

# MSW DERIVED SYNGAS UTILIZATION IN COMBINATION WITH DISTRIBUTED ENERGY SUPPLY SYSTEM: MODE SELECTION AND EVALUATION

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Syngas from MSW gasification and pyrolysis are characterized through a rotary kiln reactor followed by a gas scrubber, the components and energy & chemicals for cleaning the syngas were qualified. Then the syngas utilization modes in combination with distributed energy supply system are evaluated.

For the separated MSW sample with dry-basis higher heat value (HHV) of 15.23MJ/kg, the HHV of pyrolysis syngas is higher than 15 MJ/kg. When combined with distributed energy supply system, the syngas is cleaned first to remove dust, tar and harmful components such as NH<sub>3</sub> and H<sub>2</sub>S, then is used to supply power & heat. Based on a downtown district in a northern city in China, the syngas from pyrolysis of 43.34 ton/d separated MSW is assumed to generate power & heat through 4 routes, as shown in Fig.1:

- burning in a gas engine (1);
- burning in a gas turbine (2);
- direct combustion in a furnace to generate steam followed by a steam turbine (3);
- undergoing separation to obtain pure CH<sub>4</sub> or H<sub>2</sub> for industrial applications as avoidance of pure gas production or utilization in fuel cell (4).

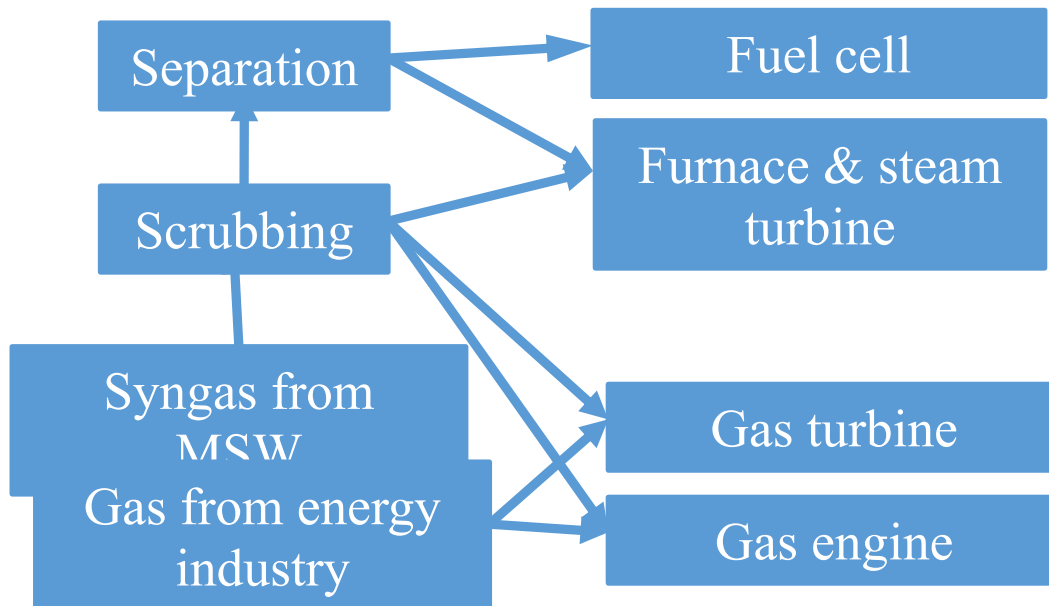


FIGURE 1 –MSW DERIVED SYNGAS UTILIZATION MODES

To avoid instability caused by syngas components variation, gas from energy industry which is available in the distributed energy supplying station is supplied as a supplementary energy source. The power & energy recovery efficiency, the consumptions of chemicals and materials and the environmental impacts of the four utilization modes are compared; based on life cycle assessment (LCA) and cost - benefit analysis (CBA) results, the suitable utilization mode is recommended.