LESSONS LEARNED FROM HANDLING AND UTILIZATION OF ORGANIC FRACTION OF MSW (OFMSW)

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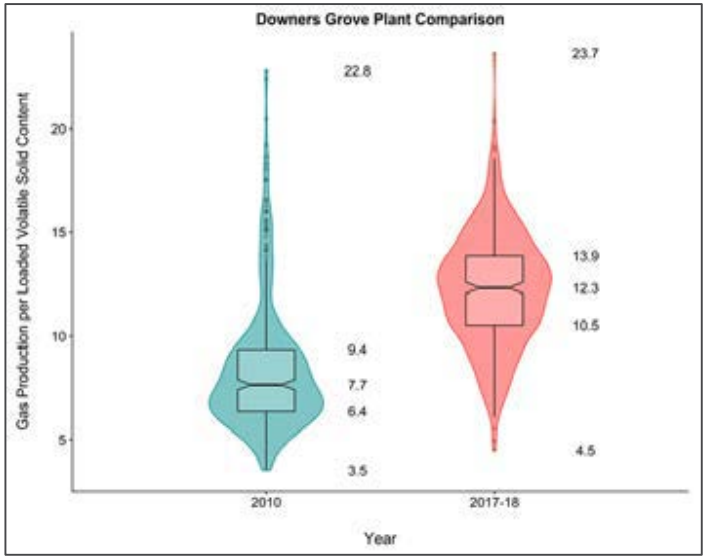
CODIGESTION OF OFMSW WITH SLUDGE AT WWTPS

Biogas production at European co-digestion plants ranges from 2.5 to 4.0 m^3 biogas/day/m^3 while at the US WWTPs sludge only digesters ranges from 0.9 to 1.1 m^3 biogas/day/m^3

Key issues learned from handling and utilization of OFMSW:

- **Need for facility upgrading/retrofitting at existing WTTPs**
  - — installation and/or upgrades of equipment, storage tank, pipelines, pumps, mixers
- **Design of new WWTPs in the future**
  - — co-digestion should be a design criteria for new WWTP constructions
- **Process instability**
  - — high variability of co-digestion feedstock characteristics (composition and volume)
  - — process upsets
- **Digestion inhibition and overloading**
  - — inhibitory substances may be generated during AD process, metals
  - — foaming issues
  - — process upsets
- **Operational issues**
  - — pipe clogging, unwanted objects/materials



- A WWTP in Illinois : up to 20% plant solid organic loading comes from local restaurants food waste
- Co-digestion resulted ~59% increase in median gas production per loaded volatile solids

Shen, Urgun-Demirtas, et al. (2015) Renewable and Sustainable Energy Reviews

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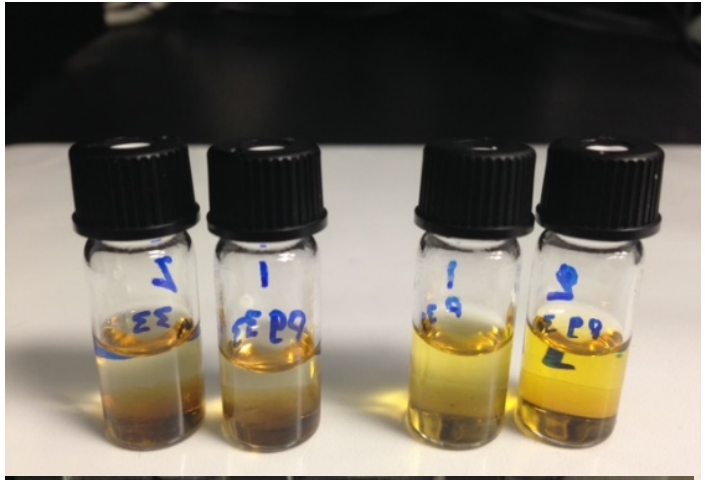
CHALLENGES IN DETERMINATION RIGHT FEEDSTOCK BLEND FOR BIOPROCESSES

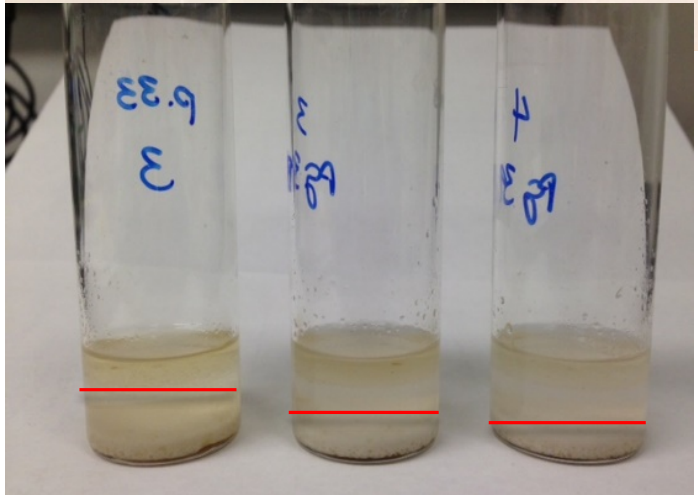
- Different Approaches in Waste Industry and Biofuel Industry
  - Total/Volatile Solid Content versus Carbon Content
  - Solid destruction ratio versus C conversion efficiency, C yield
  - If VS/TS ratio > 0.85 highly biodegradable
  - Need for development of transfer function for each tested waste stream
- EPA and USDA reports on food waste assessment in the US are not the same due to differences in selected boundaries and presence of uncertainties
- Food waste resource assessment
  - Material flow starting from the production, retail- to consumer level, waste collection and disposal
  - Local level: regulations and collection and disposal practices, location (urban, suburban, industrial zones)
  - Seasonality
  - NREL/PNNL food waste resource assessment at county level is very useful.

USDA United States Department of Agriculture

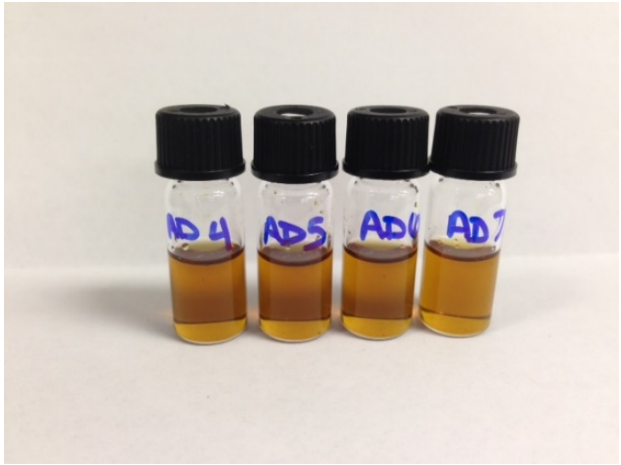
In the United States, food waste is estimated at between 30-40 percent of the food supply. This is based on USDA estimates of 31 percent food loss at the retail and consumer levels. This added up to approximately *133 billion pounds* and $161 billion worth of food in 2010.

CHALLENGES IN SAMPLE ANALYSIS





Extraction of other MSW components resulted high concentration of lipids



Reproducibility issues even in analysis of the same sample

Widely varying extraction efficiencies at the same sample

Complexity and high variability of MSW samples require utilization of 3-4 analytical methods together to understand biodegradation trend!