



Improving Compliance, Reducing Risk and Lowering Costs of Environmental Operations with Synthetic Media

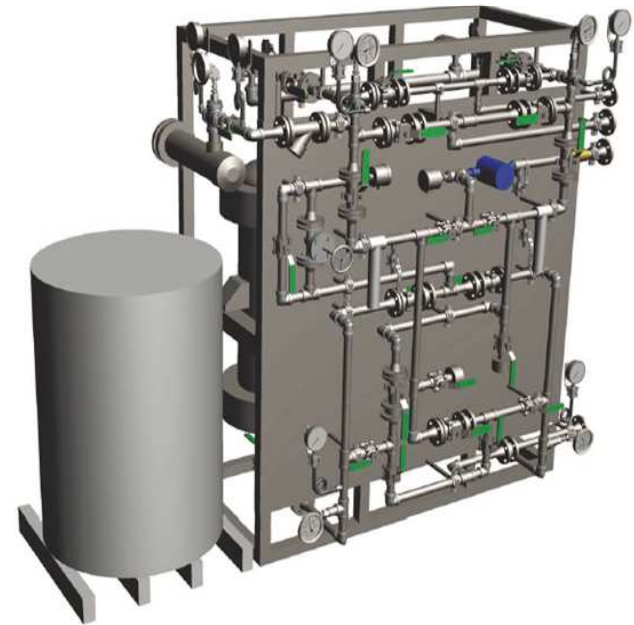
Case Studies in Manufacturing
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Outline

- Intro to ECT and Synthetic Media
- Why applications for vapor-phase treatment are surfacing
 - Example: Low airflow, high concentration
 - Example: High airflow, low concentration
- Relevance to the Industry
 - And you as a conference participant
- Discussion



Intro to ECT

- Treatment technology vendor focused on emerging contaminants for air and water applications
- Initial focus was on 1,4-dioxane: partnership with Dow Chemical
- Synthetic media (resins)
- Regenerable, sustainable adsorption technology



175 GPM Water
System



60,000 SCFM Air
System

What is synthetic media?

Derived from plastics, synthetic media can be used to collect various contaminants from liquids, vapor or atmospheric streams, treat to very low residuals and be reused indefinitely.



Ion exchange



Polymeric

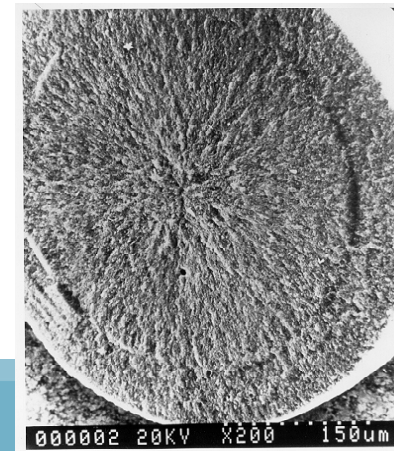


Carbonaceous



Unique Properties of Synthetic Media

- Hydrophobic
- Unique (engineered) pore size distribution
- High affinity for organic compounds: (**simple** adsorption mechanism)
- Can achieve non-detect effluent concentration at substantial loading rates in air and water
- Readily regenerated to fully restore capacity (regenerate in-place) indefinitely
- Durable, rugged, no physical attrition



First Synthetic Media System Groundwater Treatment; Lake Charles, LA



- Operating Since 1999
- Treating 1,2-DCA from > 2,000,000 ppb to ND @ 5 ppb
- Recovery and reuse!
- 17 years of loading and regenerating media > 4,000 regenerations
- No replacement of media





Now lets' shift the discussion to vapor treatment...



How is Synthetic Media Used: An Overview

- Vapor market uses two different treatment methods, depending on airflow
 - Small airflows: Focusing on highly concentrated steams with high operating costs and potential for incidents during media handling (process disruption potential)
 - Example applications in the industry
 - Gulf Coast Chemicals Production: Low flow/high concentration solvent recovery from process vents Estimate a 2-3 year capital payback
 - Refinery Venting Lake Charles: Estimate a 25-50% operational savings
 - Both applications eliminate process disruption from carbon exchanges in addition to favorable economics
 - In both cases, media is regenerated in place (full capacity renewal in less than 2 hours)
 - BWON opportunities and beyond

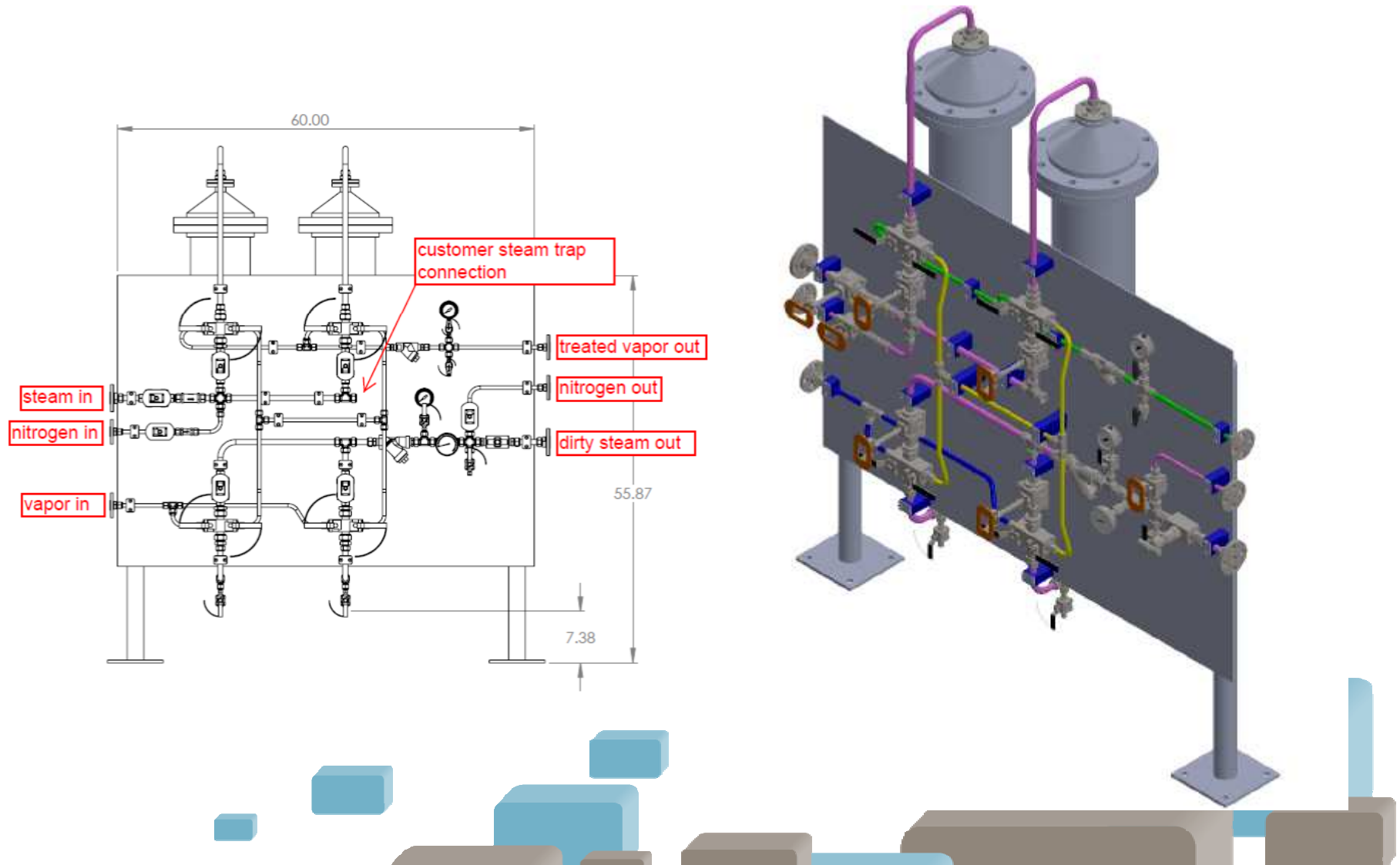


Why is Air Treatment Important to this Industry?

- Presence of regulated compounds
- Mandates to treat (ever tightening)
- Updating Programs like BWON that relied heavily on GAC
 - Carbon can heat during adsorption (requires nitrogen purge to prevent bed fires)
 - GAC requires high temperature reactivation
 - Thus it generally is replaced vs. renewed
 - Replacement is often done by Third Parties
 - Monitoring and replacement can disrupt operations



Low Flow Process Vapor Treatment System



Example Treatment Package – Energy and Chemicals



Example Applications

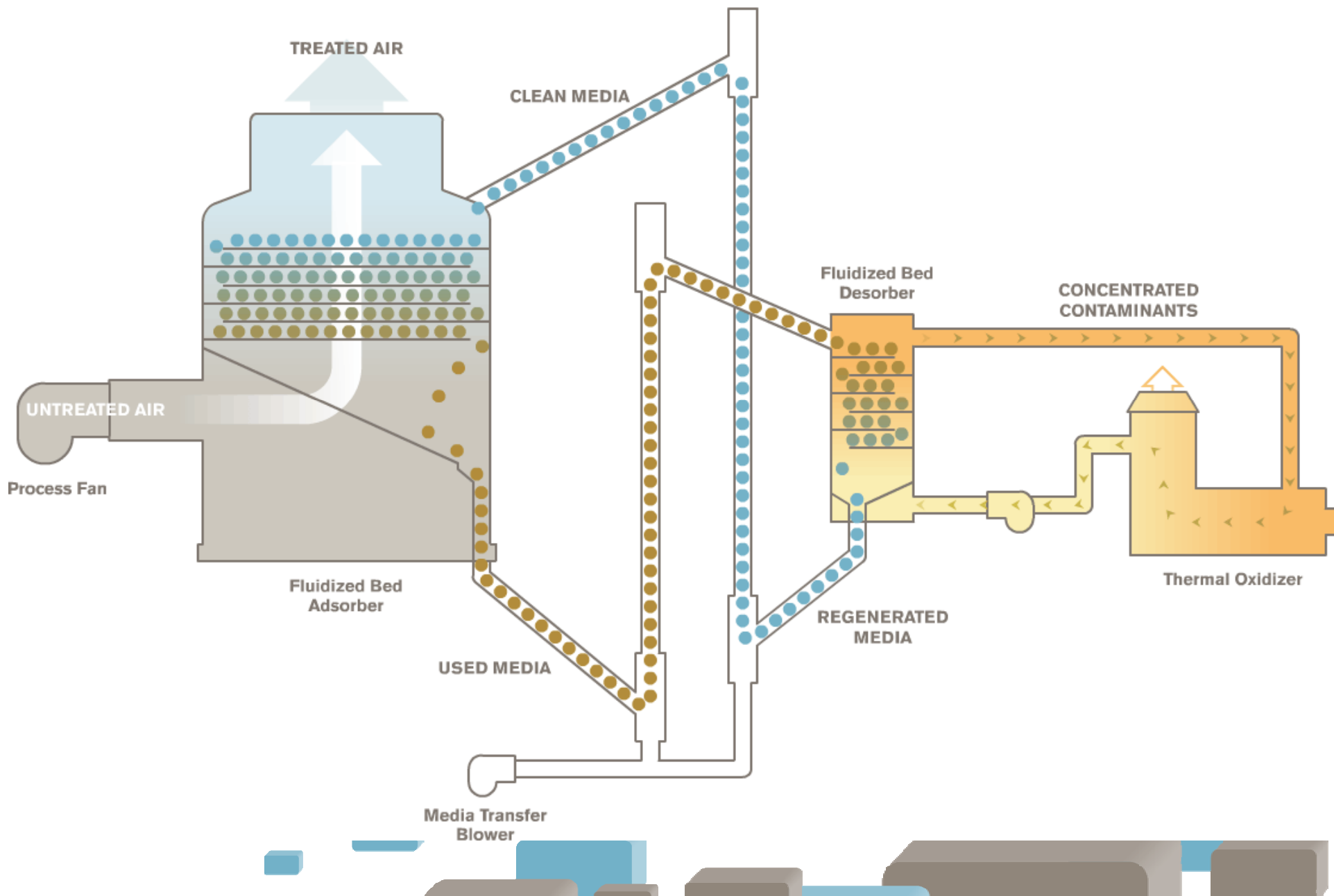
- Process Sewer Vents
 - Regenerate in place using existing infrastructure
- Wastewater Operations (tank venting, centrifuge/solids recovery)
 - Regenerate in place using existing infrastructure
 - Simplifies operations
- Tank Venting (Caustic Recovery)
 - Reliable operations under variable loading conditions
 - Regenerate in place using existing infrastructure
 - Does not require dilution (nitrogen) as media is not reactive



Synthetic Media: High Airflow Applications

- Larger Fixed Beds or Continuous Moving Beds
 - >1,500 SCFM would use moving beds
 - Applications for Maintenance Treatment (Turnaround air abatement when needed)
 - Both applications eliminate process disruption from carbon exchanges in addition to favorable economics
- Example of how the Moving Bed Design Works





Continuous Moving Bed Design for High Flow

- Continuous Moving Bed Design (uses less media and circulates continuously)



Application Space – Continuous Moving Beds

- Manufacturing (painting etc.) High flow/low concentration
 - Alternatives to thermal oxidation and Rotary Concentrators
- Odor control/fragrances
- Semiconductor fabrication
- Emission Control for Plant Maintenance (think refinery, chemical plants, tank cleaning etc.)
- Moving beds can achieve turndown of 1,000:1 (100X greater than rotary concentrators)
 - Allow product recovery if desired
 - No auxiliary fuel for oxidizer



Recap: What are the Drivers?

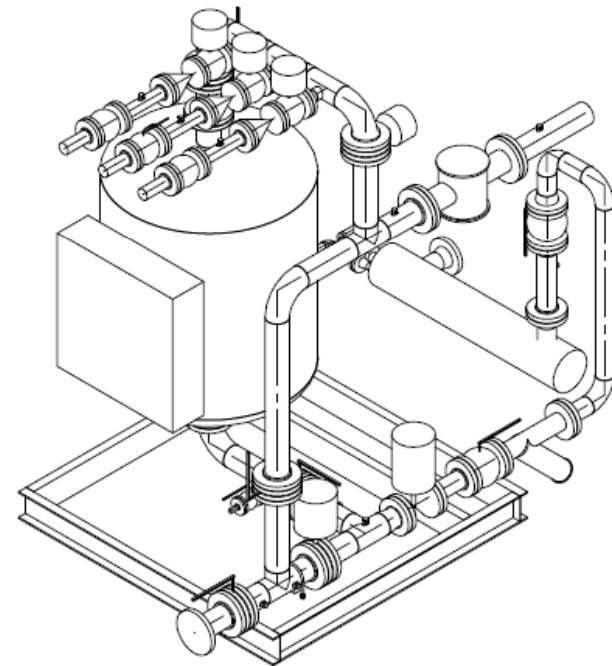
- Regulatory, Economic and Process Safety Drivers:
 - Purge gas treatment: 2-SCFH continuous solvent vent @ 30,000 ppmv
 - Vent management (Plant startup/shutdown): 150-SCFM intermittent process vent
 - BWON Program Applications –
 - Tank vent: 0.5-100 SCFM continuous nitrogen/hydrocarbon vent
 - Wastewater Operations Air Treatment: 300-SCFM continuous vent from multiple sources in process wastewater treatment
 - Fugitive Emissions from Process Sewers (manhole vents)
- Refineries and Chemical Plants have hundreds of applications like these
- GAC is the go-to treatment, costly and disruptive
- Regenerable Media Systems can be an alternative



Carbon vs a Regenerable Media Solution



Existing Carbon System



Modular Synthetic Media System



Large Candle Manufacturer

- Constituents of concern: synthetic fragrance compounds
- Issues of concern
 - Natural gas usage
 - Health & Safety (air changes)
 - Odor Control
 - Efficiency/sustainability



Large Candle Manufacturer

- Current airflow = 20,000 SCFM
- VOC conc < 5 mg/l
- Looking to increase airflow to at least 100,000 SCFM



15-30,000 CFM Moving Bed System NY State



Closing Comments

- The properties of synthetic media can present a unique value proposition
- In the energy industry we recognize two aspects that drive economics:
 - The alternative has to be equal or lower in cost on a life cycle basis
 - Smaller systems with capacity renewal are higher first cost, but much lower operating cost
 - Simple Payback in less than 2 years is possible
 - Risk reduction to operations is hard to quantify, but real



Thank you!

