

The Beneficial Use of Waste to Energy Bottom Ash in Road Construction Projects in Pasco County

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Project Summary

Ash from the combustion of municipal solid waste at the Pasco County Resource Recovery Facility was used in the construction of innovative test roadway, as part of a research pilot project. This project was funded by the Pasco County Board of County Commissioners and conducted with support from the University of Florida. The successful completion of this project has led to the approval of the use of waste to energy ash in road construction in Pasco County.

Program Description

Currently, a large fraction of the municipal solid waste stream (MSW) in the Tampa Bay area is managed using waste to energy (WTE). Combustion of MSW creates electricity for the community while reducing the volume of material that needs to be landfilled. The Tampa Bay area is fortunate to have four waste to energy facilities that can combust approximately 2.5 million tons of MSW per year and produce over 150 megawatts of renewable energy, generating to enough electricity to power over 100,000 homes. In the United States, WTE ash is disposed of in secure landfills. The permitting, construction, operation, and maintenance, of these landfills represents a significant cost to the owner municipalities.

Although no WTE ash is currently being beneficially used in the United States, there are many European countries that place a significant emphasis on ash reuse. This is due in part to the limited areas of available land, as well as more robust environmental policies with a focus on reuse and recycling. Countries such as Germany, France, Denmark and the Netherlands all have reuse rates of WTE bottom ash over 70%. Shown in Figure 1 is a photograph of the waste tipping floor and pit

area at the Pasco County Resource Recovery Facility, where waste is staged prior to combustion.



Figure 1. The "pit" at the Pasco County Resource Recovery Facility

There are a number of potential avenues for the beneficial use of WTE bottom ash (the fraction of the ash that remains in the furnace following combustion), the most commonly practiced application is the reuse of the material in a road construction project. Because WTE bottom ash is a granular material, similar in size and strength to a typical construction aggregate it can be used as both a road base course (the structural layer under the pavement) or as an aggregate in asphalt and concrete pavement. An image of processed WTE ash, used as a construction material in a road construction pilot project in Pasco County is shown in Figure 2.

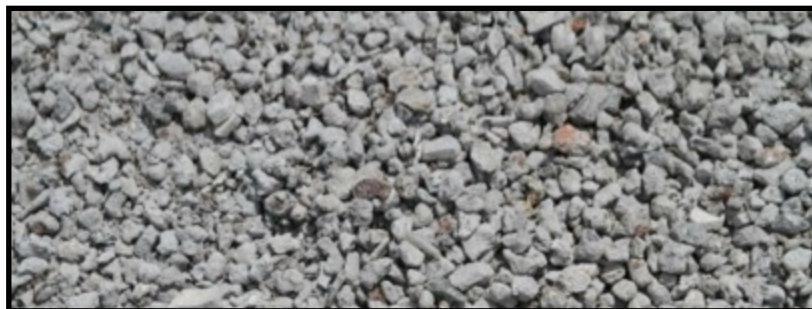


Figure 2. Processed Bottom Ash Used as a Component in Road Construction

In early 2014, John Power and the Pasco County Solid Waste Department, with support from the Pasco County Board of County Commissioners, began a research project to investigate the potential for beneficially using ash from the Pasco County Resource Recovery Facility in road construction applications. Operating under a Research, Demonstration, and Development permit from the Florida Department of Environmental Protection (Permit # 26254-004-SO-21) Pasco County Road and Bridge produced a 1,000 foot series of roadway test sections, on-site at the West Pasco Landfill, using WTE ash. Photographs of the test roadway being constructed are provided in Figures 3 and 4. WTE bottom ash was used as a partial aggregate replacement in asphalt and concrete pavements as well as the base course layer for one of the roadway sections. Groundwater monitoring wells were installed surrounding the roadway to ensure that the construction of these test sections would not result in any adverse effects to the environment.



Figure 3. WTE ash road base course being placed by Pasco County Road and Bridge

Environmental and civil engineering materials testing were conducted on ash used during the project by the University of Florida, Engineering School of Sustainable Infrastructure and the Environment, Solid and Hazardous waste management research group, under the direction of Dr. Timothy Townsend. Justin Roessler, a graduate student at the University of Florida, supported by the Pasco County project, was responsible for oversight of project research. Through the course of the

project the Hinkley Center for Solid and Hazardous Waste Management, the Florida Department of Environmental Protection, the Florida Department of Transportation, and the Pasco County Board of County Commissioners were actively involved, these parties provided extensive technical support and fostered dialogue on the most appropriate avenues to move the project forward.

Following the successful completion of the construction the ash roadway (July, 2014) and the collection of significant quantities of data on its environmental and structural performance, Pasco County Utilities with support from the University of Florida and Jason Gorrie of Covanta Energy, prepared a permit application requesting the authority to reuse bottom ash from the Pasco County Resource Recovery facility. This permit application was submitted in October of 2014, and was approved by the Florida Department of Environmental Protection in late December.

Approval of the beneficial use of WTE bottom ash for road construction in Pasco County represents the first approval of its kind in the state. With an increased emphasis on sustainable materials management and recycling, both at the state and federal level, and a goal of creating a circular economy, this project exemplifies a perfect example of how these challenges can be overcome by a group of people working together. Receiving this approval was the product of multiple years of work and a team effort by: The Pasco County Solid Waste and Public Works departments, Michele Baker and the entire Pasco County Board of County Commissioners, Jason Gorrie of Covanta Energy, John Power of Pasco County, Dr. Tim Townsend and Justin Roessler at the University of Florida, as well as many others.



Figure 4. Final Touches Being Put On The Concrete Segment Of The Test Roadway

Benefits to the Region and the Environment

Receiving approval for the recycling of WTE ash provides multiple benefits to the region and the environment. Implementing ash reuse is projected to result in a significant cost savings to the municipality. The avenues for these cost savings are two fold: first there is the cost savings associated with the reduction in the use of mined aggregates (limerock) for road construction. Next, there is the cost savings associated with the diversion of the WTE ash from the landfill, and the drop in the costs associated with disposal. Preliminary estimates project the cost savings for the beneficial use of WTE ash to be in the neighborhood of \$50,000-\$100,000 dollars per mile of two lane road constructed.

The most meaningful benefit of the approval of WTE ash reuse in Pasco County is that a significant increase in recycling rates can now be achieved. Replacement of natural aggregates with WTE ash represents a positive environmental impact as it reduces the carbon footprint (energy costs) associated with road construction and landfilling. Virgin materials require significant quantities of energy during mining, processing, and transport, all of which are reduced when WTE ash is used. Similarly, the energy inputs required to operate the landfill (where the ash was previously disposed) are decreased. Approval of the beneficial use of WTE ash also provides a benefit to the region by garnering increased publicity for the municipality. Already,

WTE ash reuse has been the focus of media attention; descriptions of the project have been presented in trade newsletters, at conferences, as well as in multiple forums throughout the University of Florida; these efforts will continue with the projects recent success. Provided in the accompanying CD is a video on ash recycling which was posted on the front page of the University of Florida website.

Finally, approval of ash recycling in Pasco county will provide a benefit to the region by opening the door for approval of similar projects in other Bay area municipalities. Pinellas County, the City of Tampa, and Hillsborough County all have WTE facilities with ash that could potentially be recycled. Now that the precedent has been set by the Pasco County team, other municipalities should find success in getting similar projects started and approved.

Steps Moving Forward

Pasco County's plan is to continue to move forward with ash recycling and begin full scale road construction projects using ash in 2015. Additionally, with continued assistance from the University of Florida, Pasco County plants to investigate avenues to mine the ash that has already been placed in the landfill, not only to use in road construction projects, but to extract and recycle the metals remaining in the material.