The Sustainable Materials Management Webinar Series

The Benefits of the Construction and Demolition Waste Recycling Industry in the U.S.

Tuesday January 20, 2015/1:30 – 2:45PM ET

Presenter: Dr. Timothy Townsend, PhD/ P.E., Professor of Environmental Engineering
University of Florida
Promoting The Recycling of Construction and Demolition Materials
It is the mission of the CDRA to:

Provide positive support and representation to the industry and CDRA members in legislative and rule-making venues that impact the recycling business.

Act as an advocate to promote C&D recycling and the recycle business in every manner possible that benefits CDRA members.

Facilitate and sponsor CDRA member interaction between the membership companies and further facilitate interaction between the membership and the many specialized services that can potentially benefit the membership such as equipment, financing, insurance and other specialized third party resources.
CDRA Facts

- Founded more than 20 years ago
- Nearly 300 members
- Located across North America
- Almost all are processors of C&D
- C&D World, the Annual Meeting of the CDRA, is March 29-31 in Nashville
C&D White Paper

- We suspected C&D was the largest waste stream in the country
- Not very well studied
- Impetus for C&D White Paper
- Another White Paper on concrete recycling
- Have material specific websites: shinglerecycling.org, drywallrecycling.org, and concreterecycling.org
Thank You For Participating

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The Benefits of C&D Materials Recycling in the US

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Sustainable Materials Management
Presentation Topics

• C&D Materials Overview
• Current State of Practice with C&D Recycling
• Quantifying the Benefits of C&D Recycling
  • Jobs, economic, environmental

Concrete

Major Market:

Construction stone (e.g., road base)
Asphalt Concrete

Major Market:

Hot Mix Asphalt Pavement
Asphalt Shingles

Major Market:
Hot Mix Asphalt Pavement
Wood

Major Market:

Fuel
Major Markets:

→ New drywall
→ Land application
Metal
Fines

Major Markets:

→ Fill material
→ Landfill cover
Refuse Derived Fuel
Other Materials

- Cardboard
- Carpet
- Carpet padding
- Plastic
- Green waste
C&D Recycling – State of Practice

Bulk Aggregate Processing Facility
C&D Recycling – State of Practice

Mixed C&D Processing Facility
Wood

Fines
Why Recycle?
Common Cited Benefits of Recycling

- Reduce landfill disposal
  - Protect environment
  - Better utilize land resources
- Save natural resources
- Save energy
- Save money
- Create green jobs
Quantifying the Benefits of Recycling

• Engineers and scientists now have a greater set of tools that we can use to quantify benefits from different waste management processes, including recycling.

• The University of Florida has been working with the CDRA to quantify the benefits accrued by C&D recycling in the US.

• Examples:
  • Landfill capacity savings
  • Energy savings
  • Life cycle environmental benefits
  • Job creation
  • Impact on local economies

Needed Information:
Amount of C&D Recycled
How Much C&D is Out There?

- US EPA 1996 $\rightarrow$ 135.5 million tons
  - 30-40% recycled
- US EPA 2003 $\rightarrow$ 170 million tons
  - 48% recycled

- Cochran and Townsend $\rightarrow$ 670 – 870 million tons

**Building-related only**

**Building and Non-building related**

Current Approach

- Mixed C&D
- Bulk Aggregate
- RAP
Range of National C&D Generation Estimates

Million tons C&D

- EPA 1996 Estimate
- EPA 2003 Estimate
- Cochran and Townsend 2002 Estimate - Lo
- Cochran and Townsend 2002 Estimate - Hi
- CMRA 2004 Estimate of CDD recycled
- Current CDRA Estimate 2012
2012 C&D Composition Estimate

- Bulk Aggregate: 64%
- RAP: 15%
- Aggregate: 6%
- Wood: 6%
- Drywall: 1%
- Asphalt Shingles: 2%
- Steel/Metal: 1%
- Fines: 5%
- Cardboard: 0%
Landfill Capacity Savings → US in 2012

- Assume 350 millions tons of C&D recycled
- Assume landfill depth of 50 ft
- Landfill area saved in one year → Over 4,000 acres
Environmental and Energy Benefits

• Highly cited environmental issues with landfills
  • Ecosystem degradation
  • Leachate contamination of water resources
  • Landfill gas issues (hydrogen sulfide)

• Direct benefits from recycling
  • Energy savings by using recycled materials versus virgin materials
  • Less energy use results in less emissions to the environment (e.g., greenhouse gases)

Carbon Footprint
Collection and Transportation

Solid Waste --> CO² → CO²

Distance

Waste Management Facility
Final Disposition

Solid Waste Management Facility

Landfill

MRF

CO₂, CH₄

Waste Management Facility

CO₂
Recycling
Recycling

Raw Materials Extraction → Manufacturing → Solid Waste → Waste Management Facility

CO₂, CH₄
Solid Waste Management and Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks
Life Cycle Assessment Tools

• A number of tools are now available that allow the quantification of energy and environmental differences between alternative management strategies over a materials lifecycle.

• Examples specific to waste:
  • **EASETECH (Denmark)** – Environmental Assessment System for Environmental Technologies
  • **MSW-DST (US)** – Municipal Solid Waste Decision Support Tool
  • **WARM (US)** – Waste Reduction Model
  • **WRATE (UK)** – Waste and Resources Assessment Tool for the Environment
WARM

- Developed for planners to track GHG emissions for an alternative scenario based on some baseline scenario
- Emissions calculations are made using life-cycle approaches that consider upstream and downstream impacts
WARM

- Web-based calculator (basic)
- Excel-based calculator (more advanced)
- Documentation (2012) and calculation transparency
Well-documented
Very accessible – even for decision-makers
Output (emissions and energy) consistent with most decision-makers at a community level who care about now (maybe more than they care about)
Energy Savings

- Waste recycling estimates were used along with WARM energy factors to estimate energy savings from C&D recycling.

Example: All of the asphalt recycled in 2012 resulted in an energy savings equivalent to 23,000,000 barrels of oil.
Greenhouse Gas Emissions

• Waste recycling estimates were used along with WARM GHG emission factors to estimate GHG offsets resulting from C&D recycling.

Example: All of the concrete recycled in 2012 resulted in a GHG savings equivalent to removing over 2.5 million passenger from the road during that year.
Job Creation

- Job statistics from both bulk aggregate and mixed C&D processing facilities have been collected.
Direct and Indirect Economic Benefit

- Economics statistics from both bulk aggregate and mixed C&D processing facilities have been collected.
Summary and Conclusions

- C&D is one of the larger components of our waste stream.
- C&D recycling is critical achieving targeted recycling rates.
- Tools are now available to quantify benefits associated with C&D recycling.
- Estimates clearly demonstrate the benefits of C&D recycling - economic, job creation, and environmental.
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QUESTIONS?

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