



AT&T 10x Case Study:

Unlocking the Potential of Connected, Reusable Pallets

AT&T has a goal – our “10x” goal – to enable carbon savings for our customers that is 10 times the footprint of our own operations by 2025. To meet this goal, we are engaging with customers and technology partners to implement and scale up carbon-saving solutions. Through this process, we are publishing a series of case studies and concepts to share our progress and learning. 10x case studies will discuss and quantify the carbon benefits of using AT&T technology to improve efficiency. In order to be included in the evaluation of progress toward our 10x goal, AT&T technology must play a fundamental role. To discover more about our goals, understand how we’ll track our progress, and see status updates and case studies like this, visit AT&T’s Connect to Good website.

The Challenge: Antiquated Pallets in the Modern Supply Chain

Every day, billions of goods—from bananas to cell phones—move through complex supply chains to destinations around the world. At some point in the chain, the majority of those goods depend on a shipping pallet. As unassuming as they might seem, shipping pallets once revolutionized how goods move around the world and facilitated enormous growth in global commerce. Today, there are approximately 10 billion¹ of these typically wooden pallets worldwide. However, despite their benefits to trade, wooden pallets present a variety of challenges for businesses and the environment (see box at right). In a modern supply chain with automated warehouses, digital-enabled logistics, and higher standards for food, employee, and consumer safety, the wooden pallet has not evolved to keep pace.

THE CHALLENGES OF WOOD PALLETS

- Financial and environmental costs of pallet disposal and replacement when no longer useful
- Food and consumer safety issues from porous surfaces
- Warehouse safety hazards from wood shards and nails
- Supply chain inefficiency from broken or lost pallets

More **durable, reusable pallets** made from composite materials address many of these challenges while also reducing pallet height, weight² and repair and replacement frequency. However, they are manufactured from advanced materials, making them cost more to produce. The ability for pallet users to effectively rent these durable pallets from a pool of pallets – called pallet pooling – eliminates the need for high up-front capital investment. Reusable, pooled pallets provide solutions to some traditional pallet challenges, but they fail to address one key problem: expensive pallet loss. The ability to effectively track pallets and control loss rates could stimulate widespread adoption of durable pallets and kick in their associated benefits.

¹ <http://packagingrevolution.net/will-pallets-be-the-biggest-application-for-the-internet-of-things/>

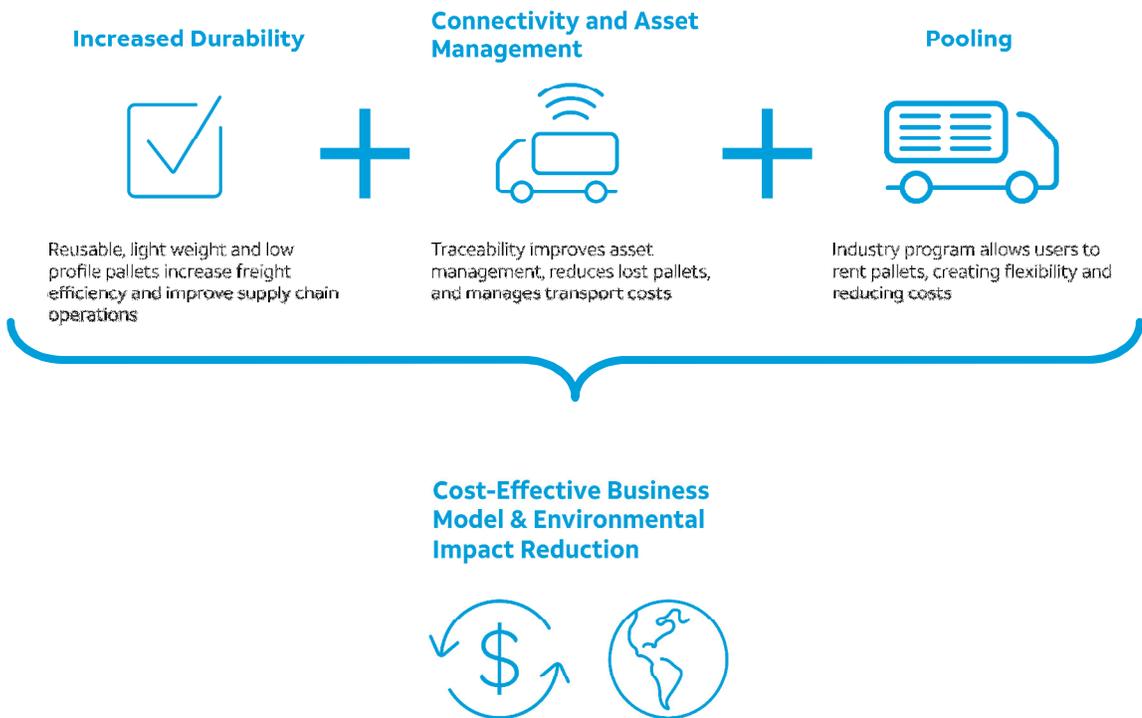
² Compared to pallets of the same strength.



The Solution: AT&T Connectivity Unlocks Potential of Reusable Pallets

Internet of Things technology connects objects to the internet, and provides the loss prevention necessary to make reusable modern pallets financially competitive in today’s complex supply chain. A **connected pallet** unlocks the benefits of reusable pallets by empowering users to maintain oversight of inventory to prevent loss and by obtaining new data from segments of the supply chain that were previously invisible.

This connectivity changes the economics of reusable pallets, enabling more widespread adoption which, in turn, generates significant financial and environmental benefits. Reusable, connected pallets allow users to reduce fuel consumption (composite pallets are typically lighter and have a lower profile than wooden pallets), decrease wood waste from broken pallets, and decrease the amount of raw materials required to produce replacement pallets by reducing the average number of pallets that are lost or broken each trip. With connectivity, users can track pallets in the supply chain as they move from one location to another, dramatically reducing the risk of loss, and the costs and time associated with locating or replacing missing pallets. Meanwhile, supply chain operators benefit from new information about how pallets and inventory move through multiple, interrelated supply chains. This combination of elements creates a business model in which **a connected, reusable pallet can be used 162 times³ before it reaches end of life, resulting in a per trip cost up to 20% lower than non-reusable alternatives.⁴**



³ Based on comparative life cycle assessment (LCA) of wood and composite pallets that was independently carried out by Pure Strategies for RM2 and critically peer reviewed.

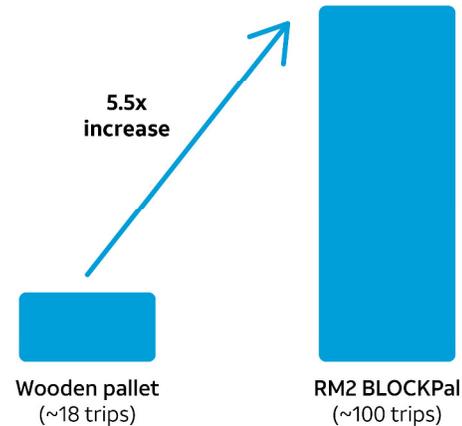
⁴ Based on RM2 analysis of supply chain models and costs.



Implementation: AT&T Provides Connectivity for RM2 Reusable Pallets

New reusable, highly durable pallets are entering the market, including the BLOCKPal™ pallet from RM2. AT&T is working with RM2 to embed an Internet of Things (IoT) based track and trace solution in every BLOCKPal pallet. This solution, called RM2ELIoT, pairs RM2's reusable pallet with AT&T's LTE-M low-power wide-area network, enabling longer battery life (expected up to 10 years) and better wireless coverage in difficult areas where pallets are often found: deep inside buildings, in below-ground storage areas, and on trailers, trains, and trucks. Together, RM2 and AT&T have created a model that lowers the final financial hurdle to reusable pallet adoption.

Average Trips Before Repair or Replacement



The BLOCKPal is made from robust, advanced composite materials making each pallet consistent in size and weight, and stronger and more durable than wooden pallets. The BLOCKPal meets ANSI, FM Global, and ISO standards for food safety⁵ and is built to withstand multiple trips. The BLOCKPal is assembled piece by piece allowing for repairs that extend its usefulness far beyond a traditional wood pallet, creating significant lifecycle advantages.

Sustainability Impact Overview

By overcoming the financial hurdles that deter widespread adoption, connectivity unlocks the full economic and environmental potential of reusable pallets. In a fully independent peer-reviewed Life Cycle Analysis (LCA), the BLOCKPal reduced water pollution, greenhouse gas emissions, and energy use when compared to wooden pallets on a per-trip basis.⁶

Widespread adoption of connected reusable pallets – particularly by large retailers and logistics providers that interact with thousands of pallets a day – could meaningfully reduce greenhouse gas emissions and other negative environmental impacts while increasing resource efficiency and lowering lifecycle costs. As companies around the world continue to set more ambitious sustainability targets, BLOCKPal and RM2ELIoT can provide new tools for reducing resource use and environmental impacts, while sustaining economic gain.

⁵ ISO 8611 & ASTM 1185 Standards. It is approved and accredited to the FM Global 4996 Approval Standard for Classification of Idle Plastic Pallets as Equivalent to Wood Pallets.

⁶ LCA conducted by Pure Strategies, in accordance with ISO 14040-14044 Standards.



Carbon Impact Measurement

If a company managing one million wooden pallet trips per year were to fully implement BLOCKPal pallets equipped with RM2ELIoT connectivity, that company could **reduce emissions by 640 metric tons of CO2e every year**. That's equivalent to:



A **21%** reduction in CO2e emissions



Taking **135** cars off the road



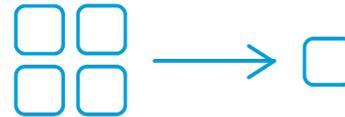
Not burning **72,000** gallons of gasoline



Switching **22,600** incandescent bulbs to LEDs

Increasing Efficiency in Logistics

One BLOCKPal pallet can replace four traditional wooden pallets.



This increases vehicle fill, resulting in:



A **17%** reduction in empty pallet traffic

1,588 fewer truckloads annually

Note: Truckload savings calculated over six million pallet trips

COMBINING RM2 BLOCKPal WITH AT&T CONNECTIVITY HAS THE POTENTIAL TO:

1. Change the financial model of shipping pallets, enabling the business case for switching to durable pallets and reducing negative environmental impacts across the value chain.
2. Enable customers to gain increased visibility into and control over their logistics and inventory management.

RM2 International S.A. specializes in pallet development, manufacture, supply, and management. The goal is to establish a leading presence in global pallet supply and improve the supply chain of manufacturing and distribution businesses. We are doing this through the effective and efficient use and management of composite pallets. It is quoted on the AIM market of the London Stock Exchange under the symbol RM2.L. To move it better, visit www.rm2.com



Carbon Impact Methodology

Carbon Trust and BSR collaborated with AT&T in the development of a methodology to measure the carbon benefits of AT&T's technology. The details of the methodology can be found on the AT&T Connect to Good [website](#). Here is a summary of the analysis:

The carbon abatement from the use of connected pallets relies on a comparative Life Cycle Assessment (LCA) of wood and composite pallets. This study was independently carried out by Pure Strategies for RM2 and was critically peer reviewed. A summary of the study is available at RM2's website: <http://rm2.com/sustainability/>. The study covers a range of environmental impact categories, however, the focus for this case study is on the carbon impacts. Data and assumptions used in the LCA study are based on RM2 data, independent testing, and assumptions from a previous LCA study performed by Franklin Associates for CHEP.⁷

Description of the enabling technology	AT&T connectivity enables traceability of the pallets, reducing pallet losses. This enables a business model supporting higher value pallets that are lighter in weight, more durable, and can withstand greater load capacity.
Impact Category	This case study focuses on carbon impacts. The LCA study more broadly covers carbon and other environmental impacts.
Materiality	The impact of connected pallets both reduced carbon emissions and enabled new sustainable business models.
Attribution of Impacts	The carbon savings described in this case study are a result of the design and manufacture of the RM2 BLOCKPal, combined with the use of AT&T's IoT technology. Both AT&T and RM2 play a fundamental role in enabling the environmental benefits of the RM2ELIoT asset management technology solution.
Relationship to Systems	This connectivity-enabled product has the ability to impact the current logistics and shipping system by creating new financial models for reusable pallets and creating increased visibility to asset tracking, enabling the potential to drive greater efficiency.

⁷ Franklin Associates: A division of ERG. (2009). *Life cycle inventory of three pallet systems: Peer-reviewed final report (detailed executive summary)*. Prairie Village, KS: Franklin Associates: A division of ERG.



ENABLING AND REBOUND EFFECTS	
Primary Effects	Carbon savings are produced from reduced fuel used to transport the pallets. This is mainly due to the lower weight and height of the composite pallet compared to the wooden pallet. As the composite pallets are more durable than the wooden pallets, they last much longer and can withstand supply chains that take a toll on traditional wooden pallets. Additionally, due to the ability to track the pallets, the pallet loss is reduced.
Secondary Effects	<p>The greater load carrying capacity of the composite pallets allows additional product to be carried per load, further reducing the number of trips. This additional benefit was not included in the study as the range and variety of products carried make it impracticable to model.</p> <p>Similarly, there are other environmental benefits because of reduced damage to products transported by the composite pallets. These were also not included in the study because of the complexities of this modeling process.</p>
Rebound Effects	No rebound effects were identified.
Trade-Offs or Negative Effects	This technology does not appear to create other outsized or irreparable environmental or social impacts.
Carbon burden from the enabling technology	The embodied carbon emissions associated with the raw materials and manufacturing of the composite pallets is higher than for the wooden pallets. This is included in the overall results of the LCA study.
CARBON ABATEMENT CALCULATION	
Scope	The scope of the LCA study is the full life cycle of the pallets including raw materials, manufacturing, distribution, use, and end-of-life (EOL). The study compares a composite block pallet with a wood block pallet.
Timeframe	The LCA study was performed in 2014.
Functional Unit	The functional unit used in the LCA study was for 100,000 pallet trips. In order to apply the result to the number of pallets enabled by AT&T, the results are also expressed in this case study using a functional unit of a single composite pallet.



Methodology

The LCA study covered the cradle-to-grave life cycle of the RM2 composite pallet and a typical wood block pallet. The life cycle was divided into the following stages:

Material Production: The acquisition of raw materials such as silica and wood, and the processing of raw materials into intermediate materials used in the pallets, such as glass fiber, and lumber.

Component Manufacturing: The manufacture of pallet components that are purchased by the pallet manufacturers, such as screws, nails, and leg inserts.

Component Transport: The transportation of materials (i.e. glass fiber roving, lumber) and components (screws, nails) to the manufacturing facility.

Pallet Manufacturing: The manufacturing and final assembly of the pallets.

Distribution: Transportation of the finished pallet to the initial customer or user.

Use – Loaded: The transportation of the pallet during use when it is loaded with product.

Use – Disposal of Lost Pallets: The disposal of pallets that are lost during use.

Use – Repair: The repairing of damaged pallets.

Use – Backhaul: The transportation of the pallet during use when it is not loaded with product (e.g., transport to the service center and/or the next user).

End of life (EOL): Transport to landfill of non-recycled pallets at end of useful life.

Removals and emissions of biogenic carbon from the wood pallets were excluded from the study (taking a net “carbon neutral” approach for biogenic carbon). Sequestration (storage of carbon) for the pallets is likely to be minimal, and end-of-life emissions from the wood are considered to be balanced by the CO₂ absorbed by the trees during their life.

To understand the impact of different methodologies and system boundaries on the results, a sensitivity analysis was carried out as part of the LCA study. This analysis indicated that no revisions to the methodology or system boundary were required.



<p>Key Assumptions</p>	<p>Key assumptions and data parameters used in the LCA study were as follows:</p> <ul style="list-style-type: none"> ▪ Pallet weight: 22.2 kg (composite)⁸, 29.5 kg (wood) ▪ Number of lifetime trips per pallet: 162 (composite), 30 (wood) ▪ Loss rate of pallets per trip: 0.5% (composite), 2% (wood) ▪ Number of pallets required for 100,000 pallet trips: 899 (composite), 4400 (wood) ▪ Distance from pallet manufacturer to first user: 600 miles ▪ Distance from user to distribution center: 525 miles ▪ Distance to next user: 100 miles. (For the wood pallet this is modeled as two transport legs of 50 miles via a service center) ▪ Distance to landfill for disposal of pallets: 30 miles
<p>Exclusions</p>	<ul style="list-style-type: none"> ▪ Products that the pallet delivers in the use stage ▪ Carbon sequestration from wood used for wood pallets ▪ Recycling of pallets at EOL ▪ Biogenic emissions from wood at its EOL
<p>Data Sources</p>	<ul style="list-style-type: none"> ▪ LCA study conducted by Pure Strategies for RM2 ▪ RM2 primary data ▪ Independent pallet use testing ▪ LCA study performed by Franklin Associates (2009)
<p>RESULTS</p>	
<p>Carbon Abatement Factor</p>	<p>The result of the LCA study is 64 metric tons CO₂e avoided per 100,000 pallet trips. Dividing this figure by the number of composite pallets (899) required for 100,000 trips gives 71.6 kg CO₂e avoided per composite pallet over its lifetime.</p>
<p>Lessons Learned</p>	<p>This case study utilized the work of the LCA from Pure Strategies and evaluated the role that connectivity can play in enabling the impacts identified in the LCA. An important lesson learned was to utilize existing, credible research to understand existing opportunities.</p>

⁸ The LCA study did not include the weight of the RM2ELIoT tracking device, which weighs about 150-200 grams. Changes to pallet design since the time of the LCA and RM2ELIoT device life cycle have not been included in the scope of the case study.