Recovery of valuable hydrocarbons from biomass/waste gasification producer gas

A. Bos **(ECN)**
L.P.L.M. Rabou **(ECN)**
B.J. Vreugdenhil **(ECN)**
J.C. van der Waal **(Avantium)**
I. van Zandvoort **(Avantium)**

July 2016
ECN-M--16-055

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A. Bos
L.P.L.M. Rabou
B.J. Vreugdenhil [1]
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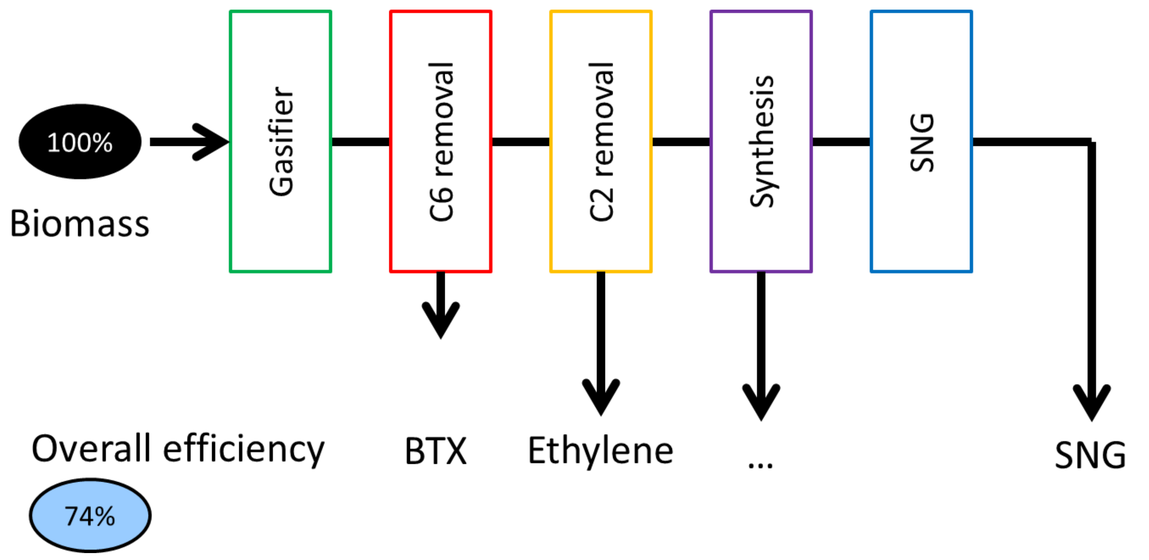
[1] Corresponding author: vreugdenhil@ecn.nl

www.ecn.nl
P.O. Box 1
1755 ZG Petten
The Netherlands

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.



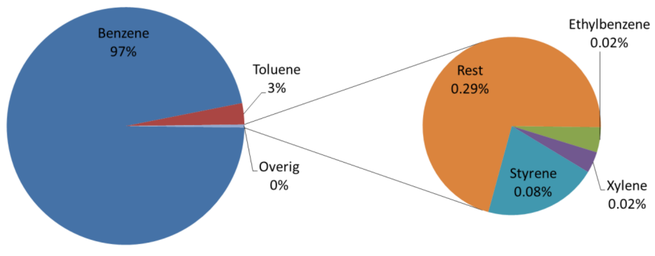
Why not harvesting these valuable compounds instead of (costly) converting them to syngas?

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

Recovery of bio-BTX from producer gas

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

Bio-BTX scrubber unit at ECN



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 reactors at ECN

Sorbent A: co-adsorption of CO_2, ethane, ethylene and acetylene can be observed.

Sorbent B: no co-adsorption of CO_2 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.

Acknowledgements

Research funded by the Dutch Ministry of Economic Affairs (Green Birds project, reference TEBE113008).

Ministerie van Economische Zaken

ECN
Westerduinweg 3
1755 LE Petten
The Netherlands

P.O. Box 1
1755 LG Petten
The Netherlands

T +31 88 515 4949
F +31 88 515 8338
info@ ecn.nl
www.ecn.nl