

## SECTION 1.0 INTRODUCTION

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The City of Jacksonville (City) contracted with TIA Solid Waste Management Consultants, Inc. (TIA) to conduct a market analysis for spent food service polystyrene generated by the Duval County Public School District (DCPS). This report will satisfy the requirements of Task Two of the additional scope of services in Attachment A-1 of the County's contract with the Department of Environmental Protection (DEP), and it includes information intended to be incorporated into Duval County's final report to DEP in connection with the County's Innovative Recycling Grant. Task 2 includes a survey of current and potential markets for polystyrene recovered by DCPS to gather information about material specifications and prices, locations of markets within Florida, and traditional and non-traditional market uses for polystyrene.

The DCPS, the 15th largest school district in the country, has a well-established comprehensive recycling program in 167 elementary, middle, and high schools throughout the district that recovers polystyrene, office paper, newspaper, telephone books, corrugated cardboard, PET, aluminum cans, fluorescent bulbs, steel cans, appliances, wood, and construction and demolition debris. Few school districts in the State of Florida recover polystyrene generated by school cafeterias, and markets for recovered polystyrene are extremely limited. For example, one district collecting the material is actually diverting the material to the local waste-to-energy facility until a new market can be found. Currently, processing costs for shredding the collected material from DCPS are covered by funds provided by the Innovative Recycling Grant.

### **1.1 Methodology and Protocols**

The objective of this study was to identify viable local and Florida markets for recovered polystyrene. This market analysis focused on one specific plastic commodity, polystyrene, a material that was recovered throughout the DCPS system and processed as a pilot project funded by a DEP recycling grant. The analysis began with inquiries to national trade associations and included surveys of existing polystyrene processors and end users in Florida, producers of polystyrene products, and businesses that may have the capacity to use processed polystyrene in their manufacturing processes.

The analysis was performed in the month of November 1999. Prior to the analysis, a list of prospective industry contacts and phone numbers was compiled representing trade associations,

handlers/reclaimers, end users, and manufacturers. (Surveys were developed for each category, and questions were compiled focusing on market requirements in terms of volumes, shipping and handling, pricing, and specifications for recovered polystyrene material.) Additionally, surveys included questions about obstacles encountered with recovering, processing, and marketing this material, as well as current and future market outlooks for the material.

## 1.2 Polystyrene Definitions

In order to accurately track and analyze data for the market analysis, **TIA** reviewed industry-standard definitions related to Polystyrene (PS) material. PS is listed as the # 6 plastic in the code system for classifying plastic containers. For purposes of this market analysis, **TIA** used the term expanded polystyrene (EPS) when gathering data and surveying market participants.

According to the American Plastics Council's (APC) resource guide, *How to Develop a Post-Consumer Plastics Handling Business*, PS is a versatile resin with physical properties that include clarity, the ability to foam, and relative ease of processing. Ironically, it is one of the least-used plastics for household packaging. PS is typically used in some yogurt containers, egg cartons, meat trays, rigid disposable drinking cups, plates, cutlery, and foam cups.

APC defines two types of PS, rigid and EPS. These materials are used extensively as packaging material, compact disk and cassette cases, foamed food service clamshells, loose-fill packaging, and electronic component packaging. According to APC, although some markets accept food service packaging items, demand is greater for EPS protective/transport packaging, which is free of contamination. **TIA's** market analysis focused exclusively on food service EPS.

The Polystyrene Packaging Council (PPC) lists four types of polystyrene food service containers. Hinged containers, plates, or cups are considered extruded polystyrene foam. Cups, containers, and shapes are expanded beaded polystyrene foam (EPS). Lids, plates, and bowls contain extruded solid polystyrene, and injection molded polystyrene is used for tumblers, glasses, flatware, dishes, and bowls.

## 1.3 DCPS's Current Polystyrene Recovery Program and Quality Review

During the City's 1997 Innovative Recycling Grant Project, EPS was collected from school lunchrooms and commingled with other recyclables for collection and processing. According to DCPS's polystyrene processor, of the approximately 242,000 pounds of material received from

DCPS during the project period, 79 percent was processed for recycling and 21 percent was landfilled.

In a study conducted in connection with the Innovative Grant Project, **TIA** found 15 percent contamination by weight for EPS sorted during the DCPS polystyrene participation study. Although that study showed an average recovery rate of 78 percent for the six schools included in the study, **TIA** believes that actual recovery rates, even under optimal conditions, would be lower than the study indicated due to contamination levels. Figure 1 depicts this sample material.

During the Innovative Recycling Grant Project, DCPS conducted several pilot studies to test samples of the processed material. The processed polystyrene was chipped and blended with composted yard waste from campus beautification projects. DCPS's polystyrene was also delivered to a concrete sculptor, tested to create insulated concrete forms (ICF), and mixed with concrete to construct a sidewalk and concrete pad for a dumpster.

**Figure 1. DCPS Polystyrene Participation Material**



## SECTION 2.0

### SUMMARY OF FINDINGS

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**TIA** summarized information obtained during the market analysis, which included detailed conversations with and survey results from polystyrene market participants. **TIA** initiated survey calls with Polystyrene (PS) trade associations to gain historical and current market information. PS reclaimers and handlers were surveyed, as well as end users and manufacturers.

**TIA** compiled a preliminary contact list for companies involved with marketing polystyrene. In order to begin the detailed survey work with these companies, **TIA** eliminated those market participants who stated they did not handle EPS polystyrene. Of the thirty-three companies contacted, **TIA** eliminated twenty-nine market participants who stated they did not handle EPS polystyrene. Attachment A provides an overview of these companies.

Survey results for four industry segments were compiled and analyzed. Copies of the survey questions for each segment are included in Attachment B. Survey findings are highlighted in the following sections.

#### **2.1 Trade Associations**

Currently, three primary trade associations promote polystyrene recycling and coordinate industry market development. All three association representatives contacted by **TIA** responded to the survey. These associations include: the Polystyrene Packaging Council (PPC) in Arlington, VA, now a part of the American Plastics Council; the Food Service & Packaging Institute (FSPI) of Arlington, VA; and the Alliance of Foam Packaging Recyclers (AFPR) in Crofton, MD.

Two of the three trade associations reported that current market values for EPS are expected to remain stable and relatively low as long as virgin prices for PS stayed depressed. These industry sources pointed out that fluctuations in market values for EPS have been predominate in recent years. The values have generally stayed low.

According to a PPC report, in the early 1990's, the price paid for delivered EPS material to Chicago was \$ .07 - \$ .09 per pound or \$140 - \$180 dollars per ton. As the mid to late 1990's

approached, EPS values dropped and generators were required to pay a fee to recycle this material. This same report indicated that in 1992, 40 million pounds of polystyrene was recycled, with the majority of the 500,000 pounds coming from Florida school cafeteria programs. DCPS is one of seven schools in this report still recovering EPS material. DCPS recovered 240,000 pounds of EPS over a one year period (1998-1999).

Industry association sources stated that post-consumer end uses for polystyrene generally include the manufacture of consumer products such as office products, letter trays, waste containers, VCR tapes and cassette tapes, and flower pots. Post-consumer polystyrene resin is also found in industrial materials like building insulation, foodtrays, and splinterless plastic lumber.

## 2.2 End Users

The following four end user markets currently accept EPS from the DCPS polystyrene processor: Florida Rock, Enviro-Comp Services, Rastra, and Kingston Statuary. TIA contacted representatives from all four end user markets. Of the four representatives contacted, two companies responded to the survey.

Florida Rock mixes processed EPS with concrete and has pilot tested the DCPS EPS material in construction of a concrete pad and sidewalk. Florida Rock has not encountered any technical obstacles when using EPS material as an additive to concrete. Their process utilizes 5 to 7.5 pounds of polystyrene per yard of concrete. At this time, the use of EPS in concrete production increases costs slightly because additional labor costs are incurred to manually add polystyrene to the concrete mix. (Standard production costs are kept down by using pre-measured formulas that are mechanically fed into the mixture.) Labor costs could be reduced if sufficient volumes of processed EPS are available to justify the addition of a tank feeder system, although the initial capital outlay for this equipment would require financing.

Florida Rock believes that an education campaign targeting concrete customers is necessary to explain the benefits of using polystyrene in the concrete mix and to increase consumer confidence levels for EPS-content concrete. In an effort to reduce costs associated with EPS use, Florida Rock suggests working with generators of homogenous EPS to encourage them to use the avoided disposal costs to offset the cost of using EPS for production of EPS-content concrete.

Enviro-Comp Services participated in a pilot project with the DCPS to produce an EPS-content compost product. Enviro-Comp Services accepted ground EPS in "BB" size particles for

blending with compost. Enviro-Comp was pleased to have participated in the innovative grant sponsored pilot project, but the company has no plans to receive additional EPS material from homogenous generators at this time.

Rastra creates a building material that consists of spent EPS mixed with cement. Items produced from this mixture include concrete wall panels for institutional and commercial construction applications. As a pilot project, Rastra used DCPS EPS material to produce sample panels. According to DCPS, school administrators expressed initial concerns regarding the possibility of bacteria growth in the panels. Environmental tests are currently being performed to determine whether bacteria growth constitutes a potential health and safety risk in connection with this EPS application.

**TIA** tried unsuccessfully to contact a Rastra representative to gather additional information concerning Rastra's market requirements for EPS. **TIA** therefore relied on internet website and conversations with DCPS recycling personnel to gather Rastra information. In spite of repeated attempts, **TIA** was also unable to interview a representative of Kingston Statuary.

### **2.3 Handlers and Reclaimers**

**TIA** contacted twenty-four Florida handlers and reclaimers during preliminary research work. Of these twenty-four participants, only three reported accepting EPS material from food service establishments.

**TIA** contacted these three handlers and reclaimers who offer an alternative handling or collection process, advanced processing technology, or innovative reduction equipment for processing EPS. **TIA** contacted Dart Container Corporation (Dart), International Foam Solutions (IFS) and Moriah Industries (Moriah).

Dart offers two programs for collecting EPS. The RECYCLA-PAK program allows generators to collect and ship post-consumer foam cups back to Dart in original shipping containers in which EPS materials were received. For large institutional customers, Dart also places material reduction equipment for collecting polystyrene in food service areas as part of the Cups are Recyclable (CARE) program. Currently, customers pay a service fee for the use of this equipment because the depressed market for virgin PS has diminished the value of post-consumer PS.

IFS is located in several states across the nation. This company sells or leases machines that significantly reduce the volume of polystyrene to a foam base. IFS accepts but does not pay generators for the foam produced by equipment located at generator sites. Once the material is reduced to a foam form, it is transferred to 55-gallon drums for collection. At the present time, processed EPS material is being collected from generators and stored due to insufficient quantities of foam to justify the cost of constructing a facility to convert the foam into pellets. IFS needs six to eight million pounds of EPS foam to warrant construction of a facility.

**TIA** was not able to contact a Florida representative for Moriah Industries prior to completion of the study. Moriah has locations in Jacksonville, Florida and Rome, Georgia. Moriah is the processing company that processed DCPS EPS using processing equipment purchased in connection with the City's Innovative Grant Recycling Project.

## 2.4 Manufacturers

**TIA** contacted three companies that manufacture polystyrene containers. Dart Container Corporation (Dart), Tenneco, and ELM Packaging Company (Polystyrene Company of America). Only two of the three company representatives responded to the survey. These companies were surveyed concerning their promotion of closed-loop recycling programs for customers who purchase their polystyrene food service containers and their use of post-consumer EPS material in their manufacturing process.

Dart Container Corporation offers the RECYCLA-PAK program described above. Dart recycles these containers by converting them into "BB" size pellets for sale to a secondary market.

ELM has EPS recycling operations in both Chicago and Los Angeles. The EPS recycling division, Polystyrene Recycling Company of America, accepts any PS with a #6 code. **TIA** contacted the Chicago recycling division to gather information. PS material is generally transported to their facility by truck. EPS food service material is accepted as long as the material is relatively clean and free of contaminants. The Polystyrene Company of America representative indicated that contamination is a predominant problem in their manufacturing process at this time. The company currently charges 15 cents per pound or \$300 per ton to recycle polystyrene.

In spite of repeated attempts, **TIA** was unsuccessful in efforts to contact a representative of Tenneco in Covington, Georgia.

## **SECTION 3.0**

### **IMPLICATIONS FOR POLYSTYRENE MARKETING**

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The Polystyrene Market Analysis study provided sufficiently reliable information that can be used as a basis for gaining insight into past and current market conditions for food service polystyrene referred to as EPS. During the course of the study, over thirty companies were contacted. Whether a company plays a role as a processor, handler, reclaimer, end-user, or manufacturer, one thing is clear, all of these companies have been impacted as a result of a deteriorated market for polystyrene since the early 1990's.

Many in the polystyrene industry aggressively promoted polystyrene recycling programs in the early nineties, especially EPS programs, as a way to prevent potentially damaging legislation. While these initial efforts to promote recycling and best management practices for manufactured polystyrene products were largely successful, the long term success of these programs has been frustrated by the realities of the market place, and deteriorating market value for EPS has limited widespread recycling.

TIA's research in connection with this market analysis indicates that EPS school collection programs were implemented in Florida without a proper end-user market to complete the recycling loop. As recovery programs expanded, contamination levels in individual programs increased without the lack of support of long-term educational assistance, a circumstance that forced many processors to stop accepting food service EPS. Many of TIA's preliminary inquiries were met with a firm response that no food service polystyrene is accepted by their facilities, unless the material was free of all contaminants, a difficult standard to meet in the absence of a fully supported infrastructure and comprehensive education program.

In 1992, 500,000 pounds of EPS material were collected in Florida from seven established school cafeteria EPS programs. According to DCPS's recycling collection hauler, BFI, 242,000 pounds were collected from DCPS over a twelve month period. DCPS is currently recovering 48 percent of the amount collected throughout Florida in the early nineties. DCPS is only one of seven schools referred to in the PPC study still recovering and marketing EPS. As a result of unfavorable market conditions, no substantial improvements in the amount of EPS collected from schools in Florida have occurred since 1992.

DCPS's waste composition study determined 5 percent of the DCPS waste stream to be polystyrene. An additional study established participation rates at 78 percent. Contamination rates by weight equaled 15 percent for this same study. DCPS's hauler tonnages calculate contamination rates of 21 percent for EPS material processed at their Materials Recycling Facility (MRF). Thus, contamination rates appear to range between 15 and 21 percent. These contamination rates would reduce participation recovery rates and impact the quality of material received for processing.

TIA's survey questions contained information requests regarding pricing and quality requirements. Many participants were not able to provide specific information for EPS material. Most market respondents had not handled sufficient quantities of EPS to quote a market price or cost per ton. Some survey participants did not respond within the allotted time frame to gather specific cost and market specification data.

The change in market conditions from the early to the late nineties is clearly demonstrated by the dramatic deterioration in EPS market values. In the early 1990's entities were paid \$140 to \$180 dollars a ton for delivered EPS. Today, Polystyrene Company of America (ELM) is the only known company found in this study quoting a charge of \$300 dollars per ton to recycle EPS material.

Industry representatives agree that traditional markets have depreciated sharply in recent years and are not expected to improve in the near future. For DCPS, this means that continued relationships with innovative end-users like Florida Rock and Rastra are important in building a potential infrastructure for Florida's EPS material. But in order to create this infrastructure for Duval County and the other 66 school districts in Florida, market requirements for homogenous EPS will need to be specified and partnerships between generators, collectors, processors, and end user markets will need to be established. All EPS generators, including not only schools but also corporate cafeterias, special events, and theme parks who use EPS material in routine food service operations, will benefit from standardized market specifications.

The next step for DCPS is to move forward and calculate the full economic implications for recovering EPS in order to develop viable market relationships with end users such as Florida Rock and Rastra. In order to begin these next steps, DCPS needs certain cost figures. BFI collection costs to haul DCPS EPS material are available through DCPS's 1998/1999 recycling collection contract. The DCPS EPS processor, Moriah Industries, can provide processing costs per ton for the Innovative Grant Recycling Project. DCPS will, therefore, be able to calculate the

full cost to recover food service EPS. A review of avoided disposal costs for recyclables diverted is an important additional calculation. Calculating these savings will allow DCPS to review how much of the primary costs associated with a recycling program, collection and processing, are currently being covered as a result of avoided disposal. Any move to apply these savings in payment to an end-user would be premature. This information will provide DCPS with the ability to perform a full-cost-accounting analysis for the collection, processing, marketing and disposal of EPS material.

In order for DCPS to implement a strong recycling program that is institutionalized throughout the school system, **TIA** recommends a review of all current reports of and activities in the current recycling program, including the polystyrene program participation evaluation , the waste composition study, this polystyrene market analysis and the forthcoming paper market analysis. In addition, the DCPS has issued a bid for solid waste and recycling collection services, the outcome of which will provide DCPS with some time to review the existing collection program. A review of this information will aid DCPS to evaluate the feasibility of continuing an economically viable polystyrene recycling program for school cafeterias that is institutionalized throughout the school system.