (material source)

Origin Latitude	The latitude of the origin (material source)
Origin Longitude	The longitude of the the origin (material source)
Destination Code	A unique identifier of the destination plant of the backhauling route
Destination	The final destination of a backhauling route
Destination Latitude	The latitude of the destination plant
Destination Longitude	The longitude of the destination plant
Transportation Number	A unique identifier assigned to each inbound transportation
Route ID	A unique identifier assigned to each backhauling route
Route	The specific route taken for the backhauling
INCOTERMS	International Commercial Terms, in Holcim it is divided between Delivered and Pickup. Delivered means that Holcim is responsible for the transport and delivers the product at the customer's site. Pickup means that the customer is responsible for the transport and picks up the product at Holcim’s plant.
Type of Vehicle	The category or type of vehicle used for inbound transportation
Material Code	A unique identifier of the material being transported in the backhauling route
Material	The description of the material being transported in the backhauling route
Volume Transported [tons]	The actual amount (in tons) of material transported during the backhauling route
Freight Cost Per Ton [$/ton]	The cost (in $) incurred to transport one ton of material
Distance [km]	The distance (in kilometers) covered during the backhauling route