FLUID COKING

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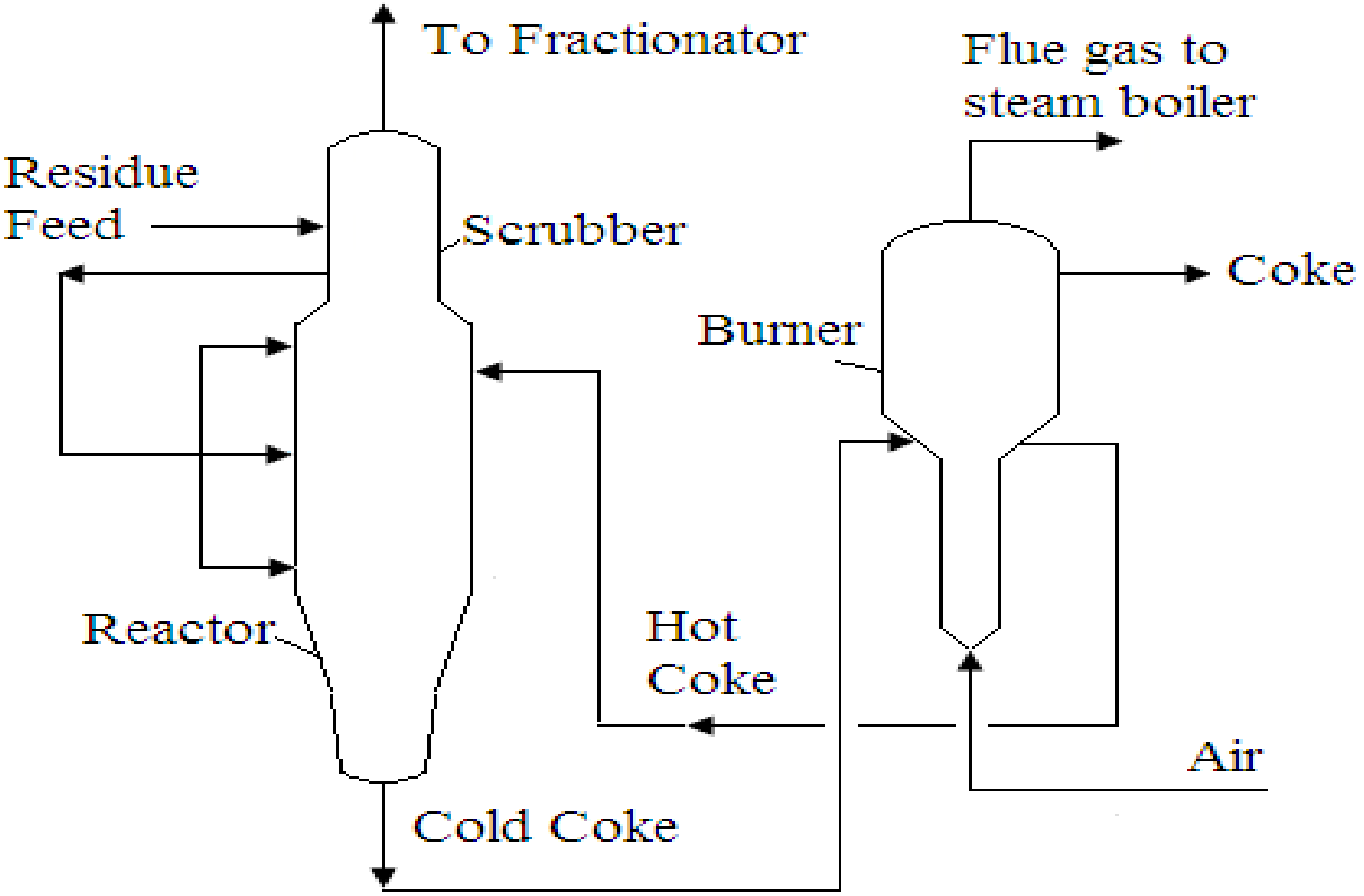
- Fluid coking is a continuous fluid bed technology.
- It thermally converts heavy hydrocarbons such as vacuum resid, atmospheric resid, oil sands bitumen, heavy whole crudes, deasphalter bottoms, or FCC bottoms to lighter products.
- Fluid Coking is currently used commercially in refineries for deep conversion and as the resource to upgrade heavy oils/bitumens.

FLUID COKING

- Fluid coking uses two vessels.
- A reactor and a burner.
- Both the reactor vessel and burner vessel contain fluidized beds with coke particles circulating between the two vessel by fluidized solids techniques.
- Coke particles are circulated to transfer heat to the reactor.
- The residuum is cooled by distributing it as a thin film of liquid on the outside of the hot coke particles.



Fluid coking process

PROCESS DESCRIPTION

- Heated by the produced coke
- Cracking reactions occur inside the heater and the fluidized-bed reactor.
- The fluid coke is partially formed in the heater.
- Hot coke slurry from the heater is recycled to the fluid reactor to provide the heat required for the cracking reactions.
- Fluid coke is formed by spraying the hot feed on the already-formed coke particles.
- Reactor temperature is about 520°C, and the conversion into coke is immediate, with complete disorientation of the crystallites of product coke.
- The burning process in fluid coking tends to concentrate the metals, but it does not reduce the sulfur content of the coke.

- Characteristics of fluid coke:
  - High sulfur content,
  - Low volatility, poor crystalline structure, and low grindability index.

- Flexicoking, integrates fluid coking with coke gasification.
- Most of the coke is gasified. Flexicoking gasification produces a substantial concentration of the metals in the coke product.

Flaxicoking

- ✓Flaxicoking process integrates conventional fluid coking with coke gasification process for upgrading heavy resids.
- ✓The gasification is effected by the addition of air and steam to a fluidized solids vessels.
- ✓The gaseous products are subsequently treated to produce a clean fuel gas.

Why we use the flaxicoking?

- ✓This process converts these feeds to a 99 wt.% yield of hydrocarbon fuel gas, naphtha, middle distillates, heavy gas oil and a low sulphur coke gas.
- ✓The remaining 1 wt.% is petroleum coke containing metals and other ash components present in the feed.

Process description

- ✓Conventional flexicoking process.
- ✓Dual gasification flexicoking process.

Conventional flexicoking

- ✓In the simplified flaxicoking process residuum feed is injected into the reactor where it is thermally cracked to a full range of vaporized products plus coke, which is deposited on the fluidized coke particles.
- ✓The heavier fractions are condensed in the scrubber and are normally recycled back to the coking reactor.
- ✓The lighter fractions proceeds overhead from the scrubber to a conventional

- ✓The heat required for the endothermic reaction in the reactor is supplied by a circulating hot-coke stream from the heater.
- ✓In the gasifier, oxygen which enters at the bottom of the bed can react in two ways.

- ✓If it reaches a coke particles, it reacts to produce a mixture of CO and CO_2.
- ✓Secondly, oxygen can react in the void space between particles with the CO which has been formed to produce more CO_2.
- ✓Throughout most of the bed, the slow

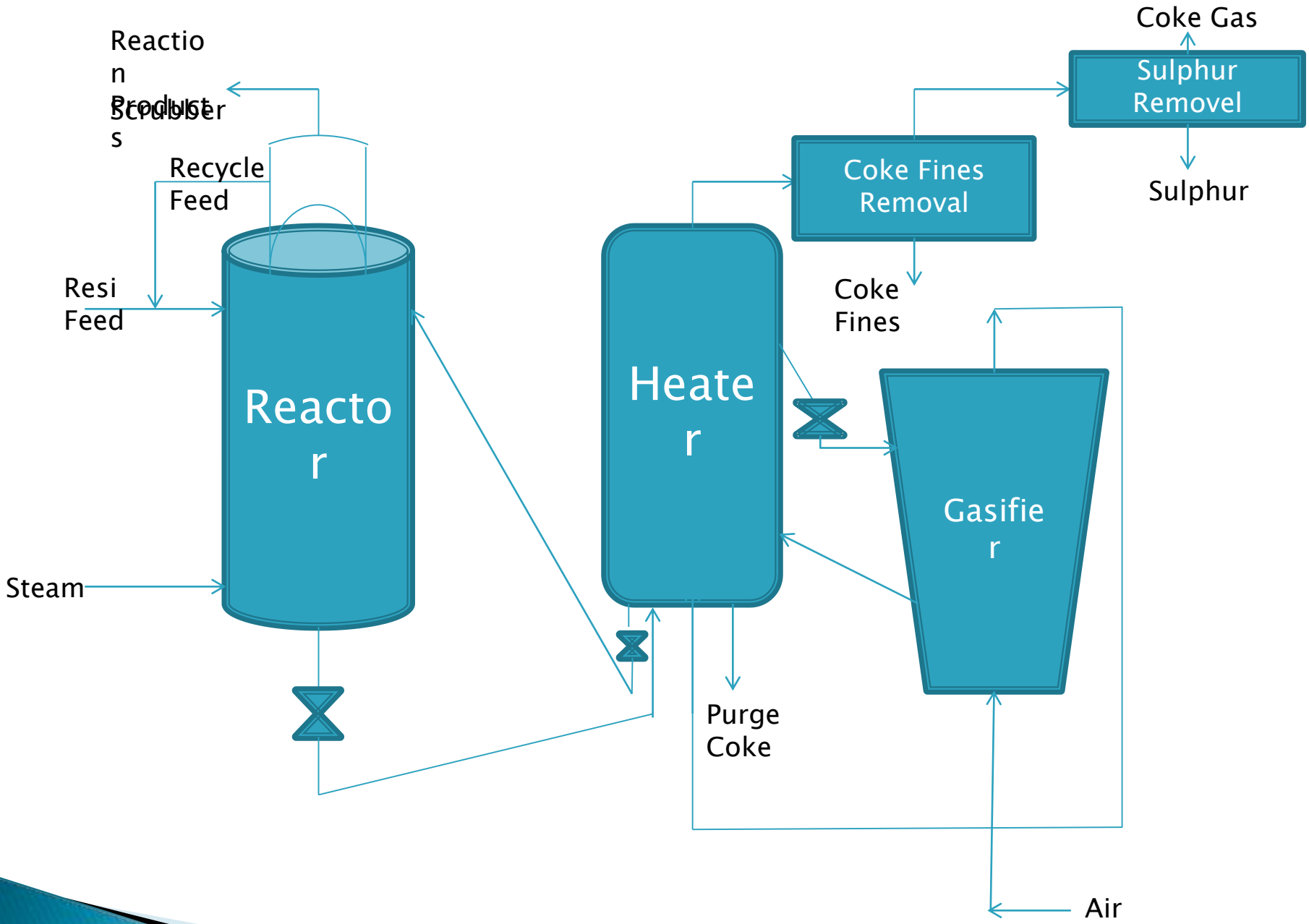


Figure: Convection flexicoking process.

Dual gasification flexicoking

- ✓In the air gasifier, coke is burned with air to provide heat of reaction for the reactor.
- ✓The steam gasifier with resulting production of low heating value coke gas.

- In the steam gasifier, a H2/CO rich synthesis gas is produced which can either be water gas shifted for H_2 manufacture or used as a synthesis gas.
  The synthesis gas produced in dual gasification flaxicoking can be used in a variety of ways, including manufacture of chemicals and indirect liquids.

- ✓Coke is circulated to the air gasifier where it is burned with air to form CO_2.
- ✓Hot coke is also circulated to the steam gasifier where the gasification of carbon with steam to form CO and H_2 is one of the predominant reactions taking place.
- ✓As the result of the steam gasification, all of the components necessary for water gas shift reaction are present, and at the condition of the steam gasifier this reaction is at equilibrium.
- ✓Since the water gas shift reaction produces some CO_2, gasification of coke

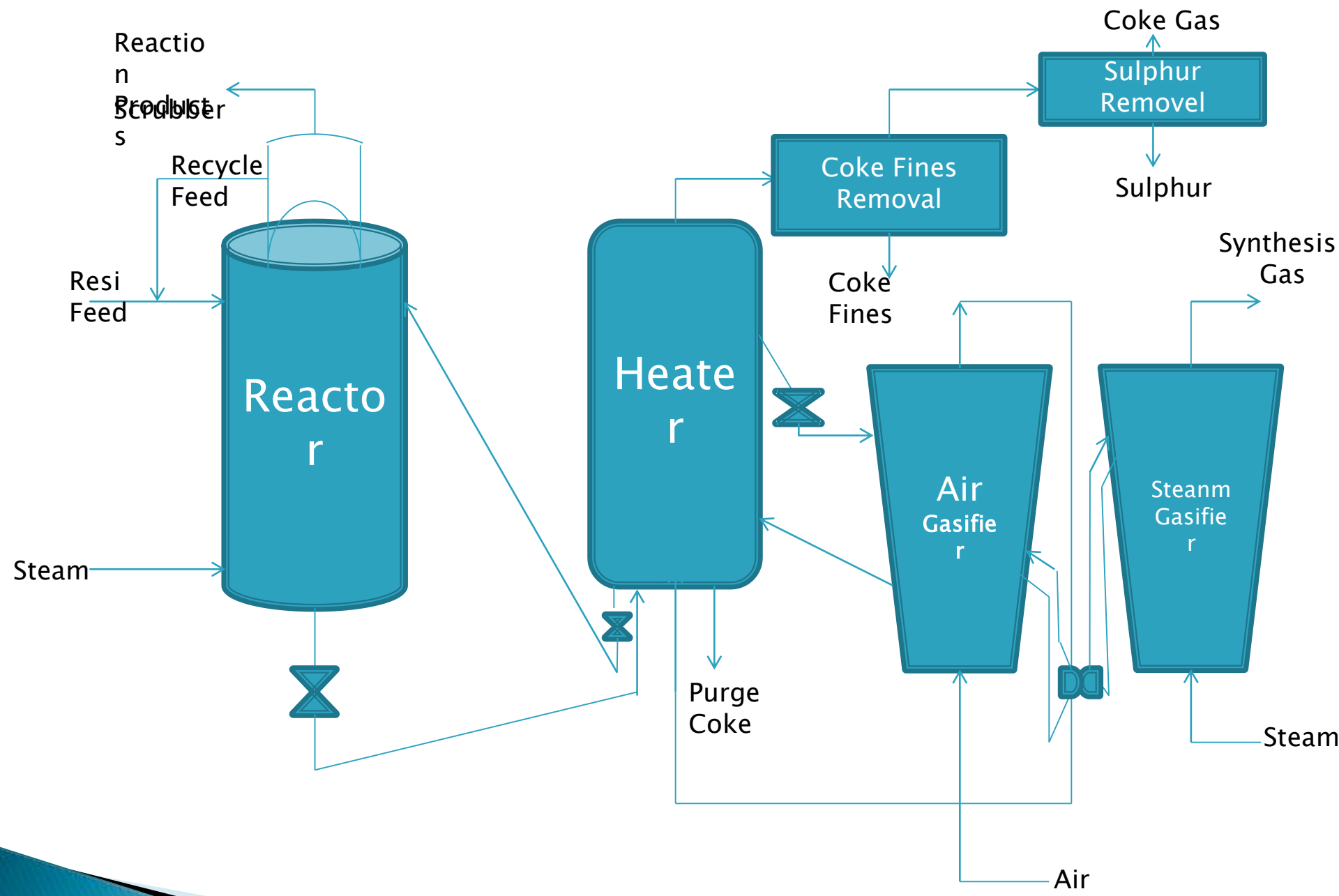


Figure: Dual gasification flexicoking process.

Thanks