



Presentation for UNECE  
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Geneva

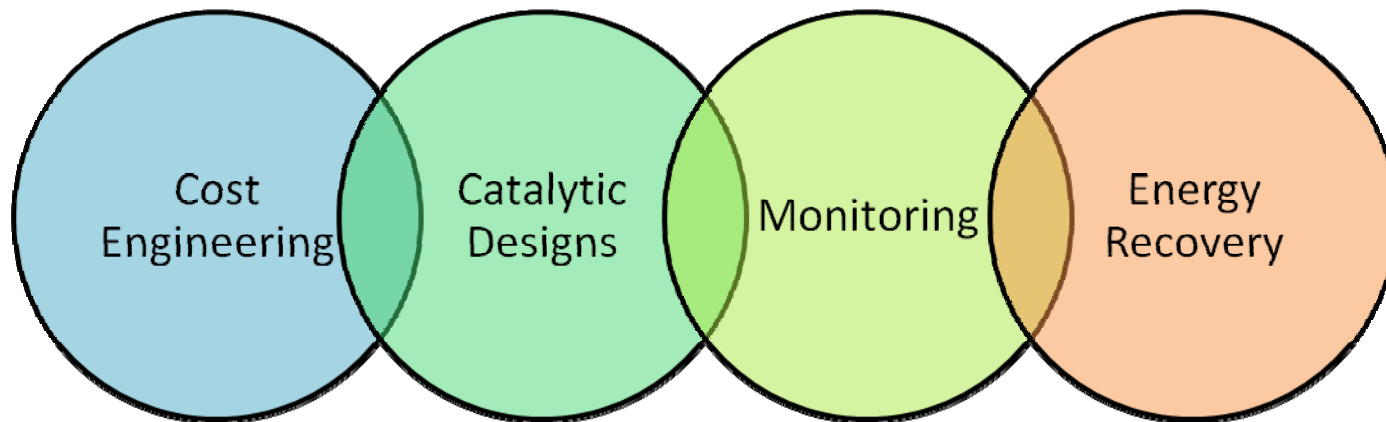
New VAM Technologies



**HarworthEnergy**<sup>™</sup>

- Process Safety
- CAPEX (unit cost plus installation)
- OPEX (electricity cost, spares)
- Reliability / Availability
- Footprint size (land constraint)

## Main Areas of Innovation



- Cost engineer design and manufacturing process
- Geographical location of manufacture (China/India can reduce manufacturing cost over Europe by c.30% to 40%, currently US costing relatively low)
- Procurement in scale
- Improved procurement
- Design for production of multiple units of modular installation type (single design rather than design for a particular application)
- Typical two can RTO has a high market cost/margin – compliance market appears to have given little incentive for cost reduction

- Significant benefits in terms of electrical use OPEX
- Technical challenges in terms of catalyst material design (poisoning, life, fouling)
- Technical challenges in terms of dust fouling
- Cost of equipment > higher/lower?

*Clear progress is being made in this field, expected that there will be further work in this area as the sector matures*

- Large pool of technology available
- Careful procurement required rather than new technologies
- Integration of packages required
- Understanding of methodologies required to engineer solutions
- Exhaust end concentration monitoring problematic (need to have a temperature resistant transducer mechanism or cool the sample)

- Single Market Leader for Power Generation – no real competition
- Hot water relatively simple and cheap
- Steam recovery more expensive, and can some technologies better suited than others
- Exhaust gas can be discharged directly to mine downcast shaft for heating
- Future long term possibilities with other technologies (ORC cycle)