

# Sustainable Fuels Production

## Gas Purification and Heat Recovery Solutions

John Winter | GSTC Conference 2021, San Antonio | October 12, 2021

**SCHMIDTSCHACK**

 **ARVOS**  
GROUP

# 1 — Challenges

# CHALLENGES

## IN CONVERTING RENEWABLE FEEDS TO SYNGAS

### Capex, Capex, Capex

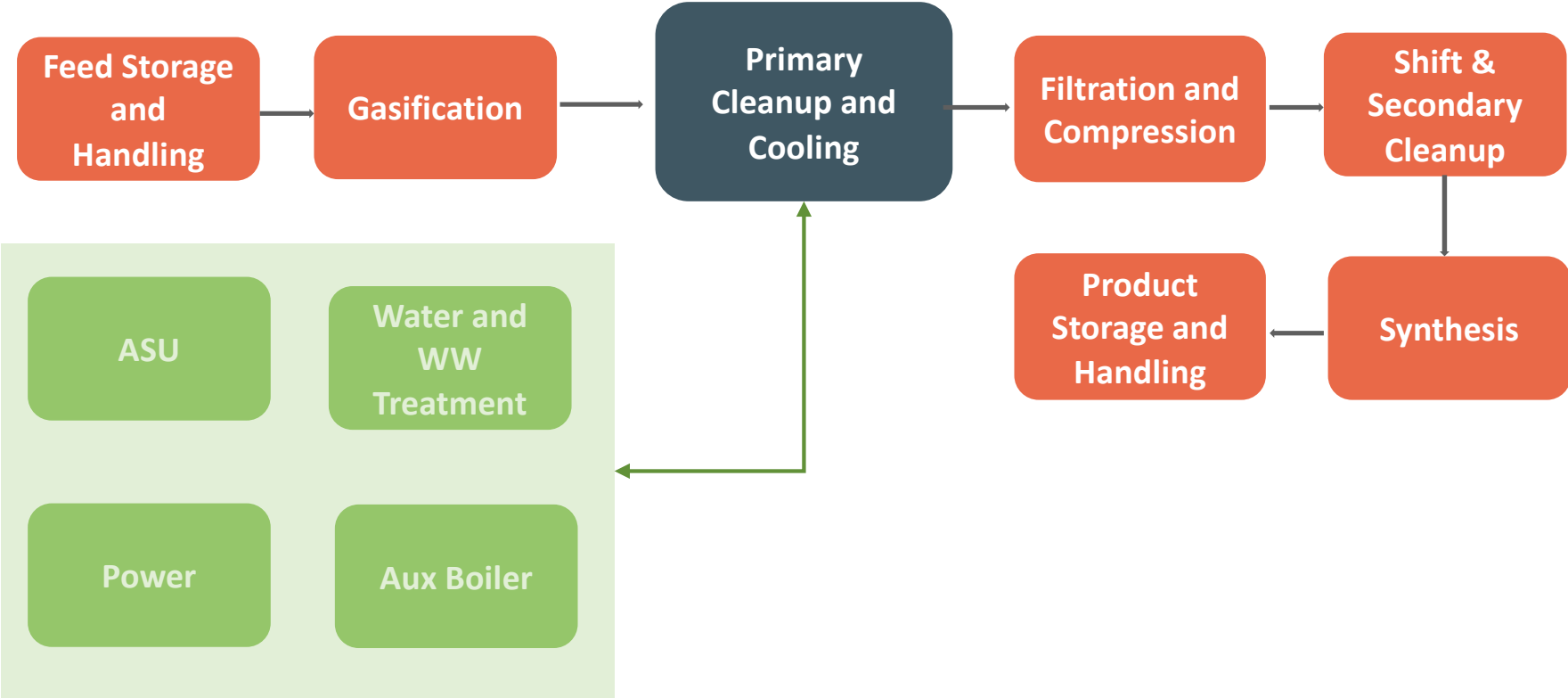
- Feedstock sourcing within economic transportation radius - Capex vs. Opex
- Feedstock variability - Opex, Capex
- Feedstock upgrading – How Much?
- Scale – constrained by feedstock supply and density, leading to pressure on Capex and Opex
- Certainty of subsidies sufficient for financing?
- Percieved technical risk, limited installed base



# CHALLENGES

## COMPLEXITY

SCHMITSCH SCHACK



# 2 — Approved Solutions



# OPTIMIZED SOLUTIONS BASED ON OUR EXPERIENCE

## SCHMIDTSCHESCHACK SCOPE

### Objectives

- Purification – convert tars, oils, and methane to syngas
- Cooling – reduce temp to downstream specification

### Criteria

- Recovered heat converted into high value form/steam
- Lower project carbon intensity
- Low capex
- High Reliability, availability, maintainability

### Constraints

- Site: Height, Footprint, Noise, Access
- Installation labor
- Environmental

# FULL HEAT RECOVERY, HIGH CONTAMINANTS SOLUTION

## FLUID BED GASIFICATION, LOW PRESSURE

### SCHMIDTSCHESCHACK Scope

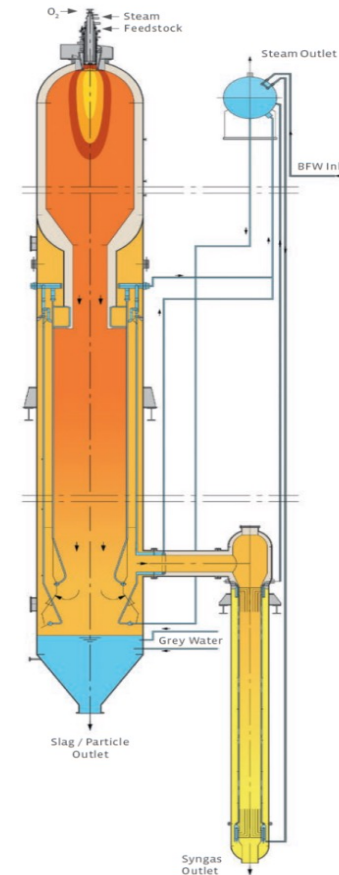
- POX Reactor to Technology Vendor Specification, 1st and 2nd Stage syngas cooling, slag handling, some ash cooling and miscellaneous equipment
- Plugging avoidance
- High halide concentrations
- High variability/design range for ash and halides

### SCHMIDTSCHESCHACK Solutions

- Two stage cooling modified from coal applications, soot blowing
- Aggressive thermal reforming
- Special metallurgy in wet areas
- Ph control, water circulation
- Specially designed to avoid fouling

Status - delivered

Modified for Height Reduction



# REVISED FULL HEAT RECOVERY SOLUTION

## FLUID BED GASIFICATION, LOW PRESSURE, MULTIPLE TRAINS

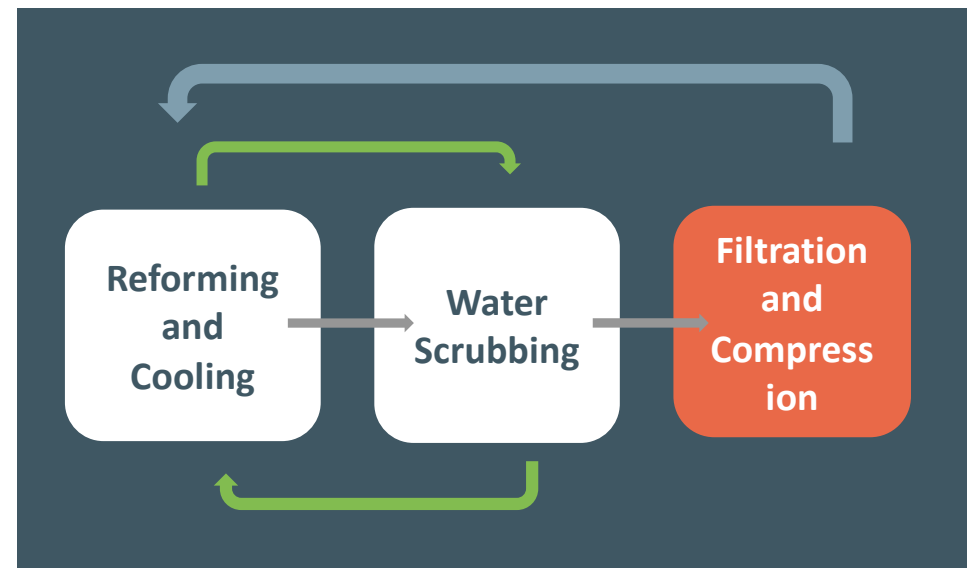
### SCHMIDTSCHKE SCHACK Scope

- POX Reactor to Technology Vendor Specification, 1st and 2nd Stage syngas cooling, Water Scrubbing, some ash cooling and misc equipment, slag handling

### SCHMIDTSCHKE SCHACK Solutions

- Integrated syngas cooler sump with water scrubbing system to conserve water and reduce corrosion risk cost
- Improved yields and reduced oxygen consumption through optimized severity of methane reforming
- Assisted client with out-of scope system designs and system integration for startup to improve capex and efficiency; startup and shutdown scenarios for multi-train plant
- Targeted Ph control to reduce chemical consumption

**Status – designed and quoted**





# FULL HEAT RECOVERY, BIOMASS SOLUTION

## FLUID BED GASIFICATION, LOW PRESSURE

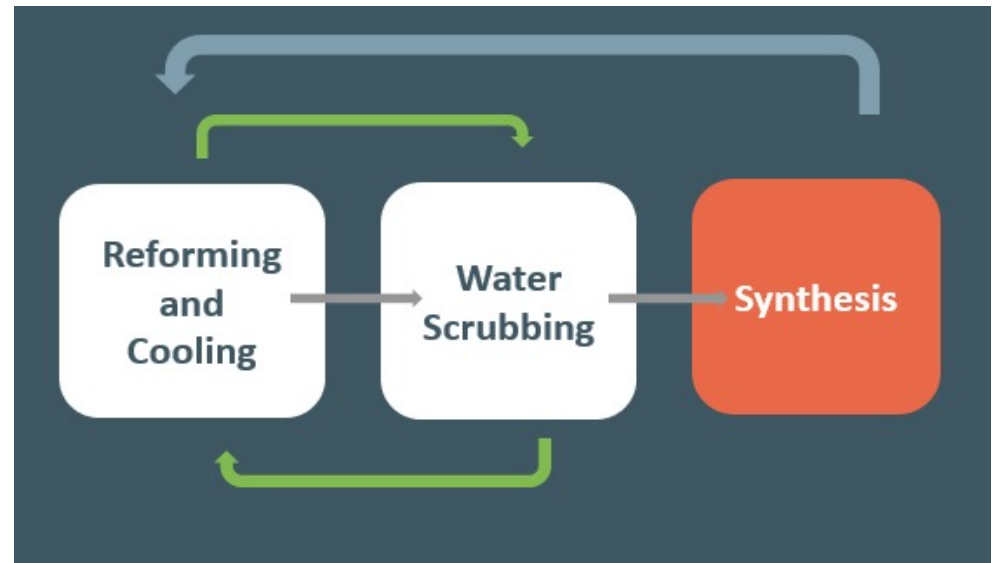
### SCHMIDTSCHESCHACK Scope

- POX Reactor to Technology Vendor Specification, 1st and 2nd Stage syngas cooling, Water Scrubbing, some ash cooling and misc equipment, slag handling

### SCHMIDTSCHESCHACK Solutions

- Reformer tuned for best integrated plant results; accepts other plant streams to boost yield and lower carbon intensity- increased load for syngas cooling
- Scrubber and cooler optimized for this system to reduce water consumption and circulation
- Water system and pH management simplified

Status – designed and quoted



# LIMITED HEAT RECOVERY, HIGH PRESSURE SOLUTION

## FLUID BED GASIFICATION, BIOMASS, HIGH PRESSURE

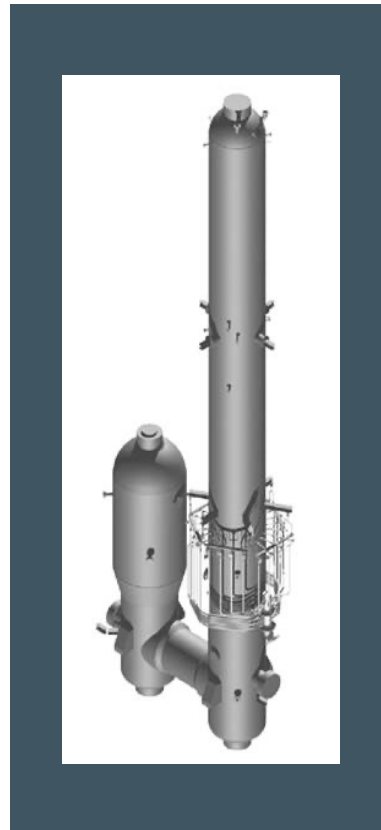
### SCHMIDTSCHESCHACK Scope

- Integrated POX and cooler, raw gas inlet for POX, slag handling

### SCHMIDTSCHESCHACK Solutions

- Integrated syngas cooler and reformer - pressure affects geometry!
- Sensible heat recovery limited for capex reduction and downstream use of sensible heat
- Both thermal reformer( in cooperation with technology supplier) and heat exchanger designs modified to reduce height constraints

Status – detailed design underway



- Slag handling system modified to reduce height and capex, minimize corrosion potential
- SCS proprietary quenching features added to allow exceptionally wide operating range without excessive capital cost
- Incorporated steam superheat into syngas cooling for boost in steam value/GJ to project

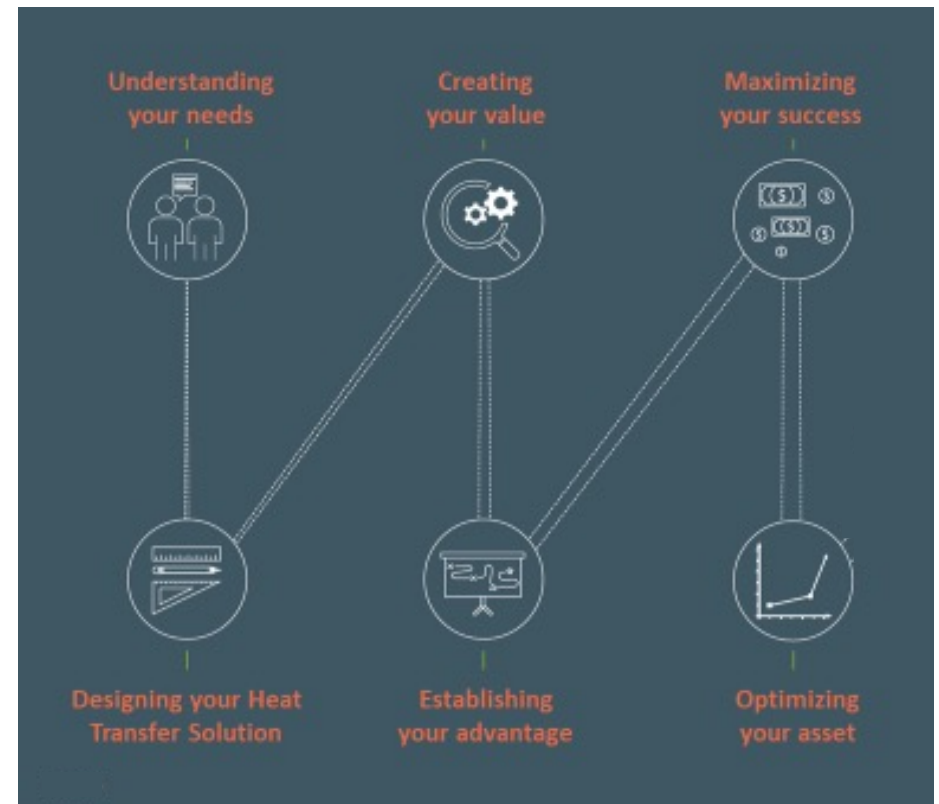
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— Economical Advantages

# ECONOMICAL ADVANTAGE

## HOW TO COLLABORATE

- Design to only necessary requirements can reduce equipment costs by up to 30%.
- Renewable Fuel subsidies drive product prices to 2-3 times fossil (without carbon tax) equivalents; so optimizing steam/power/ fuel gas cycles allows both incremental economic improvements and control of pass/fail scenarios.
- Thermal reforming optimization – reductions of oxygen consumption up to 10% can be realized as well as improving yields.
- SHHPS lowers power costs and carbon intensity



# 4 — How to Benefit

# HOW TO BENEFIT

## OUR CONTRIBUTION TO YOUR PROJECT

- FEL0, FEL1 estimates for early economic analysis. SCHMIDTSCHESCHACK experience with project engineering studies for last 3 years renewable fuels projects provides a good database for Capex and OPEX
- We will work with other technology providers to provide FEL2 engineering studies to deliver more complete project definition.
- Our systems and resources in place provide full FEL3 studies and firm price estimates for equipment or entire installed gasification units in cooperation with other technology suppliers and fabrication partners while SCS resources concentrate on core process and equipment expertise.
- Contact [john.winter@arvos-group.com](mailto:john.winter@arvos-group.com)

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