

Large Public Venue Diversion

Final Report Contract #IWM-CO212

Introduction of Biodegradable Plastics

BACKGROUND

The City of Indian Wells is located in the shadows of the snow-capped mountains in the beautiful Palm Springs region of the California desert. Each year the City hosts The Tennis Masters Series. It is one of only six tournaments where the men and women come together in a Grand Slam format.

This world-class tennis event is held at the Indian Wells Tennis Garden stadium. The facility is located on 189 acres with eight outside courts and a stadium that provides seating for over 16,000 fans.

During the two-week period of the tournament play, the City's year round population of 3,600 swells as over 250,000 seasonal visitors come to see the tennis and consume over 200,000 meals within the stadium grounds.

The amount of waste generated during the two week event is almost equal to 1% of the City's annual waste disposal. Therefore, the City of Indian Wells has dedicated itself to implementing programs to divert the event's wastes.

As part of the City's efforts a food scrap program was planned beginning in April 2000 with a pilot grant from the California Integrated Waste Management Board (CIWMB). The first full-scale implementation of the food scrap diversion program was at the 2001 tennis event.

Since 2001 the food diversion program has successfully diverted food scraps from the kitchen, suites and food court area for off-site composting at California BioMass. Finished compost, as part of a "closed-loop" system, is now being used for landscaping at the Tennis Garden.

The Tennis Garden's initial pilot program successfully diverted 24 percent of the waste in 2001. The Table below illustrates the diversion tonnage of the 4-year life of the program.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

Table 1
Diversion Tonnage for the Tennis Garden
(In Tons)

YEAR	CARDBOARD	COMMINGLED RECYCLABLES	FOOD SCRAPS	TOTAL
2001	9.65	1.82	8.13	19.6
2002	3.91	11.32	4.01	19.24
2003	7.72	6.78	8.00	22.5
2004	14.09	3.34	10.58	28.01

As can be seen from Table 1, the food diversion program has synergistically enhanced the total recycling efforts at the Tennis Garden. Table 2 illustrates the diversion results over the life of the food diversion program.

Table 2
Diversion Summary for the Tennis Garden
(In Tons For All Materials)

YEAR	TOTAL DIVERTED	TOTAL DISPOSED	TOTAL GENERATED	DIVERSION PERCENTAGE
2001	19.6	59.96 (REV)	79.56	24.6%
2002	19.24	61.32	80.56	23.8%
2003	22.5	69.56	92.06	24.4%
2004	28.01	66.52	94.53	29.63%

History of Food Scrap Program Improvements

Each year of the food scrap diversion program saw both challenges and improvements. The significant developments for each year after the 2001 pilot year are presented below.

2002

Contamination problems in the second year of the program (2002) caused a decline in the total amount of food waste diverted when compared to 2001. An informal waste study was done at the end of the 2002 event as part of the analysis to determine the reasons for the decline. The waste analysis showed that the predominant components remaining in the waste were bits of food scraps attached to plastic items such as plates, cutlery, and cups.

Using the results of the 2002 analysis, an expanded diversion strategy was developed in post-event roundtable discussions between staff at the Tennis Garden, California BioMass, Waste Management, the City and its consultant EcoNomics Inc.

The expanded strategy consisted of:

- **Increased Training:** The six person recycling team would be assigned to areas exclusively and held responsible solely for the food waste containers in each of their respective areas.
- **Tighter Collection Schedules:** Collection of roll-off boxes for trash and recycling would be coordinated to prevent cross contamination due to bins being too full, not available, or not delivered to the recycling yard.
- **Extension of On-site Efforts:** The active site presence by City staff and its consultant was extended by 10 days prior to the event and 3 days after the event.
- **Introduction of Biodegradable Plastics:** As the waste survey identified non-biodegradable plastic items as the primary contamination factor preventing additional diversion via composting, the introduction of biodegradable plastics into the stadium's food service was seen as a logical extension of the food scrap diversion program.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

Within the context of the expanded strategy, in May 2002 the CIWMB approved a two-year contract (#IWM-C0212) to introduce biodegradable plastics into the Tennis Garden venue. The timing of the program improvements was prioritized to focus first on increasing the food scrap diversion in 2003 along with the ancillary cardboard and container recycling.

The training efforts were synchronized between retail vendors for the cardboard and the food service vendor for food, wine bottles, and cardboard. Concurrently, work was begun to identify performance requirements that biodegradable items would need to meet in order to be accepted by Restaurant Associates, the food vendor for the Tennis Garden.

2003

The changes identified during 2002 led to a noticeable improvement in the diversion results. As shown in Table 1 and 2 above, several improvements in diversion were achieved. First the amount of food waste diverted increased back to the 8-ton level achieved in 2001. Second, the amount of clean separated cardboard almost doubled. The amount of commingled recyclables decreased by a similar amount showing that the cardboard was not being mixed in with the glass, metal, plastic water bottles, and aluminum.

The tighter hauling schedule reduced the contamination levels. The increased on-site presence allowed more training of the retail vendors during the set-up week prior to the event. Also, additional training and coordination was achieved with the housekeeping management and supervisors by earlier on-site presence.

Post-event meetings between all parties once again were held and further refinements were made to the program for implementation in 2004. The primary improvements identified were:

Food Scrap Diversion

- Food diversion efforts in the kitchen can be started earlier in 2004. Chefs' familiarity and acceptance of the program will allow earlier container set-ups in kitchen to capture first pre-event meals.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

- A ramp behind the dock area will be built to allow easier and safer emptying of food waste containers.
- Signage needs to be updated and a more sophisticated graphic needs to be developed for containers in the Food Court area and "back of the house" areas.
- Establishment of three-shift training and monitoring to avoid the deterioration in placement of trash and recyclables in proper roll-off bins that occurred during the 9:00 p.m. to 5:00 a.m. shift.
- Expand program focus to general stadium area for diversion of additional beverage containers.

As noted above, a concurrent effort was being made during 2003 to determine the performance requirements for the biodegradable plastic food items. The major highlights were:

Introduction of Biodegradable Plastic Food Service Items

- Identified the desirability of exploring concept of sponsorship from a biodegradable plastic resin producer(s)
- Identified the emergence of a reliable ASTM standard for biodegradability (D6400) of plastics via composting and the ASTM D 5338 Standard Testing Method-98 (Reapproved in 2003) for determining Aerobic Biodegradation of Plastic Materials.
- Obtained Restaurant Associates tentative agreement to review biodegradable food service items for use in 2004 event.
- Obtained agreement in December 03 from Restaurant Associates to provide listing of plastic items used in Mar 03 event.

(More detail on the 2003 biodegradable work tasks is contained in following pages of this report.)

2004

The program had its most successful year in 2004. Despite a change in housekeeping firms, the largest crowd in the

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

stadium's history, and the addition of two new food areas, the program functioned extremely well.

The program expanded its collection of plastic bottles and beverage containers through the distribution of 25 Plaza Rubbermaid 35 gallon containers throughout all levels of the stadium. The increase in volume necessitated the addition of two 4-yard bins and added a task of transferring the material from the 4-yard bins to the commingled roll-off box.

As can be seen from Table 1, the amount of commingled recyclables significantly increased due to the expansion of the collection of water bottles throughout the stadium. Source separated cardboard diversion also increased significantly. This increase in cardboard diversion confirms that the increase in the tonnage for the commingled recyclables was due to an increased diversion of glass, plastic and aluminum and not because cardboard was being placed in the commingled bins.

The final piece of the expanded program that was achieved during 2004's event was the introduction of biodegradable food service items into the Tennis Garden venue. The use of biodegradable plastic food service items was the culmination of the three-year effort described above.

BIODEGRADABLE PLASTIC PROGRAM GOALS

At the beginning of the biodegradable plastic project a set of goals was established to educate and guide all the various parties involved in the event. These goals included a specific numerical goal so that all parties understood what success would look like and to establish the performance expectations of the overall project. The goals established were:

1. Establish the viability of utilization of biodegradable plastics in a large venue environment.
2. Divert 60% of total event wastestream by adding use of biodegradable plastic items.
3. Stimulate the development of markets for biodegradable plastics through demonstration of successful usage by one of the nation's largest catering and food service companies (Restaurant Associates).
4. Establish future sustainability strategies for the current diversion program with the inclusion and acceptance of biodegradables.

BIODEGRADABLE PROGRAM IMPLEMENTATION

The following series of steps were taken over the two-year life of the project. Each step was necessary to achieve the overall project goal of the introduction of biodegradable plastic food service items into the Tennis Garden stadium.

STEP 1 Assessment of Biodegradability of Resins

The first step of the contract was to establish the biodegradability of the resins being produced by companies such as Novamount S.P.A.; Eastman Chemical Company; BASF; Dupont; and Cargill Dow. Over the course of the two years that the project ran, the field of biodegradable plastics experienced (and is still experiencing) rapid development and growth.

Two ASTM specifications were identified by the project as useful in determining what resin suppliers products would be considered as suitable for use by Restaurant Associates. Resin suppliers that market their product under ASTM D6400 conform with the biodegradation rates identified in the standard. The D6400 standard is the end product of 8 years of work by the ASTM Subcommittee D20.96 on Environmentally Degradable Plastics that is part of Committee D-20 on Plastics.

In addition if a resin or product supplier's plastic product composts according to ASTM Test Method D 5338, it is likely that the plastic item will be compostable at a rate that would be consistent with other materials undergoing biodegradation at a compost facility. All of the suppliers listed in this task have resins that meet the ASTM D6400 standard and would likely compost as described in the ASTM Test Method D 5338.

Confirmation of the development of the biodegradability standards described above was presented by the BPI at the workshop held by the CIWMB on October 27, 2003. Consequently the amount of funds originally dedicated to this task were significantly reduced and used to increase the outreach effort and onsite monitoring during the tournament.

Although the project identified in its early stages that establishing a comprehensive biodegradability standard for composting would be beyond the scope of the program, actual composting by California BioMass of the waste generated at

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

the 2004 event would provide anecdotal support for the standards established by the American Society for Testing and Materials (ASTM).

The practical confirmation of the compostability of the biodegradable food service items introduced into the Tennis Garden was their complete decomposition in California Biomass composting processes. A three-part field experiment was developed by the project team to ascertain the "real world" compostability of the biodegradable food service items.

The first field experiment was to bury just the biodegradable forks, knives, spoons, cups, and bowls in an active compost pile at the post screening stage. The items were buried on May 21, 2004 and the pile was examined on June 12, 2004. No remains or pieces of the biodegradable items could be found. All items had biodegraded completely in a 21-day period.

A second field experiment was set up at the end of the event on March 24, 2004. Food waste was mixed with the biodegradable items and placed in a compost pile at the pre-screening stage. The pile was examined on June 12, 2004. No remains or pieces of the biodegradable items could be found. All items had biodegraded completely in an 80-day period.

The third field experiment is ongoing at the time of the writing of this report. (June 14, 2004). This field experiment was, as the others, set up at the end of the event on March 24, 2004. Five bags of waste were collected from the signed Food Scrap plaza containers located in the Food Court area of the stadium grounds. The weight of the bags was recorded at 145 pounds. They were placed in a 33-gallon trash can and transported to the California BioMass facility in Thermal, CA. The bags contained the actual waste generated by patrons without any modification. As such, they contained a mixture of food scraps, paper napkins, biodegradable plastic forks, spoons, knives, and salad bowls, and regular non-biodegradable plastic cups, forks, straws, bags, plates, and paper plates. The bags were placed in a static pile and will be exhumed and examined in late July or early August 2004 to determine the level of degradation of the materials in the bags. The results of the third field experiment will be added as an addendum to this report when they are finalized.

STEP 2 Establish Performance Requirements for Biodegradable Food Service Items

This portion of the implementation of the project was the most challenging. There were two hurdles that needed to be overcome. First, paradoxically, the rapid pace of improvement in the quality of biodegradable food service items and second, the wide variety of sizes, styles, and shapes of the plastic items that are used at the stadium.

The rapid pace of improvement in quality created a moving target in attempting to finalize performance standards. In order to present the highest quality biodegradable food service items to the stadium's food vendor (Restaurant Associates), it was necessary to move the timeline for meetings to late 2003. This timeframe was the latest point that the performance specifications could be reviewed and biodegradable items could be ordered for use at the event.

The three significant areas of ongoing quality improvement are in terms of the ability to handle hot foods, the appearance of the finished product, and the ability to accept traditional promotional printing and logos on cups. Two specific examples illustrate the rapid pace of development and the impact on this project. A more heat resistant cutlery was available 60 days after the event and a branded soft drink cup that would have fit into the Tennis Garden's overall sponsorship and food service programs was available 90 days after the event. It is likely that both these new items will be used in 2005 but they were too late for introduction into the 2004 program.

The second hurdle identified above is the wide variety of sizes, styles, and shapes of the plastic items that are used at the stadium. The negotiation process that determines the number of vendors providing food at the Tennis Garden compounds this issue. The final configuration of the vendors and their specific requirements for food service items can be fluid up to as little as 60 days before the event.

The final 2004 Food Court arrangements resulted in Restaurant Associates managing the majority of the food distribution with the exception of Jamba Juice, John's (a local Indian Wells area restaurant) and Del Rio Tacos.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

Using the final Food Court arrangements, the project team focused the introduction of biodegradable items on the five food booths managed by Restaurant Associates.

A finalized list of food service items was obtained from Restaurant Associates in January 2004 and was compared to sizes and styles of items available in biodegradable form. Table 3 below illustrates all the plastic items used at the Tennis garden, their availability in the size and style, and their performance with respect to hot food.

Table 3
Complete List of Food Service Items and Substitution Feasibility

PLASTIC ITEMS USED AT TENNIS GARDEN	NOT AVAILABLE IN BIODEGRADABLE	AVAILABLE IN BIODEGRADABLE	STYLE AVAILABLE		HOT FOOD OK	
			YES	NO	YES	NO
Bowl 20 oz White		✓		✓	✓	
Bowl 30 oz White		✓		✓	✓	
Bowl 16 oz Jade		✓		✓	✓	
Bowl 16 oz China Class		✓		✓	✓	
Bowl 16 oz Silverw		✓		✓	✓	
Bowl 16 oz Wild Flower		✓		✓	✓	
Cup Crystal 6 oz	✓					
Cup Fiesta Margar	✓					
Cup Martini Clear	✓					
PLASTIC ITEMS USED AT TENNIS GARDEN	NOT AVAILABLE IN BIODEGRADABLE	AVAILABLE IN BIODEGRADABLE	STYLE AVAILABLE		HOT FOOD OK	

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

GARDEN			YES	NO	YES	N O
Cup Shooter	✓					
Cup Clear Small		✓	✓			✓
Cup Clear Medium		✓	✓			✓
Plate 9" White		✓		✓		✓
Plate 10.25" White		✓		✓		✓
Plate 7.5" White		✓		✓		✓
Plate 6" Clear	✓					
Plate 9" Clear	✓					
Plate 10.25" Clear	✓					
Plate 10.75" White		✓		✓		✓
Plate 10.25" Black	✓					
Plate 9" Black	✓					
Plate 10.75 Black	✓					
Straw, Jumbo 7.75"	✓					
Straw 6"		✓		✓		✓
Cutlery Fork White		✓	✓			✓
Cutlery Knife White		✓	✓		✓	
Cutleryp Spoon Wht		✓	✓			✓
Cutlery T-Spoon		✓	✓			✓

A further selection criterion emerged when the vendor requested that items be available within a 24-hour time frame for reordering. The vendor required this condition as the total

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

number of items ordered is projected based on attendance trends that are not available until the event is actually underway. This last criterion effectively limited the number of distributors of biodegradable items to those that operated within the Los Angeles basin.

A shipment of biodegradable food service items was sent to Restaurant Associates in January 2004. The biodegradable items that were approved by Restaurant Associates (RA) in late February 2004 were 15 ounce salad bowls, 6 ounce cups, straws, and all flatware (forks, knives and spoons). In the next week the list was revised several times as Restaurant Associates tried forks in hot dishes with unsatisfactory results.

In response, a package of all biodegradable items was again sent by FEDEX to RA's New York office for final review. The final outcome that was agreed upon by all parties was as follows:

- No biodegradable items would be used in the suite area due to the high expectations of the guests and the marginal performance of the utensils with hot food.
- Biodegradable cups would be used at the margarita bar in the Food Court.
- Biodegradable flatware would be used in the Food Court with the exception of two vendors that served side orders of hot beans that could melt the cutlery.
- Biodegradable 15 ounce bowls would be used for all salads served in the Food Court.

Step 3 On-Site Implementation During Event

On the first day of the tournament all biodegradable items in the Food Court were tested with all menu items for performance, appearance, and customer acceptance.

Photo documentation of failure of the forks in hot black bean dishes from the Del Rio outlet resulted in pulling biodegradable forks from two of the food vendors.

The straws were found to be too narrow in diameter and too short for general use and were not used. Spoons, knives, and

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

the 6 ounce cups all were satisfactory. Forks were used in foods that were not too hot (i.e. Foods with hot liquids such as beans).

As the event progressed the introduction of the biodegradable bowl for the salads was delayed as the salads were prepared the night before and the bowl needed to demonstrate that it could be stored overnight in the refrigerator without degrading. It was also critical to demonstrate that no deterioration of the salad occurred and that it remained crisp and maintained its fresh appearance.

The bowls were placed into use on day 8 of the 15-day event after Restaurant Associates' on-site manager and the City's consultant tested the bowls under actual conditions and were satisfied that there were no performance issues. The 15-ounce salad bowls performed very well and the appearance of the salads were actually enhanced by the shape and the transparency of the bowl when compared to the non-biodegradable bowl.

The Food Court was surveyed each day throughout the event for the distribution and use of the biodegradable items. Each manager of the individual restaurants was asked how the items were performing and to identify any issues. These daily check-ins were useful and were needed to keep track of inventory, usage, and to promote the use of the biodegradable items.

The daily distribution of the biodegradable items throughout the Food Court needed to be carefully monitored. This was due to the use of a mix of the selected biodegradable items with the non-biodegradable items.

Some of the non-biodegradable plastic items used were cups imprinted with the tournament sponsor's logo, non-biodegradable forks that needed to be used due to the degradation of biodegradables in hot food, different sized cups that were not available in biodegradables, and other such items. This issue was further compounded by the existence of a prior inventory of non-biodegradable spoons, knives, and cups that the vendor wanted to use before using the biodegradable items.

Onsite monitoring was also required to insure that orders for additional stock were filled within a 24-hour timeframe.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

Staging cases of the biodegradable items in the Los Angeles warehouse of the distributor and transporting the cases to the Tennis Garden by the City's consultant accomplished this 24-hour order fulfillment. As biodegradable plastics become more readily available this type of effort will not be required but currently speed of delivery and ease of access is an impediment to ease of substitution of biodegradables.

Additional Implementation Support Activity

The introduction of biodegradable food service items represents a large change to the food vendor with performance risks and esthetic issues. Use of the items by the food vendor is essentially at its sole discretion. However, if a company could be identified that would sponsor the substitution of biodegradable plastic for traditional plastic items then the use of the biodegradables would be part of the contract between the Tennis Garden and its food service vendor. The contract could then identify specific biodegradable items whose use would be required as part of the terms of the contract.

The Tennis Garden staff and the City's consultant developed the concept of a specific Environmental Sponsorship for the tennis event to provide a financially positive element into the biodegradable substitution process.

Discussions were held in July and August of 2003 with Tennis Garden staff regarding the best method of structuring a sponsorship within the context of introducing biodegradable plastics. The management of the Tennis Garden assigned the Director of Sponsorship Sales for the Tennis Gardens to work with the City and its consultant. The Director is responsible for all phases of the development of corporate sponsorships. Follow-up meetings were held in September, October, and November 2003 to identify: (1) what levels of sponsorships could be offered and (2) what products would work best for a consumer oriented market.

For instance, Coca-Cola served in biodegradable cups would tie in the soft drink product with the "green" biodegradable plastic container. As part of this type of sponsorship Coca-Cola would then be the exclusive soft drink served in the Tennis Garden during the event.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

Sponsorship Development

The project gradually came to realize the basic centrality of sponsorships to the stadium and large venue world. They interact with the media dollars at various levels and these sponsorships sit at the core revenue structure of profitability.

The largest challenge in creating the Environmental Sponsorship was connecting an essentially industrial supplier of biodegradable resin (i.e. Dow, Dupont, Eastman Kodak, etc.) with a consumer market. Promotional plans for coupons and store advertising work with consumer brands more easily than with industrial suppliers.

Several sponsorship concepts were identified. The first approach used a multiple sponsorship package. For instance, Coca-Cola would be contacted as a consumer brand and would use biodegradable cups. As part of this arrangement both Coca-Cola and the producer of the resin and the cup would be cross-promoted in a package.

When a sponsor pays money to the event the sponsor receives a sponsorship package. The proposed Environmental Sponsorship package included 90 minutes of ESPN commercials, on-air exposure of main court signage, and exclusive use of Coca-Cola as the soft drink sold at the event. In addition, there are other elements of the package that provided for use of a suite and other favorable event conditions.

The second approach pursued was to work with individual Food Court vendors. Two of the vendors were known for their pro-environmental stance and they were to be asked to use biodegradable cups for their products during the event.

The third sponsorship package examined was for the BPI to jointly promote all the producers of biodegradable resins. The connection at the consumer level could not be established and the option was dropped.

The world of sponsorships is a fairly complicated and sophisticated arena. There are numerous types of sponsorships and what is received in return for the granting of a sponsorship varies greatly in value from \$10,000 to over \$150,000. The cost of a sponsorship to Coca Cola or similar sponsors varies greatly, but can be a large financial commitment.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

An individual sponsorship by a national drink provider was the approach that almost succeeded for 2004. It collapsed in the last week preceding the event due to inability to separate the amounts and responsibilities between the local company sponsorship and the participation of the corporate parent at the national level.

The work on sponsorships was successful in developing a new class of sponsorship at the Tennis Garden. The Environmental Sponsorship is being offered for the 2005 event. The Tennis Garden and the City's consultant are pursuing this option for inclusion in the 2005 event.

COST ANALYSIS

Overview

There are three interrelated cost components to this project. The first component is the comparison of the cost of biodegradable food service items to non-biodegradable plastics. The second component is the impact of the food scrap program and biodegradables on the housekeeping and disposal costs. The third component is the financial contribution of the Environmental Sponsorship.

The limited distributorship of biodegradable items is a significant factor in procuring biodegradable food service items. This factor was magnified by the food vendor's requirement that order fulfillment needed to be within 24-hours. This requirement effectively limited the source of biodegradables to the Los Angeles based firm of BIOCORP,NA. The 24-hour turn-around was assured by BIOCORP ordering 20 cases of the 15-ounce PLA bowls and staging them in its Los Angeles warehouse.

The number of cases ordered is another major determinate of costs. Although the exact number of cases is proprietary, the total number of cases ordered did not reach the threshold for obtaining a direct manufacturer discount.

Cooperative purchasing would be another option to reach the threshold for obtaining a direct manufacturer discount. The contract between the City and the CIWMB asked for the feasibility of lowering purchase costs through a cooperative

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

purchasing program. The City explored this option as part of a food diversion program with the Desert Sands Unified School District.

The feasibility of cooperative purchasing failed on two counts. First, the City would have to purchase the biodegradables for both the Tennis Garden (a private firm) and the school (a public entity). It was not legally feasible for a public entity (the City) to cooperatively purchase for both a public firm and a school district. Second, the number of cases was still insufficient to trigger a direct manufacture sale.

The 2004 event required a \$583 subsidy to equalize the premium cost of the biodegradable forks, knives, spoons, bowls, and cups. As more items are introduced the premium will increase in total to a possible maximum of \$3,500 to \$5,000. This projection assumes a usage of 100 cases with a 40% premium on bowls and an average 15% premium on cutlery and cups. (1000 count case).

A total cost scenario projection was developed based on the success of the food scrap and recyclables diversion and assuming a constant rate of improvement in the quality and style of biodegradables. The best total cost structure can be achieved by (1) the complete substitution of biodegradable food service items throughout the Tennis Garden with the diversion of all food scraps and a consequent 50% to 80% reduction in the event's \$15,000 disposal bill and (2) an Environmental Sponsorship with a value averaging between \$50,000 to \$300,000. The project team feels this scenario is achievable within the next three years.

Analysis of the Cost of Biodegradables vs Non-Biodegradables for the 2004 Event

There is a range of cost differentials between biodegradable food service items and their comparable non-biodegradables. The table below shows the range of percent premiums that biodegradable items cost as of February 2004.

Table 4
Comparison of %Cost Premiums FOB Los Angeles for
Biodegradable vs Non-Biodegradable Food Service Items

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

FOOD SERVICE ITEM	COST PREMIUM OF BIODEGRADBLE ITEMS
Cutlery	0% to 10%
Plates	5% to 15%
Bowls	15% to 40%
Cups	5% to 20%

The variability in cost premiums in Table 4 depend on the number of cases ordered, the style of the item, and the negotiation leverage of each of the parties.

For example, the catalogue price for a case of 1000 biodegradable forks was quoted at \$25 FOB Los Angeles. The cost quote was reduced to \$16 once the number of cases was determined. The final price was reduced again at the conclusion of the negotiation between the food vendor and the biodegradable distributor. The final cost was within 2% of the cost for regular non-biodegradable plastic forks.

At the other end of the spectrum are the clear PLA 15 ounce bowls. The price premium for this item is 40% as of February of 2004. The resin PLA performed very well in the 15-ounce salad bowls used in the 2004 event. It withstood overnight storage holding the undressed salad and showed no adverse reactions to acidic salad dressings. Finally, it composted completely both in 21 day and 80 day compost field tests. The challenge now is to lower the price point to compete with the non-biodegradable bowl.

Disposal Costs for the 2004 Event

The food scrap and recycling programs saved the Tennis Garden a total of \$13,800 in refuse removal and disposal costs. This figure is the combined savings of \$840 in tip fee avoidance and \$12,900 in reductions of haul costs for 40 loads. After four years of development, the diversion program is now consistently providing disposal cost savings of sufficient magnitude to assure the continuation and institutionalization of the program.

The 2004 tip fee savings for the Tennis Gardens of \$840 was a result of the elimination of the normal \$30.00 per ton tip fee. This savings is calculated by taking the 94.53 tons of material generated by the event and multiplying it by the \$30/ton tip fee charged at the local landfill. This equals a total of

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

\$2,835.90, which is what the Tennis Garden would have paid if no diversion program were in place. Instead, only 66.52 tons was dumped at the landfill (total of 94.53 tons minus 10.58 tons of food scraps minus 14.09 tons of cardboard minus 3.34 tons of commingled recyclables). The 66.52 tons disposed multiplied by \$30 per ton equals the reduced tip fee total of \$1995.60, which yields the \$840 savings in tip fees.

In addition to the tip fee savings there is no haul charge for the collection of food scraps and recyclables. A total of 40 loads of recyclables and food scraps were hauled during the event. If the cardboard and beverage containers and food were collected as waste, the haul charge would have been equal to \$324/load times 40 loads = \$12,960. Thus, the Tennis garden reduced its haul charges by the amount of \$12,960.

Two sources of additional labor costs were incurred. First, the incremental time spent in training the kitchen and janitorial staff. An estimate of this incremental cost is arrived at by taking the 15 extra minutes in training multiplied by 35 people who were involved in the program. This yields a training time of 8.75 hours. At a blended rate of \$11/hour, the total training cost was approximately \$96.25.

The second additional labor cost was incurred by the stationing of one person at each loading area to insure that recyclables went into the proper bin and were not thrown out as trash. Again this is an incremental cost as the person also kept the area clean and performed other duties. At \$8/hr and 6 hours/day times 16 days the total additional labor was \$768.

Finally, an additional \$1,200 in savings was realized through a closer attention to pickup frequency and the consequent reduction in transportation costs.

OVERALL PROJECT FINDINGS & GOAL ACHIEVEMENTS

This section provides a listing of the significant challenges and the solutions that worked at the Tennis Garden. There is also a listing of the recommendations to any party that may be contemplating the introduction of biodegradable food service items into a stadium environment. Finally, the original goals of

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

the project are reviewed and compared to the results actually achieved.

CHALLENGES AND SOLUTIONS

CHALLENGE – Fear of Disruption of Stadium Operations

When contacted regarding the introduction of biodegradable plastics the first question a stadium owner/operator will ask themselves is, "How will this impact my operation and profitability?"

Solutions

Over time, the introduction of biodegradable plastics will lower disposal costs. The disposal cost savings will require a significant level of effort and the stadium management will need outside assistance in locating a compost outlet, getting its food vendor(s) educated on suppliers of biodegradable items, and coordinating the overall waste, recycling, and composting elements with the hauler.

Recommendation(s)

A formal presentation to stadium management should be made that outlines the complete program and the steps needed to implement. It should include a clear numeric goal on what disposal cost savings are expected at the end of the program implementation. Determine if a break-even outcome is acceptable or if a net positive saving must be demonstrated. The path to obtaining the savings or break-even point and the method of measurement needs to be clear. Regularly communicate how the project is doing on its projections and modify if necessary. Avoid surprises or over-promising results.

When projecting the required time needed for full implementation allow one year for pilot scale activities so that all operational issues can be identified, quantified, and addressed. The second year should be the point in time when the program can become part of the routine procedures of stadium operations.

CHALLENGE – Fitting the Program into Existing Conditions

The constraints imposed by time pressures, security, and meal preparation make recycling and the introduction of biodegradable items a low priority consideration to the

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

operations management. The operational demands are primary and take precedence over environmental concepts.

Solutions

All the challenges can be overcome provided that the individuals introducing recycling, biodegradable utensils and other environmental concepts recognize that their program must conform to the operational demands of the stadium.

In order to conform to the operational demands, the program must:

- Develop the implementation plan well in advance of the stadium's play season.
- Establish a good working relationship with the operational staff of the stadium.
- Be ready to work the same hours as the operations and kitchen staff.
- Never interrupt the workflow of the kitchen or operations staff during event play.
- Always clear all changes in product introduction or housekeeping routines in advance.
- Always place the needs of the stadium operations first.

Recommendations

Do not rush implementation. One year before introducing biodegradable items into a food scrap program meet with all affected parties. This will include stadium senior management, operations and maintenance staff, security (to gain access to all portions of the stadium), food vendors, senior chefs, and skybox, suite management.

Do not attempt full-scale implementation. Identify the portions of the stadium where biodegradable items can be comfortably introduced. If any problems are encountered, real or perceived, replace biodegradable with trusted products immediately. Develop a solution after the day's event when the pressure is not so intense.

Work with the chefs and the food vendor management. They are the people who have the most exposure to the introduction of biodegradable items. They are also the people who will have

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

the best insight into the demands that must be met and will have the best ideas on what needs to be accomplished.

Walk the stadium. Observe the flow of people, the timing of peak meal periods, test the biodegradables in the menu items. At slack periods explain the program to the individual food distribution managers and identify the people who support the concept. They will be able to provide insights into how restocking should occur, inventory requirements, and will have suggestions on what additional items are candidates for substitution by biodegradables.

Get the biodegradable distributor on site during the initial introduction of the biodegradable items. This will allow immediate feedback on performance requirements, successes, and needed improvements.

CHALLENGE – Training and Impacts on Existing Staff Duties

All stadiums and large venues will have a large housekeeping/janitorial staff. In addition, the food service vendors will also have a broad number of employees starting with the chef at the leadership role on down to the dishwashers and loading dock handlers.

All of these individuals will need to understand the food scrap diversion portion of the program. As the number of biodegradable items introduced into the program expands, the housekeeping staff will begin to have responsibilities for identifying the proper manner to handle the increasingly compostable wastes.

The training of all the people involved will need to encompass one-on-one training at the leadership level, group training for line staff, and on-site follow-through during the stadium play times.

The large numbers of employees, the long hours, and the compressed time stress imposed by inflexible play schedules and meal preparation deadlines all add together to resist any additional job duties.

The signage for the recycling may, or may not, want to identify the biodegradable portion of the overall program.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

The quality of the staffing will vary from very good to not good at all.

There will likely be language barriers and/or cultural management differences.

Solutions

The job duties must be carefully and smoothly integrated into existing job functions.

If the biodegradable items are deposited into separately marked containers, then special housekeeping staff should be identified and made part of a special recycling team.

Where appropriate, there should be bilingual training and signage. There may be a portion of the staffing that is functionally illiterate and a color-coded signage system may need to be designed.

It is probable that at the beginning of the introduction of biodegradable product into the stadium that there will be a mix of both biodegradable and regular plastic items. The food vendor will need to keep two paths of replenishment in place and will need assistance to make the dual inventory work smoothly.

Recommendations

Be aware of the long hours and the compressed time frames under which both the food concession and housekeeping staff are operating. Adjust the training to their schedules and be prepared to redesign the pacing and flow of work if needed.

Observe the effectiveness of training and be sure that bilingual and color-coding is used when required.

Form a special recycling team. Identity the good employees, get them on the team and reward with bonuses of movie tickets and other desirable recognitions.

If operating in a multicultural environment, be sure to work within the expected methods of chains of command. Do not go around or over the supervisor once that person has been identified and designated.

CHALLENGE – Food Vendors Uncertainty About Biodegradable Performance

Most venues usually have an exclusive seating area such as suites, skyboxes, clubhouse, or similar setups. A catering firm that is under contract to the stadium management usually services these areas. These areas have a wider variety of menu items and can have a clientele that is more demanding in terms of appearances, esthetics, and service expectations. The utensils may be silverware with food served on ceramic plates. Appetizers and snack foods may be served between meals on plastic plates.

Food outlets of a more informal nature service the remainder of the stadium seating. Typical menu items are pizza, Mexican food, hamburgers, and similar offerings. Almost all utensils and plates are plastic with some food served on paper plates.

Each seating area presents unique challenges to the introduction of biodegradable plastics items. The exclusive sections of a stadium have a clientele that is more demanding in terms of appearances, esthetics, and service expectations. There is a mix of cutlery used in the skyboxes ranging from permanent (i.e. silverware and ceramic plates) to plastic items that have a very high level of finish and feel. The types of plates and, to some degree the utensils, that are available in biodegradable form do not match the level of finish of the non-biodegradable items. The sensitivity of the biodegradable items to hot foods and liquids is also an issue to the catering service.

At the other end of the spectrum are the food outlets serving the regular stadium seating that utilize only plastic cutlery. The challenges here are first, hot foods that can cause degradation of the utensils and plates and, second, the wide variety of sizes and types of plastic items used in the food outlets. The sizes of bowls, plates, and cups are very important to the vendors, as portion control is critical to their profitability. A third challenge to the introduction of biodegradables is that many of the existing plastic cups have company logos and other promotional printing on their sides.

Solutions

The relationship with the food vendors is one of the most important elements of the successful introduction of biodegradable plastics. The vendors are being asked to allow

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

the introduction of a new critical component into their food service. Their concerns are valid and need to be fully addressed. If the vendor can see that you are adaptable and responding to their concerns they will begin to take broader steps to accommodate the substitution of biodegradable items into their system.

They are looking for three things: price, performance, and the service capability to meet their shifting requirements (the number of meals served varies directly with the variation in attendance figures.) Meet these three requirements and the number of biodegradable items in use will grow.

The introduction of specific biodegradable items on a one-at-a-time basis will allow experience to be gained and for the vendor to grow confident of the biodegradable products. A limited number of successful items is a realistic goal. Full scale-implementation of 100% biodegradable will take time and needs additional development both in variety of products manufactured and the depth of distribution.

Recommendations

Begin the introduction of biodegradable items in the regular stadium seating area food outlets. The hot food issue and the lack of finish and feel preclude the use of biodegradable items in the high-end seating areas.

Identify the food outlets that serve cold drinks, ice cream, and food items like hamburgers, pretzels and the like. The foods will serve well on the biodegradables and the vendors can develop a confidence in the biodegradable alternatives.

Identify what size cups, bowls, and styles of cutlery are available and can be delivered reliably to the stadium. Start with a few items that can be guaranteed without hesitation and then exceed the vendors expectations for timely delivery.

Continue the dialogue with the food vendors. Their initial response is likely to be polite but non-committal. Follow-through and introduce items on a one-at-a-time basis. At the end of the day (or night) check the performance of the item, make any requested modifications and continue the dialogue.

The management of food preparation and delivery is cyclical with peak demand periods. Do not expect any interaction

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

during the peak periods; in fact, its best to stay out of the kitchen.

CHALLENGE – Hot Food/Styles/Printing and Biodegradability

The heat sensitivity of the biodegradable plastics is an area that requires additional attention. The biodegradable needs to begin decomposing at 150 degrees Fahrenheit in order to compost. Foods are served at 140 to 160 degrees F. The ten degree temperature overlap compromises the ability of the biodegradable items to be accepted by catering companies for obvious performance related reasons.

The ability of biodegradable cups to allow the printing of various logos and promotional messages is both a technical and market acceptance issue. Current proprietary pilot projects appear to be successful in addressing the challenges of printing. The issue of coordination with national promotional campaigns is more complicated and is addressed in the section below on sponsorships and endorsements.

At the time of the 2004 event, biodegradable products could not satisfactorily match the wide variety of sizes and types of plastic items used in the food outlets. The exact sizes of bowls, plates, and cups are very important to the vendors, as portion control is critical to their profitability.

There will be issues in replenishment of biodegradable product at the food vendors' concessions and subsequent collection of the disposed items until the variety of biodegradable items expands. The limited variation in the availability of biodegradable products will result in a dual inventory of some biodegradable product mixed in with traditional plastic items.

Solutions

This is a fundamental issue that will likely be addressed as the major resin producers expand their distributorships and product lines. A major soft drink company has completed the research and development of a biodegradable cup that is projected to be available commercially for the 2005 event.

Recommendation

Do not attempt to introduce a biodegradable product into an event if there are any performance issues. One melted hot

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

plate will likely result in the failure of any program. Work with the distributor before to determine the performance parameters of the item. Be vigilant during the roll-out of the program and immediately remove any item as soon as any doubt arises about its performance.

CHALLENGE – Profitably Integrate the Sustainability Concepts into Stadium Operations

All stadiums and large venues are involved with many types of sponsorships and celebrity sports endorsements. These arrangements impact efforts to introduce biodegradable items as they usually dictate what brand of food products are sold and what type of logos and promotional messages are printed on cups. The monetary value of sponsorship and endorsement arrangements is considerable and their importance to stadium management is significant.

Sponsorships are highly valued and the terms of the arrangements dictate food brands, advertising, and promotions very explicitly. These arrangements impact biodegradable cups particularly and eliminate certain cup substitutions.

The corporate sponsor or the exclusive food product provider may change from season to season. Thus a sponsor that accepts and supports the concept of substitution of biodegradable items may be changed to a sponsor that knows nothing about the concept and the program will need to reintroduce itself.

Any effort to obtain celebrity endorsements involves their agents. This greatly complicates the endorsement possibilities and limits the name recognition selection to minor players or to players who will involve themselves directly in the negotiation.

Some sponsorships are done on a regional or national level. The breadth of the terms makes it difficult for an individual program at an individual stadium to gain entry into the discussion.

Solutions

The most effective approach to handling potential sponsorship barriers is to create a separate category of environmental sponsorships. This approach allows for more freedom and

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

creativity than attempting to work around the barriers of existing arrangements.

Environmental sponsorships are currently associated with efforts to portray the sponsor as environmentally supportive. The sponsorship potential identified in this project would broaden the benefits to the sponsor to include sale of product, branding, and broad based exposure.

For instance, Coca-Cola served in biodegradable cups would tie in the soft drink product with the "green" biodegradable plastic container. As part of this type of sponsorship Coca-Cola would then be the exclusive soft drink served in the stadium.

The sponsorship discussion in Section 1 of this report provides a detailed description of the sponsorship experiences gained from this project. At the conclusion of the event, valid sponsorship potential was established.

Recommendations

Recognize the basic centrality of sponsorships to the stadium and large venue world. They interact with the media dollars at various levels and these sponsorships sit at the core revenue structure of profitability.

Identify all branded plastic food service items. Do not attempt to introduce any biodegradable items that do not support the stadium's sponsorship branding theme.

Identify places where biodegradable items can supplement branded pre-printed sponsor items. For instance, the branded cup may be 16 ounce and the food vendor may want to offer an 8-ounce portion but there is no pre-printed 8 ounce cup provided by the sponsor. Ask the stadium management to check with the sponsor for permission to introduce a clear 8 ounce biodegradable cup.

Utilizing a two-year timeframe, begin discussions with the stadium management on the development of an environmental sponsorship. This approach transforms sponsorship barriers into sponsorship support.

The technology of biodegradable plastics is quickly evolving and this will allow more options for printing logos and satisfying sponsorship branding requirements and expectations.

PROJECT RESULTS

The project began with the following goals:

1. Establish the viability of utilization of biodegradable plastics in a large venue environment.
2. Divert 60% of total event wastestream through utilization of biodegradable plastic items.
3. Stimulate the development for the market for biodegradable plastics through demonstration of successful usage by one of the nation's largest catering and food service companies.
4. Establish future sustainability strategies for the current diversion program with the inclusion and acceptance of biodegradables.

During the project a fifth goal was established to determine the compostability of the items used in the event.

GOAL 1

The project successfully established the viability of using biodegradable plastics in a large venue.

- Clear 6 ounce plastic cups were used at the Margarita Bar with no performance issues.
- Biodegradable spoons were used at Ben & Jerry's.
- Biodegradable forks, knives, and spoons were used at four outlets serving salads, sandwiches, and BBQ chicken plates.
- Clear PLA 15-ounce bowls were used for salads. The bowls demonstrated that they allowed salads to be prepared the night before and stored overnight in refrigerators with no bowl degradation and no negative impacts on the salads freshness or appearance.

GOAL 2

The project did not meet its goal of diverting 60% of the total event wastestream by adding use of biodegradable plastic

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

items. When the goal was set it envisioned the introduction of 100% biodegradable plastic throughout the event. A 100% usage of biodegradables was not achievable for four reasons.

1. Marginal performance of forks and spoons in hot foods such as beans with a high liquid to solids ratio. The marginal performance may also have been due in part to the high ambient temperature (90 degrees+) with the cutlery standing all day in direct sunlight.
2. The wide-spread use of preprinted cups as part of sponsorship agreements.
3. The wide range of sizes and types of plastic items used by the food vendors coupled with the requirement to have a distributor with a 24 hour response time. These conditions limited the range of biodegradable items that could be introduced.
4. The need for the catering company to have a certain feel and finish to the plastic items used in the high-end seating (i.e. the suites) which current biodegradable products cannot match.

The effect of the four barriers required a dual usage of biodegradable and non-biodegradable plastic throughout the event. The mixture was not compostable and thus the increase in diversion was limited. The event was successful in diverting 10.6 tons of food waste, 14.1 tons of cardboard, and 3.4 tons of glass, plastic, and aluminum. The total event generated 95 tons of waste, diverted 28 tons of food and recyclables with an overall diversion rate of 29%.

GOAL 3

The project's third goal was to stimulate the development for the market for biodegradable plastics through demonstration of successful usage by one of the nation's largest catering and food service companies. Restaurant Associates was the food vendor for the event and provides similar services for events on a national basis. Their confidence in the biodegradable items used in the event was established and they expressed a willingness to use the items in the future. In light of their statements we believe that the project's third goal was achieved.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

GOAL 4

The project's fourth goal was to establish future sustainability strategies for the current diversion program with the inclusion and acceptance of biodegradables. The successful introduction of the cups, bowls, and cutlery has provided a basis for the establishment of an Environmental Sponsorship by the management of the Tennis Garden.

The sponsorship program will assure the further development and strengthening of a sustainability strategy within the Tennis Garden. The recycling program began with aluminum cans over 6 years ago. It now encompasses an extensive event-long diversion program for recyclable containers, cardboard, and food waste.

The introduction of the biodegradable plastics into the event is being broadened as sponsorship arrangements are currently under development and will be implemented in 2005. This involvement with sponsors, along with the additional R&D being done by the biodegradable resin producers, will result in an expansion of the level of biodegradable plastic usage throughout the Tennis Garden.

Given the experience demonstrated at the Indian Wells Tennis Garden, there is no barrier standing in the way of the introduction of biodegradable plastics; stadiums throughout California can introduce them with confidence.

GOAL 5

An additional goal was established in mid-project to conduct field tests of the compostability of the biodegradable plastic items. A three-part field experiment was developed by the project team to ascertain the "real world" compostability of the biodegradable food service items. A practical confirmation of the compostability of the biodegradable food service items introduced into the Tennis Garden was their complete decomposition in California Biomass composting processes. Hopefully, the results of these field tests will contribute to the growth of biodegradable plastics usage.

THE NINETEEN STEP PROGRAM

1. Most large venues (baseball and football stadiums, the Tennis Gardens, etc.) are privately owned and operated.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

Their decision to use biodegradable plastics and to implement waste diversion programs is entirely voluntary. This means the biodegradable project must always operate in a spirit of cooperation with respect for the main reason the venue exists: as a location for the sporting event.

2. The best ways to get stadium owners and managers to agree to participate in a biodegradable plastics and a diversion program are to inform them of (1) the potential for avoided disposal costs, (2) environmental benefits of the programs, (3) the fact that biodegradable can be used without loss of aesthetics or functionality, and (4) examples of stadiums where biodegradable have been successfully used.
3. Begin work with stadium owners, managers and the food service vendor(s) at least 8 months prior to the introduction of biodegradable plastics. Form a team that includes the above plus the waste hauler, the compost facility, and the local government and/or consultant who will coordinate the program. Take time to let team members get to know and trust each other.
4. Make the first use of biodegradable plastics a pilot test at the venue. Select one week, or a special event, or a pre-season set of games or some finite timeframe within which to test the biodegradable plastics.
5. Understand the entire food service system, literally from "soup to nuts". Research all the types of food service items used, the stock on hand, the typical rate of usage, the temperature (both stored temperature and temperature when food is served), and any imprints (logos or corporate names) on food service items. Learn how the current system works so you can replace non-biodegradable items with biodegradable in a seamless fashion.
6. Get to know your biodegradable supplier(s) well in advance of the event. Make sure you know their distribution and delivery system, including the advance time needed for orders and delivery of items to the venue. Design a method to fill orders from the stadium food vendors in the same timely manner (usually 24 hour

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

lead time, or less) they experience with non-biodegradable.

7. Training of stadium managers, food service personnel, chefs, kitchen workers and janitorial staff is key and time consuming. Assume that personnel will be stressed, tired and may change during the biodegradable project. Be prepared for this. As difficult as it may be, always remember you are adding a (sometimes unwanted) extra job to the workdays for these employees. Your honest enthusiasm for the biodegradable project, plus explaining the positive benefits of the program, will go a long way toward engaging these employees to support the use of biodegradable.
8. Plan to work the same hours as the stadium employees. This includes the evening "post event" shifts when the stadium is cleaned, food is prepared for the following day, food containers are ordered and/or delivered, and waste is collected and placed in containers to go offsite either to the compost facility, recycling facility or for disposal. (working alongside the stadium employees during all shifts also goes a long way toward saying that you are committed to the program and are willing to physically put in the time required to make sure it works.)
9. Keep abreast of changing developments in ASTM standards for biodegradability and the vendors and their products that meet the standards for your project. When new products are introduced, obtain samples and specifications. Keep these in mind as substitutes for any non-biodegradable items still in use at your target venue.
10. Give all the food vendors numerous samples of each type and configuration of biodegradable plastic container and cutlery two months in advance of the event so they can decide whether the products are aesthetically acceptable and whether they meet the internal standards of the vendors. Bear in mind these vendors have complex contract requirements with the stadium that must be met. Encourage the food vendors to test the containers and cutlery to their satisfaction. If a particular container does not work for them, endeavor to find another that will.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

11. Give your compost facility staff the ASTM specifications for the biodegradables you plan to use, along with samples that they can compost to make sure the facility can maintain compliance with all the federal, state and local regulations governing compost facilities. This will give the compost facility confidence in the biodegradable prior to the pilot program.
12. Beware of storing biodegradable items in the sun or at venues where temperatures climb above 90 degrees in the daytime. Take special precautions to make sure biodegradable items are stored inside in a cool place.
13. Placement of recycling containers for food scraps and biodegradables is key. Placement must make use of the containers easy and fast for kitchen and event staff. If the public must sort biodegradable, food scraps and other recyclables from solid waste, signage is key!
14. Don't try to use biodegradable items in the high-end seating such as skyboxes, suites, etc. until at least year 3 or 4 of the program. The expectations of the guests in these areas are high and this is the most difficult place to introduce biodegradables, at least at this point in time.
15. Test all biodegradable items with each type of food being served by each food vendor on the first day of the event. Immediately pull any item(s) that do not perform perfectly. Word of one melted fork in the hot beans travels fast and you don't want the program to receive undeserved negative publicity.
16. Plan to fully staff the stadium or the event, working the same hours as stadium personnel. Make a detailed schedule (similar to that of restaurant shifts) showing what personnel from the local government agency and/or their consultant) will cover the event at all times. This schedule is sacred. If someone has to change their shift, it is up to them to find a fully trained replacement. The program will not "run itself". Expect that you will need to troubleshoot the program throughout the entire event or the entire duration of the pilot program.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

17. Never argue with stadium manager, employees or food vendors. Comply with their needs and requests on the spot and work out problems after hours, not in the heat of the event. Always recognize their main job is to supply food and to put on a successful sporting event. Biodegradables will never be their top priority.
18. Stadiums and special sporting events utilize a complex system of sponsorships to make the sporting events financially viable. Sponsorships are highly treasured and are very valuable to the corporations courted by the stadiums and the events. Once a pilot program has been successfully completed, it is highly desirable to see if you can implement an environmental sponsorship for the biodegradables at your target venue. In this way a sponsor can require the use of biodegradables for its food and/or beverage products, and possibly for other foods and beverages. This is invaluable in gaining cooperation from stadium management and the food vendors to keep a biodegradable program going.
19. These projects change well-established systems of food service, janitorial, and disposal practices in large venues. They can be viewed, at first, as disruptions to the orderly operation of the venue. Being a change agent requires a long-term commitment to the project and the ability to meet challenges with long hours of work in an enthusiastic and calm approach. The results are well worth it.

THE FUTURE OF BIODEGRADABLE PLASTICS AT THE TENNIS GARDEN

The waste diversion goals and achievements at the Tennis Garden have grown steadily ever since the inception of the pilot food scrap program in 2001. The disposal savings are now saving the Tennis Garden \$13,800 per year. These savings, combined with the overall increased level of tighter management control over housekeeping and waste disposal services, has internalized the food scrap and recycling program into the management of the Tennis Garden.

FINAL REPORT - USE OF BIODEGRADABLE PLASTICS IN STADIUMS

The successful substitution of 100% of the plastic food service items would result in another jump in disposal cost savings of a similar magnitude. As noted in the discussion on costs, a total cost scenario projection was developed. The scenario is based on the success of the food scrap and recyclables diversion and assumes a constant rate of improvement in the quality and style of biodegradables. The best total cost structure can be achieved by (1) the complete substitution of biodegradable food service items throughout the Tennis Garden with the diversion of all food scraps and a consequent 50% to 80% reduction in the event's \$15,000 disposal bill and (2) an Environmental Sponsorship with a value averaging between \$50,000 to \$300,000. The project team feels this scenario is achievable within the next three years.