***14. Submit an assessment of your installation processing, shredding and emission abatement measures and demonstrate why they can be considered to represent BAT for the sector in relation to treatment of waste and abatement of emissions.***

We have two discrete air emissions loops that share a common stack for ease of sampling and monitoring but are otherwise independent.

The first is focused on removal of organics that are released during shredding through a combination of wet and dry scrubbers (activated carbon) to remove organic vapor from the air stream.

* The wet scrubber also provides a secondary benefit of removal of trace particulates and potential acid mist (that might be released from processing primary batteries)
* This was selected as our starting emission control because they are simple, relatively low capex expenditure, relatively modular systems that we can operate on an extended production ramp and learning curve and scale if necessary.
  + We have an estimate of how much of the battery solvent will be emitted during shredding and drying, but we haven’t verified at scale how much reports to the process water loop (vs emitted to the air) and how that quantity changes with battery feed (ex. power tools have less solvent than cell phone batteries per unit weight)
* We are expecting the wet scrubber to remove contaminates through a combination of physical (collect and settle out) and chemical (absorption) means.
  + The primary organic solvent, dimethyl carbonate, has relatively high solubility in water (+12%)
  + We worked with Hargrove, a contract engineering firm in the US, to model the scrubber/organic interaction, and model a potential emission control design.
  + We deviated from their design because the modeled single use water loop would leave an unacceptably large water requirement, so we made the determination to recirculate some of the scrubber water, accept the potential loss in dry scrubber service life, and dispose of scrubber water when/if removal efficiency starts to drop to unacceptable levels.

The main alternative considered to control organics was a thermal oxidizer (TO, RTO).

* This was not incorporated due to uncertainties in the quantity of organic emissions mentioned above.
  + Because of the capex intensive nature of RTOs, they benefit greatly from a well-defined contaminate load, and continuous operation.
    - An RTO also brings a greater level of complexity and maintenance requirements.

The second emission loop is a bag house style dust collector.

* This style was the recommendation from the equipment manufacturer.
* It was sized to control the airflow generated from grinding and separating the battery materials and collect the particulate matter.
* We have extensive experience operating this style of dust collection within the wider organization (Ecobat Resources).

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