3RD CLASS
CHEMICAL PROCESS INDUSTRY

AMMONIA PRODUCTION

CHAPTER 1

- LECTURE 1

BY

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Chemical engineering

Chemical engineering is that branch of engineering concerned with the development and application of manufacturing process:

physical changes of materials

chemical changes of materials

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These processes may usually be resolved into a coordinated series of unit physical operations and unit chemical processes.

Chemical Engineering

chemical engineering is that branch of engineering concerned with the development and application of

Manufacturing Processes

Physical change

Unit Chemical Processe

Resolved series of

Unit Physical Operations

Unit Chemical operation

The work of the chemical engineer is concerned primarily with the:

#design,

#construction,

operation of equipment and plants

in which these unit operations and processes are applied.

Chemical engineer can be defined as:

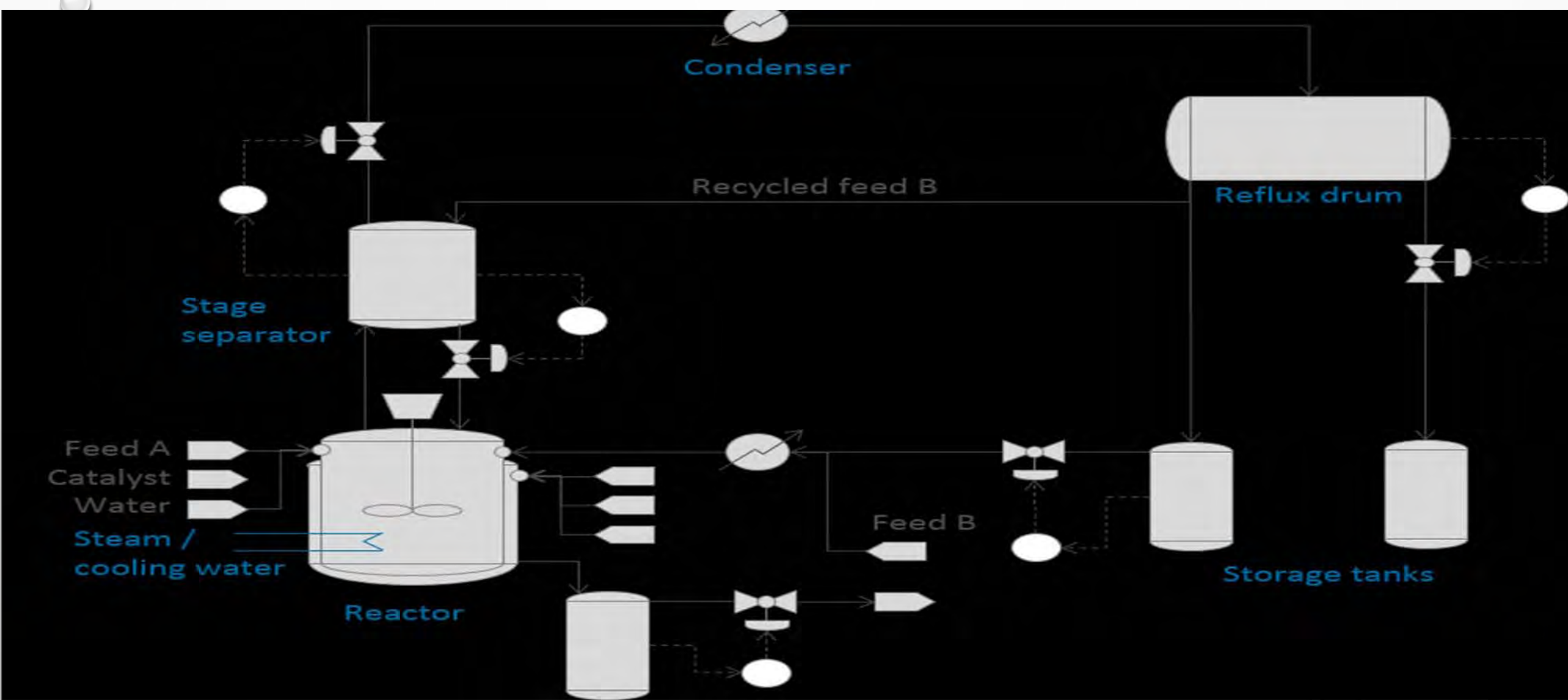
“the application of the principles the physical sciences together with the principles of economics and human relations to fields that pertain directly to processes and process equipment in which matter is treated to effect a change in state, energy content or composition."

❑ Types of processes

** projects,*
**batch process,*
** mass production,*
*and *continuous process.*

- batch process refers to a process that consists of a sequence of one or more steps that should be performed in a defined order. a finite quantity of the product is produced at the end of the sequence, which is repeated in order to produce another product batch.

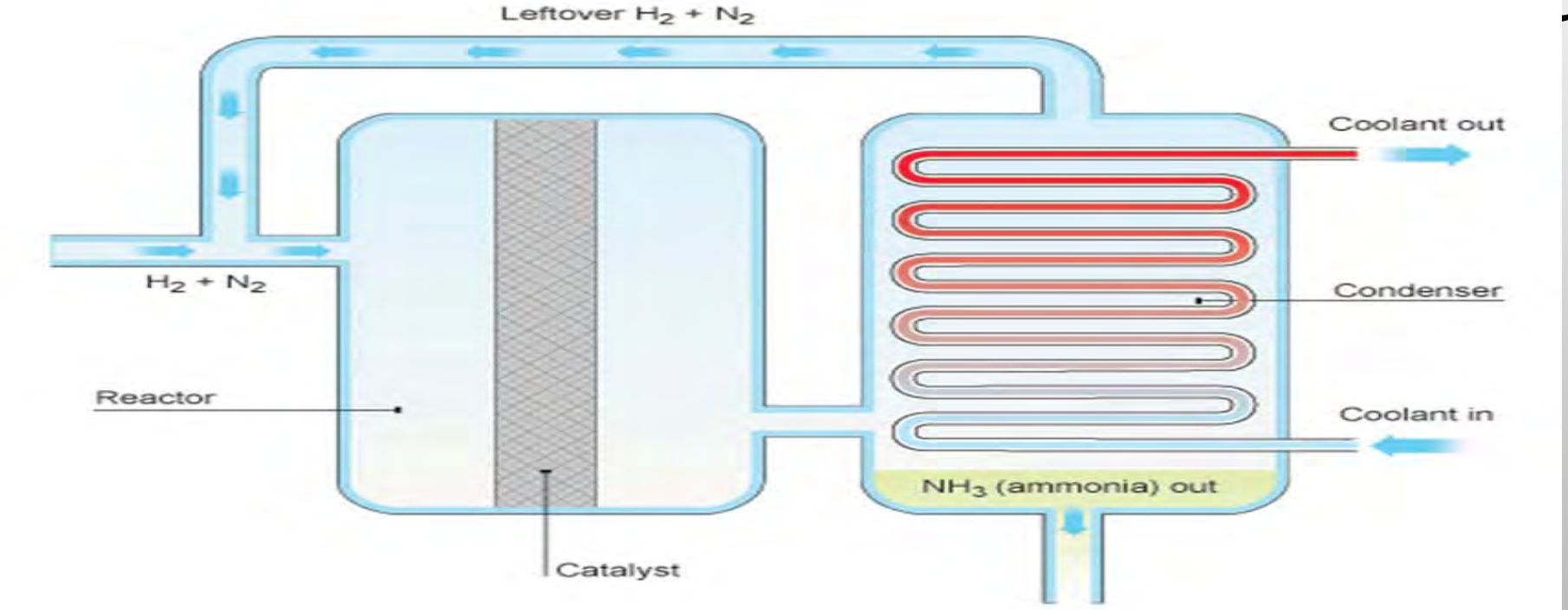
- **BATCH PRODUCTION PROCESSES**
- batch processes consists of a discontinuous flow of raw and processed materials
- e.g fine chemicals, biotechnology, beverage, and pharmaceutical.



CONTINUOUS PROCESS

A continuous process refers to a processing that involves moving a single work unit at a time between every step of the process without any breaks in time, substance, sequence or extend.

the flow of product or material is continuous.



What are the differences between unit operation and unit process?

unit operation

in any system when the physical changes occurs or only physical properties of a component is changes then that is called unit operation . General example for this is boiling of water in which the physical state of a water changes from liquid to the vapor so we say that the boiling is an unit operation.

In industry distillation, absorption, adsorption, extraction, leaching, humidification, dehumidification, evaporation, crystallization all are unit operation. In this only physical properties of component are changes

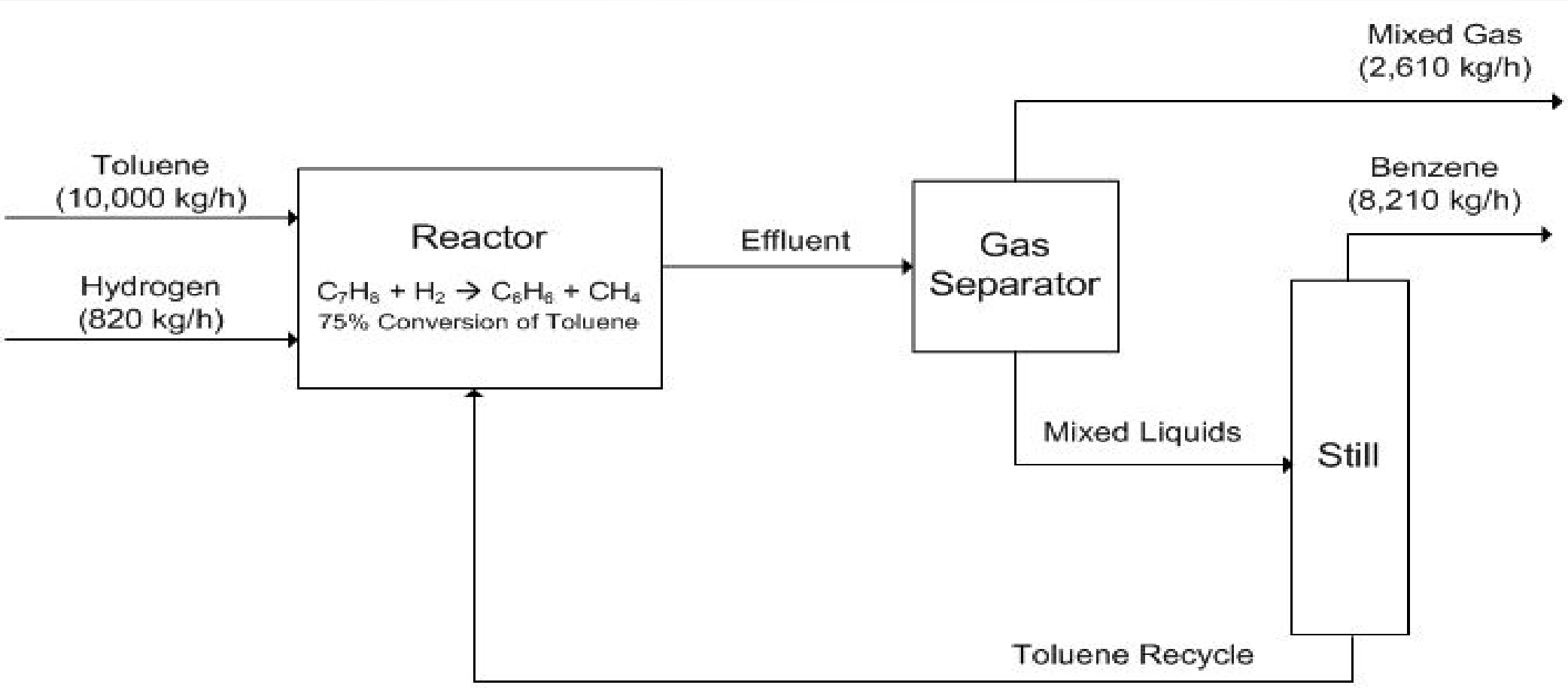
unit process

In any system where the reaction takes place and because of which the chemical properties of a component is changes that is called an unit process.

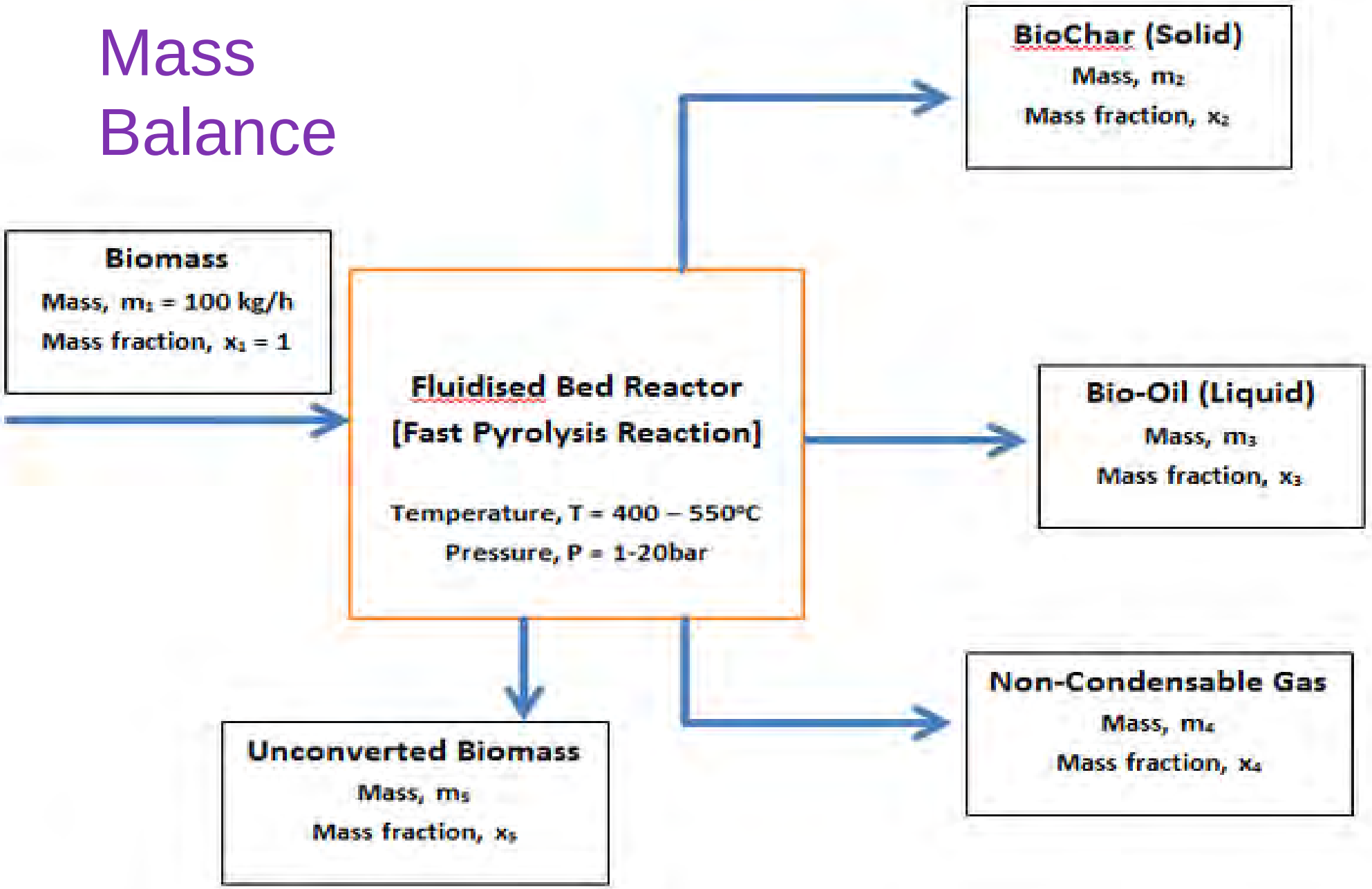
In general we say that the rusting of iron is unit process.

In inudstry oxidation, reduction, hydrogenation, dehydrogenation, alkylation, chlorination, bromination and many more.

BLOCK FLOW DIAGRAM



Mass Balance



HEAT BALANCE

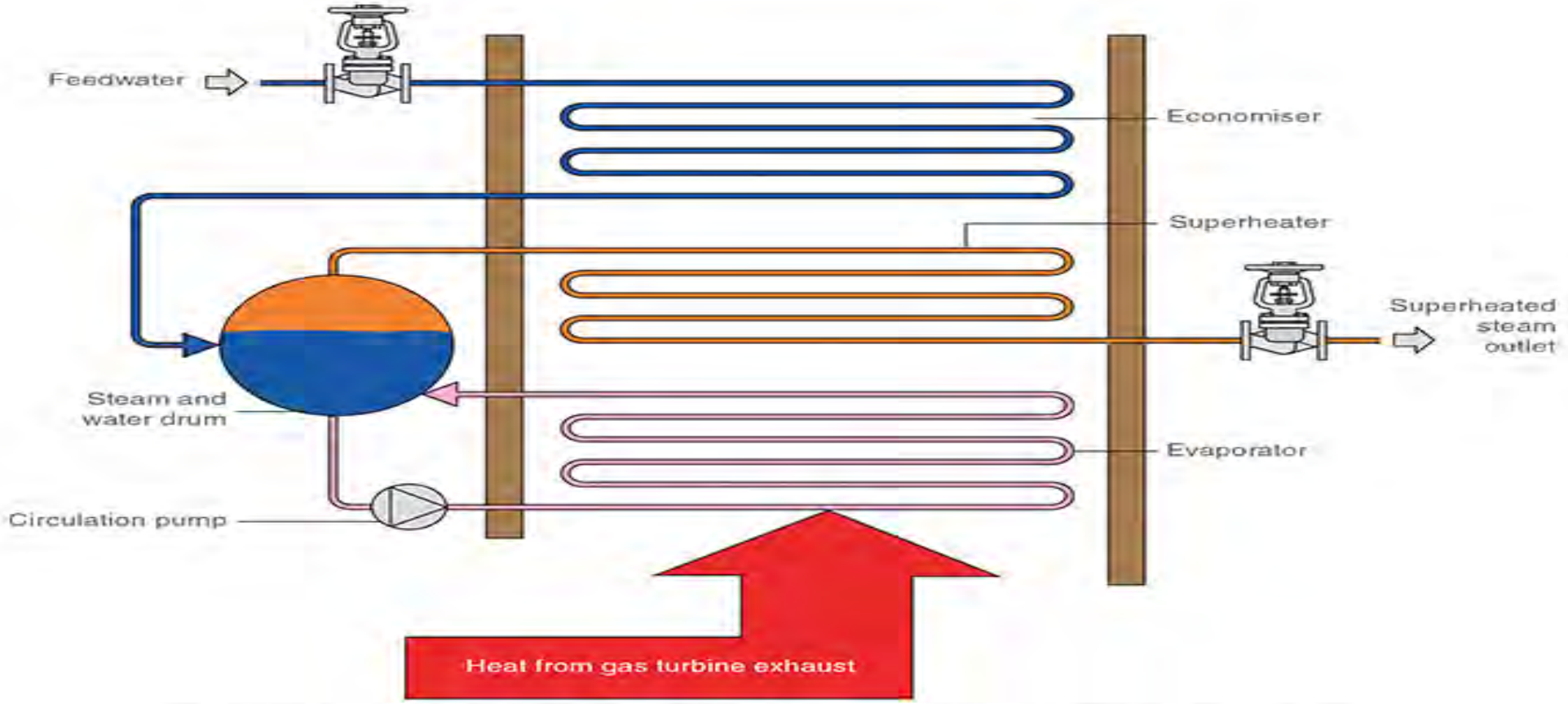
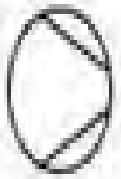
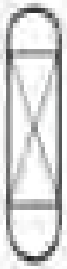
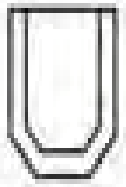
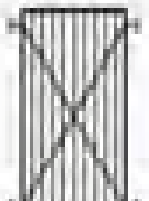


Fig. 3.3.9 A forced circulation water-tube boiler as used on CHP plant

	Pump		Vacuum pump or compressor		Bag		Gas bottle
	Fan		Axial fan		Radial fan		Dryer
	Packing column		Tray column		Furnace		Cooling tower
	Heat exchanger		Heat exchanger		Cooler		Plate & frame heat exchanger


Heat exchanger


Heat exchanger


Heat exchanger


Condenser


Heater / Cooler


Fixed tube sheet heat exchanger Shell and tube


Tube bundle heat exchanger

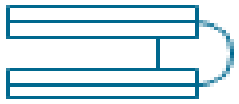

Tube bundle, floating head


U-tube bundle

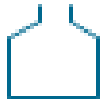

Kettle reboiler


Plate type heat exchanger


Finned tube heat exchanger


Double pipe type heat exchanger


Oil burner


Boiler

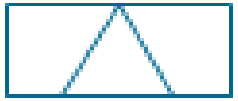

Fired heater

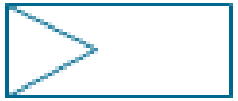

Cooling tower

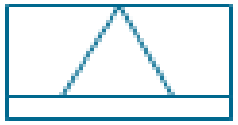

Cooling tower

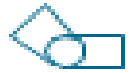

Cooling tower


Condenser

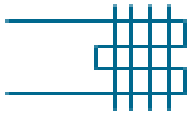

Refrigerator


Direct refrigerator


Indirect refrigerator

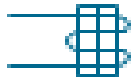

Automatic stoker


Evaporative condenser


Condenser (air cooled)


Oil separator


Chilling evaporator


Air cooling evaporator

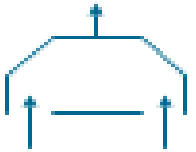
Fan blades horizontal

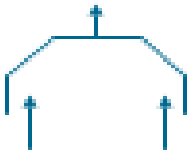

Fan blades vertical

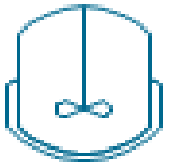

Fan blades (4)

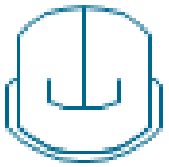

Triple fan blades


Air-blown cooler

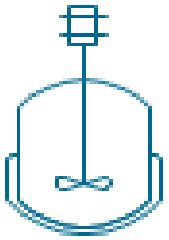

Extractor hood (slot)

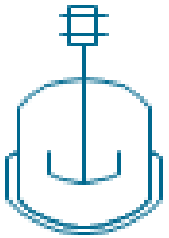

Extractor hood (open)

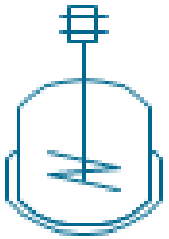

Autoclave (propeller)


Autoclave (anchor)


Autoclave (helical)


Autoclave with motor (propeller)


Autoclave with motor (anchor)


Autoclave with motor (helical)