California Table Grapes

A packaging and distribution system case scenario

The case scenario that follows was developed around a Full Disclosure® model. The information used to create the model was provided by several large grower/shippers operating in California's San Joaquin Valley.

The *California Table Grapes* model is a fair and accurate representation of a real-world packaging and distribution system. It compares the economics of shipping in Corrugated Common Footprint (CCF) containers vs. returnable plastic containers (RPCs).

The Commodity

Californians have been cultivating grapes for over two centuries. Franciscan friars established missions in the region in 1769. The padres planted a European grape variety (the Mission grape), in order to make sacramental wine.

The boom for table grapes came to California in the early 1800s. In 1839, the first table grape vineyard was planted on pueblo land near present-day Los Angeles.

Today, California wine, table grapes and raisins are important agricultural commodities, with approximately 700,000 acres planted in vineyards. In the United States 97 percent of commercially grown table grapes are from California.[1]

In 2003, California's table grape production is expected to total 740,000 tons.[2] That equates to over 77 million, 19-pound capacity containers shipped annually.

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[1] California Table Grape Commission (11/15/03).

[2] California Department of Food and Agriculture (CDFA) 2003 crop production forecast (9/15/03).

This case scenario focuses on several large grower/shippers of table grapes in California's southern San Joaquin Valley. For the purposes of the discussion, we'll call the grower/shippers **California Table Grapes**.

What is a Case Scenario?

What's the difference between a *case study* and a *case scenario*? A *case study* typically concentrates on a real-world situation or commodity, which is then brought to light through a thorough interpretation of actual data.

A *case scenario*, on the other hand, still uses real-world situations and data. But it "recasts" this information in a way that maintains the subject's anonymity and protects confidential information. This case scenario contains accurate information, however it has been "generalized" to protect sensitive information.

The Case

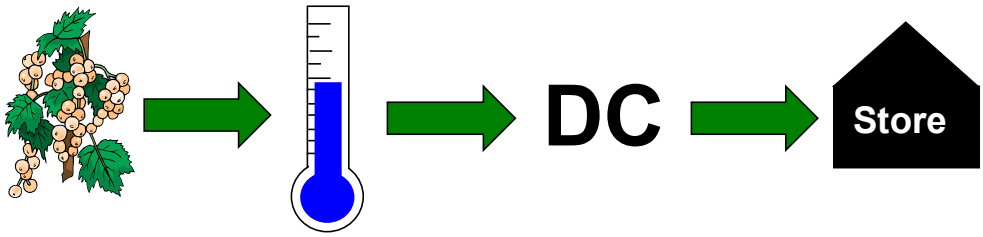
California Table Grapes is one of the largest growers and shippers of grapes for fresh eating in the United States. The packaging and distribution system for California Table Grapes typifies that of a large produce grower/shipper.

California Table Grapes grows many types of table grapes, including Thompson Grapes (green seedless), Crimson Varieties (red seedless), and Red Globes (red seeded). Depending on variety, the harvest and shipping season in the San Joaquin Valley typically begins in early July and continues through November.

Depending on the variety of grape and time of year, ripe fruit is picked at nearby vineyards. The grapes are then cleaned, sorted and packed into mesh plastic bags or clamshells.

Packaged grapes are then placed into 19-pound capacity containers, loaded onto pallets, and transported to one of California Table Grapes' many cold storage facilities.

From the cold storage facility, semi-trailer trucks transport the grapes to distribution centers (DCs). At the DC, pallets of grapes are "broken down" (reconfigured for retail), loaded onto delivery trucks and distributed to retail outlets.



At retail outlets, corrugated containers are knocked down, placed into balers and recycled for the positive economic value of old corrugated containers (OCC).

RPCs, on the other hand, must complete the return trip, which requires sorting, washing, sanitizing, warehousing and redistributing to California Table Grapes. This is the infamous and often costly RPC "backhaul leg."

For more details on the California Table Grapes distribution system and the RPC backhaul leg, go to the section "Distribution Profile."

Container Profile

When California's table grape industry began, all products were shipped in wooden lugs. By the early 1980s, most growers had moved to the use of corrugated containers.

Today, because of the many varieties of grapes shipped and different market requirements, California Table Grapes uses a wide variety of containers and packaging materials.

Grapes are most often packaged in two-pound (approximate) plastic mesh bags or clamshells. Packaged grapes are then placed into corrugated containers, RPCs, or expanded polystyrene (EPS) shipping containers.

This case scenario assumes that grapes are packed into either 19-pound capacity CCF containers, or 19-pound capacity returnable plastic containers. CCF containers weigh 1.9 pounds (tare weight); RPCs weigh 3.65 pounds (tare weight).

Grapes Corrugated Common Footprint (CCF) container
(CCF photo provided by corrugated manufacturer)

Grapes Returnable Plastic Container (RPC 1)
(Container photo from CHEP web site)

Container	External Dimensions L x W x H (inches)	Tare Weight (lbs)	External Cube (inches ^{3})
Grapes CCF	23.625 x 15.625 x 4.75	1.90	1753
Grapes RPC 1	23.625 x 15.750 x 5.24	3.65	1950

Packing Materials

The 19-pound capacity Corrugated Common Footprint containers and 19-pound capacity returnable plastic containers can accommodate one layer of grapes, which have been pre-packaged at the vineyards in approximate two-pound bags.

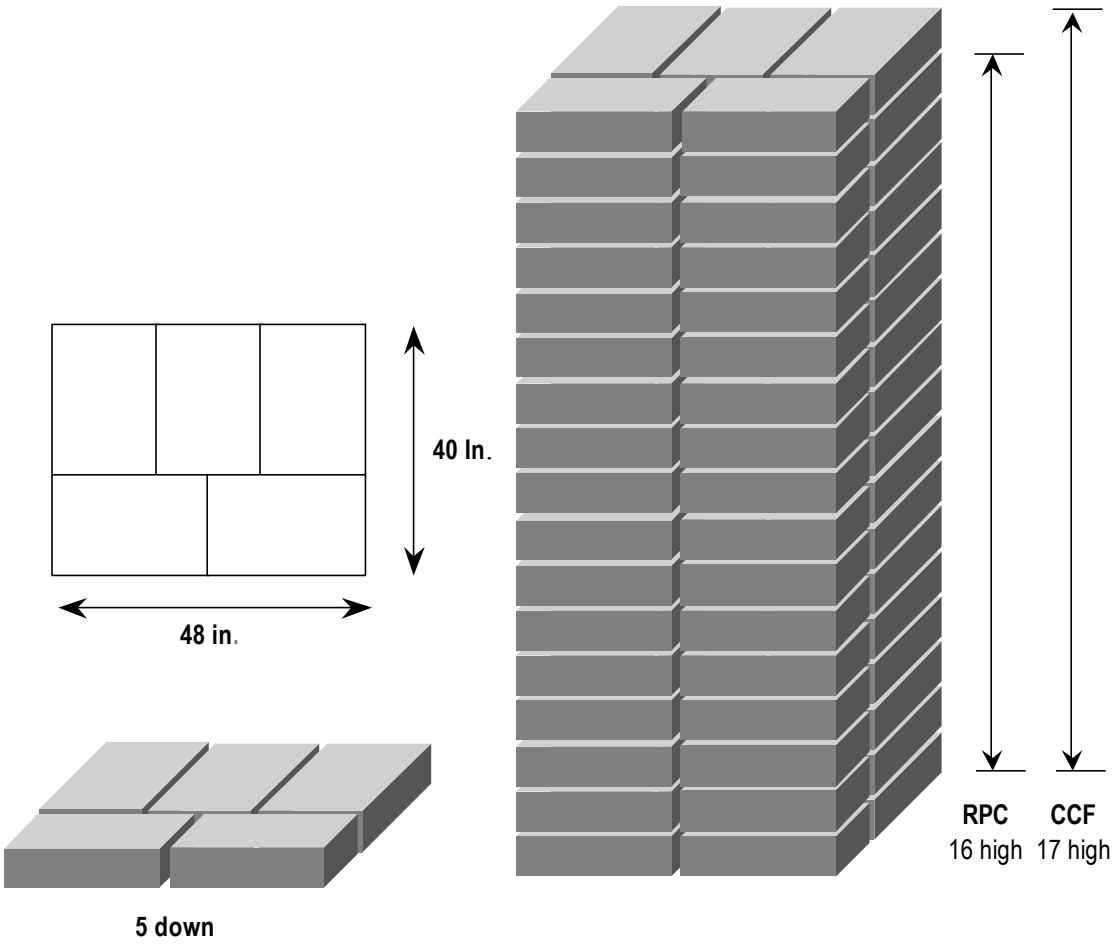
Corrugated containers require no other packing materials. RPCs, on the other hand, require a single face linerboard protective sheet at the bottom of each container. This linerboard is necessary to shield the bagged grapes from damage caused by vibration against the hard plastic surface of the RPC during shipping. The cost of this additional linerboard for RPCs is $0.08 per container.

RPCs also require an identification label that appears on the outside of each container. The ID labels cost $0.03 each, making the total packing material cost for RPCs an additional $0.11 per container.

Pallet Configuration

Pallets are loaded by forklift or pallet jack onto trailers as single-level loads (as opposed to double-level loads where two layers of pallets are stacked). California Table Grapes uses standard 40” x 48” GMA pallets.

Pallets loaded with CCF containers are configured five down (five boxes per tier), 17 layers high (or 85 containers per pallet). Pallets loaded with RPCs are configured five down, 16 layers high (or 80 containers per pallet). Pallets containing RPCs were lower because they were height-constrained (refer to the table that follows).



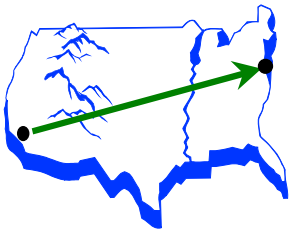
Container	Stacking Pattern (containers/layer x number of layers)	Container Gross Weight (lbs)	Containers per Pallet	Full Pallet Weight (lbs)	Pallet Height; includes 4" pallet (inches)	Pallets per Trailer
Grapes CCF	5 per layer, 17 high	20.90	85	1776.5	84.75	22**
Grapes RPC 1	5 per layer, 16 high	22.65	80	1812	87.84*	22**

* Pallets with RPCs are height-constrained (in this case limited to 16 layers), due to a 92-inch trailer door height limitation.

** Trailers carrying both corrugated containers and RPCs are weight-constrained at 22 pallets/trailer.

Distribution Profile

This case scenario assumes that grapes are shipped 2,800 miles. For the sake of illustration, that's the approximate distance from Delano, California (southern San Joaquin Valley) to New York City.



The distribution profile for California Table Grapes consists of several steps. Grapes packed into shipping containers at the vineyard are transported via 28-foot flatbed trucks approximately 30 miles, to one of their cold storage facilities. Grapes can spend from one day to more than three weeks in cold storage, as they await transportation to the DC.

Note: Three weeks in a cold storage facility impacts cycle time and will decrease the number of "turns" or trips an RPC can make each year (considering grapes' limited growing season).

From the cold storage facility grapes are trucked via 53-foot refrigerated trucks to distribution centers, where they are unloaded by forklift and broken down (re-palletized) for distribution to retail outlets.

Note: Grapes ship FOB (free on board) from the California Table Grapes cold storage facilities. That is, the retailer purchasing the grapes pays for the freight costs. This is important to keep in mind, as costs are being allocated later on in the modeling process.

The 2800-mile trip from the California Table Grapes' cold storage facility to the DC takes about four days (approximately 96 hours).

At the DC, the process of breaking down the unitized loads from the grower/shipper, placing them into storage, then subsequently "picking" orders to ship to the retail store can involve many more steps. For this case scenario, the analysts assumed that the containers are stored in the DC using the original shipper's unit load (pallet). Containers are then re-stacked for shipment to stores on mixed pallets containing similar commodities, such as other produce items requiring refrigeration.

The mixed pallets leaving the DC are loaded onto 48-foot, refrigerated delivery trucks for transportation to retail outlets. Once at the retail stores, pallets are unloaded from the trailers and prepared for retail presentation.

Empty corrugated containers are broken down and recycled for their old corrugated container (OCC) value ($0.06 per container[3]). At this point, the corrugated container's function in the distribution of California Table Grapes' products is complete.

[3] $0.06 per container is based on an OCC value of $65/ton. The value of old corrugated containers fluctuates according to time and geographic location.

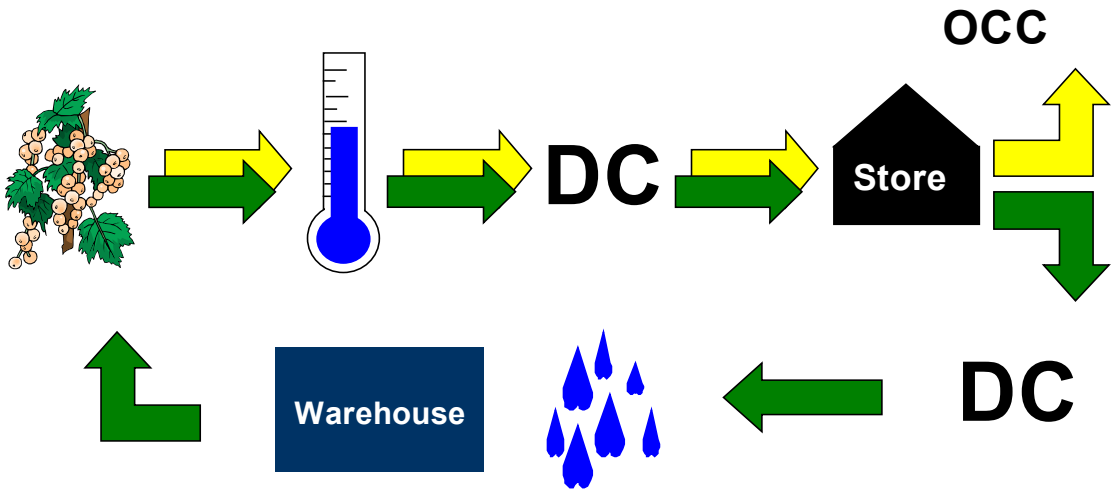
In 2002, more than 74% of all corrugated containers in the US were recycled. It is estimated that this recycling rate grows to over 90% at the retail level. [4]

RPC Backhaul Leg

Unlike corrugated containers (which have been recycled for their OCC value), RPCs now begin the long trip back to the grower/shipper.

First RPCs are transported back to a sorting area at the DC where they are sorted according to size, condition and pooler. From the DC, RPCs are transported to a washing station where they are washed, sanitized and refurbished. From the washing depot, RPCs are transported to a warehouse for holding. When needed, they are shipped back to California Table Grapes.

Product Distribution System



RPC Return Trip (Backhaul Leg)

California Tables Grapes estimates that it takes on-average 42 days (or about six weeks) for an RPC to make this round trip. (Remember, grapes can spend more than three weeks in cold storage.)

In addition, grapes are a seasonal product, and the harvest/shipping season is limited to about 150 days (or five months) from July through November. Given this situation (six-week round trip, 150-day growing season), each RPC makes about 3.6 complete cycles (or "turns") per year.

The RPC backhaul leg is an expensive and often time-consuming operation, and is thoroughly examined in the **Comparison** portion of the case scenario.

[4] American Forest & Paper Association, 2003.

The Comparison

The California Table Grapes case is a real-world situation that objectively compares real system costs of using corrugated (CCF) vs. RPCs. Using the information provided by several large grower/shippers, the model development team started analyzing the case.

The model for California Table Grapes was created using the Full Disclosure® modeling tool. Full Disclosure allows the user to accurately compare the distribution system economics of corrugated containers to RPCs (in this case, a Corrugated Common Footprint container to an RPC 1).

The model developers carefully placed container and distribution system data provided by the grower/shippers into a Full Disclosure model of their situation. In addition to data provided by the grower/shippers, the model developers also used key data points, which are industry-accepted or commonly agreed-upon values. California Table Grapes also accepted these data points.

Note: The information in the following table came from industry sources, and represents commonly agreed-upon values. For more information on these data points and how they were determined, see the Full Disclosure Tables of Common Values.

Data Point	Defined As…	Value Used in Model
Full running rate per mile	Operating cost per mile when truck is fully loaded	$1.55/mile
Loading and unloading productivity at grower/shipper	Rate at which truck can be loaded	37 pallets/hour
Loading and unloading productivity at DC *	Rate at which a truck can be loaded/unloaded	30 pallets/hour
Loading and unloading productivity at retail store *	Rate at which truck can be loaded/unloaded	15 pallets/hour
Labor rate at grower/shipper	Hourly rate for one worker at California Table Grapes	$8.35/hour
Labor rate at DC#	Hourly rate for one worker at	$24/hour

* Source: Willard Bishop Consulting, "Understanding the Cost and Performance of Returnable Produce Shipping Containers," 1999.

Source: Major U.S. retailer, 2003.

	the distribution center	
Labor rate at retail store[#]	Hourly rate for one worker at the retail store	$19/hour
Labor rate at washing station[#]	Hourly rate for one worker at the washing station	$10/hour
Recycling Value per Unit	Value per container from recycling old OCC (assumes OCC is $65/ton[5])	$0.06/corrugated container
RPC useful life	Number of years an RPC lasts before it breaks or wears out (assumes 24 lifetime trips x 42 days/trip = 1008 day useful life ÷ 150 day season = 6.72 years)	6.7 years
RPC washing costs	Cost to wash and sanitize one RPC	$0.35/container
RPC loss and theft rate	Percentage of RPCs that must be replaced annually due to lost (misplaced) containers or stolen containers	5% (Normalized to 2% in the Full Disclosure model to account for seasonality)

Annual Containers & Cost per Container

This case scenario assumes that California Table Grapes ships 1,500,000 containers of grapes annually.

California Table Grapes currently pays $0.94 for each 19-pound capacity Corrugated Common Footprint container.

California Table Grapes currently leases its RPCs from a third-party pool provider. They pay $0.85 per container, per trip to lease from the pool provider. California Table Grapes also pays $8.00 per container to replace lost or stolen RPCs.

[5] Value as of 6/1/03. OCC value (like many of the values in the table) fluctuates according to time and geographic location.

Why lease containers?

Some grower/shippers are required by the retailer to ship in RPCs. For that reason, some growers, like California Table Grapes, have turned to leasing RPCs rather than purchasing a pool of containers.

Although leasing containers may seem like a prudent economic decision, there are still start-up costs involved in deploying RPCs. Many grower/shippers require major capital investments in specialized palletizing and handling equipment.

Plus, all parties involved in the distribution system may want to consider whether leasing costs are sustainable by the pool operator over time. To assist in understanding the implications of leasing and who bears the cost, the AF&PA commissioned the development of a Rental Analysis Excel® spreadsheet. This spreadsheet imports the results of a Full Disclosure model, and allows the user to assign owners and allocate rental costs to those owners.

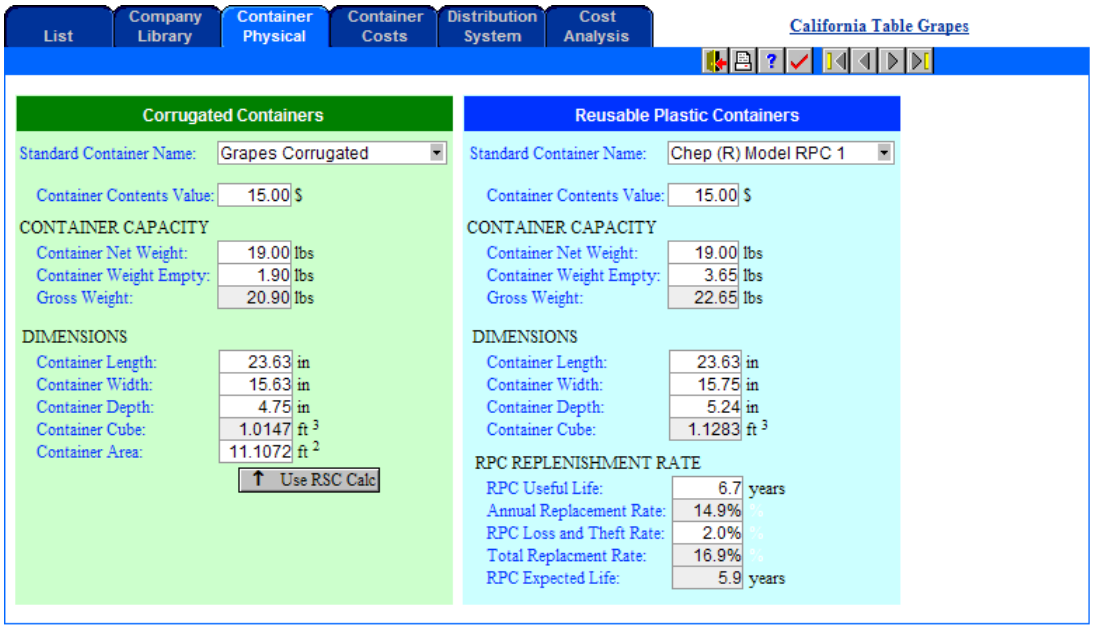
Model Building with Full Disclosure

The model-building process using Full Disclosure involves taking all the information and data points supplied to this point and systematically applying them to the various screens in the application. Although the application is flexible enough to support many modeling approaches, the following descriptions follow the approach used to develop the California Table Grapes Full Disclosure model.

Because California Table Grapes leases containers, the model developers chose to build two models, one which depicts a scenario where RPCs are purchased by the grower/shipper (Steps 1-4), and one which analyzes the economics and cost owners in a rental scenario (Step 5).

Step 1. Define each container (size, weight, useful life).

The graphic shows the Full Disclosure **Container Physical** screen, where the modelers described the two containers - CCF and RPC. Notice that this screen displays all the critical dimensions, weight and RPC replenishment requirements. Replenishment requirements include useful life (expressed in years of service) and loss and theft rate.

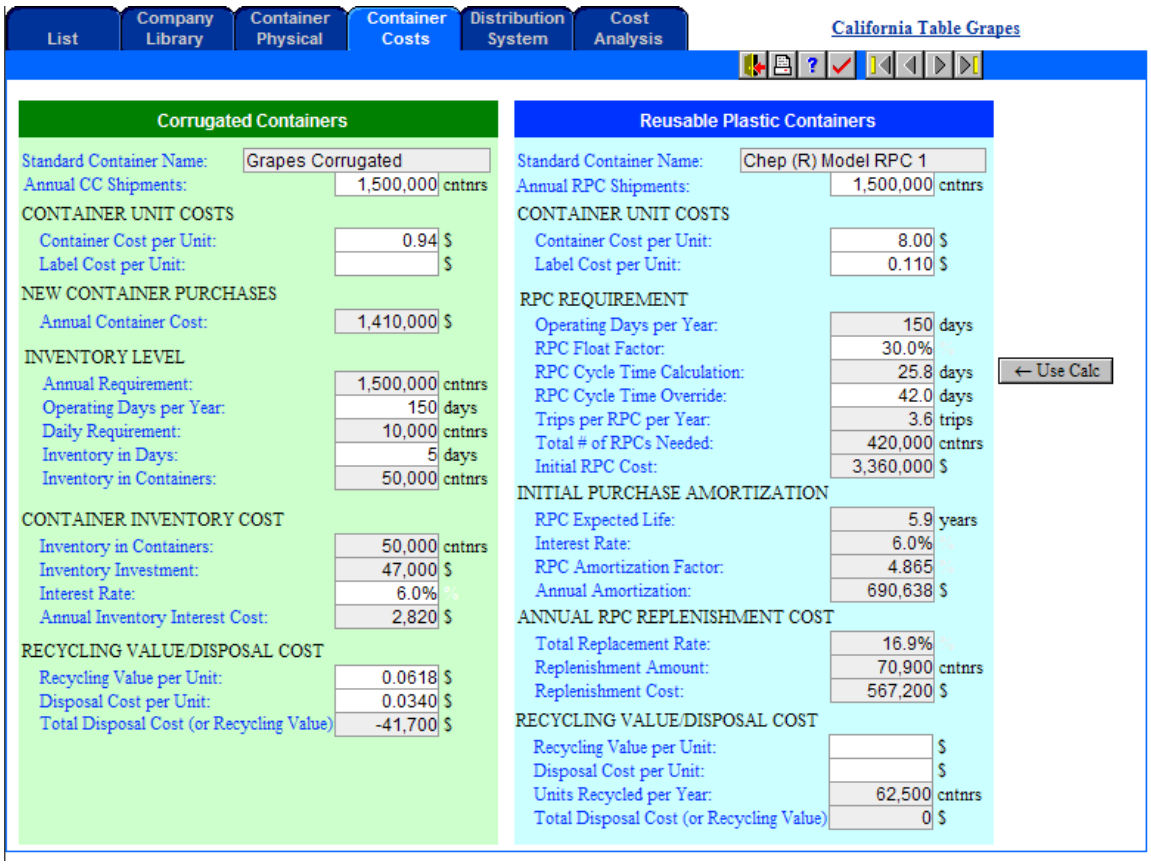


Container Physical screen

Step 2. Define container costs.

The Full Disclosure **Container Costs** screen displays the costs associated with the 19-pound capacity Corrugated Common Footprint container and the 19-pound capacity RPC. In addition to costing information, this screen is where the modelers defined the inventory levels, recycling values and RPC cycle time.

Note that the values entered in Full Disclosure directly correspond to information provided by California Table Grapes.

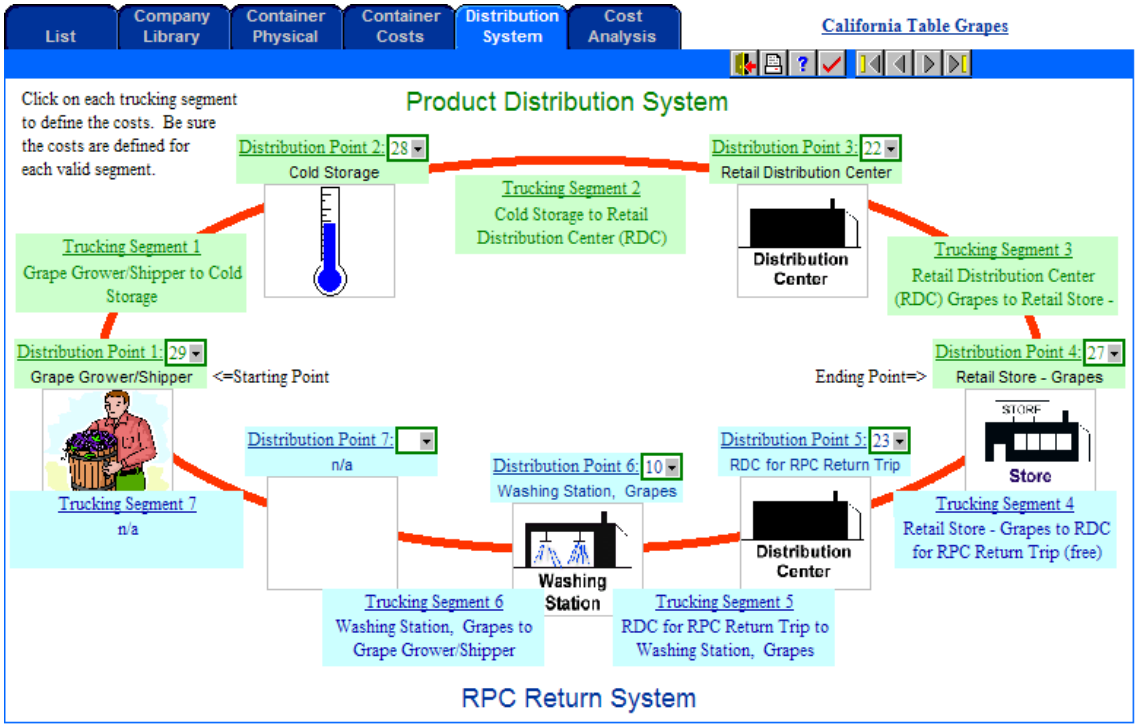


Container Costs screen

Step 3. Define the points and segments in the distribution system.

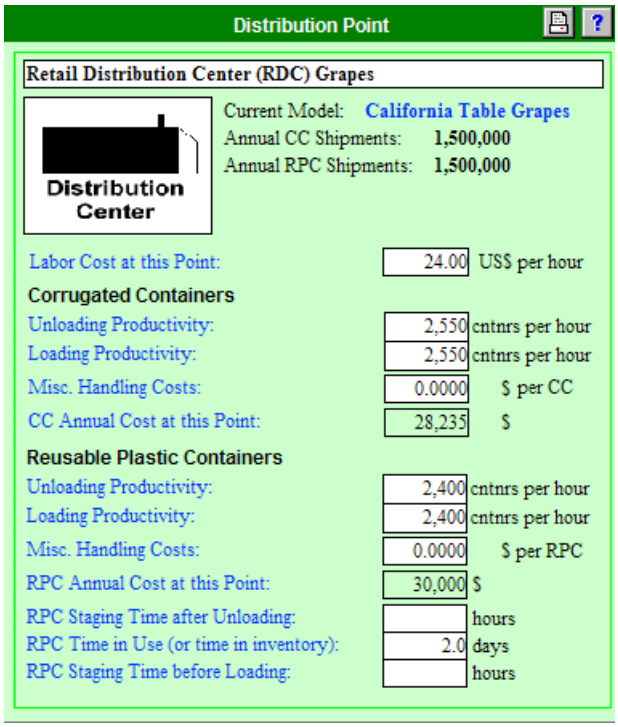
Full Disclosure's **Distribution System** map allows the user to define all the distribution points and trucking segments in the trip. Each distribution point (for example, grower, DC, retail store, washing station) in the system is first defined. Then costs associated with the point are determined. Finally, by drilling down on each segment (leg) of the trip, the user can define the specific details of that leg (such as distance traveled, payload, etc.).

Note that the Full Disclosure distribution map closely resembles the Product Distribution System flowchart.



Distribution System map

By drilling down on a Distribution Point in the map, the labor rates and loading and unloading productivity rates at that point were defined. The graphic below shows how the modelers specified these values for both containers at the distribution center.

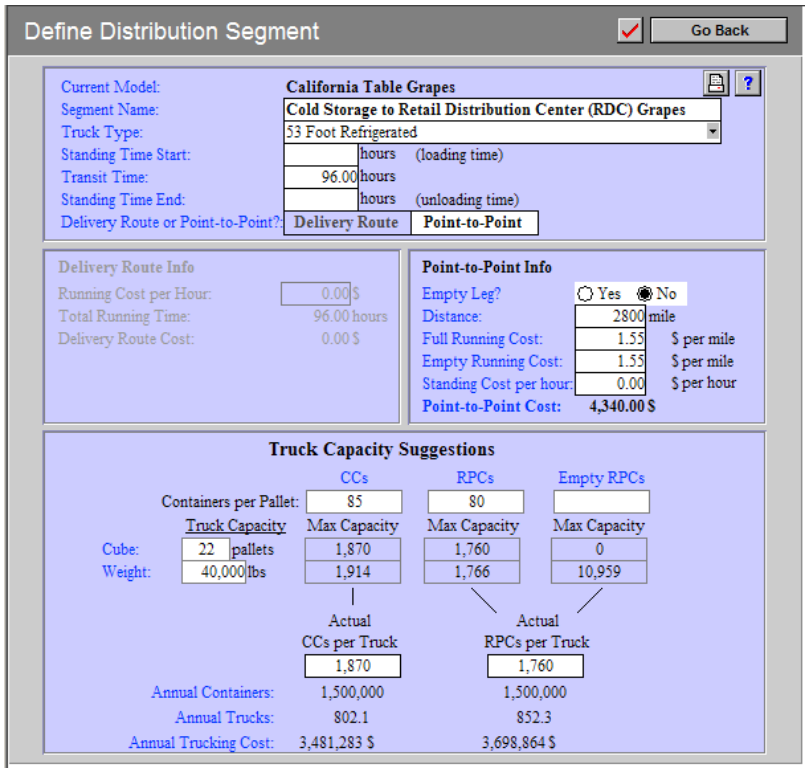


Drill down on map defines distribution point data

Defining Distribution Points

Appropriate distribution points were defined and representative data entered for every point in the system (including all points in the RPC return trip).

Defining distribution segments (legs) of the trip allows one to specify the number of miles traveled, running cost per mile, and the type of truck used. It's also where the user specifies the number of containers that can be loaded into a trailer before weighing out or cubing out. The graphic shows how one segment on the distribution map (the cold storage to DC leg) was defined.



Drill down on map defines segment data

At this point, it is appropriate to view (and review) the results of the model building process.

Step 4. Analyze the results.

The Full Disclosure **Cost Analysis** screen allows the user to see a summary of the model results.

Here the user sees a summary of all the data entered into the model. Container costs are highlighted, as are annual label costs, trucking costs, handling costs, operating impacts, and disposal costs. Results are displayed by comparing a Corrugated column to an RPC column, and calculating the variance for each cost category. The accounting charge to amortize the initial container investment may be included or excluded.

List | Company Library | Container Physical | Container Costs | Distribution System | Cost Analysis — California Table Grapes

Cost Summary | Sensitivity Analysis | Charts

Corrugated Containers		Reusable Plastic Containers		Variance
Annual Container Cost:	1,410,000 $	Annual Replenishment Cost:	567,200 $	-842,800 $
Annual Label Cost:	0 $	Annual Label Cost:	165,000 $	165,000 $
CC Trucking Costs:	3,951,435 $	RPC Trucking Costs:	4,442,465 $	491,029 $
Total trucking costs include trucking and any standing costs at unloading and loading.		*Total trucking costs include trucking and any standing costs at unloading and loading.*		
CC Handling Costs:	63,503 $	RPC Handling Costs:	831,818 $	768,315 $
Total handling costs include unloading, handling, and loading.		*Total handling costs include unloading, handling, and loading.*		
CC Operating Impacts:	0 $	RPC Operating Impacts:	0 $	0 $
Operating impacts are detailed at various distribution points.		*Operating impacts are detailed at various distribution points.*		
Disposal Cost (or Recycling Value):	-41,700 $	Disposal Cost (or Recycling Value):	0 $	41,700 $
CC Inventory Value:	47,000 $			
CC Inventory Interest Cost:	2,820 $			-2,820 $
		RPC Initial Cost:	3,360,000 $	
		RPC Annual Amortization:	690,638 $	690,638 $
Annual CC Cost:	5,386,058 $	**Annual RPC Cost:**	6,697,121 $	1,311,063 $
			Variance without RPC Amortization:	620,424 $

Cost Summary screen

Note that RPCs incur higher costs associated with trucking (additional $491K) and handling (additional $768K). These cost differences are primarily the result of the RPC backhaul trip requirements, including washing and warehousing costs.

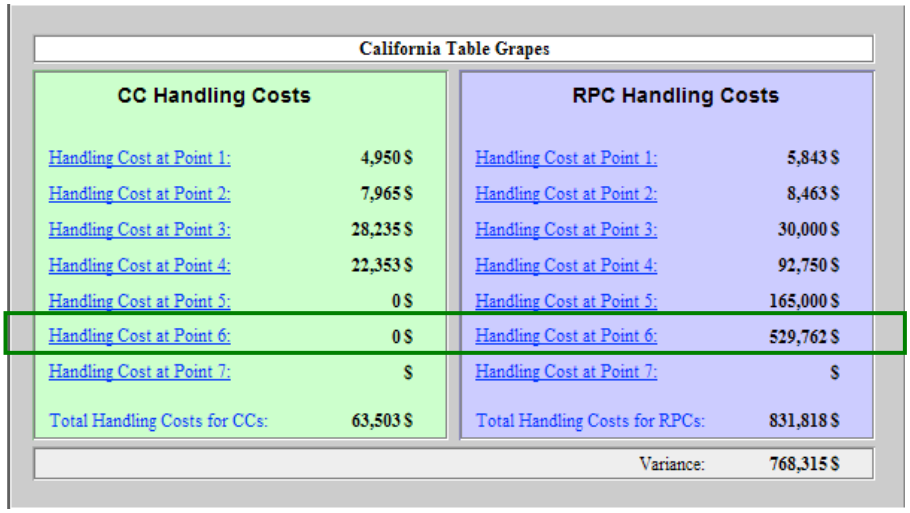
Full Disclosure effectively shows where in the distribution system (which segment) costs are incurred. The graphic below is a drill-down on Trucking Costs and is derived from information in the **Distribution System** map. Segment 5 (the DC-to-washing station leg) and Segment 6 (the washing station-to-grape grower leg) accurately represent costs associated with the RPC return trip.

California Table Grapes

CC Trucking Costs		RPC Trucking Costs		
Trucking Cost on Segment 1:	157,059 $	Trucking Cost on Segment 1:	166,875 $	Grower to Cold Storage
Trucking Cost on Segment 2:	3,481,283 $	Trucking Cost on Segment 2:	3,698,864 $	Cold Storage to DC
Trucking Cost on Segment 3:	313,093 $	Trucking Cost on Segment 3:	372,180 $	DC to Retail
Trucking Cost on Segment 4:	0 $	Trucking Cost on Segment 4:	0 $	Retail to return DC (free)
Trucking Cost on Segment 5:	0 $	Trucking Cost on Segment 5:	34,091 $	DC to Washing Station
Trucking Cost on Segment 6:	0 $	Trucking Cost on Segment 6:	170,455 $	Washing Station to Grower
Trucking Cost on Segment 7:	$	Trucking Cost on Segment 7:	$	
Total Trucking Costs for CCs:	3,951,435 $	Total Trucking Costs for RPCs:	4,442,465 $	
		Variance:	491,029 $	

Drill down on Trucking Costs

Another area of interest is Handling Costs. Here again the additional handling costs incurred at every stop in the RPC return trip dramatically increase the overall annual cost to ship RPCs.



California Table Grapes			
CC Handling Costs		**RPC Handling Costs**	
Handling Cost at Point 1:	4,950 $	Handling Cost at Point 1:	5,843 $
Handling Cost at Point 2:	7,965 $	Handling Cost at Point 2:	8,463 $
Handling Cost at Point 3:	28,235 $	Handling Cost at Point 3:	30,000 $
Handling Cost at Point 4:	22,353 $	Handling Cost at Point 4:	92,750 $
Handling Cost at Point 5:	0 $	Handling Cost at Point 5:	165,000 $
Handling Cost at Point 6:	0 $	Handling Cost at Point 6:	529,762 $
Handling Cost at Point 7:	$	Handling Cost at Point 7:	$
Total Handling Costs for CCs:	63,503 $	Total Handling Costs for RPCs:	831,818 $
		Variance:	768,315 $

Washing Station

Drill down on Handling Costs

The impact of RPC washing costs is shown at Point 6. Note how Full Disclosure identifies the cost to wash a container at this distribution point.

Initial Conclusions from Full Disclosure Analysis

This portion of the analysis reveals that Corrugated Common Footprint containers are economically favorable to RPCs in distributing California Table Grapes' products.

As shown in the cost summary, corrugated containers show an annual cost advantage of $620,424 (without RPC amortization). If you factor in the amortization cost of the RPCs over their useful life, the advantage to corrugated containers is even more pronounced. Here you see an annual cost advantage of $1,311,063 for corrugated containers. RPCs increase overall cash costs in this supply chain by 11.5%, or by 24.3% if you include RPC amortization.

Another way of thinking about this is to realize that if RPCs are used in this supply chain, overall system costs will go up by over $620K per year. The impact is even higher (about $1.3M per year) if you include the annual amortization expense of paying for the original supply of RPCs. There is more to be learned from this scenario, however. The next step uses the Excel-based Rental Analysis Spreadsheet to uncover more details on the economics of pool operations.

Who really pays the cost of renting an RPC?

Step 5. Analyze the economics and "owners" in a rental situation.

> The complete, unabridged "Why's and How's of Performing a Rental Analysis" are meticulously detailed in the Full Disclosure 1.3 documentation. To view the printable version of this material, click here.

RPC system operators often make the following offer to a grower/shipper:

"If you pay a rental fee each time you ship a product in an RPC, we (the pool operator) will set the price per trip rental price at about what you are currently paying for a corrugated container."

In return for paying this rental fee, the RPC system operator agrees to furnish the containers; gather, transport, sort, inspect and clean the containers; and return them to the grower/shipper for the next shipping cycle. They also agree to make the investment to purchase the initial pool of containers and to replace containers that are lost or stolen outside of the grower/shipper's control.

This offer may seem appealing. However, the Full Disclosure analysts have found that a scrupulous investigation of "who really bears the cost" in a rental situation can provide great insight. To that end, the Rental Analysis Spreadsheet was used to determine exactly who is responsible for the various costs involved in shipping grapes in rented RPCs.

Rental Analysis Details

The analysis of the California Table Grapes rental arrangement with the RPC pool operator began by identifying which "player" (or participant) in the distribution system "owned" (was responsible for) the cost of each portion of the trip. This allowed the modelers to accurately determine who bears the cost of each activity, and where in the distribution system these costs arise.

The modelers imported the data from the California Table Grapes model into the Rental Analysis spreadsheet. (This is an easy process, and is automated in Full Disclosure.)

The team defined three cost owners within the distribution system: California Table Grapes (the grower/shipper), a major retailer and an RPC pool operator.

Once owners were defined, an owner was assigned to each of the following costs in the model:

- Container costs
- Trucking costs
- Handling costs
- RPC rental costs (including loss and theft)

Here's what the modelers saw when they imported data from Full Disclosure and assigned owners to all the container costs. Note that the values displayed in the ANNUAL CC COST row are exactly the same as those in the Full Disclosure **Cost Summary** screen for the California Table Grapes model.

Also note that owners for each of these areas have been assigned in the right hand column of the spreadsheet.

Cost Summary

	CCs	RPCs	Variance	Owner	
Annual Container Cost	1,410,000	567,200	(842,800)	Grape Grower	**CC**
				|Pool Operator	**RPC**
Annual Label Cost	0	165,000	165,000	Grape Grower	**CC**
				Grape Grower	**RPC**
Trucking Costs	3,951,435	4,442,465	491,029	***Distributed by segment***	
Handling Costs	63,503	831,818	768,315	***Distributed by point***	
Operating Impacts	0	0	0	***Distributed by point***	
Disposal Cost/Recycling Value	-41,700	0	41,700	Retailer	**CC**
				|Pool Operator	**RPC**
CC Inventory Interest Cost	2,820		(2,820)	Grape Grower	**CC**
RPC Amortization Cost		690,638	690,638	|Pool Operator	**RPC**
ANNUAL CC COST	**5,386,058**	**6,697,121**	**1,311,063**		
		Variance without RPC Amortization	620,425		

Cost Summary data imported directly from Full Disclosure model

As another example, the graphic that follows shows how rental costs are apportioned for the various owners in the California Table Grapes model.

Rental Costs

Distribution Point #	Point 1	Point 2	Point 3	Point 4	Point 5	Point 6	Point 7	Total for All Points
Point On/Off	*On*	*On*	*On*	*On*	*On*	*On*	*Off*	*for comparison*
Distribution Point Name	Grape Grower	Cold Storage	DC	Retail Store	DC Return	Washing Station		
Owner	Grape Grower	Grape Grower	Retailer	Retailer	Retailer	|Pool Operator		
Rental Fees								
Rental Fee per Container	0.85							
Total Rental Fees at this Point	1,275,000	0	0	0	0	0	0	**1,275,000**
Non-Refundable Deposit Costs								
Deposit per Container	8.000	8.000	8.000	8.000	8.000	0.000		
Refund per Container	8.000	8.000	8.000	8.000	8.000	0.000		
Annual Cost of Non-Refundable Deposits	0	0	0	0	0	0	0	**0**
Lost and Stolen Container Costs								
RPC Time in Use (days)	7.0	21.0	3.5	3.5	3.5	3.5		**42.0**
Average Number of RPCs Required (at this point)	70,000	210,000	35,000	35,000	35,000	35,000	0	420,000
Safety Stock (*based on* RPC Float Factor)	0	0	0	0	0	0	0	0
Average Number of RPCs on Hand	~~70,000~~	~~210,000~~	~~35,000~~	~~35,000~~	~~35,000~~	~~35,000~~	0	**420,000**
Loss and Theft Rate (at this point only, % per year)	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%		**12.0%**
Annual Cost of Lost & Stolen RPCs	11,200	33,600	5,600	5,600	5,600	0	0	**61,600**
Capital Costs								
Total Deposits Paid during the Year	12,000,000	12,000,000	12,000,000	12,000,000	12,000,000	0	0	
RPC Time in Use (days)	7.0	21.0	3.5	3.5	3.5	3.5	0.0	
Deposit is debited X days in advance (days)	0.0		0.0	0.0				
Refund is credited Y days after return (days)	0.0		0.0	0.0				
Average Time a Deposit Remains Outstanding (days)	7.0	21.0	3.5	3.5	3.5	3.5	0.0	
Interest Rate on Capital								
Annual Capital Cost of Deposits	0	0	0	0	0	0	0	**0**
Other Costs								
Other Expenses per Container Trip	0.0200	0.0100	0.0100	0.0100	0.0100	0.0800		
Annual Other Costs	30,000	15,000	15,000	15,000	15,000	120,000	0	**210,000**
Total Rental Costs at this Point	**1,316,200**	**48,600**	**20,600**	**20,600**	**20,600**	**120,000**	**0**	**1,546,600**

Rental costs apportioned between California Table Grapes, the retailer and the pool operator

Rental fees ($0.85 per container) are owned by California Table Grapes. Loss and theft of containers is typically about 5% per year. However, the

modelers normalized the loss and theft rate to 2%, to account for product seasonality (150-day shipping season).

Administrative costs incurred for the RPC pool administration are assumed at $0.02 per container at the grower/shipper, $0.01 per container at the cold storage facility, the DC and the retail store, and $0.08 per container at the washing station.

Rental Analysis Results

A careful examination of the rental analysis overall summary shows higher overall system costs and the pool operator bearing substantial additional costs.

Overall Summary of RPC Rental Costs vs. Corrugated

California Table Grapes

Cost Owner	Full Disclosure Model			Rental Costs		Total RPC Rental Cost	RPC Rental vs. Corrugated
	Corrugated	RPC	Variance	Fees	Other		
	(1)	*(2)*	*(3)=(2)-(1)*	*(4)*	*(5)*	*(6)=(2)+(4)+(5)*	*(7)=(6)-(1)*
|Pool Operator	0	1,992,146	1,992,146	(1,336,600)	120,000	775,546	775,546
Grape Grower	1,582,794	346,181	(1,236,612)	1,319,800	45,000	1,710,981	128,188
Retailer	3,803,265	4,358,794	555,529	16,800	45,000	4,420,594	617,329
Unassigned	0	0	0	0	0	0	0
Grand Total	**5,386,058**	**6,697,121**	**1,311,063**	**0**	**210,000**	**6,907,121**	**1,521,063**

Rental analysis summary

The costs shown in the **Full Disclosure Model** columns of the spreadsheet are as expected. We see the pool operator paying the cost to purchase, transport, clean and warehouse the containers. Plus, we see California Table Grapes paying to purchase the corrugated containers and the packing materials for the RPCs.

The **Rental Costs** columns show how these costs were allocated across the three owners. Notice that the pool operator earns the rental fees being paid by California Table Grapes as revenue or negative costs. (And, conversely, we see California Table Grapes paying those rental fees.) However, the pool operator also bears more costs associated with administering the RPCs than do the other owners in the system (in this case, $120,000 annually).

The **Total RPC Rental Cost** reflects RPC rental fees, RPC replacement costs, any forfeited deposits, associated packing material costs, and RPC administration expense required to track these expensive assets.

According to the analysis, the RPC pool provider is sustaining a loss of more than $775,000 annually to operate this float of containers.

Why would an RPC system provider, choose to operate at a financial loss? How long can that rental rate be sustained?

Furthermore, the **RPC Rental vs. Corrugated** column shows that the retailer is spending an additional $617,000 each year to ship in RPCs. This equates to $0.41 more per container using RPCs. Some retailers who promote or require

RPCs believe there are financial gains to be made in handling RPCs at the DCs, and that these gains outweigh the added cost to ship in returnable plastic containers (and the associated loss of recycle revenue). However, very little evidence exists to substantiate these claims.

And, finally, we turn to the costs incurred by California Table Grapes. Owing to the fact that California Table Grapes does not pay for shipping to the DC (this cost is incurred by the retailer), the results of the analysis from their perspective is only somewhat negative. That is, California Table Grapes sees its net costs increase by $128,000[6] (or an additional $0.09 per container) with RPCs.

The Conclusion

California Table Grapes operates a large fruit growing, packing, warehousing and distribution system. The California Table Grapes case scenario compared Corrugated Common Footprint containers to RPCs in both a purchase situation and a rental (lease) situation.

The results demonstrate that the corrugated container was more economical in both situations (buy and maintain a float of RPCs or lease RPCs). In addition, the rental analysis showed the true owners of the cost of each segment of the distribution system.

The perspective of this scenario was purposefully broad. The analysis was performed with an objective eye toward the overall system economics of each container type. The modelers did not take the perspective of the grower, nor the retailer, nor the pool operator.

But now may be a good time to consider the perspective that a grower/shipper might have. For example, as it pertains to this case scenario:

- From the grower/shipper's perspective, one might ask, "When seeing the results of the costs that are currently being borne by the pool operator, how long can that pool operator continue to 'operate in the red' as far as the rental rate on their containers?"
- As a follow-on question, again from the grower/shipper perspective, "Will these relatively low and 'subsidized' rental rates gradually begin to 'creep up' as time draws on, and pool operators feel more comfortable with their market influence?"

With that said, many conclusions can be drawn from this analysis:

- Overall system costs (that is, cash costs not including amortization) increase 11.5% with the introduction of RPCs into the supply chain.
- The retailer's system costs increase significantly (16%), due mainly to higher RPC transportation and handling costs.

[6] This figure does not include the cost of any capital investments, such as RPC case erection and handling equipment.

- The grower/shipper's system costs increase (8%). This is primarily due to the cost of the additional packing materials RPCs require ($165K annually), and to the additional administrative costs the grower/shipper must pay to maintain a pool of RPCs ($45K annually).[7]
- The impact of washing and sanitation costs should not be underestimated. Grapes (like most produce) must be transported in clean containers. The washing cost value assumed in the model ($0.35 per container) may be too low.
- As a general rule, the distance traveled (in this case 2,800 miles) affects the economics of the case. RPCs are generally more expensive than corrugated containers when shipped at distances greater than 250 miles. [8]

This case scenario clearly shows the economic advantages of Corrugated Common Footprint containers when objectively compared to RPCs. If you'd like more information about this case, or information on developing a customized scenario for your needs, contact the Corrugated Packaging Alliance.

The Model

The Full Disclosure California Table Grapes model is available for download. However, you must have Full Disclosure 1.3 installed to import and display the model.

Download California Table Grapes model

More information on getting Full Disclosure

[7] Note: Several offsetting costs (such as the lower per-container rental price for RPCs) reduce the total advantage to corrugated to $128,188, as shown in the Rental Analysis Summary graphic.

[8] Source: Sensitivity Analysis White Paper, 2003, American Forest & Paper Association.