NEXT SHALE 2017

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Navigating the Future of Unconventional Resources

NOVEL & LOW COST SOLUTION TO REDUCE EMISSIONS, ODORS, EVAPORATION, BIRDS

BUTEL VENTURES / GREATARIO COVERS

HEXA-COVER®

NS17 - 106

Emissions from AST

- Affected by contents (volatility) and characteristics (type of tank)
  - Determines Vapor Pressure (VP)
  - VP tied to Working Losses & Standing Losses
  - Tank Color – affects heat absorption (darker = increase in VP / lighter = lower VP)
  - Roof type – determines vapor space
    - Fixed (vapor space varies with liquid level)
    - Floating (vapor space constant with liquid level)

Working Losses

- Emissions generated & released while liquid is pumped into (loading) and out of (unloading)
  - Movement generates vapors – splash or submerged
- Fixed Roof Tank – emissions (vapors) escape when liquid pushed into tank (displacement)
- Floating Roof Tank – emissions (vapors) escape when liquid is removed from tank due to clingage loss

Standing Losses

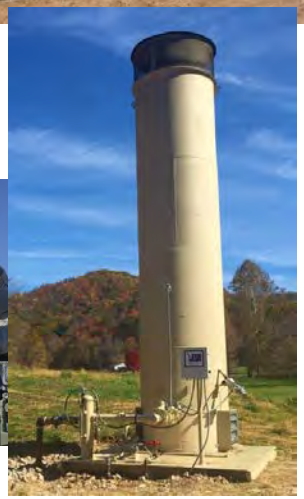
- Emissions generated from vaporization of liquids (breathing) and heat expansion
  - Volatile liquids always generate vapors
  - > vapor space = > vapor quantity (fills space available)
  - Temperature variations (+) cause liquids to expand = more vapor = more VP

EPA and State Emissions Regulations

- Upstream Oil & Gas
  - EPA 40 CFR 60 Quad O / Oa
    - PTE of >6 tpy VOCs = action
  - Various State emissions standards/permitting (e.g., Title 30, Texas Administrative Code, Chapter 115)
- Midstream Terminals and Downstream Storage
  - EPA 40 CFR 60 and 63
  - VOCs / HAPs – Operating Permits (Title V)

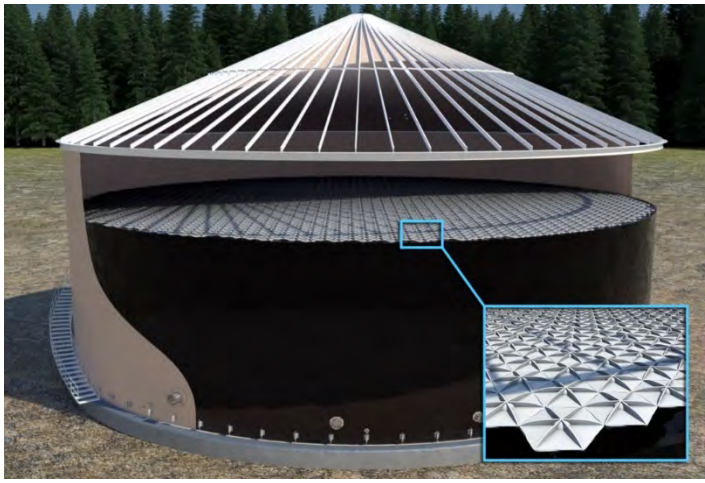
Available Options to Manage Emissions

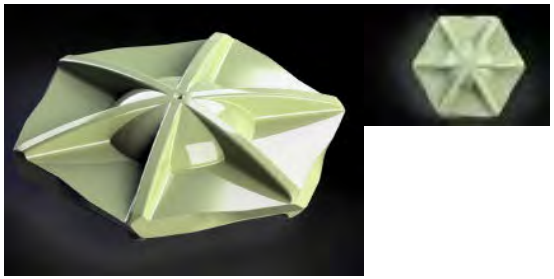
- Vapor Recovery Units – recover (partial liquid, balance as gas)
  - Partial revenue recovery, CAPEX, ongoing OPEX, reliability, maintenance, depreciating asset
- Combustors or Flares – destruction
  - Lost product revenue, GHG emissions, CAPEX, ongoing OPEX, reliability, maintenance, visibility
- Activated Carbon Vent Scrubbers – destruction
  - Lost product revenue, CAPEX, ongoing OPEX, Hazardous Waste created



Available Options to Manage Emissions

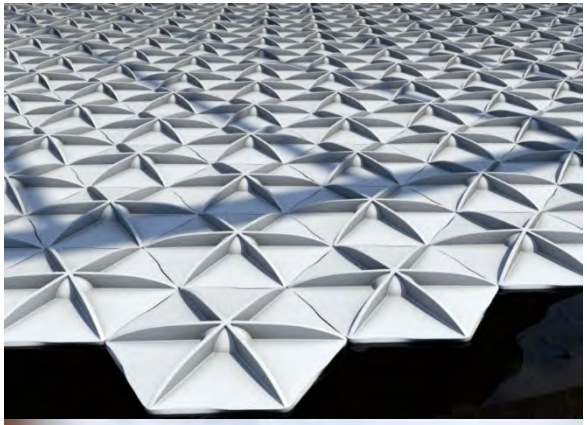
- Internal floating roofs – reduce
  - Retains product revenue, CAPEX, ongoing OPEX, reliability, inspections
- HEXA-COVERS® (Oil & Gas Duty)
  - Retains product revenue, low cost (purchase or rental), maintenance free, passive, no ongoing OPEX, long-life, easy to install
  - ***Retrofit into operating tanks!!!***





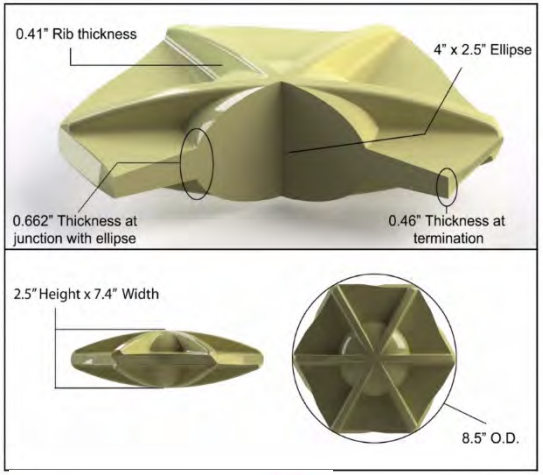
HEXA-COVER® Oil & Gas Duty Covers

- Placed within tank to form a flexible, interlocking blanket that floats on the liquid surface to reduce evaporation of VOLs into tank vapor space
  - Up to 98% surface coverage (100' dia)
  - Easily deployed through thief hatch or tank manway
  - Can be used in conjunction with VRUs to reduce vapor load and improve reliability



HEXA-COVER® Oil & Gas Duty Covers

- Hexagon shape, roughly 8” diameter with symmetric and interlocking ribs enable covers to distribute naturally and uniformly
- Made of low density Dupont™ Zytel® 612 nylon resin
- Resistant to majority of hydrocarbons up to 212 ^{o}F
- Classified as “static dissipative” by ASTM Test Method D257
- Resistant to thermal shock and weight gain



DUPONT™ ZYTEL®

GREATARIO'S HEXA-COVER® FLOATING COVERS FOR OIL & GAS INDUSTRY

ZYTEL® NYLON DELIVERS STRONG CHEMICAL RESISTANCE AND LOW MOISTURE ABSORPTION IN HIGHLY AGGRESSIVE TANK APPLICATIONS

Application

Benefits Gained

HEXA-COVER® Oil & Gas Duty Covers

- Significantly reduces evaporation of VOLs, emissions of VOCs, HAPs and odors from Fixed Roof AST
  - Independent testing gave results of 66% reduction for Toluene (80 ^{o}C)
  - Field testing (1000 bbl) gave results of 93% reduction for n-Heptane & 52% reduction for BTEX
  - Field testing (1000 bbl) gave results of 47% reduction for NMVOC (including Ethane, Propane & Butane)

HEXA-COVER® Oil & Gas Duty Covers

- Retains heat within liquid
  - Client testimonies of >20% energy savings for heated tanks (2013 CNRL Stewardship Report)
- Reduces water vapor in tank head space
  - Independent testing (1000 bbl) gave results of 53% reduction
- Reduces head space temp
  - Independent testing (1000 bbl) gave results of 25%

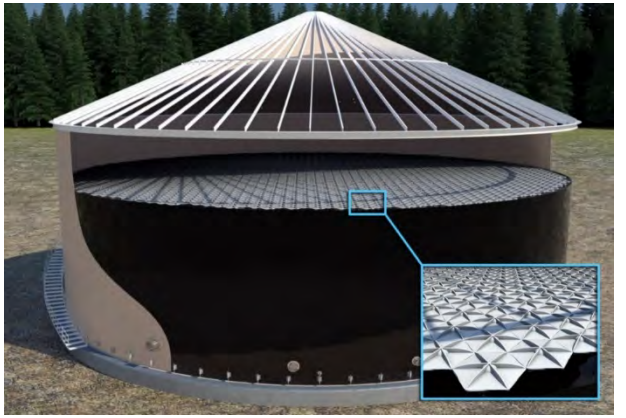
LEHDER®

Case Study - Heated Heavy Oil

- Alberta & Saskatchewan Canada
- Over 2100 installations – 400 & 1000 bbl fixed roof AST
- Reduced VOC emissions and Odors
- Cut heating costs from 20 to 35%
- Reduced water vapor in head space and prevented freeze-up of thief hatch and PVV – no tank collapses
- Reduced defoaming chemical usage

Case Study - Transmix Breakout Tanks

- Ontario Canada
- 30 ft & 60 ft dia AST
- Mixture of Diesel and Gasoline
- HEXA-COVERS® reduced emissions of VOC = reduced ground level benzene by >50%
- HEXA-COVER® received preliminary approval for Benzene Emission Reduction Factor of 50% by Ontario Ministry of Environment

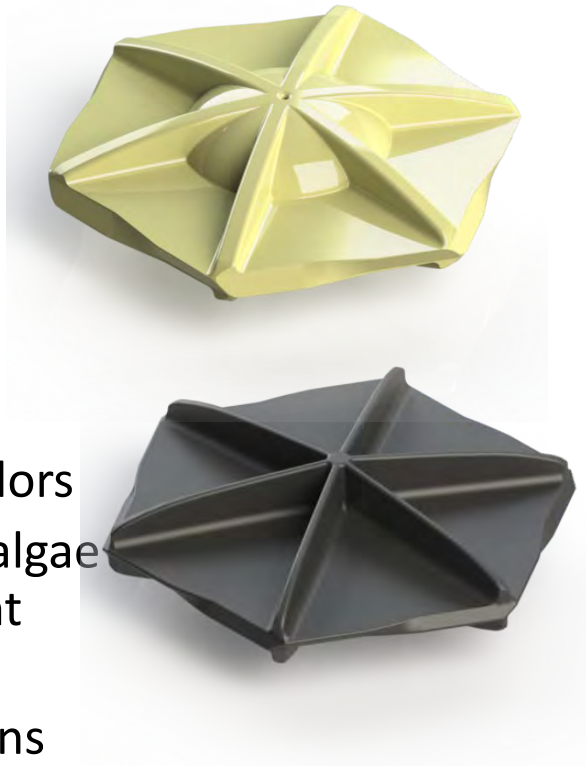


Case Study - Oilsands DilBit Tanks

- Alberta Canada
- 21 meter dia Dilbit Sales Tank
- Existing VRU fully loaded
  - add'l would cost >$3 Million
- HEXA-COVERS® to reduce load to VRU
- Added benefit - reduced evaporative loss of expensive condensate / diluent
- Calculated payback period is extremely short
- Client plans to install in all Dilbit & Diluent tanks!!!!

Other Applications

- Crude Oil – upstream, midstream and refinery
  - Conventional / unconventional / heavy
- Condensate, Gasoline, Diesel & Refined Products
- Heated Heavy Fuel Oil
- Ethanol, Cyclo-Hexane, others
- Also available in API Duty and Water Duty versions
  - API Separators – evap, VOC & HAPs emissions, odors
  - Frac Water Containment – evap, heat retention, algae prevention, VOC & HAPs emissions, bird deterrent
  - Oily Produced Water Containment - – evap, heat retention, algae prevention, VOC & HAPs emissions
  - Produced / Salt Water Tanks – odors, emissions
  - Boiler Feed Water – reduce oxygen saturation



Position as Air Pollution Control Device / Equipment

- Utilize HEXA-COVERS® as "air pollution control equipment" to limit the PTE from crude oil, condensate and oily produced water Fixed Roof AST to <6 tpy VOCs (& HAPs) and have the HEXA-COVERS® included under a state legally and practically enforceable air permit that limits PTE to <6 tpy VOCs.
  - Utilize 3rd party (Exova) and Field Testing (Ledher Enviro) results to gain State Approval for Emission Reduction Factor of 50% or greater. If not successful, then;
  - Conduct Field Testing with USA Operator to determine Emissions Reduction Factor under State approved test procedure / protocol.
    - Greatario Covers willing to provide enough HEXA-COVERS® for a single tank pilot test at our cost, with Oilco covering shipping, installation, vent gas sampling and analysis and report generation
  - Alternative is to install VRUs and or Enclosed Combustors and report Tank emissions under NSPS OOOO / OOOOa.

Commercial Terms

- Purchase – 50% down with PO, 50% at shipping

- Rental - $0 down, 24 month fixed term, 3rd year at discount
  - Subject to 3rd Party credit approval

Want more info?

- Western Canada – Butel Ventures
  - Steven Butel (587-583-8333)
- Central USA – Global ProSys, LLC
  - Steven Butel (587-583-8333)