

## PYROLYSIS / GASIFICATION DESIGN & ENGINEERING SERVICES

### BACKGROUND INFO

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Klean Industries provides design and engineering services from early-stage conceptual project planning through detailed engineering packages necessary for project construction. Klean utilizes its core competencies in mechanical and chemical engineering, and more specifically in reactor design and syngas cleaning processes.

### PRELIMINARY DESIGN SERVICES

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Klean, along with the customer, will identify the key project parameters and goals. This information is then used to initiate the preliminary design phase.

#### **Preliminary Design Services & deliverables typically include the following:**

- Basic unit operations defined
- Preliminary Heat & Mass balance (Process Flow Diagrams) with:
  - Fuel Feed Rates
  - Energy output (syngas and/or steam)
  - Parasitic loads
  - Overall plant efficiencies
- Preliminary P&ID's and equipment sizing
- Budgetary Capital and O&M costs

#### **Additional services to this phase can include:**

- Syngas Cleaning / Flue Gas Cleaning
- Power Generation options
- Emissions Analyses
- 3D Models depicting plant configuration and scale
- PowerPoint presentations for project stakeholders

The Preliminary Design phase is a relatively low-cost, high value service that can support early stage project development activities including project financing, permitting and economic analyses.

### DETAILED ENGINEERING SERVICES

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After preliminary design is complete Detailed Engineering can commence.

#### **Detailed Engineering tasks and deliverables typically include:**

- Mechanical and Structural Assembly drawings
- Final P&ID Diagrams
- Detailed / Final Heat & Mass Balance
- Electrical and Instrumentation Diagrams
- Pipe sizing and Orthographic drawings

Klean Industries can also provide turn-key equipment supply and project construction in conjunction with our construction partnership firms. Please contact us to discuss such services.