

Using pallets to drive waste out of the supply chain

White Paper

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Executive summary

There is a market opportunity to eliminate \$750M to \$3B of annual supply chain waste that exists today due to inefficient pallet usage.

In the last decade, the introduction of plastic pallets has introduced a viable alternative to wooden pallets. This white paper explores the benefits offered by multi-use plastic pallets across the supply chain. These benefits exist due to the inherent nature of plastic pallets, namely:

1) greater uniformity, 2) lighter weight, 3) higher quality, and 4) improved hygiene. In addition, the nature of manufacturer and retailers operations and the attributes of the actual product moving through the supply chain are critical factors in driving additional and potentially significant savings.

There is a market opportunity to eliminate between \$750M-\$3B annually of supply chain waste that exists today due to inefficient pallet usage.¹ Cost savings from using plastic (versus a comparable multi-use wooden pallet) accrue to manufacturers and retailers from plant and distribution center operational efficiencies. In addition, there are significant potential cost savings from reduced transportation costs, which may be captured by manufacturers, retailers, or third party fleets. Finally, there are a number of additional benefits that are difficult to quantify directly, such as reduced greenhouse gas emissions to meet corporate sustainability goals, improved employee safety and satisfaction, food safety, brand perception, increased collaborative manufacturer-retailer relationships, and the ability to add additional technologies to the pallet.

¹ Based on estimated market size of 520M pallet issues per annum across grocery, consumer packaged goods, and pharmaceutical products
(Source: external team analysis)

Introduction:

“Pallets move the world”

In the United States, 80% of all commerce is carried on a pallet.² Despite their prolific nature, however, pallets are often considered to be an insignificant part of the supply chain. In fact, while manufacturers, logistics providers, and retailers have continued to become more sophisticated, the average pallet has largely remained the same for over 50 years. And while supply chain optimization has reached the boardroom at most companies in today's environment, the pallet continues to be an afterthought and is not typically viewed as a key cost savings lever.

In the early 1990s, CHEP, a subsidiary of the public Australian company Brambles Ltd, entered the US market with a pooled pallet system that altered the ownership model. Previously, manufacturers (the pallet buyer) purchased pallets outright; upon receipt, retailers could dispose of pallets as they wished or set up an exchange with the manufacturer to try to reuse the pallet, though quality was inconsistent. A pooled pallet system offered a third-party ownership model, where pallets were owned and policed by the pooled pallet provider. Manufacturers paid an “issue fee” to rent the pallet for a single trip; upon receipt, retailers collected and/or returned pallets back to the pool.

The introduction of a pooled pallet system gave manufacturers access to higher quality pallets and a lower cost of usage, as the pool improved operational efficiency. CHEP subsequently introduced the “block 4-way” pallet which further improved the quality of pooled pallets. These innovations drove significant supply chain savings and were the last major innovations in pallets until the introduction of pooled plastic pallets. Pooled pallet providers now offer pallets made of both wood and plastic; there are distinct differences between the two pallet types. **The purpose of this white paper is to explain the benefits realizable to manufacturers and retailers by using a pooled plastic pallet in the context of shipping from a manufacturer/supplier to a retailer.**

While supply chain optimization has reached the boardroom, the pallet continues to be an afterthought and is not typically viewed as a key cost savings lever.

² G. Raballan and E. Aldaz-Carroll, “How do different standards increase trade costs? The case of pallets” (World Bank Policy Research Working Paper # 3519, 2005).

Problem

Pooled wooden pallet users experience several key pain points that lead to waste in the supply chain. These pain points will be explored further in this section, which presents information collected through interviews with manufacturers, retailers, and distribution centers. The following section, then explores how plastic pallets can eliminate these pain points, leading to cost savings for supply chain stakeholders.

1. Lack of uniformity

Given the intrinsic nature of wood, wooden pallets lack uniformity and consistency in dimensions and quality, particularly after re-use. This results in issues for manufacturers and retailers using palletizers or other automation. Lack of uniformity of pallets can also contribute to product damage; missing or broken boards can change top deck coverage, resulting in excess product overhang, product slippage between boards, sub-optimal case utilization per pallet, and need to use supporting packaging materials such as slip sheets.

2. Weight

Multi-use wood pallets weigh up to 27 lbs. more than plastic pallets. The weight of a wooden pallet contributes to increased fuel costs during transportation and difficulty in handling.

3. Poor quality

The quality of pooled wooden pallets has been an issue for both manufacturers and retailers. The most commonly cited quality issues include: protruding nails, wooden shards, and broken/missing boards. These issues have led to increased risk and cost across the supply chain, including damaged product, plant/DC housekeeping needs, employee injuries, customer injuries, increased accidents (e.g., spills) at distribution centers, and increased time/effort to load/unload pallets. In addition, for manufacturers and retailers who use automated processes, wood pallets can cause disruptions to manufacturing and packaging lines.

4. Hygiene

Wooden pallets absorb moisture, bacteria, and pathogens, increasing contamination risk, particularly when transporting food products. Wooden pallets can be infested by insects, and in some cases require chemical treatment for preservation. Manufacturers also see increased risk of contamination during the manufacturing process due to the nature of wood (e.g., potential wood shards in manufacturing facility), possibly violating certification standards in some industries.

Solution

Plastic pallets offer a significantly improved platform for manufacturers and retailers, which can solve some of the challenges identified above and eliminate waste in the supply chain. The elimination of waste results in direct and indirect

cost savings captured by the manufacturer, transportation provider, and/or retailer.

The following exhibit captures key features of the plastic pallets:

Key features of plastic pallets over wooden pallets

Consistent	Plastic pallets have consistent 48" x 40" dimensions that meet GMA standards
Light weight	Plastic pallets typically weigh significantly less than wooden pallets. For multi-use pallets, the weight difference can be as high as 27 lbs.
Durable and strong	Plastic pallets are typically built with strong, durable plastics such as HDPE (high density polyethylene), which increases the useful life of the pallet and helps the pallet maintain standard dimensions throughout its lifetime
Recyclable	Plastic pallets are 100% recyclable and can be remolded into new pallets after their useful life
Safe	Plastic pallets do not have protruding nails or broken boards, which can injure employees or damage equipment or products
Hygienic	Plastic pallets do not absorb liquids and are impervious to infestation
Improved top deck coverage	Plastic pallets can have as high as 97% top-deck coverage, offering increased stability
Ability to add technologies to platform	Given the design of plastic pallets, there is ability to add technologies to the platform (within the plastic frame) that can drive additional waste out of the supply chain (e.g., readable/writable RFID tags, temperature monitoring solutions, vibration sensors, tracking history)

SUPPLY CHAIN COST SAVINGS

By switching from wood to multi-use plastic pallets, manufacturers and retailers realize significant financial benefits through reduced supply chain waste. While a significant proportion of savings offered by plastic pallets occurs in all circumstances, certain supply chain situations realize additional savings based on product type and the manufacturer's operational processes.

The following exhibit lists the total potential savings (in dollars per pallet turn) to

manufacturers and retailers. The party responsible for transportation naturally accrues related savings. However, these savings can be shared between manufacturers and retailers in a more collaborative environment. Note that this analysis reflects average cost savings realized, although some customers may benefit significantly more if other constraints are applicable (e.g., weight per pallet restriction).

	Manufacturer (\$/pallet turn)	Transportation (\$/pallet turn)	Retailer (\$/pallet turn)
General savings			
Reduced housekeeping labor and equipment	0.22 - 0.26	-	0.22 - 0.26
Reduced forklift maintenance and product falls	0.06 - 0.11	-	0.06 - 0.11
Reduced fees/restocking charges from retailer	0.09 - 0.09	-	-
Other savings	0.09 - 0.13	-	0.03 - 0.07
Product related savings			
Lower slip-sheets usage*	0.10 - 0.80	-	-
Lower product damage in DC and in-transit	0.05 - 0.24	0.01 - 0.06	0.09 - 0.40
Lower transportation costs from weighed out product* (i.e., trailer load-ability)	-	0.76 - 1.05	-
Process related savings			
Reduced equipment downtime and maintenance*	0.29 - 0.37	-	-
DC level savings for manufacturers with forward DCs*	0.29 - 0.57	-	-
Savings from LTL shipments between manufacturer and retailer*	-	1.60 - 2.70	-
Total savings	0.51 - 2.56	0.01 - 2.76	0.40 - 0.83

* Note: These savings are not always realized, as they are dependent on a specific operational process being in place. Therefore, the lower point of the total cost savings range does not include these particular savings

QUANTIFICATION OF SAVINGS

General benefits of plastic pallets

Reduced housekeeping expenses:

Plastic pallets do not cause shop floor debris, unlike wooden pallets that can leave behind wood shards and nails. This results in cost savings in

housekeeping labor and equipment. The following exhibit illustrates potential cost saving of up to \$0.26 per pallet turn seen by manufacturers and retailers.

Lower sanitization labor in manufacturing plant		Lower sanitization labor in trailers		Reduced cleaning equipment rental charges	
Assumed facility size (annual pallet turns)	75,000	Assumed facility size (annual pallet turns)	75,000	Assumed facility size (annual pallet turns)	75,000
Corresponding sanitization labor hours saved (hr/week)	6 – 9	Average annual trailers received	3,000	Monthly rental cost of cleaning equipment	\$1,100
Labor rate for sanitization (/hr)	\$ 17	Time taken to clean a trailer (mins)	5	Annual rental cost of cleaning equipment	\$ 13,200
Weekly savings from sanitization labor	\$ 102 – \$ 153	Annual labor hours spent	250	Reduction in cleaning due to plastic pallets (%)	50%
Annual savings from sanitization labor	\$ 5,304 – \$ 7,956	Cost of annual cleaning labor	4,250	Annual savings	\$ 6,600
Savings / pallet	\$ 0.07–\$ 0.11	Savings / pallet	\$ 0.06	Savings / pallet	\$ 0.09

Forklift maintenance and product spills:

Plastic pallets provide a cleaner warehouse environment. This results in reduced forklift tire damage and maintenance, as well as lower product damage caused by forklift spills from wooden shards.

For an average facility of 75,000 annual pallet turns, the annual cost of forklift tire maintenance is estimated to be \$7,000. Plastic pallets are believed to reduce this damage by 50%, providing savings of \$0.05 per pallet turn. The annual cost of forklift spills is estimated to be around \$4,000 to \$5,000. This cost can be significantly reduced by using plastic pallets, resulting in savings of \$0.05 to \$0.06 per pallet turn.

Reduced fees/restocking charges from retailer

Retailers consider pallet quality an important dimension when assessing inbound product quality. Most retailers charge restocking fees to manufacturers for every bad pallet received. These fees are typically in the range of \$5-10 per pallet. Some retailers charge even more stringent “bad-pallet penalties” of \$25 per pallet.

Considering that, on average, 1% of pallets received into a retailer fail the retailer’s criteria for “good pallets” and that most retailers (90%)

charge a restocking fee of \$5-10, switching to plastic pallets can provide cost savings as high as \$0.09 cents per pallet turn to the manufacturer.

Other savings

Manufacturers and retailers switching to plastic pallets also observe other savings:

- **Safety:** Plastic pallets weigh less than wooden pallets and do not have protruding nails / shards, offering a safer working environment for warehouse employees. This can result in lower worker’s compensation insurance premiums for manufacturers and retailers. Such savings are estimated to be up to \$0.04 per pallet turn
- **Product Stability:** The consistent dimensions and greater top-deck coverage result in less product lean for plastic pallets when they are stacked. Product lean associated with wooden pallets is estimated to cost \$0.01 per pallet turn, driven by increased risk of pallet stacks falling and damaging product

When added together, these other benefits can provide savings of \$0.09 to \$0.13 per pallet turn for manufacturers and of \$0.03 to \$0.07 per pallet turn for retailers.

In cases where the product shipped weighs out trailers, the lower weight of the plastic pallets allows manufacturers to ship more product per truckload, resulting in transportation cost savings.

BENEFITS OF PLASTIC PALLETS APPLICABLE TO CERTAIN PRODUCT CATEGORIES

Lower slip-sheets usage

Manufacturers are often required to use slip sheets when product is loaded on wooden pallets. Several reasons for using slip-sheets are listed below:

- Corrugated slip-sheets are used with product that is prone to damage (e.g., bagged pet foods) to minimize the likelihood of product damage from protruding nails / splinters from the wood pallets
- Paper sheets are used for product with high risk of contamination (e.g., boxed dry foods) to protect the product from odors or other bacterial infections commonly found in wooden pallets
- Cardboard sheets are commonly used for product with small package sizes to protect packaging from uneven pressure caused by wooden pallet slats. Slip-sheets can range from \$0.10 to \$0.40 per sheet and can be used in multiple quantities. Considering the full spectrum of cases from one \$0.10-paper based slip-sheet to two \$0.40-corrugated slip-sheets, plastic pallets can provide savings of \$0.10 to \$0.80 per pallet turn.

Lower product damage in plant and in-transit to retailer

Plastic pallets, due to their consistent size, high top-deck coverage and absence of protruding

Lower product damage in manufacturing plant		Lower product damage during transportation		Lower product damage in retail DC	
Annual product damage as a percentage of cost	0.10%	Annual product damage as a percentage of cost while in transit	0.025%	Annual product damage as a percentage of cost	0.10%
Cost of merchandise / pallet	\$ 400 – \$ 1,900	Cost of merchandise / pallet	\$ 400 – \$ 1,900	Cost of merchandise / pallet	\$ 700 – \$ 3,200
Annual product damage	\$ 0.40 – \$ 1.90	Annual product damage	\$ 0.11 – \$ 0.48	Annual product damage	\$ 0.70 – \$ 3.20
Product damage attributed to pallet defects	12.5%	Product damage attributed to pallet defects	12.5%	Product damage attributed to pallet defects	12.5%
Savings / pallet	\$ 0.05 – \$ 0.24	Savings / pallet	\$ 0.01 – \$ 0.06	Savings / pallet	\$ 0.09 – \$ 0.40

nails/splinters, reduce the chance of pallet-related product damage. The extent of product damage benefits is contingent upon the value of the product on the pallet. The following exhibit demonstrates product damage savings due to plastic pallets for tissues (low value product) and protein (high value product). Certain product categories were excluded, such as prescription pharmaceutical drugs, that would have skewed the saving potential, given the extremely high value of the product.

Lower transportation costs from weighed out product

Plastic pallets weigh about 35% less than their multi-use wooden alternatives. In cases where the product shipped weighs out trailers, the lower weight of the plastic pallets allows manufacturers to ship more product per truckload, resulting in transportation cost savings.

The following exhibit demonstrates the range of transportation cost savings for a manufacturer shipping heavy product.

More product shipped (TL)	
Weight savings per pallet (lb)	27
No. of pallets / truck	26
Total weight savings / truck (lb)	702
Truck capacity (lb)	45,000
Weight savings %	1.6%
Example shipping rate (/ mile)	\$ 1.80 – \$ 2.50
Average shipment distance	700
Average cost of shipping	\$ 1225 – \$ 1750
Cost savings	\$ 19.60 – \$ 28.00
Savings / pallet	\$ 0.75 – \$ 1.08

Note: Transportation cost savings could be higher if manufacturer's pallet configuration allows more pallets per truck.

BENEFITS OF PLASTIC PALLETS APPLICABLE TO CERTAIN BUSINESS PROCESSES USED BY MANUFACTURERS

Reduced equipment downtime and maintenance for automated processes

Given the consistent dimensions of plastic pallets, equipment (e.g., palletizers, automated conveyor belts) can be calibrated precisely to reduce the chances of line stoppages due to pallet related breakdowns. Plastic pallets, with no risk of shards / splinters, also reduce the cost of maintaining equipment. Fewer line stoppages and equipment maintenance result in savings for manufacturers as outlined in the exhibit below.

Note that in many cases, the use of plastic pallets would be a necessary condition for a manufacturer or retailer to be able to implement a fully automated manufacturing or warehousing system, given its superior uniformity and durability. This benefit is not captured in the cost savings calculation below.

In many cases, the use of plastic pallets would be a **necessary condition** for a manufacturer or retailer to be able to implement a fully automated manufacturing or warehousing system.

Reduced automation equipment downtime		Reduced automation equipment maintenance	
Cost of operating an automation equipment (/hr)	\$ 500	Cost of maintaining an automation equipment	\$ 50
Annual reduction in downtime by using plastic pallets (hr)	40 – 50	Maintenance reduced (hr/wk)	1
Annual savings / automation equipment	\$ 20,000 – \$ 25,000	Annual maintenance savings / automation equipment	\$ 2,500
Pallets processed / automation equipment	75,000	Pallets processed / automation equipment	75,000
Savings / pallet	\$ 0.27 – \$ 0.33	Savings / pallet	\$ 0.03

Savings from less than truckload (LTL) shipments to retailers

When shipping smaller quantities to retailers, manufacturers often prefer to use third party LTL carriers. The weight of the shipment is an important parameter in the LTL carrier's billing structure. Typically, LTL carriers have a weight multiplier of \$0.06/lb to \$0.10/lb. Plastic pallets, which weigh about 27 lbs lighter than multi-use wooden pallets, result in cost savings of \$1.60 to \$2.70 per pallet turn.

DC level savings for manufacturers with forward DCs

Manufacturers that use a forward DC as part of their distribution network can also recognize some general benefits of plastic pallets within their DCs. Benefits from lower housekeeping, forklift maintenance, and transportation related benefits can accrue at the DC, resulting in potential DC-level manufacturer savings of \$0.29 to \$0.57 per pallet turn.

HOW PLASTIC PALLETS FIT INTO OTHER CORPORATE PRIORITIES

Sustainability

Use of multi-use plastic pallets results in lower fuel consumption throughout all legs of transportation, given the lighter weight of plastic versus multi-use wood pallets. On average, a plastic pallet weighs 27 lbs less, resulting in 1,300 fewer gallons of fuel consumed for every 100,000 issues. This is equivalent to a reduction of 12 tons of greenhouse gas emissions.³ Additionally, plastic pallets are typically recyclable and avoid deforestation.

Given the increasing focus of both manufacturers and retailers on sustainability practices, plastic pallets offer an opportunity to contribute to greenhouse gas emission reduction targets.

Employee safety and satisfaction

Multi-use plastic pallets improve employee safety due to: 1) higher quality and 2) lower weight. Given that plastic pallets do not have protruding nails or wooden splinters, they cause fewer employee injuries, both at the manufacturer and at the retailer. Additionally, given the lighter weight of plastic, plastic pallets can generally be handled by one employee, versus the two employees required under OSHA standards⁴. When heavy wooden

pallets are currently handled by one person, the risk of employee injury is greatly increased.

Food safety

Plastic pallets are more hygienic than wooden pallets, due to several inherent properties of plastic, namely: 1) impervious surface that does not absorb liquids, 2) no fumigation necessary to sanitize after use, and 3) impenetrable surface to insects. For consumables, the lower risk of contamination is an important benefit.

Automation

In today's environment, manufacturers are often looking to increase automation within their manufacturing facilities. Some manufacturers have even moved to an entirely "lights out" environment, with fully automated processes. Such processes and equipment heavily rely on consistency and traceability of pallets throughout the entire process. It is virtually impossible to operate such facilities using multi-use wooden pallets, given their lack of uniformity. For manufacturers exploring such automation, plastic pallets are a pre-requisite. For other manufacturers, the decision to switch to plastic pallets may prepare them to explore automation possibilities in future

Improved supplier scorecards (manufacturers)

An increasingly common practice in the grocery and FMCG industries is for retailers to issue 'scorecards' to their suppliers along a number of dimensions, including quality of inbound

³ "Streamlined Life Cycle Assessment of iGPS, Typical Pooled Wooden Pallets, and Single-Use Wooden Pallets" (2008): <http://bit.ly/PBLPLW>

⁴ Based on OSHA weight limits for lifting loads; <http://1.usa.gov/OQ83Nh>

shipments. In some cases, pallet quality is included as a discrete dimension in the scorecard. Higher quality and uniformity among pallets may improve supplier scorecards and customer relationships for manufacturers.

Ability to add other technologies to platform

The design of plastic pallets allows for other technologies to be added to the base pallet (i.e., embedded within the plastic frame). Such technologies include: temperature monitors,

vibration sensors, writable RFID tags. The benefits of such technologies would be additive to the benefits presented earlier. For example, in the case of temperature monitors, product spoilage could be reduced; these cost savings would be additive to product damage figures presented in the previous section. Similarly writeable RFID tags may assist in meeting product traceability requirements or achieving compliance with forthcoming food safety regulations (eg. FMSA).

OPPORTUNITY

In light of the benefits described above, there is a significant opportunity for both manufacturers and retailers to drive waste out of the supply chain using plastic pallets. While all product categories will benefit from some level of cost savings, annual potential cost savings will be maximized under a certain set of product and process attributes, namely: 1) high product weight, 2) high speed through the supply chain, 3) high product value, 4) high level of automation, and 5) other considerations (including longer transportation distances, importance of food safety, use of slip sheets).

While plastic pallets have intrinsic benefits for manufacturers and retailers as laid out in the preceding pages, there is still some general misinformation about their use in the marketplace today. Figure 1 summarizes these misconceptions and the corresponding facts about the use of a plastic pallet.

Figure 1. Common misconceptions associated with plastic pallets and corresponding facts

Common misconception	Actuality
Pallets are not a critical driver of savings	We estimate that \$750M-\$3B of waste per annum currently exists in the supply chain that could be eliminated through the use of plastic pallets
Plastic pooled pallets cost the manufacturer more than wood pooled pallet providers	Plastic pooled pallets offers a lower net cost due to supply chain efficiencies stemming from benefits of plastic vs. wood, manufacturing process and product characteristics
Pallet benefits are small and difficult to measure	Research confirms that current users of plastic pallets can easily monetize benefits
Cost savings only exist in unique situations	Cost savings exist across all product categories in all situations, and can be especially large for certain sizable categories
Benefits are limited to cost savings	Plastic pallets offer additional benefits that may align to corporate priorities. In addition, usage of plastic pallets and RFID capability may be a necessary condition to implement a fully automated manufacturing or warehousing system
Pallets are just a shipping and racking medium	Given the design of plastic pallets, there is ability to add technologies to the platform (within the plastic frame) that can drive additional waste out of the supply chain and enhance product quality (e.g., writable RFID tags, temperature monitoring solutions, vibration sensors)

Note: While this white paper focuses on the cost savings opportunity in the context of shipping from a manufacturer to a retailer, there may be additional savings opportunities available in shipping raw materials from a supplier to a manufacturer. These additional cost savings opportunities are not addressed in this section.

The following case study illustrates the potential cost savings across the supply chain, in transitioning a dairy business from wooden to lightweight plastic pallets.

Figure 2 illustrates the cost savings per pallet across the manufacturer/supplier, transportation provider, and retailer.

Figure 3 illustrates the cost savings per 100,000 pallet turns captured by the manufacturer and the retailer, assuming that transportation savings are shared equally. Note that both the manufacturer

and the retailer enjoy significant cost savings, both from improving day-to-day operational efficiency and from sharing transportation cost savings due to lighter pallet.

Figure 2. Cost savings per pallet, based on transitioning a dairy business from wooden pallets to lightweight plastic pallets⁵

	Cost savings per pallet (\$/pallet)					
	Manufacturer		Transportation		Retailer	
General savings						
Reduced housekeeping labor and equipment	\$ 0.22	- \$ 0.25			\$ 0.22	- \$ 0.25
Reduced forklift maintenance and product falls	\$ 0.08	- \$ 0.08			\$ 0.08	- \$ 0.08
Reduced fees/restocking charges from retailer	\$ 0.09	- \$ 0.09			-	-
Other savings	\$ 0.09	- \$ 0.13			\$ 0.03	- \$ 0.07
Process related savings						
Reduced automated equipment downtime and maintenance	\$ 0.29	- \$ 0.37				
DC level savings for manufacturers with forward DCs	\$ 0.43	- \$ 0.52				
Product related savings						
Lower slipsheets usage	\$ 0.20	- \$ 0.20				
Lower product damage in DC and intransit	\$ 0.10	- \$ 0.13	\$ 0.03	- \$ 0.03	\$ 0.17	- \$ 0.21
Lower transportation costs from weighed out product			\$ 0.76	- \$ 1.05		
Total savings	\$ 1.49	- \$ 1.76	\$ 0.78	- \$ 1.08	\$ 0.49	- \$ 0.61

⁵ Assumes manufacturer uses automation and forward DC

Figure 3. Cost savings per 100,000 pallet turns, based on transitioning a dairy business from wooden pallets to lightweight plastic pallets⁶

	Cost savings per 100,000 pallet turns (\$)			
	Manufacturer		Retailer	
General savings				
Reduced housekeeping labor and equipment	\$ 21,500	- \$ 25,100	\$ 21,500	- \$ 25,100
Reduced forklift maintenance and product falls	\$ 7,600	- \$ 8,200	\$ 7,600	- \$ 8,200
Reduced fees/restocking charges from retailer	\$ 8,800	- \$ 8,800	-	-
Other savings	\$ 8,900	- \$ 13,400	\$ 2,500	- \$ 6,600
Process related savings				
Reduced automated equipment downtime and maintenance	\$ 29,300	- \$ 36,700		
DC level savings for manufacturers with forward DCs	\$ 42,500	- \$ 51,500		
Product related savings				
Lower slipsheets usage	\$ 20,000	- \$ 20,000		
Lower product damage in DC and intransit	\$ 10,300	- \$ 12,500	\$ 17,100	- \$ 20,900
Lower transportation costs from weighed out product				
Shared transportation savings				
Lower transportation costs from manufacturer to retailer DC, shared by manufacturer and retailer	\$ 39,100	- \$ 54,050	\$ 39,100	- \$ 54,050
Total savings	\$188,000	- \$230,250	\$87,800	- \$114,850

⁶ Assumes manufacturer uses automation and forward DC; assumes manufacturer and retailer share transportation cost savings equally

Conclusion

In conclusion, there is significant opportunity to drive waste out of the supply chain by transitioning to plastic pallets. Cost savings from this effort will be enjoyed by both the manufacturer and retailer, due to benefits in day-to-day operations and reduced transportation costs due to a lighter pallet. Cost savings may vary depending on operational processes and product attributes, but cost savings do exist in all situations.

In addition to cost savings, there are additional benefits to using plastic pallets. These include lower environmental impact, improved employee and/or customer safety, lower risk of food safety violations, and improved manufacturer-retailer collaboration and relationships. Additionally, the ability to integrate add-on technologies into plastic pallets will create future opportunities to derive additional savings.

Given the numerous benefits and the volume of pallets used in today's environment, a shift to

Cost savings from this effort will be enjoyed by both the manufacturer and retailer, due to benefits in day-to-day operations and reduced transportation costs due to a lighter pallet.

plastic pallets would result in significant operational and logistics-related cost savings across the globe, to the benefit of the entire supply chain.