Recovery of valuable hydrocarbons from biomass/waste gasification producer gas

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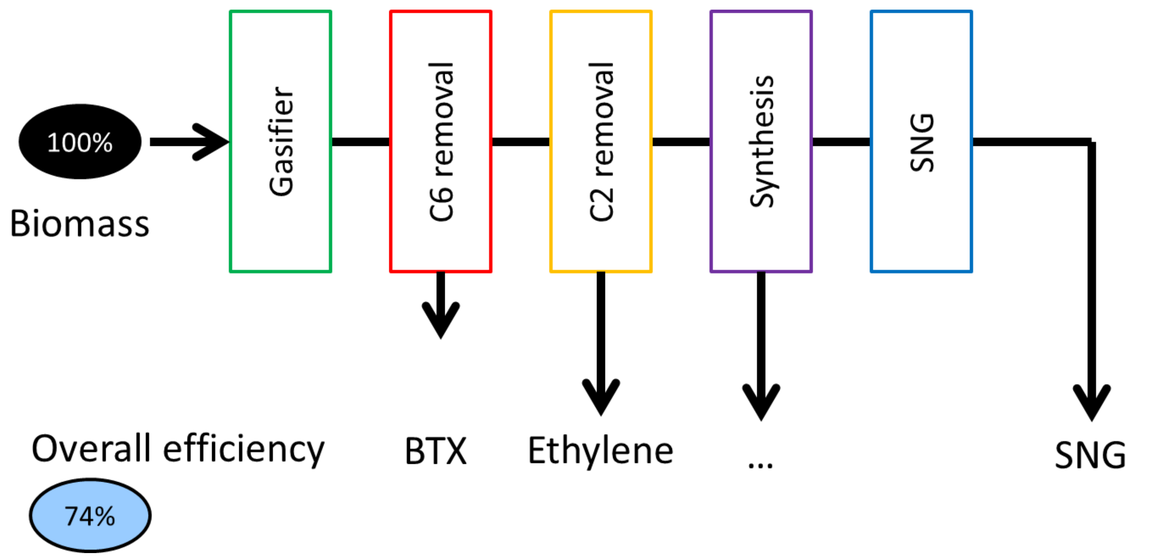
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Co-production: a smart option for biomass and waste

- Low-medium T gasification produces CH_4 and other gaseous hydrocarbons (e.g. olefins, BTX).
- In synthesis applications, olefins and aromatics lead to catalyst deactivation and must be removed from the gas.



Why not harvesting these valuable compounds instead of (costly) converting them to syngas?

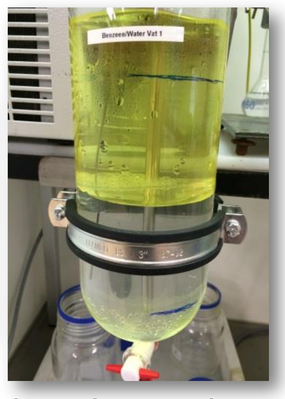
Co-production of green chemicals and materials
→increased revenues of gasification plants
→ lower production cost

Recovery of bio-BTX from producer gas

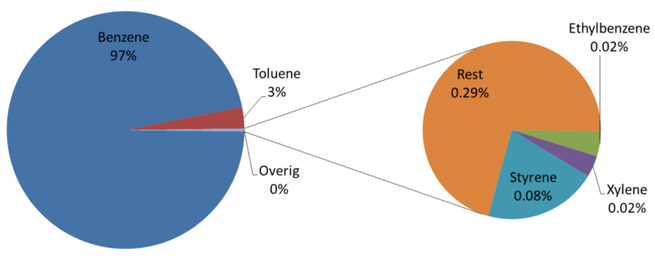


Bio-BTX scrubber unit at ECN

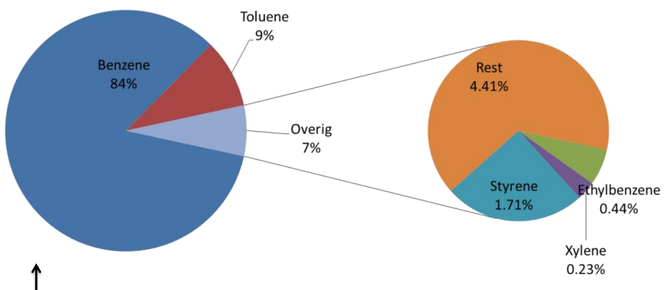




> 1 kg bio-BTX from beech wood gasification, > 95% recovery.



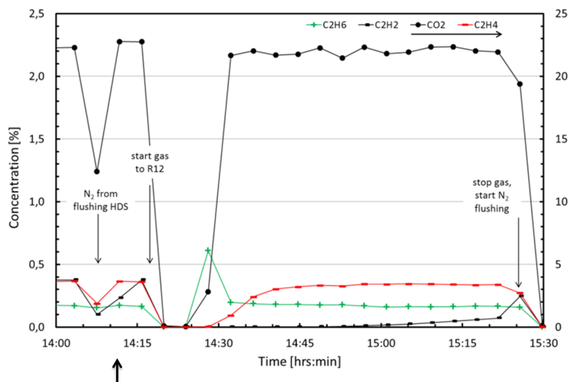
Composition of bio-BTX from waste (wt.%).



Composition of bio-BTX from beech wood (wt.%)

Recovery of bio-ethylene from producer gas

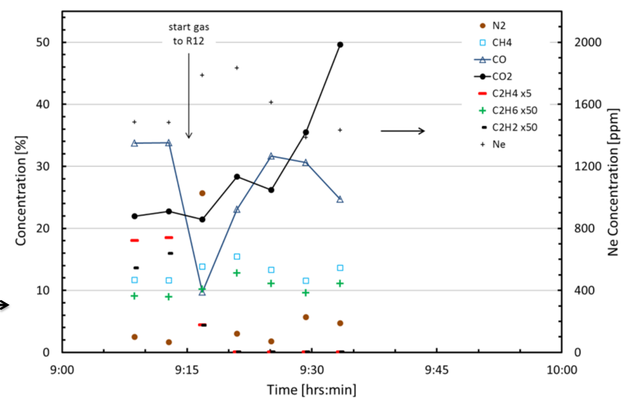
2 selected sorbents developed by Avantium tested at ECN under realistic gasification conditions.



Sorbent A: co-adsorption of CO2, ethane, ethylene and acetylene can be observed.

Sorbent reactors at ECN

Sorbent B: no co-adsorption of CO2 or ethane, but signs of reaction with H_2 and/or CO.



Conclusions

- Despite challenges (fuel feeding, melting, agglomeration, deposition, corrosion), there is an opportunity for waste gasification to produce valuable compounds (ethylene, C_3-C_5 hydrocarbons, BTX) → up-cycling.
- Recovery of BTX from wood and waste gasification successfully proven at lab-scale.
- Further research needed for development of sorbents for separation of ethylene from producer gas → points for attention: co-adsorption of acetylene and CO_2, reactions with H_2 and/or CO.

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