BRISTOL ULL

**Dans Green/Black Notes**

10th April 2020

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**HEADLINES**

* Schematic:
  + Needs changing to accurately represent AD plant/water treatment
  + Description of high/low quality of output needs changing
  + Dan G to update
* P-recovery:
  + Standard sewage treatment (i.e. without purposeful phosphorus removal) takes P content down from 9 mg/l (influent) to 5 mg/l (effluent).
  + P removal technology is tried and tested: chemical dosing, or biological nutrient removal (BNR). Chemical dosing is the most prevalent and works with low energy sewage treatment systems (eg trickling filters), but there is the embodied carbon of producing and transporting the chemicals (e.g. ferric sulphate). BNR uses more energy at the sewage works, being based around aeration.
  + Still, phosphorous a critical resource with issues around food security; also when lost to rivers and sea it’s difficult (impossible?) to recover.
  + Key questions on wider cost-benefit therefore could perhaps focus on:
    - The value of P, and specifically the impact on food production resulting from constraints in supply
    - The carbon intensity of P-recovery treatment, and of P-mining/shipping (from Africa)
    - The Eutrophication of rivers and sea; cost to ecosystem services
* Plastics:
  + Little water industry can do to control the amount arriving in sewage or food waste; they are the downstream end of a complex system. Speak to Water UK (Stuart Colville)…
  + Focus upstream - good link perhaps between both food waste and plastics in terms of efficiency of reduction upstream
* Macro-economic modelling links well with possible national level focus on mechanisms for plastic reduction (e.g. regulation on single use) and P-recovery (e.g. incentives)

**FULL NOTES**

* Re: schematic, efficiency of biogas dependent on carbon intensity, good electric; also CHP efficiencies vary a lot and especially depending on age
  + Compost (low/high quality): current and proposed schemes
  + Big plastic particles can appear in food waste and sewage. Larger ‘macroplastics’ screened out at the start of sewage treatment. Very low levels of microplastics in final effluent after sewage treatment; nearly all are partitioned into the sewage sludge.
  + Liquid sludge > sludge cake; AD just one aspect
  + Needs revising
* Re: P-recovery,
  + Thames Water/Slough use Canadian firm, Ostara; proof of concept/potential revenue generation. Main drivers: reducing maintenance cost of removing struvite that blocks pipework around anaerobic digesters; potential income from sale of phosphate-rich granule output from the Ostara process
    - Receives liquors (high strength) from sludge thickeners and AD unit
  + Standard sewage treatment (without purposeful P removal) removes just under half of the incoming quantity i.e. 9 mg/l in influent, 5 mg/l in effluent
  + Purposeful P removal achieves much lower levels in effluent; to comply with 1mg/l or 2mg/l permits (typically, where required)
  + Both phosphorous and nitrogen are issues in rivers; only nitrogen a real issue in marine environment
  + Technology is tried and tested:
    - Chemical:
      * ferric sulphate binds phosphorous to sludge, capturing most (gets it down to 1-2mg/l in effluent); sludge then is higher in phosphate than normal
      * WW have 54 sewage works across Wessex; 8,200 tonnes of treatment chemical. Usually ferric sulphate, which is derived from copperas (ferrous sulphate), or magnetite.
      * Chemical works in: Humberside, Thames estuary, Runcorn – e.g. Kemira, Industrial Chemicals
      * For every tonne of ferric sulphate produced, 0.17 tonnes of CO2 emitted and ~0.06 emitted per tonne delivered to WW sites = 0.23 t CO2/ tonne delivered
      * On average 5 tonnes embodied carbon in the ferric sulphate used per tonne of phosphorous removed from effluent
    - Other systems possibly better, but pros and cons:
      * E.g. biological nutrient removal (more in Severn Trent region): less chemical used, but more energy for aeration
      * Ferric sulphate dosing work with low energy trickling filters (where partially treated sewage is trickled over rocky media that host biofilm), e.g Saltford water recycling centre.
  + Removal of phosphorous upstream not easy (low phosphate diet) unless phosphorus is banned in products such as detergents, dishwasher tablets etc.)
* Plastics:
  + As with food waste; so with plastics (i.e. more efficient to remove upstream than down)?
  + Material substitutes (e.g. vegetable-based polymers such as PLA) not making much difference as they are designed to be somewhat durable – perhaps temporal (i.e. break down after 5 years, not 100, but still clogging water infrastructure)
  + Water industry downstream so less able to impact upstream – water infrastructure can inadvertently become a gathering point for plastics: actions on plastics include: water company pledge – Xm plastic bottles removed from supply chain; organisational waste stream plastic reduction (eg packaging) ; Bristol Waste/Bristol Water joint campaign to reduce use of tap water, but also encouraging reduction in plastic bottled water
  + Research into micro-plastics in water cycle through UKWIR
* National level:
  + Very siloed: Natural Environment Programme is focused solely on rivers and Coastal Waters; nothing on circular economy or CO2! Driven by EU Habitats Directive; Urban Waste Water treatment directive; Water Framework Directive etc
  + 25 year plan – systems leadership? DEFRA/DH/BEIS, etc?
  + National Carbon Budget
* Key contacts:
  + EA, Andy Hicklin, Wessex Area Environment Manager
  + Water UK: Stewart Colville, Head of Policy at Water UK

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