



## Syngas Reforming Using Hot Oxygen Burner Technology



The commercial scale Hot Oxygen Burner (HOB) shown is capable of heating 300 tons per day of oxygen. The HOB system was designed for reforming syngas (99.9% tar and hydrocarbon conversion) produced from gasification of municipal waste. The same design can be used to reform syngas from various biomass and hydrocarbon feedstocks and fuel. Heating the oxygen can be provided by natural gas, propane or recycled tail gas from downstream processes.

### Background

Gasification followed by the Fischer Tropsch gas-to-liquids (GTL) process is an important pathway to producing renewable fuels from solid feedstocks. Depending on the gasification technology used, the synthesis gas (syngas) produced from the gasifier may still contain a significant fraction of hydrocarbons and tars. This fraction, if left unconverted, may result in lower yields of fuel as well as pose technical and economic challenges for downstream steps of syngas cooling and clean up. For this reason, renewable fuel project designers include a secondary reforming step. In this step, additional oxygen and steam can be mixed downstream of the gasifier to convert the remaining hydrocarbons and tars into additional syngas.

### Technical Specifications

Oxygen Firing Rates	20 to 1000 TPD
Feed Pressure	Up to 500 psig
Hydrocarbon/Tar Conversion	>99%

### Process Improvements Using Hot Oxygen

Unlike conventional secondary reforming processes, Linde offers a Hot Oxygen Burner (HOB) technology for partial oxidation that does not require steam and helps achieve greater efficiencies in hydrocarbon/tar conversion to syngas. HOB technology creates a pre-heated oxygen jet to rapidly entrain and reform the hydrocarbon containing streams. The high oxygen temperature (>3600°F) combined with high momentum of the oxygen jet has been demonstrated to achieve significant reductions in mixing time. This leads to more efficient and complete conversion of hydrocarbons to syngas.



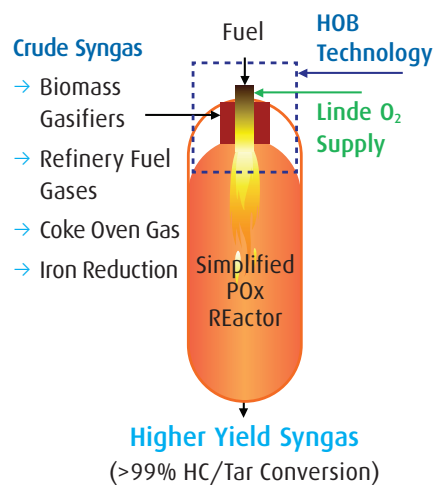
**Benefits** In addition to potentially higher yields, HOB Technology provides several key benefits to syngas secondary reforming processes when compared to conventional processes:

- Enables simpler and more flexible partial oxidation reactor design
- Accelerated system start-ups
- Operational stability with varying feed gas composition
- Greater flexibility to process various feedstocks including off-gases, coke oven gas, natural gas, and other hydrocarbon streams
- Enhanced uptime for processes downstream of gasifier
- Reduced soot formation
- Does not require fired heaters; minimizes NOx and CO<sub>2</sub> emissions

- Features**
- Oxygen Supply
  - Hot Oxygen Burner (HOB) and flow control skids
  - Design services for syngas inlet

**Summary** HOB Technology is a preferred method for reforming of hydrocarbon-containing waste streams delayed coking unit off-gases, coke oven gas, and waste gas streams from iron reduction processes in steel manufacturing. Reforming is also required by processors seeking to biologically convert syngas streams to alcohols and other liquid chemicals.

**Diagram: Hot Oxygen Burner Technology**



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