

The Technology of Joint Synthetic Fuel

100% Synthetic J-BUF (Joint Battlespace Use Fuel)

Theorized methods to manufacture full synthetic fuel blends that can be used in both diesel engines and turbine engines.



Written by R.C. Knight
President of Integrated Synthetic Fuel Incorporated
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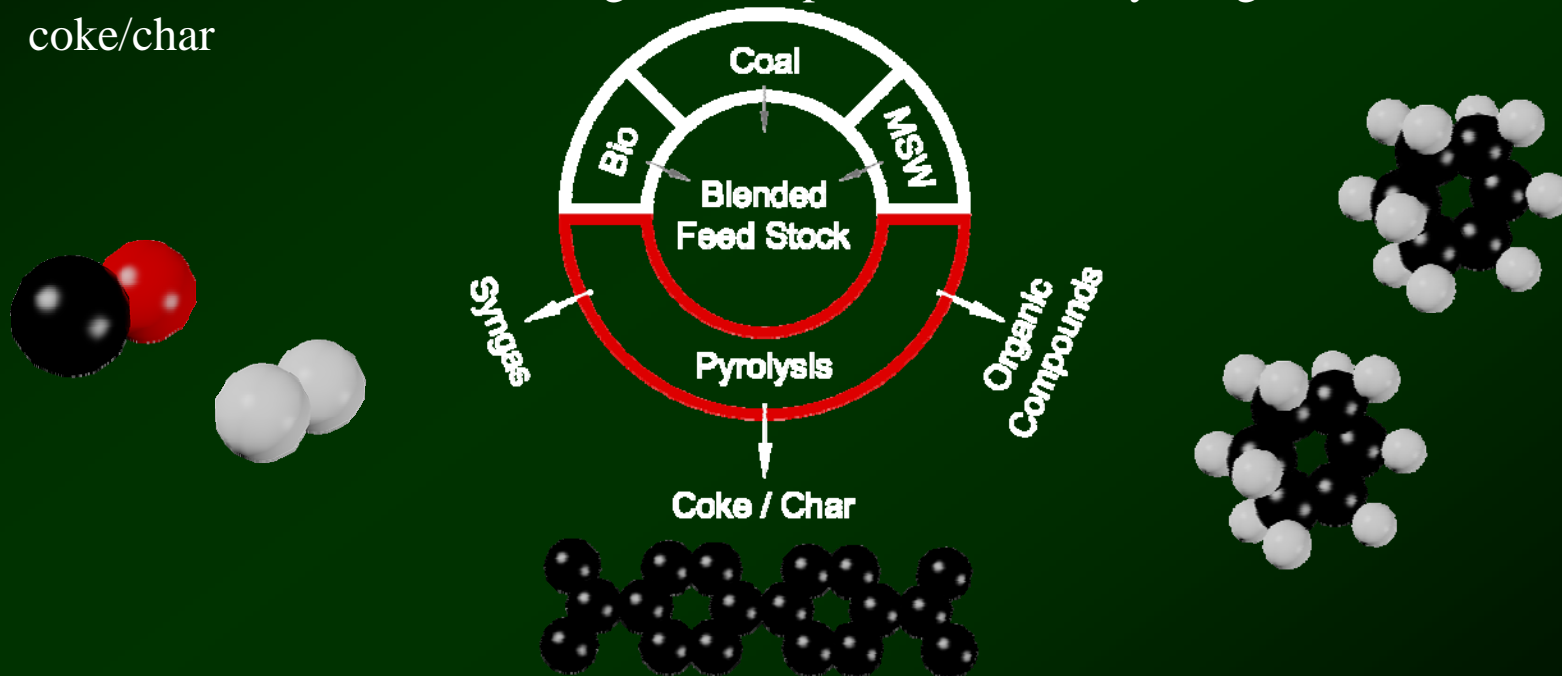
General Introduction

- Current single synthesis process produce fuels that are not able to meet current specifications (ASTM D1655 & ASTM D975)
- FT fuel has a low density & problems with elastomer swelling
- JP-900 fuel has a high density & a low cetane number
- Co-processing low density synthetic (LDS) fuel (FT fuel) with high density synthetic (HDS) fuel (JP-900 fuel) may lead to a joint fully synthetic blend
- Emission concerns of some feed stocks and processes. (Coal)
- Blending feed stocks can reduce calculated CO² by including biomass & solid municipal waste
- Additional processes can be added to use CO² for more product



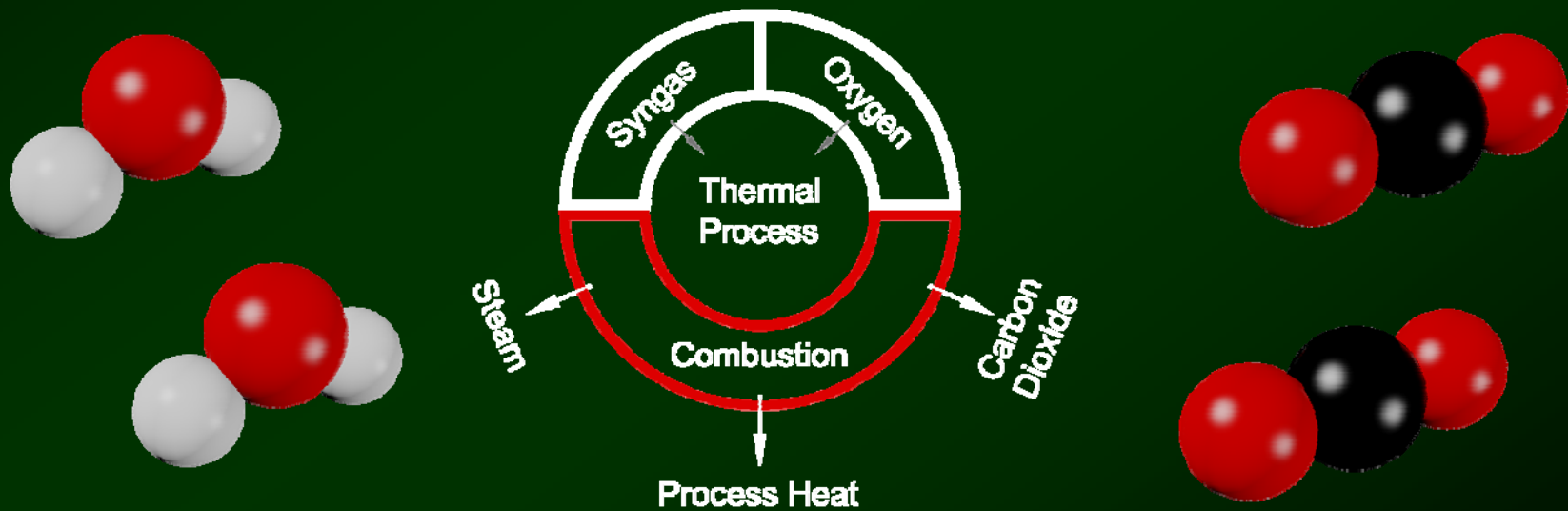
Pyrolysis – Feed Stock Equalizer

- Pyrolysis is the preliminary step that breaks blended feed stocks into core processing materials
- HDS can be made from the organic compounds & LDS by the gasification of the coke/char



Combustion of Pyrolysis Syngas

- Combustion of initial syngas and oxygen creates process heat, steam and CO²
- The heat and steam can be used for pyrolysis & gasification
- CO² be directed to CH₃OH conversion



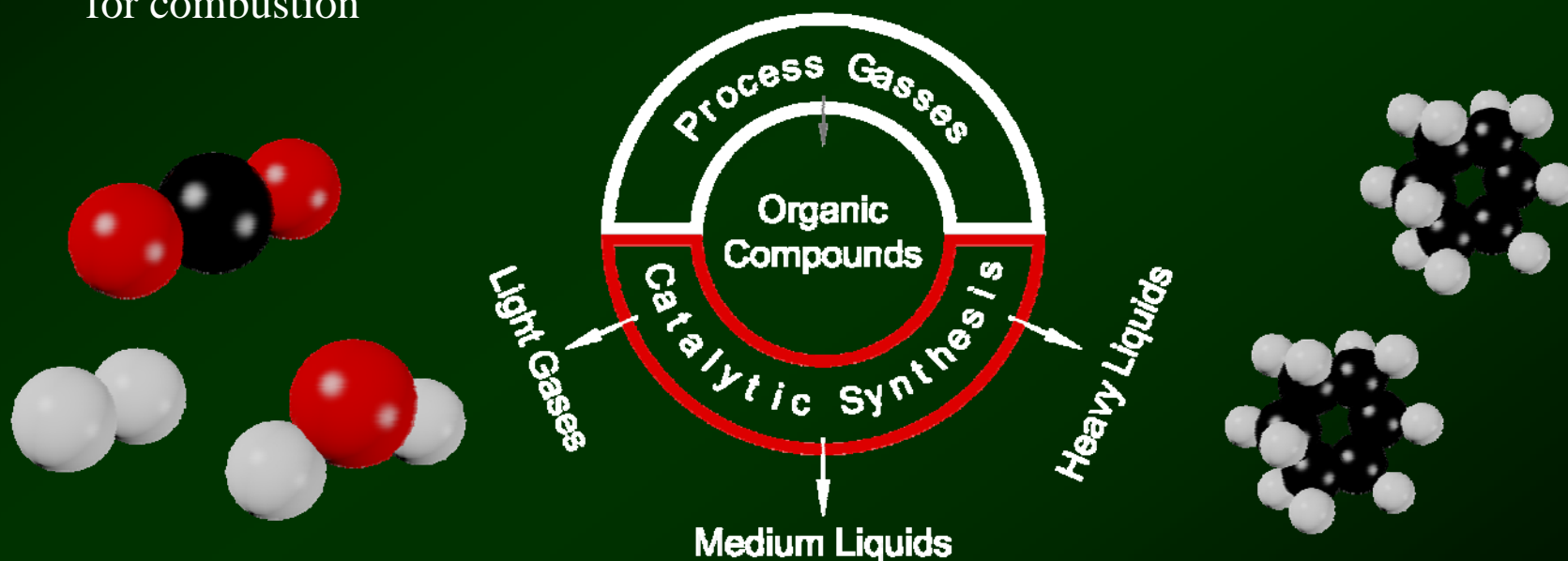
Gasification of Coke/Char

- Coke/Char is gasified and separated into syngas for catalytic synthesis and hydrogen is produced for HDS hydrogenation & CH₃OH conversion
- Some heat & steam may be recovered for lower additional process utilization



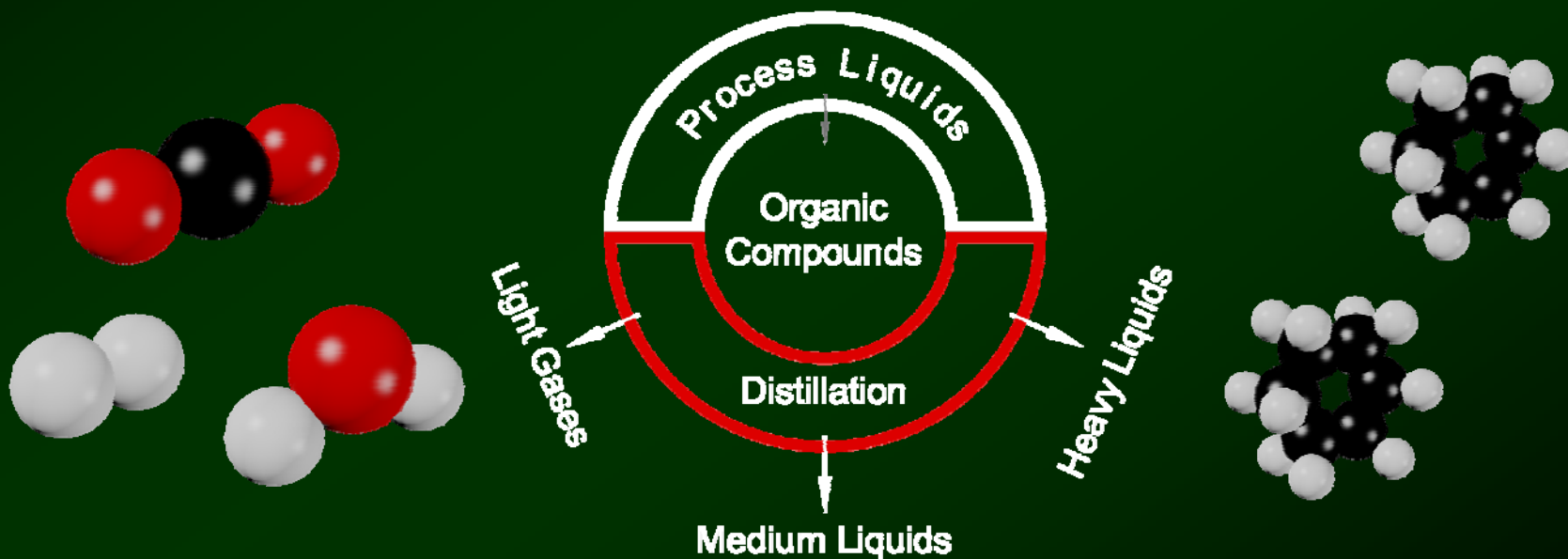
Coke/Char Syngas Catalytic Synthesis

- Syngas from the gasification of the char is synthesized into various products, the majority going to medium cuts for LDS production and for blending with HDS
- Heavy liquids (tars) can be recycled to the feedstock input & light gasses utilized for combustion



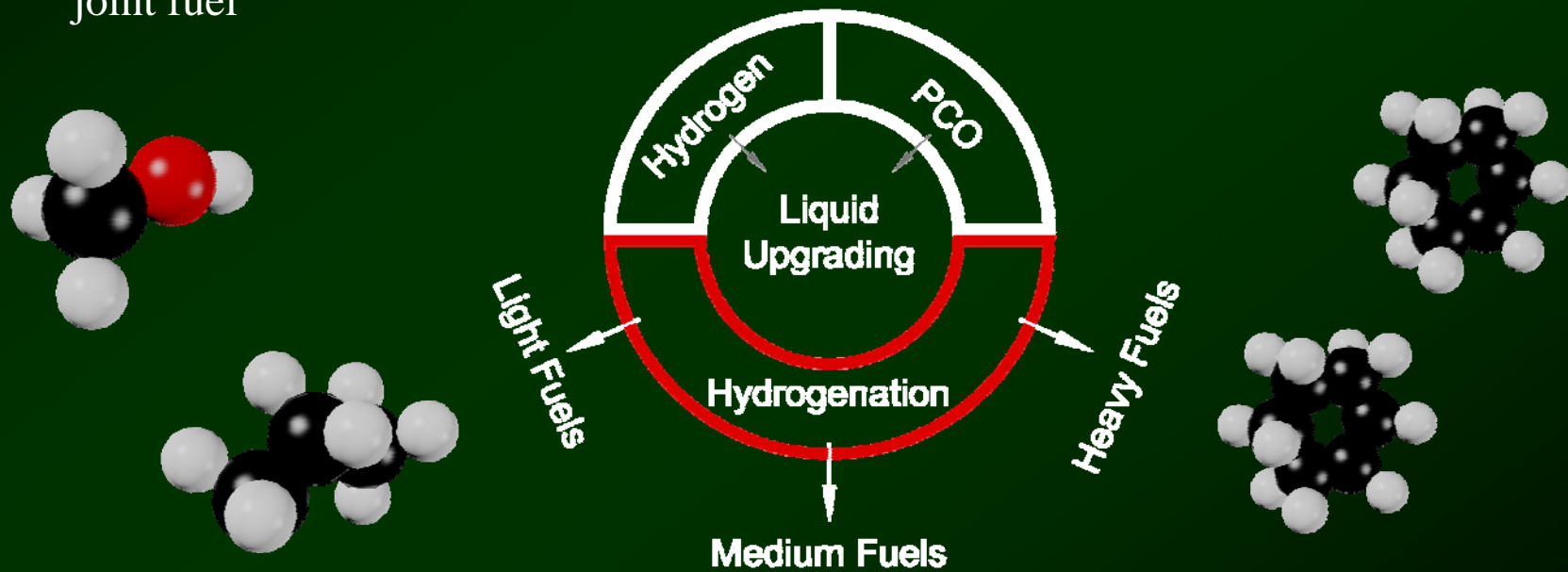
Distillation of Organic Compounds

- Organic compounds from pyrolysis are cleaned and distilled into various liquids, the bulk going to medium cuts for HDS fuel once hydrogenated
- Heavy liquids are recycled to the beginning and light gasses directed to combustion or syngas catalytic conversion for LDS production



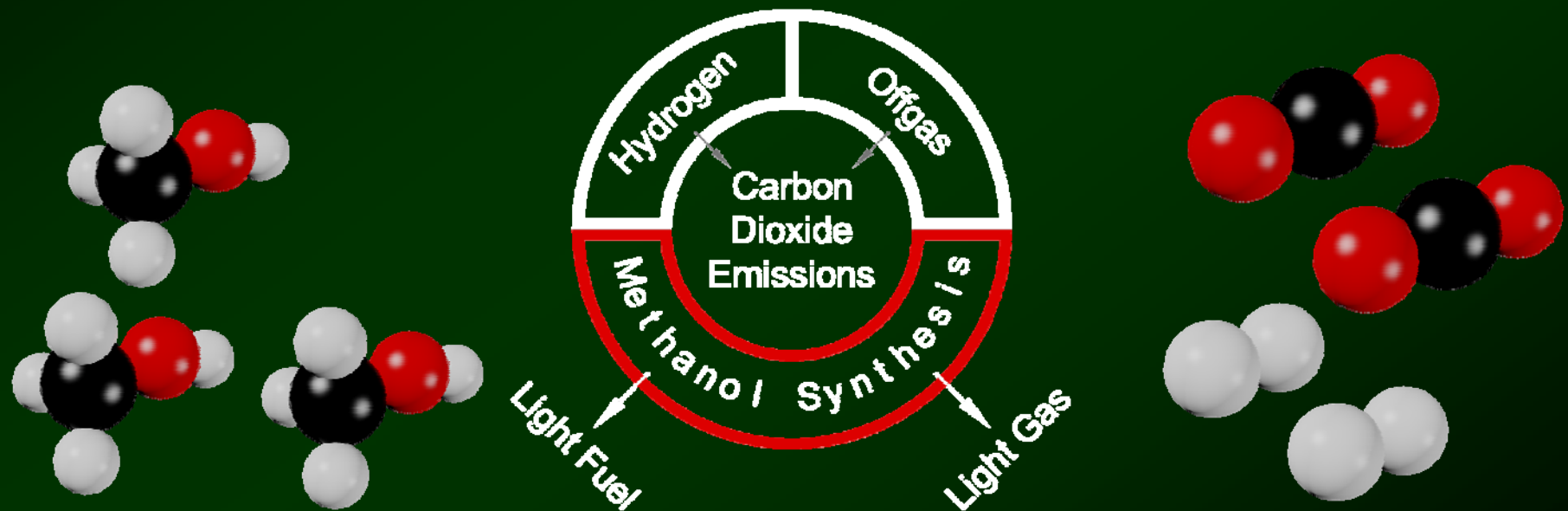
PCO Upgrading

- The medium liquids from pyrolysis and processing will be referred to as Pyrolysis Chemical Oil (PCO) as JP-900 was initially made from refined chemical oil
- The PCO is hydrogenated into HDS fuel for blending with LDS for fully synthetic joint fuel



Methanol Synthesis of CO² Emissions

- CO² emissions synthesized into methanol
- Methanol may be a product or used with flex fuel & hybrid fuel cell cars
- Methanol may be processed with process naphtha for gasoline production



Alternative Process Method: Super Saturation Cavitation

- Controlled cavitation with a hydrosonic pump may allow for a streamlined processing methods by allowing syngas to be co-processed directly with PCO
- Diverse fuel output may be able to be controlled by pump speed or rotor design

