

Municipal Solid Waste Project

University of Oklahoma- CBME- ChE 4253 (Fall 2018)

Part 3- Gasifier Section Studies

The object of this study is to determine the feasibility of changing the processing of municipal solid waste in the city of Norman, or in the area if that is more convenient, from the current combination of recycling and landfilling to the production of chemicals.

This Task Statement

You are requested to determine the operating conditions of the gasifier section, size it and present the economics. Do it for the City of Norman and for the OKC area MSW available.

- 1) **Municipal Solid Waste:** Obtain its composition in terms of types of solid refuse (Paper, cardboard, Textiles, rubber, leather, food wastes material, metals, glass, plastics, etc). Because Norman gathers wood and yard wastes separately, do not include those. Use information from Norman or other surrounding cities. If not available, use regional or national average values.
- 2) **Convert MSW composition to Atom- mole%:**
- 3) **GASIFIER:** Vary different conditions of oxygen flowrate and water (liquid or steam?) addition per unit mass of MSW to obtain the optimum Syngas composition. Use Aspen (submit only one simulation file).
- 4) **Gasifier Sizing and Costing:** Obtain the gasifier size. One gasifier or many? Consider different solid velocities. Obtain the cost. Gasifiers are not listed in the usual costing programs available. If this is correct, find similar equipment to obtain some cost. Quenching is performed just by injecting water in a quench-cooler.
- 5) **Front End Design:** MSW needs some processing before entering the gasifier. There is usually the following: Metal removal (Fe, Al, Cu and others) using various methods, glass removal (? You decide) followed by drying (do you need drying?), shredding and pelletizing. Draw a flowsheet. Remember Ash/Tar disposal as well as metals/glass handling.
- 6) **GASIFICATION SECTION FCI and PRODUCT COST.** Obtain the capital investment and the operating costs of this Gasification Section only. Be realistic with % suggested by the usual sources. Do not include air separation plant and eventual steam production boiler.

Grading Rubric: 1): 10%, 2) 5%, 3) 35%, 4) 20%. 5) 20%. 6) 10%

Final Thought: A good Engineer makes decisions aiming at optimal economic objectives and technical constraints. Technicians only simulate and do not usually optimize. We want you to become the former!!!