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Abstract No. 28

APPLICATION OF ANAEROBIC DIGESTION FOR BIOGAS AND METHANE PRODUCTION FROM FRESH BEACH-CAST BIOMASS

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Topicality

- **Accumulation and decomposition of beach-cast biomass** on the seaside is a common problem affecting coastal marine ecology, especially in eutrophication-affected water bodies

- The most economically feasible way could be **the processing of fresh biomass** to gain possible values such as nutrients or energy

- Collected beach-cast biomass laying ashore and containing **common macroalgae types specific to the Baltic Sea** was used as a feedstock for anaerobic digestion to produce biogas and methane

Environment and Recreation

- The impact of climate change on marine and ocean ecology is noticeable: the temperature of the world ocean is increasing, glaciers are melting and shrinking, marine flora and fauna are changing, and fish catch amounts are rapidly decreasing

- Changes in the water ecosystems induced by increasing eutrophication intensity, more frequent and aggressive environmental extreme events, and stronger storms are influencing marine coastal areas and contributing to more significant amounts of seaweed masses washed out ashore

- **The Baltic Sea region has a developed tourism industry, and its recreational value is negatively affected by the inconveniences (such as smell, insects, and untidiness) due to algae and seaweed accumulation and decomposition on the beaches**

- Public health, socio-economic and environmental targets in marine coastal areas have been directed to seek various solutions to cope with the environmental degradation caused by beach-cast biomass

Beach-Cast and Its Origin

- Three types of macroalgae can be found on the coastline of the Baltic Sea:
  - **brown, red and green algae**







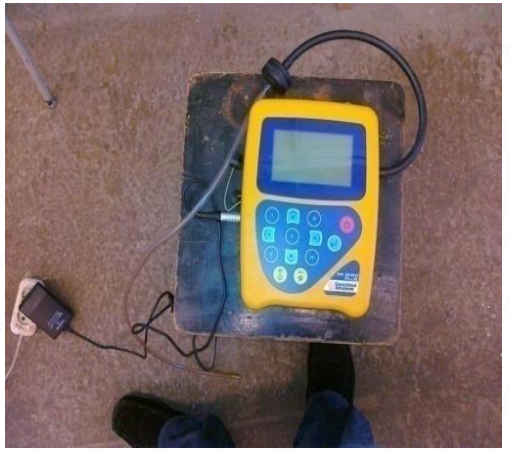

Beach-Cast and Its Origin

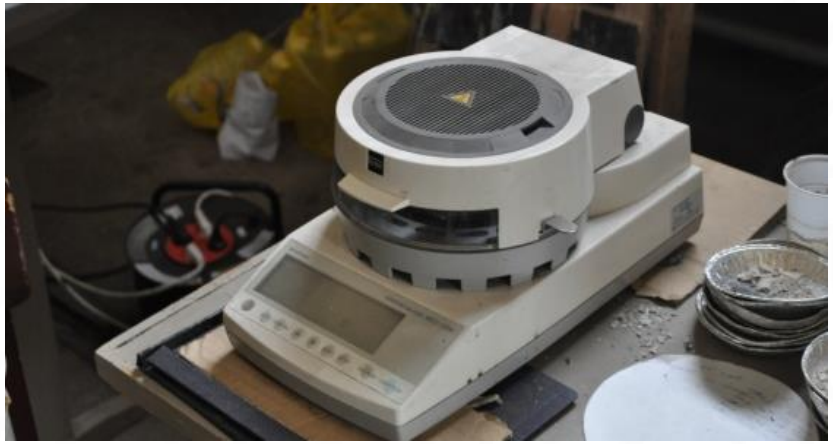
- Beach-cast biomass for anaerobic digestion was collected on the coastline of Latvia (near Jurmala) and Sweden in Kalmar
- Selected beach-cast masses laying ashore and containing macroalgal biomass of common macroalgae specific to the Baltic Sea were mixed for consolidated samples

Materials and Methods

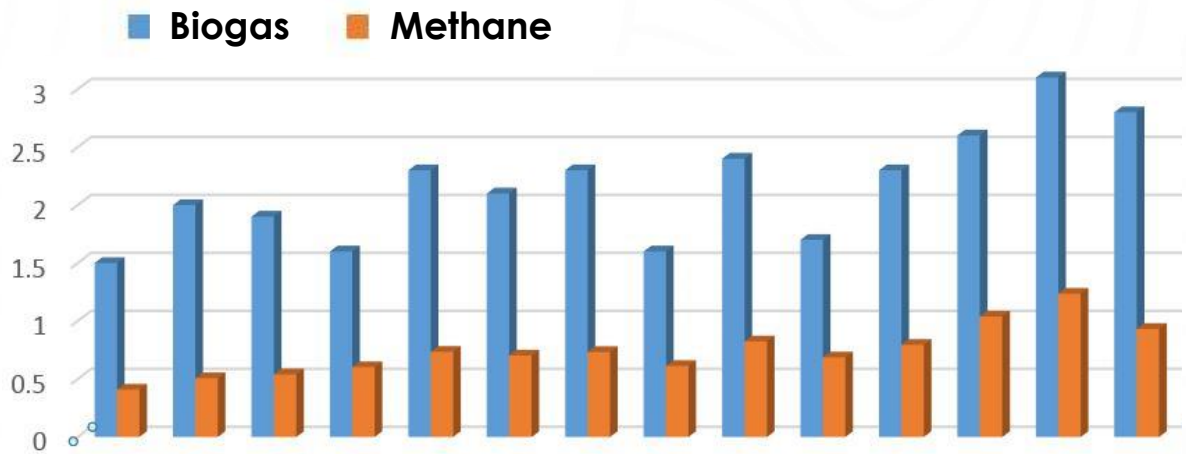
- Beach-cast consolidated samples were applied to ultimate and proximate analyses

- Biogas production was investigated using laboratory equipment consisting of 16 x 0.75 L bioreactors

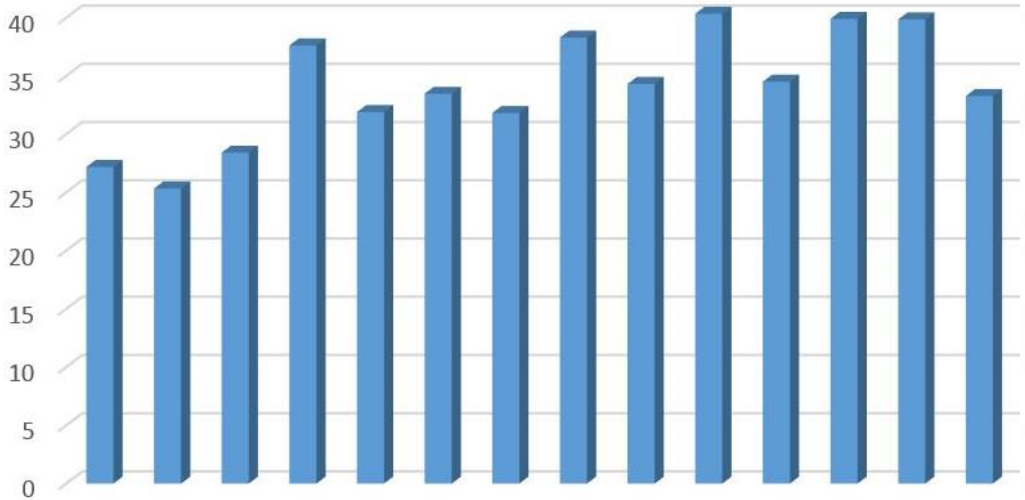




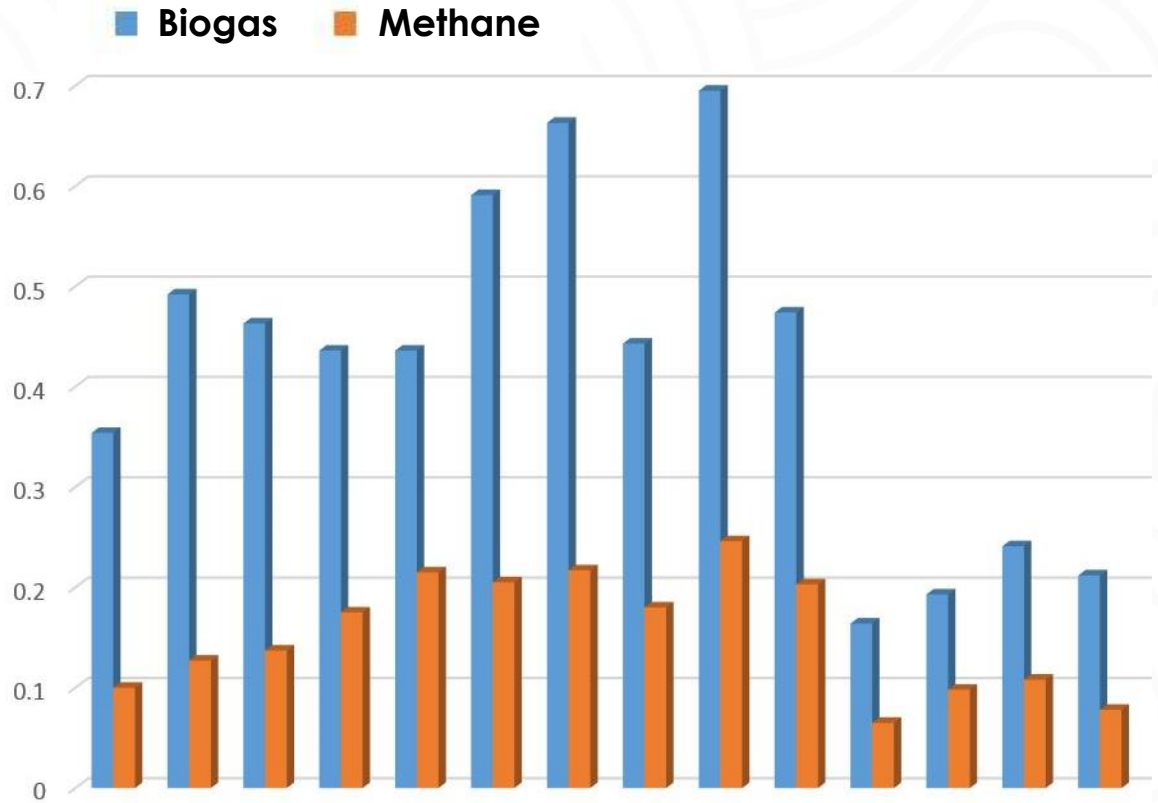
Research Results



Biogas and methane yield (L) from beach-cast



Average methane content (%) for differently pretreated samples



Specific biogas and methane yield (L/gdom) for differently pretreated samples

Conclusions

- After the range of experiments in bioreactors under anoxic conditions, it was obvious that using fresh beach-cast biomass as a feedstock for anaerobic digestion to produce biogas and methane is possible; however, biogas and methane yields were low, indicating that biomass pretreatment (rinsing or drying) is needed

- Relatively negligible methane content in biogas could be attributed to the composition of raw material that contained sea salts inhibiting the metabolism of methane-forming bacteria

- Relatively better methane output from dried samples did not support the idea of less yield with a higher presence of salts

- Without pretreatment, beach-cast biomass anaerobic digestion is not economically justified; an option is co-fermentation with other types of waste biomass (such as manure or sewage sludge) to provide more optimal conditions – it may optimize the C:N ratio and avoid inhibition induced by the presence of salts in beach-cast biomass

Acknowledgements

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