

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

گرافیک و نقشه خوانی

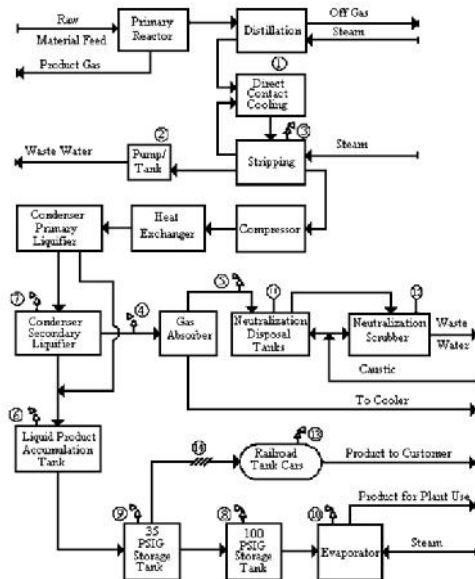
بخش: نقشه خوانی

تعیین و تنظیم:

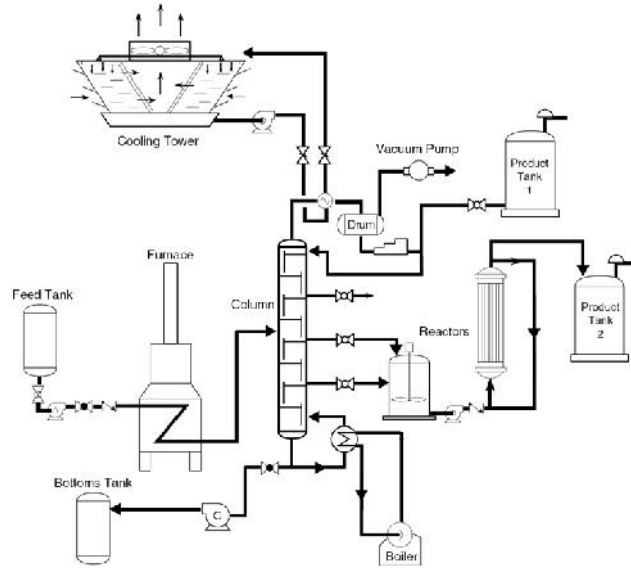
رحمت... پور عطا
میر سعید سید دراجی (عضو هیات علمی دانشگاه رنجان)



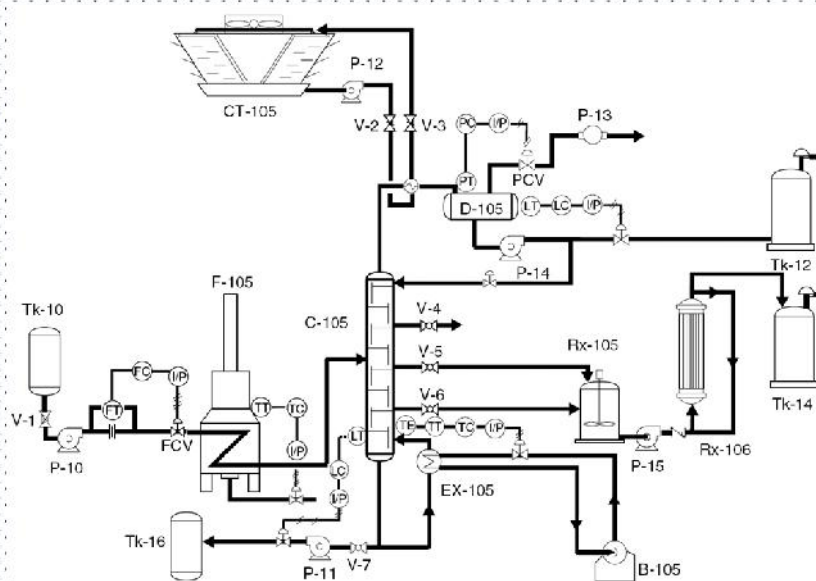
Block Flow Diagram (BFD)



Process Flow Diagram (PFD)



Process and Instrument Diagram (P&ID)



Process and Instrument Symbols

Valves



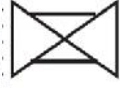
Gate
Valve



Needle



Ball



Plug



Diaphragm



Globe
Valve



Butterfly



Three-Way
Valve



Process and Instrument Symbols

Valves



Check Valve



Four-Way

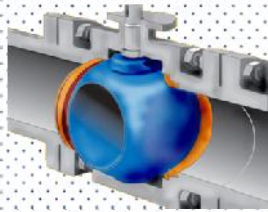
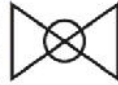


Angle



Process and Instrument Symbols

Ball Valve (شیر توپی)



v



Process and Instrument Symbols

Butterfly Valve (شیر پروانه‌ای)

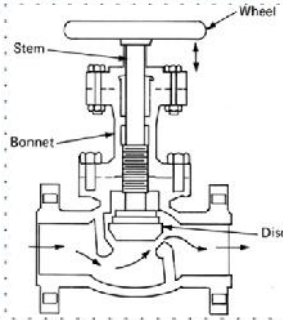
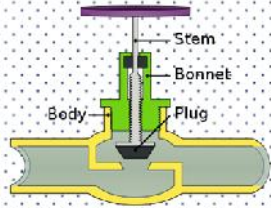


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Process and Instrument Symbols

Globe Valve (شیر ساچمه‌ای)

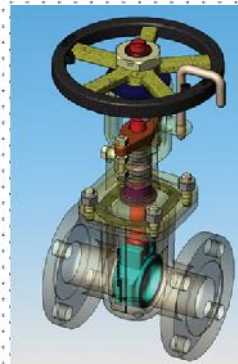
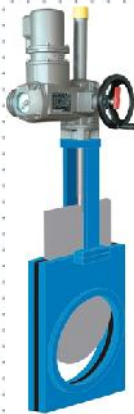


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Process and Instrument Symbols

Gate Valve (شیر دروازه‌ای)

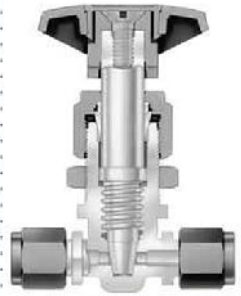


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Process and Instrument Symbols

Needle valve (شیر سوزنی)

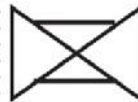


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Process and Instrument Symbols

Plug Valve (شیر مجرا بند یا سماوری)

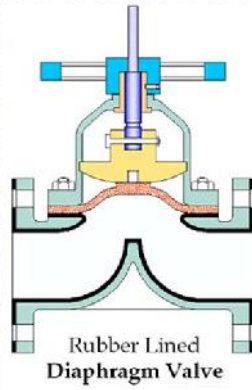
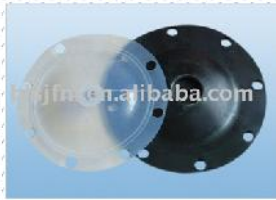


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Process and Instrument Symbols

Diaphragm Valve

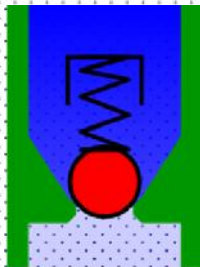


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Process and Instrument Symbols

Check Valve (شیر یکطرفه)



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Process and Instrument Symbols

Pumps & Compressors

Pumps & Compressors

Positive Displacement Pumps

پمپهای جابجایی مثبت

Rotary دورانی

Reciprocating

تناوبی

Centrifugal Pumps

پمپهای گریز از مرکز

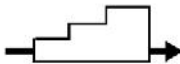


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Process and Instrument Symbols

Pumps

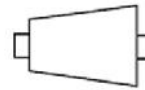
Positive Displacement



Positive Displacement



Centrifugal Pumps



Turbine



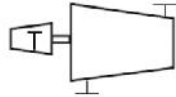
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Process and Instrument Symbols

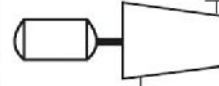
Compressors



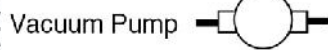
Centrifugal Compressor



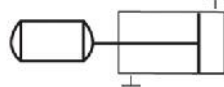
Centrifugal Compressor (Turbine Driven)



Centrifugal Compressor



Vacuum Pump



Reciprocating Compressor



Rotary Compressor



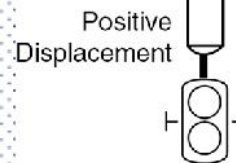
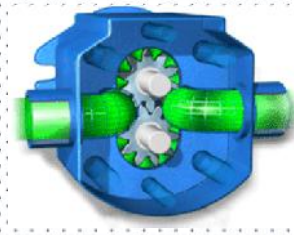
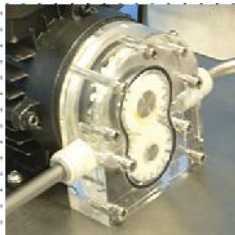
Rotary Screw Compressor

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Process and Instrument Symbols

Positive Displacement : Rotary



Positive Displacement



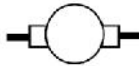
Gear Pump

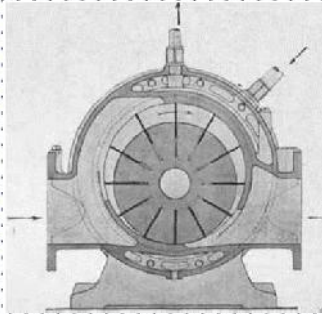
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Process and Instrument Symbols

Positive Displacement : Rotary

Vacuum Pump 

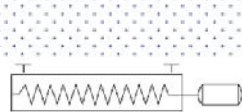


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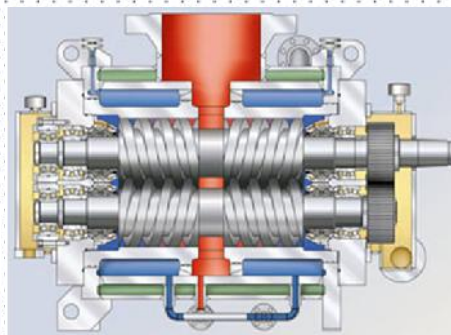
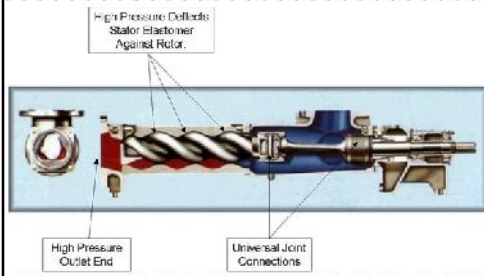


Process and Instrument Symbols

Positive Displacement : Rotary

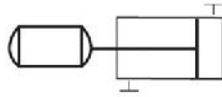

Rotary Screw
Compressor

Screw Pump 

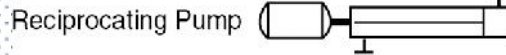


Process and Instrument Symbols

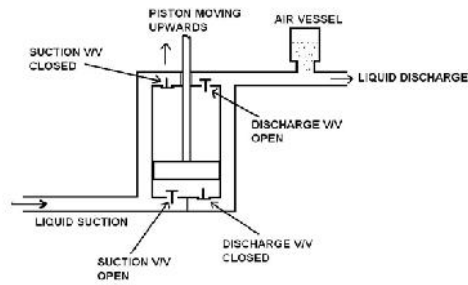
Positive Displacement: Reciprocating



Reciprocating Compressor



Reciprocating Pump



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Process and Instrument Symbols

Centrifugal

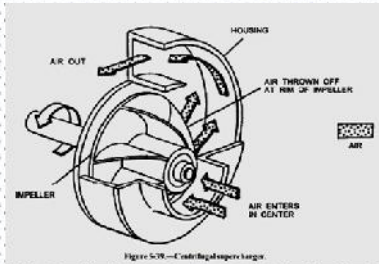
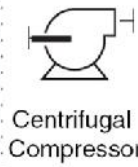
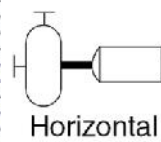


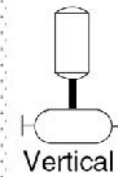
Figure 5.78—Centrifugal compressor



Centrifugal Compressor



Horizontal



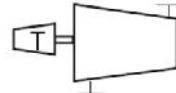
Vertical



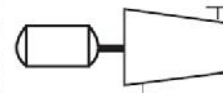
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Process and Instrument Symbols

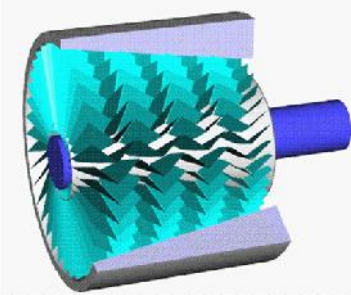
Centrifugal



Centrifugal Compressor
(Turbine Driven)



Centrifugal
Compressor

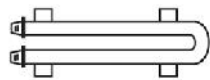


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Process and Instrument Symbols

Heat Exchangers



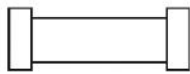
Hairpin Exchanger



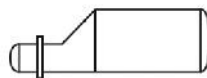
U-Tube
Heat Exchanger



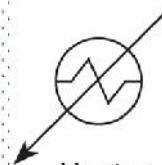
Shell & Tube Heat Exchanger



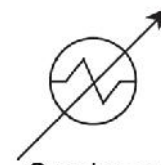
Single Pass
Heat Exchanger



Reboiler



Heater



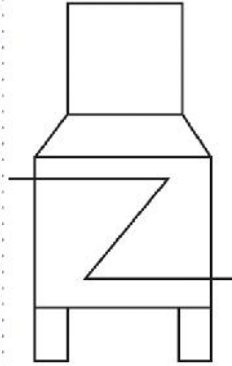
Condenser

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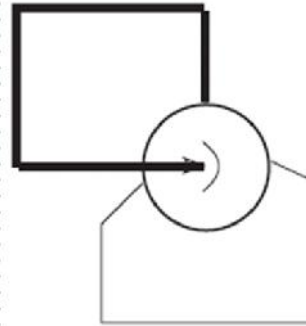


Process and Instrument Symbols

Furnace And Boiler



Furnace



BOILER

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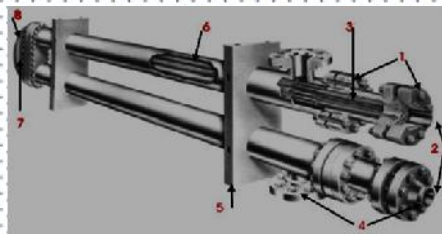


Process and Instrument Symbols

Heat Exchangers



Hairpin Exchanger



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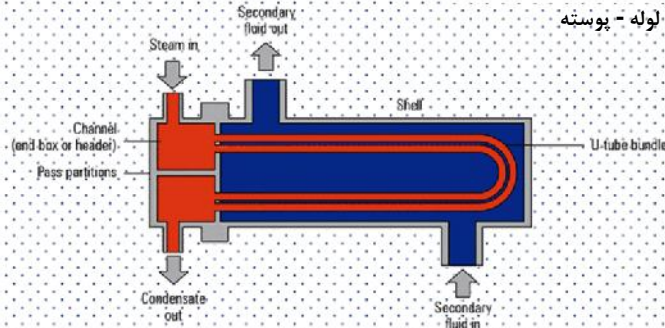


Process and Instrument Symbols

Heat Exchangers



Shell & Tube Heat Exchanger



مبدل های حرارتی لوله - پوسته

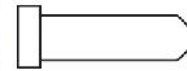
shell and tube heat exchanger

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Process and Instrument Symbols

Heat Exchangers



U-Tube Heat Exchanger

Tubes

Available in Copper, 90/10 Cu/Ni, 316 Stainless Steel, Admiralty or Carbon Steel. Tubes are roller expanded.

Shells

Rugged shell available in Steel and 316 Stainless Steel. Minimum clearances between shell and baffles reduce by-pass and maximize heat transfer.



Heads

Heads available in Cast Iron, Brass, 316 Stainless Steel or Fabricated Carbon Steel.

Tube sheets

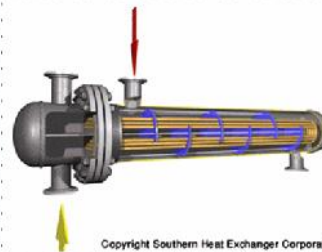
Thick Carbon Steel, 316 Stainless Steel or 90/10 Cu/Ni tube sheets.

Baffles

Precision punched baffles assure effective circulation by providing minimum clearances between the tubes and tube holes. Baffle cuts and spacing for each diameter are consistent with best practices. Standard available material includes Carbon Steel, Brass and 316 Stainless Steel.

Supports

Movable, fabricated Carbon Steel available on all sizes.



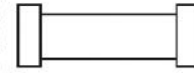
Copyright Southern Heat Exchanger Corporation

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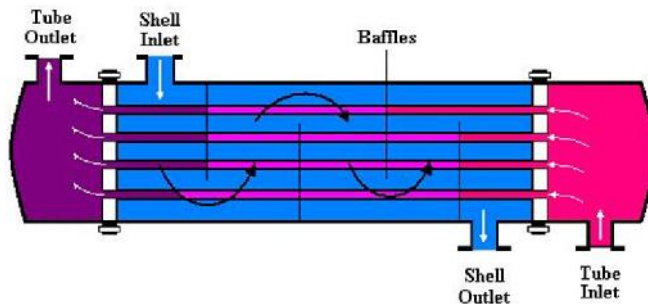


Process and Instrument Symbols

Heat Exchangers



Single Pass Heat Exchanger

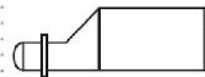


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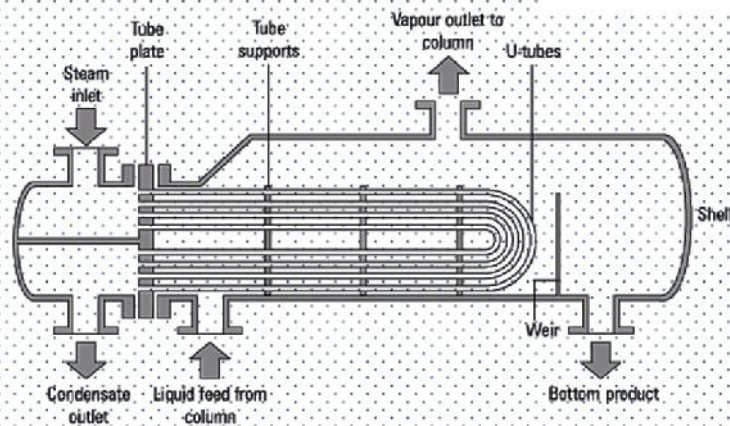


Process and Instrument Symbols

Heat Exchangers



Reboiler



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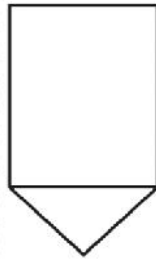


Process and Instrument Symbols

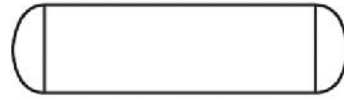
Vessels



Tank



Bin



Drum or Condenser

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Process and Instrument Symbols

Vessels

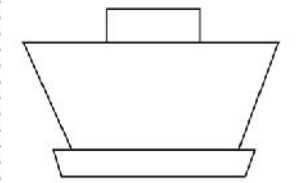


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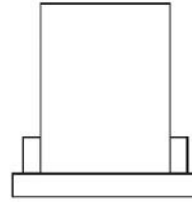


Process and Instrument Symbols

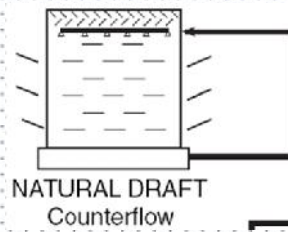
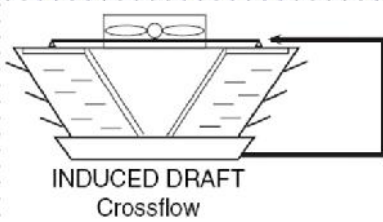
Cooling Tower



Induced-Draft Cooling Tower



Forced-Draft Cooling Tower

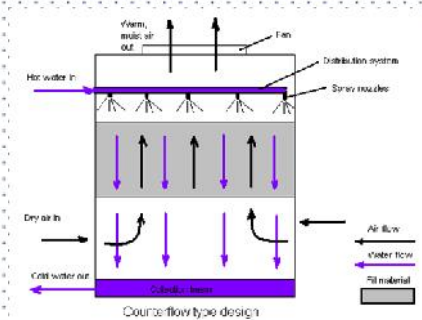
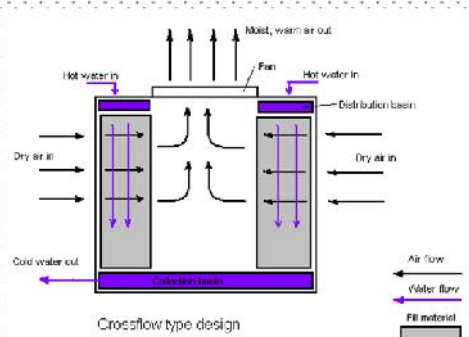


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Process and Instrument Symbols

Cooling Tower



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Process and Instrument Symbols

Cooling Tower

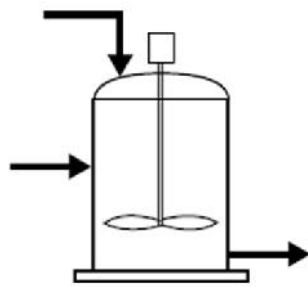


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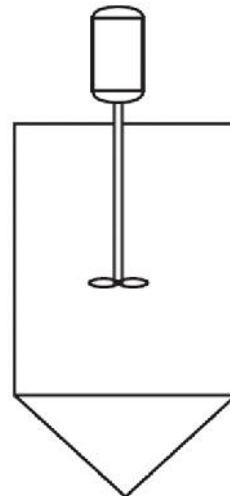
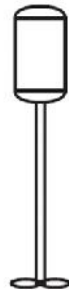
Process and Instrument Symbols

Reactor



Mixing Reactor

Mixer



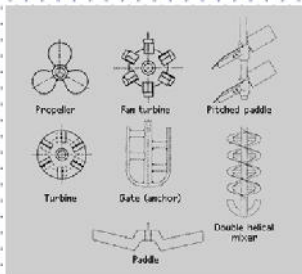
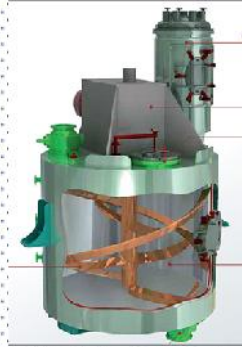
Mixing Reactor

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Process and Instrument Symbols

Reactor



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Impeller Selection



Process and Instrument Symbols

Tower

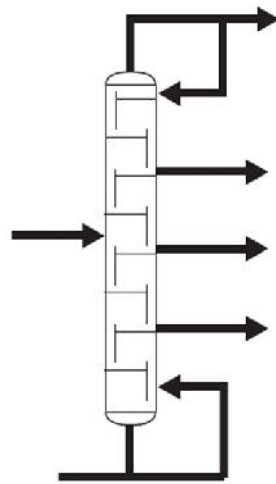


PLATE TOWER



Tower



Tower with Packing

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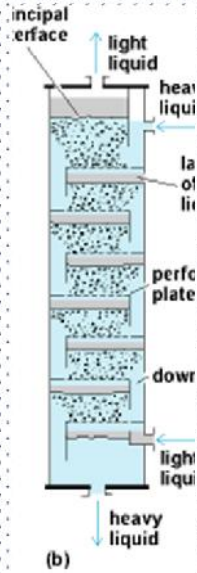


Process and Instrument Symbols

Tower



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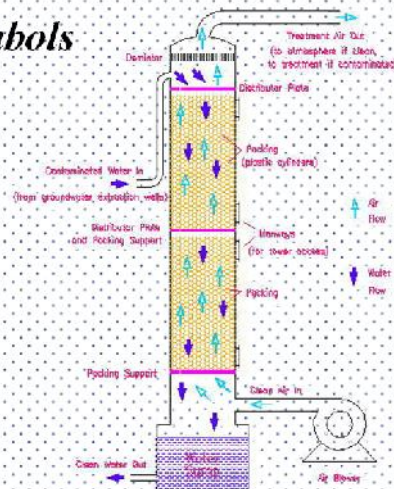


Process and Instrument Symbols

Tower

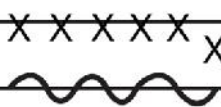


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Process and Instrument Symbols

Line Symbols

Future Equipment	-----
Major Process	—————
Minor Process	—————
Pneumatic	—— // // // ——
Hydraulic	—— L L L ——
Capillary Tubing	—— X X X X X X ——
Electromagnetic Signal	——  ——
Electric	-----

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Process and Instrument Symbols

Instrument Symbols

























(TI)	Temp Indicator	(FI)	Flow Indicator
(TT)	Temp Transmitter	(FT)	Flow Transmitter
(TR)	Temp Recorder	(FR)	Flow Recorder
(LI)	Level Indicator	(PI)	Pressure Indicator
(LT)	Level Transmitter	(PT)	Pressure Transmitter
(LC)	Level Controller	(PRC)	Pressure Recording Controller

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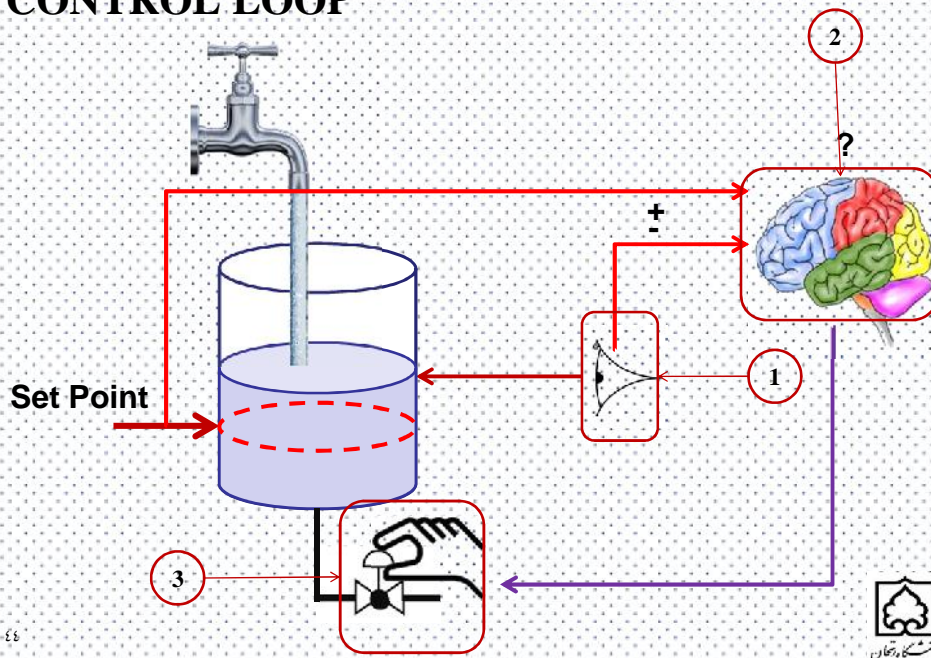
Process and Instrument Symbols

Instrument Symbols

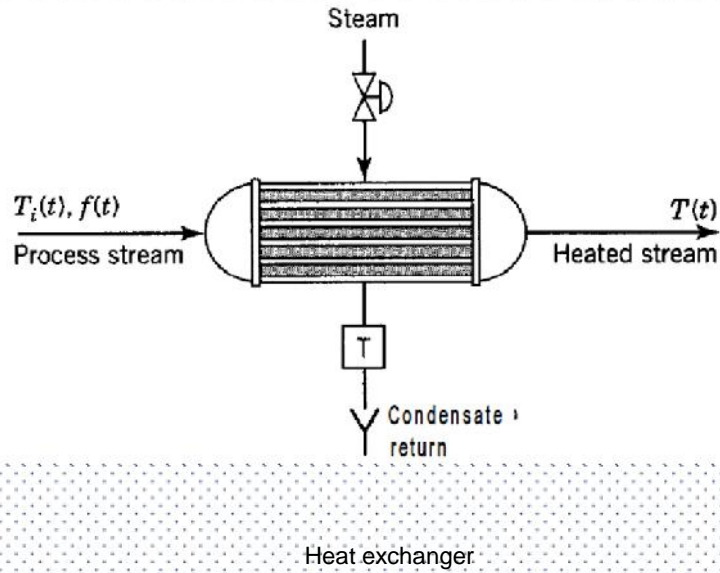
 TI	Temp Indicator	 FI	Flow Indicator		Transducer
 TT	Temp Transmitter	 FT	Flow Transmitter		Pressure Indicating Controller
 TR	Temp Recorder	 FR	Flow Recorder		Pressure Recording Controller
 TC	Temp Controller	 FC	Flow Controller		Level Alarm
 LI	Level Indicator	 PI	Pressure Indicator		Flow Element
 LT 65	Level Transmitter	 PT 55	Pressure Transmitter		Temperature Element
 LR 65	Level Recorder	 PR 55	Pressure Recorder		Level Gauge
 LC 65	Level Controller	 PC 55	Pressure Controller		Analyzer Transmitter



CONTROL LOOP



CONTROL LOOP

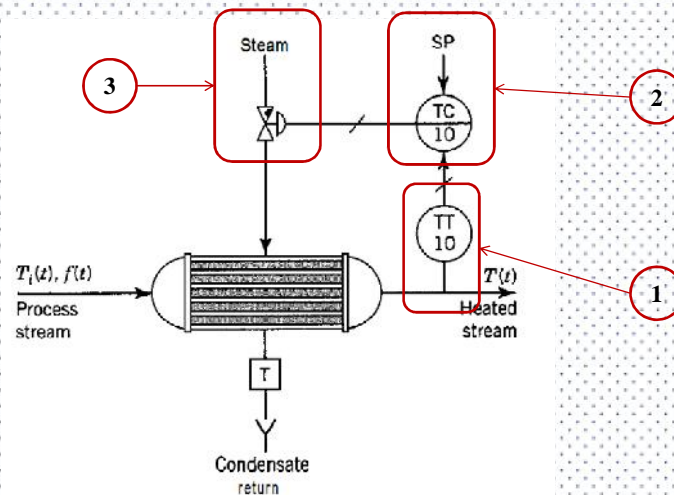


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CONTROL LOOP

Heat exchanger control system

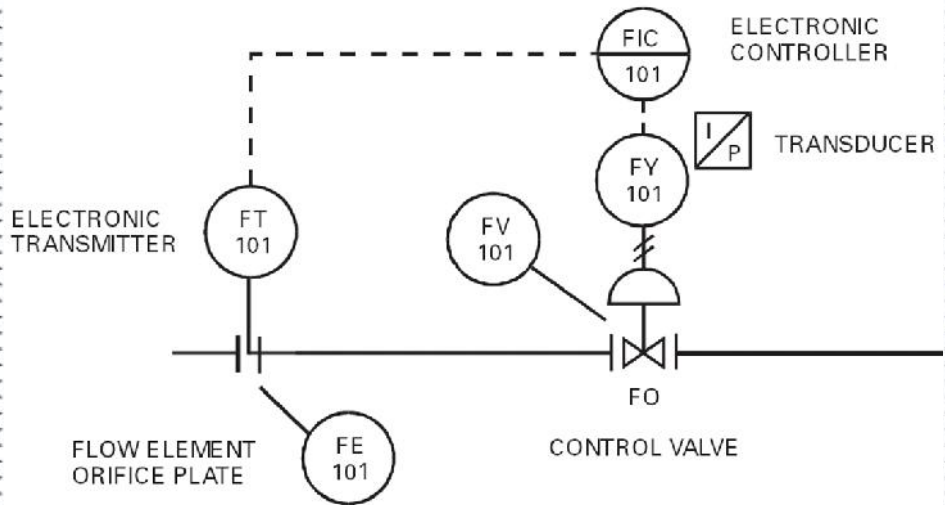


1. Sensor/transmitter Also often called the primary and secondary elements.
2. Controller The "brain" of the control system.
3. Final control element Often a control valve but not always. Other common final control elements are variable-speed pumps, conveyors, and electric motors.

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CONTROL LOOP

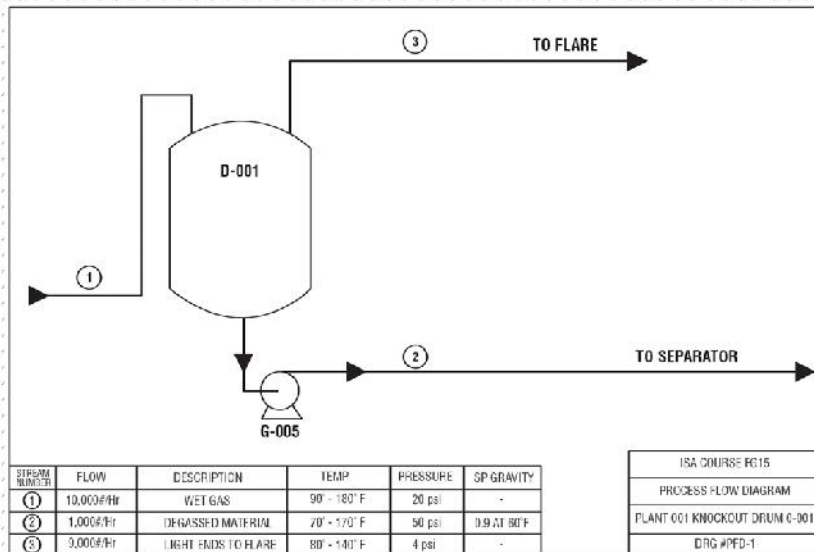


AN ELECTRONIC CONTROL LOOP - CONTROLLING FLOW

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Process Flow Diagram



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