

ABSTRACT

Customer trials in the polyurethane foam manufacturing industry can generate a significant volume of residual materials and by-products. Depending on the specifics of the customer trial, these residual materials and by-products can be either hazardous or non-hazardous by RCRA definitions. Covestro LLC and their by-product management partner WTS



created a framework to ensure these residual materials are recovered and managed in a compliant, cost-effective, timely, and sustainable fashion. This framework is built on a firm

foundation of Hazard Communication and Product Stewardship and consists of five elements. The first element is preparation that involves understanding the materials being used in the trials including the competitors' products which were being replaced and estimating the volumes and characteristics of the expected residual materials. The second element is recovery and it ensures the collection of the residual materials are done in a manner that maximizes the end-of-life options. The third element is transport with a goal of minimization in order to maximize sustainability. The fourth element is end-of-life and involves the selection of the most appropriate disposal, recycling, reclamation or even circular applications such as responsible direct re-use. And finally the fifth element is documentation; no job is done until the paperwork is filed. This framework was approved by Covestro LLC leadership and is in place. The sample size is smaller than expected due to a lower than usual number of customer trials approved during COVID-19, but initial indications show that the framework will provide for a consistent and defensible process across the entire region (US, Canada, and Mexico).

PROBLEM FORMULATION

- Moving from an unsatisfactory situation to well understood problem
- Recovery and management of materials following customer trials lacked consistency and accountability



- Confident that statutory obligations were being met, but needed improvement in efficiency, costs, and sustainability including circularity
- Customer expectations for material management were increasing and most competitors were already offering some services
- Identified an opportunity to standardize the process across North America
- Focused on aligning new process with Covestro's focus on Responsible Care®, stewardship, sustainability, and circularity
- Partnered with an expert in materials management
 - Subject matter experts
 - Non-asset based company allowing for objective and independent recommendations
 - Network of material management assets
 - Network of potential direct uses of by-products and reclaimed materials
 - Shared commitment to the guiding principles of Responsible Care®
- Confirmed using tabletop exercise



OVERVIEW OF SOLUTION

- Before customer trial
 - Utilize On-Line Portal for capturing key information upfront
 - Develop understanding of anticipated materials
 - Estimate of volumes
 - Begin regulatory review of materials
 - Begin evaluation of management options
 - Begin paperwork
- During customer trial

- Advise on collecting material in ways to maximize management options
- Complete regulatory review of materials
- After customer trial
 - Recommend multiple options for management of materials
 - Covestro to choose preferred option
 - Provide report on sustainability metrics

PREPARATION: UNDERSTANDING THE MATERIALS

- SDS for Covestro materials
- Non-disclosure agreements for SDS for competitor's materials
- Understand reaction products
- Materials evaluation and characterization
- Regulatory review of materials
- Begin identifying management options



MATERIAL RECOVERY

- Goal is to maximize end-of-life options
- Segregation of materials to avoid contamination that may devalue materials
- Containerize for alignment with transport and end-users' needs



TRANSPORT

- Goal is to minimize transport
- Compliant packaging, labeling, markings, and manifests
- Align transport method with volume of material
- Focus on local and regional solutions

END OF LIFE: MATERIAL MANAGEMENT OPTION

- Research alternate uses of material

- Landfill Avoidance
- Fuels Substitute – Engineered Fuel Program
- Recycling
- Reclamation
- Material Substitution – Direct Use (Circular Economy)
- Access to WTS RCMS® Managed Supplier Network
- Provide compliant and safe options that can be evaluated on
 - Total Cost
 - Timing – Feasibility of Implementation
 - Sustainability
 - Circularity

DOCUMENTATION: PAPERWORK & REPORTING

- EPA ID # if applicable
- Profile preparation
- Shipment Documentation and Recordkeeping Requirements
 - Generator Regulatory Reporting Requirements
 - Sustainability/Waste Minimization Tracking
- One project invoice/credit

LESSONS LEARNED

- Upfront collaboration and preparation is key
- Appropriate collection of recycling material maximizes management options
- Multi-Criteria Decision Analysis is needed to identify best option amongst multiple viable options
- Redirection of residual materials and by-products away from the waste stream can materially impact sustainability and circularity

