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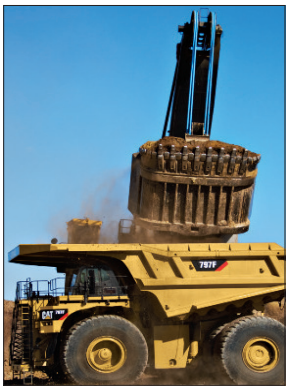
MIT–EDF CASE STUDY SUMMARY



Caterpillar

THROUGH LIGHTER CONTAINERS AND CONSOLIDATED INBOUND SHIPMENTS, COMPANIES CAN REDUCE BOTH COSTS AND EMISSIONS

This is a real-life example of how Caterpillar, the world's largest manufacturer of mining and construction equipment, cut carbon emissions and costs by switching to lighter-weight containers and consolidating inbound shipments of truck parts to its assembly facility. This Caterpillar story is the second in a series of EDF and MIT case studies about carbon-efficient logistics.

This case study is part of a series featuring leading companies in a variety of industries that are finding opportunities to reduce carbon emissions and cut transportation costs through improved logistics practices. Environmental Defense Fund sponsored this series to highlight opportunities and to call on companies to improve the carbon-efficiency of logistics networks. The analysis for this series was conducted by researchers with the Center for Transportation and Logistics at the Massachusetts Institute of Technology.

Background

Freight transport accounts for 15 percent of corporate carbon emissions, making it one of the largest sources of business-related CO_2 pollution in the U.S . Long-entrenched inefficiencies in transportation arrangements also cause unnecessary consumption of fuel, not to mention avoidable expense.

Caterpillar is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives. Headquartered in Peoria, Illinois, Caterpillar employs nearly 130,000 people globally, with 2012 annual sales and revenue of more than $65 billion.

Rethinking shipping and packaging to reduce emissions

Caterpillar assembles enormous vehicles, including large-scale mining trucks, in a manufacturing facility in Decatur, Illinois. By analyzing the inbound supply chain to this facility, Caterpillar identified two strategies to reduce costs and carbon emissions—reducing the weight of the containers used to carry bulky parts, and consolidating inbound shipments.

Reducing the weight of packaging

Parts needed to manufacture the mining trucks are transported to Caterpillar's assembly plant in Decatur in returnable steel containers. These containers, in circulation for 50 years, are specially designed to protect often cumbersome parts on their way to the assembly line. They vary in shape and size and can hold loads ranging from 3,000 to 6,000 pounds.

Caterpillar has been working for the past four years to phase out these steel containers and replace them with plastic versions that can hold similar loads but weigh significantly less. A typical steel tote box weighs 235 pounds, and a comparable plastic container weighs 70 pounds.

Caterpillar's internal studies have determined that the fuel savings from "light-weighting" inbound containers, the greater ease of handling them, and the opportunities to standardize shapes and sizes in inbound logistics, all justify the capital expenditure, with a calculated two-year return on investment (ROI).

However, several organizational and capital barriers to implementation emerged:

- Up-front capital expenditure is needed.

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- Careful orchestration is required to manage the introduction of the plastic containers across all suppliers, as the current steel containers are taken out of circulation and properly disposed of.
- New tracking mechanisms must be put in place, as there is a higher risk of misplacing the new, lighter-weight containers.
- Product designers need to take into account the new containers as they develop new features in the trucks, so they can maximize the re-use rates of the containers.

Caterpillar was able to determine that 9.5 percent of existing shipments could easily move over to "light-weighting," with a potential reduction in CO_2 emissions of 16.5 percent on the targeted transportation lanes as a consequence.

Consolidating inbound shipments

Caterpillar also conducted an analysis to determine whether any of the mining vehicle parts from suppliers could be combined for transport to Decatur, based on shipment type and location. Currently, most suppliers ship direct to the plant in Decatur, even if they are located close to other suppliers.

There were several considerations to determine the feasibility of consolidating shipments from suppliers:

- Varying packaging requirements
- Size and weight of the part to be shipped
- Capacity of the shipping vehicle
- Distance of the supplier from Caterpillar's assembly plant
- Time frame by which the parts needed to arrive to maintain assembly schedule
- Distance between the supplier warehouses —adding stops to an existing route increases time and costs, and must be offset by the total resulting costs savings and emission reduction of the consolidation

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Caterpillar discovered that, by consolidating 500 shipments, it could achieve a 2 percent cost reduction and close to 4 percent in CO_2 reductions on inbound shipments to the Decatur plant. This is a manageable project that affects less than 5 percent of total shipments. The analysis also demonstrated that Caterpillar could double the CO_2 savings by consolidating up to 2,300 shipments. This change, though, would result in increased cost savings of only a further 1 percent.

Results

This analysis demonstrated that Caterpillar can achieve cost and carbon reductions through improved inbound logistics practices at its Decatur facility. Reducing the weight of shipping containers offers an annual reduction of 130 metric tons of CO_2 emissions. Additionally, by identifying the ideal balance between environmental impact and profitability, clustering inbound shipments together will allow for an additional reduction of 210-530 metric tons of CO_2 emissions.

By following the example of leading shippers like Caterpillar, we can create a future where freight transport remains affordable, results in less carbon pollution, and minimizes the threat to public health.

MIT Center for Transportation & Logistics

[i]By end-source. Analysis based on U.S. Energy Information Administration Annual Energy Outlook 2012, Table 19. Energy-Related Carbon Dioxide Emissions by End Use. June 25, 2012

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