

Solid Fuel Gasification and Syngas Applications

**8th Annual Tulane University Engineering Forum
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**Larry Bailey
Eastman Gasification Services Company**

About Eastman

- Founded by George Eastman in 1920 to supply photographic chemicals for Eastman Kodak
- Became an independent company in 1994
- Headquartered in Kingsport, TN
- Global manufacturer of chemicals, plastics and fibers
- Approximately 11,000 employees worldwide
- 2007 sales revenue of \$6.8 B
- Pioneer in coal gasification – first commercial U.S. coal gasification facility in 1983



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**Chemicals from
Wood (1920)**



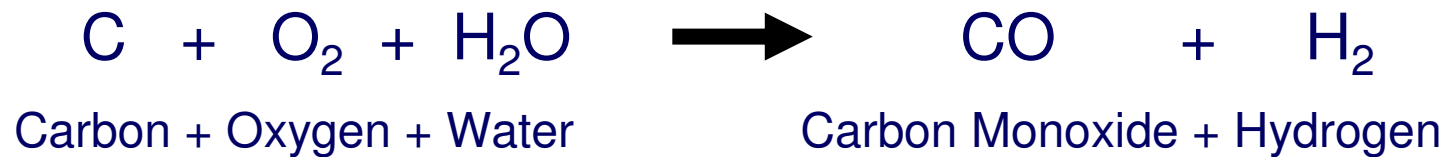
A History Based on Use of Domestic Alternative Feedstocks



Chemicals from Coal (1983)

"Gasification 101"

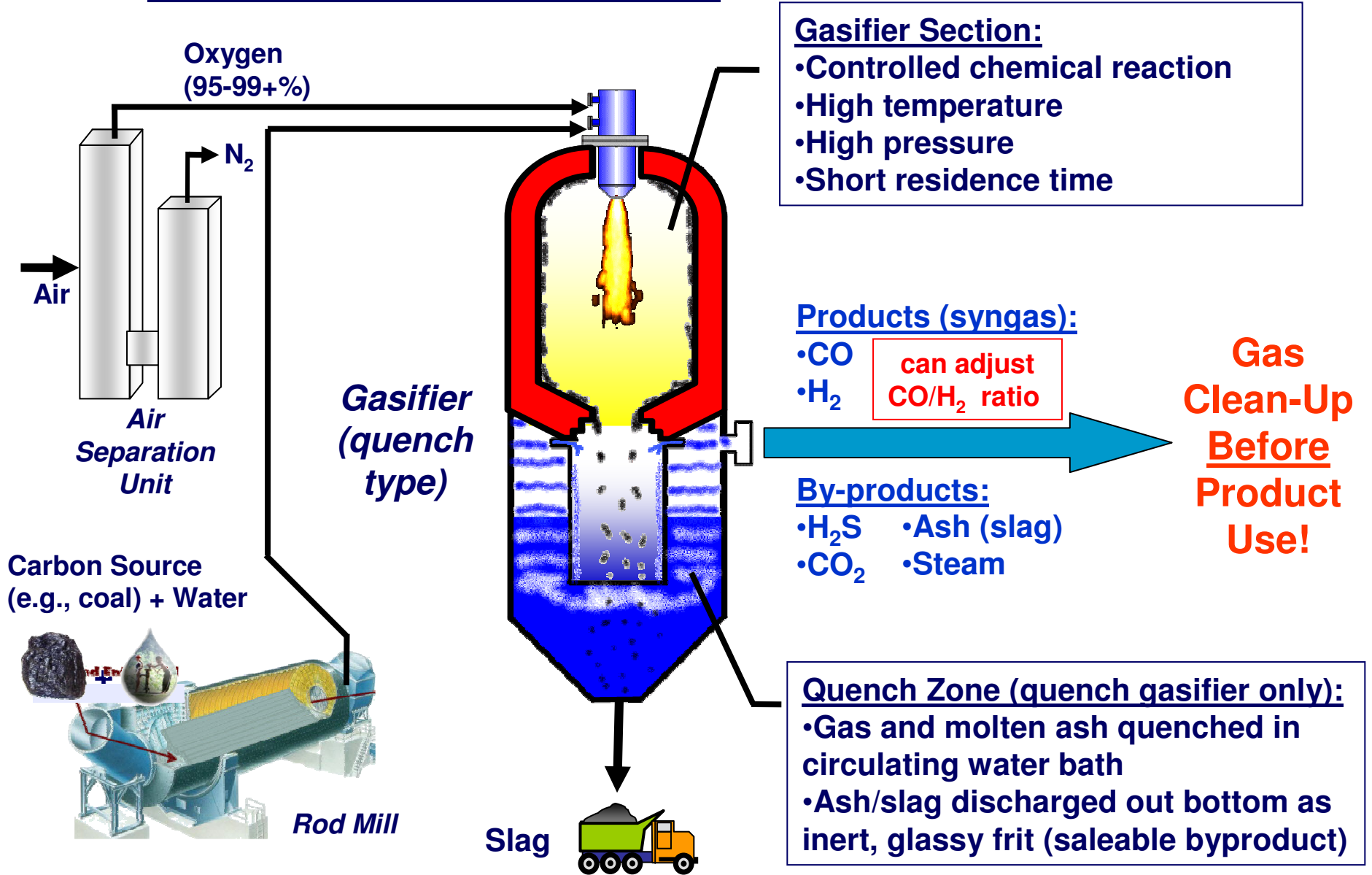
Just the Basics



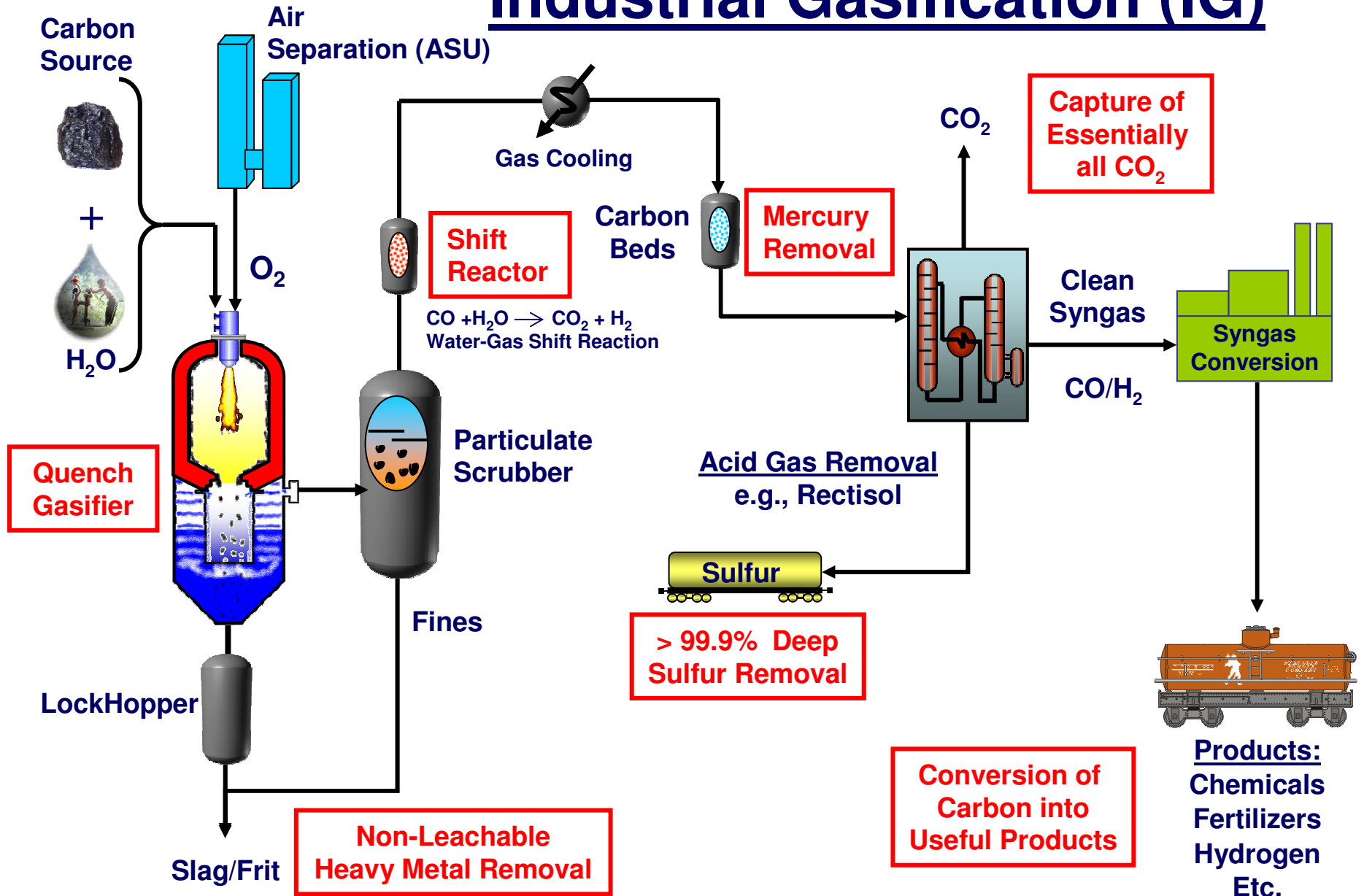
The partial oxidation of carbon to produce a "synthesis" gas or "syngas".

Gasification is not combustion ($\text{C} + \text{O}_2 \rightarrow \text{CO}_2$).

Gasification Basics



Industrial Gasification (IG)



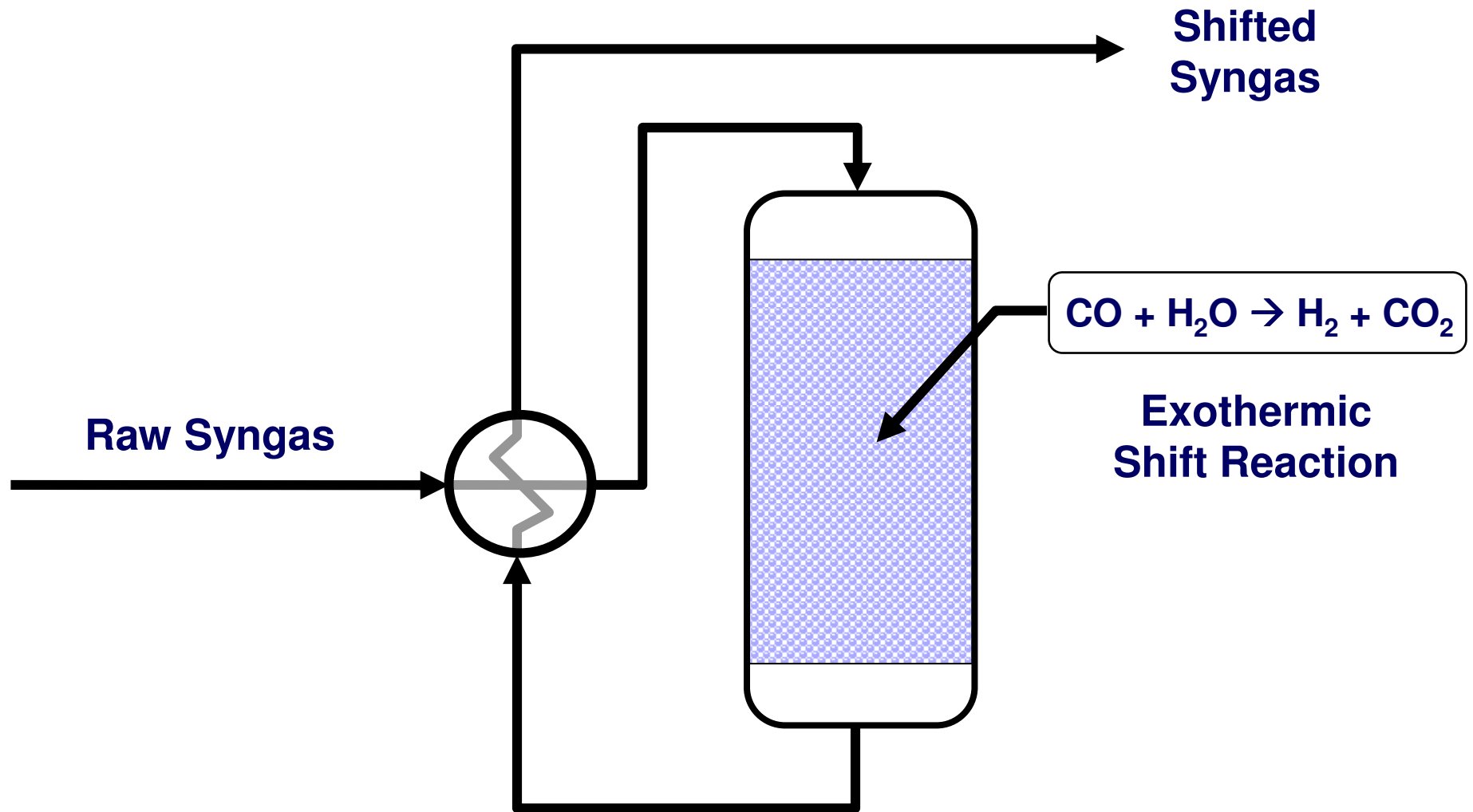
Solids Handling – Feedstock Slurry Preparation (with some gasifiers, can feed as dry solids)



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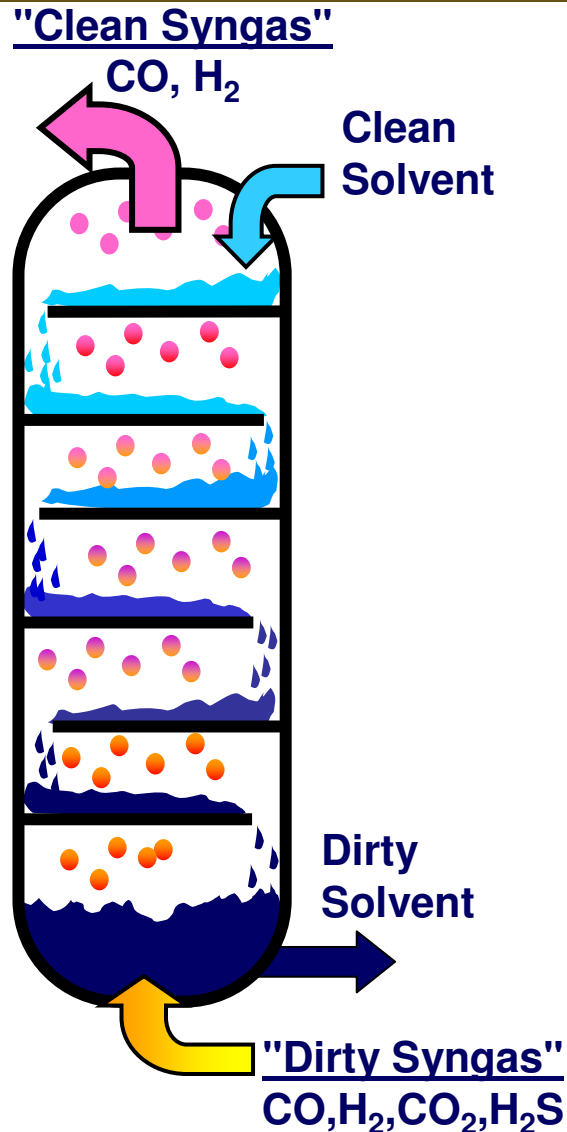
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Shift Reactor Adjusts H₂/CO Ratio



AGR Technologies Provide Deep Sulfur Removal

(AGR = Acid Gas Removal)



Major Technology Options:

- **MDEA** (methyldiethanolamine) – Chemical absorption, 98% to 99+% S removal, large CO₂ slip, moderate operating temperature, lowest capital cost, often inadequate for chemical production from syngas
- **Selexol**[™] (UOP) – Physical absorption, 99+% S removal, variable CO₂ slip, higher cost than MDEA
- **Rectisol**[™] (Lurgi/Linde) - Physical absorption, 99.5% to 99.9+% S removal, complete CO₂ removal possible, similar total cost to Selexol[™], coldest operating temp.
- **Warm Syngas Cleanup** - New technologies (e.g., RTI/Eastman) being developed that operate at high temperatures (> 600 F) and at ppm sulfur levels

The H₂S recovered from these technologies is further converted to either elemental sulfur (e.g., Claus/SCOT) or sulfuric acid.

Hg Removal Demonstrated for Almost 25 Years

Vapor-Phase Mercury Removal

Essentially complete
mercury removal ($\geq 95\%$)
via activated carbon beds



Eastman's Coal Gasification Facility – Kingsport, TN

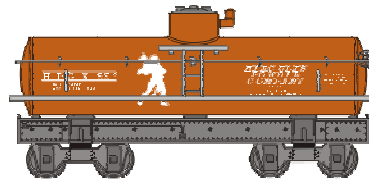


Eastman Chemicals from Coal – The Big Picture

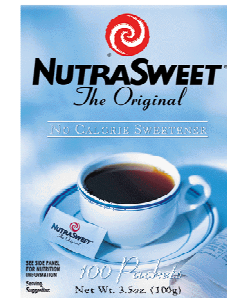
It's likely you have used a product based on coal gasification from Eastman's facility.



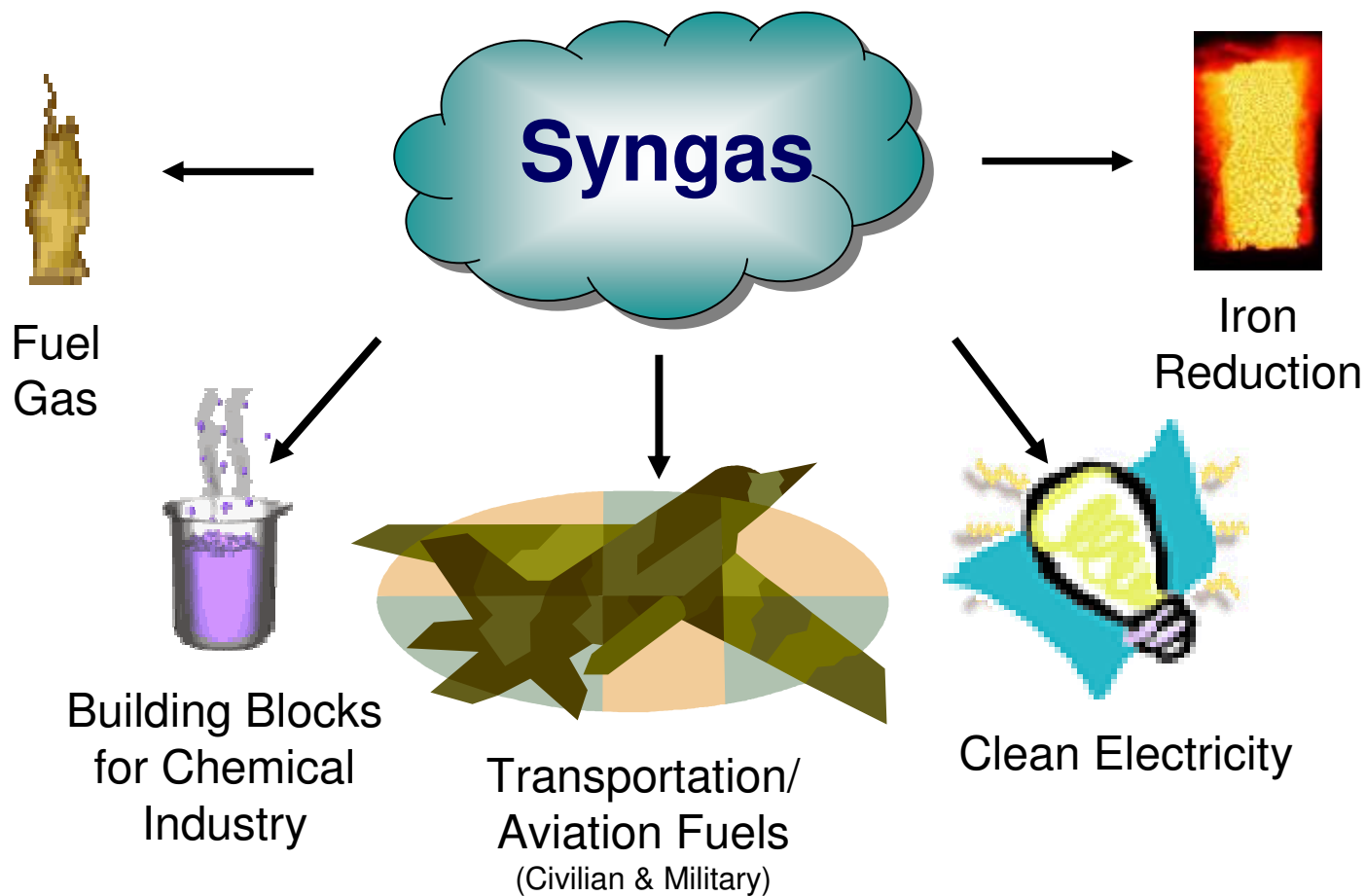
Coal



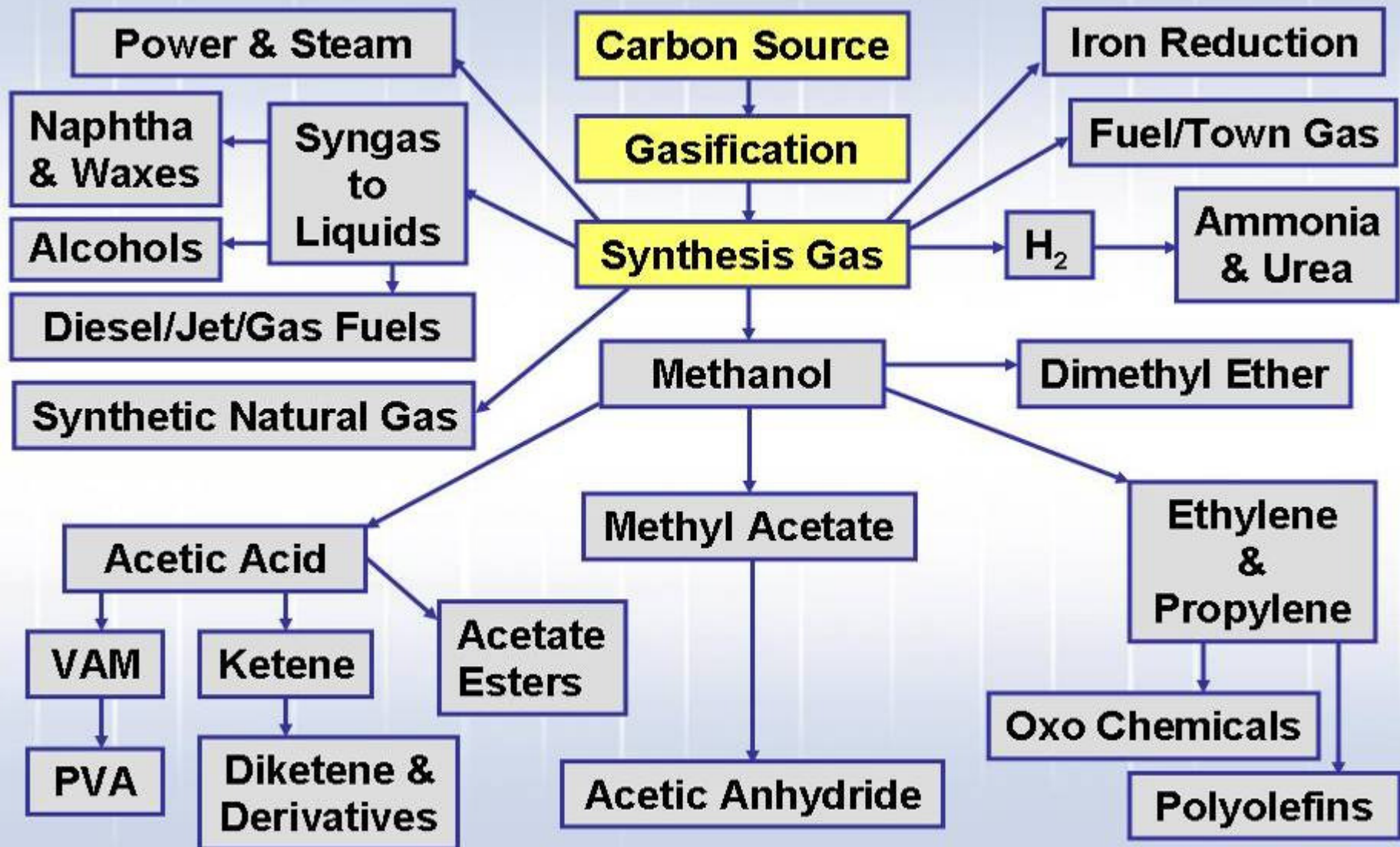
Acetic Anhydride
Acetic Acid
Methanol
Methyl Acetate



Syngas from Gasification has Multiple Applications



Gasification Can Produce Almost Any Product Made from Oil or NG



Questions?



We Believe So.

Eastman – Making It Happen.