

Group:

Process: Water removal and syngas cleaning

Topic	Specific	Generic
Economics	<ul style="list-style-type: none"> • What is the diameter of the sour water stripper? • What is the height of the H₂S absorber • What powers the compressor? • What powers the pumps • What type of compressor and pumps? • 	<ul style="list-style-type: none"> • What efficiencies have you used for the compressors, motors, turbines, etc. • What are the materials of construction, with references justifying choices?
Safety	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • What are key safety-related variables • What streams contain hazardous materials (explosive, toxic, etc.)? • Be sure to cover all six layers of safety- give an example of each
Equipment capacity	<ul style="list-style-type: none"> • At what value of fouling factor must the condenser be removed and cleaned? • How do you determine the size of the flash drums? • How many trays are in the CO₂ absorber? 	<ul style="list-style-type: none"> • What process conditions (production rates, stream compositions) define the “worst case” for equipment sizing. (Needed for economics) • What are the pipe diameters?
Equipment flexibility (see also, process control)	<ul style="list-style-type: none"> • What heat source is required for the reboiler in sour water stripper 	<ul style="list-style-type: none"> • Which flows are dependent, which independent?
Reliability	<ul style="list-style-type: none"> • How high above ground does must the stripper reboiler be? • What special considerations are required to prevent compressor damage? 	<ul style="list-style-type: none"> • Materials of construction? (Needed for economics) • What is the equipment most likely to fail? • What is the most critical equipment?
Process control	<ul style="list-style-type: none"> • How do you achieve the desired split of flow 5 to 6 and 8? • How is stream 5 forced to be stream 4 plus absorbed gas? (Same for stream 8) • How is the distillation tower pressure controlled? • How does the compressor achieve exactly 54 bar at outlet? Exactly 1 bar at inlet? • What is the volume of the reflux sour water drum? 	<ul style="list-style-type: none"> • Consider the categories of control objectives (Marlin, Chapter 2)

Monitoring	<ul style="list-style-type: none">• What can “go wrong”	<ul style="list-style-type: none">• Which variables need to be measured, even though not used for process control or safety automation?
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Group:

Process: Gasification and Shift reactors

Topic	Specific	Generic
Economics	<ul style="list-style-type: none"> • What kind of heat exchanger is located after the WGS reactor? • What type of catalyst is in each reactor, and how much is used? • What is “ultra-high pressure steam”? How much superheat is provided? 	<ul style="list-style-type: none"> • What efficiencies have you used for the compressors, motors, turbines, etc. • What are the materials of construction, with references justifying choices?
Safety	<ul style="list-style-type: none"> • Are these shift reactors exothermic or endothermic? • What happens when the cooling is lost to the Gasification reactor? 	<ul style="list-style-type: none"> • What are key safety-related variables • What streams contain hazardous materials (explosive, toxic, etc.)? • Be sure to cover all six layers of safety- give an example of each
Equipment capacity	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • What process conditions (production rates, stream compositions) define the “worst case” for equipment sizing. (Needed for economics) • What are the pipe diameters?
Equipment flexibility (see also, process control)	<ul style="list-style-type: none"> • How is the duty of the heat exchanger at the outlet of the WGS reactor modified during plant operation? 	<ul style="list-style-type: none"> • Which flows are dependent, which independent?
Reliability	<ul style="list-style-type: none"> • What flow sensors and valves are used in this system? Why? 	<ul style="list-style-type: none"> • Materials of construction? (Needed for economics) • What is the equipment most likely to fail? • What is the most critical equipment?
Process control	<ul style="list-style-type: none"> • How is the raw gas split between the two reactors? 	<ul style="list-style-type: none"> • Consider the categories of control objectives (Marlin, Chapter 2)
Monitoring	<ul style="list-style-type: none"> • What can “go wrong” in each reactor? What sensors are provided to monitor each reactor? 	<ul style="list-style-type: none"> • Which variables need to be measured, even though not used for process control or safety automation?

Group:

Process: CO₂ sequestration and gas combustion

Topic	Specific	Generic
Economics	<ul style="list-style-type: none"> • What powers the compressor? • What powers the pumps • What type of compressor and pumps? • 	<ul style="list-style-type: none"> • What efficiencies have you used for the compressors, motors, turbines, etc. • What are the materials of construction, with references justifying choices?
Safety	<ul style="list-style-type: none"> • What if a pressure is too high? Too low? • 	<ul style="list-style-type: none"> • What are key safety-related variables • What streams contain hazardous materials (explosive, toxic, etc.)? • Be sure to cover all six layers of safety- give an example of each
Equipment capacity	<ul style="list-style-type: none"> • How do you ensure that 70 C is achieved at each inter-stage cooler? • What limits the maximum flow through the system? • Is there equipment missing after the last heat exchanger and before the pump? 	<ul style="list-style-type: none"> • What process conditions (production rates, stream compositions) define the “worst case” for equipment sizing. (Needed for economics) • What are the pipe diameters?
Equipment flexibility (see also, process control)	<ul style="list-style-type: none"> • How are the interstage pressures regulated to their optimum values? • What determines the flow rate through the compressors? 	<ul style="list-style-type: none"> • Which flows are dependent, which independent?
Reliability	<ul style="list-style-type: none"> • What controls are needed to prevent damage to the compressor? • What other equipment is required between stages? 	<ul style="list-style-type: none"> • Materials of construction? (Needed for economics) • What is the equipment most likely to fail? • What is the most critical equipment?
Process control	<ul style="list-style-type: none"> • Why are the interstage temperature selected to be 70C? • How are the interstage temperatures controlled? 	<ul style="list-style-type: none"> • Consider the categories of control objectives (Marlin, Chapter 2)
Monitoring	<ul style="list-style-type: none"> • What measurements are needed to monitor the “health” of the compressor? 	<ul style="list-style-type: none"> • Which variables need to be measured, even though not used for process control or safety automation?

Group:

Process: Methanol synthesis

Topic	Specific	Generic
Economics	<ul style="list-style-type: none">• What catalyst is used in the reactor? How much?• How many trays are in the distillation tower?• Describe the exchanger HX2.	<ul style="list-style-type: none">• What efficiencies have you used for the compressors, motors, turbines, etc.• What are the materials of construction, with references justifying choices?
Safety	<ul style="list-style-type: none">• What components are vented to the flue gas?• Is the reaction exothermic or endothermic?	<ul style="list-style-type: none">• What are key safety-related variables• What streams contain hazardous materials (explosive, toxic, etc.)?• Be sure to cover all six layers of safety- give an example of each
Equipment capacity	<ul style="list-style-type: none">• How is the size of the flash drum determined?• What is the best temperature for stream 7? How is it achieved?	<ul style="list-style-type: none">• What process conditions (production rates, stream compositions) define the “worst case” for equipment sizing. (Needed for economics)• What are the pipe diameters?
Equipment flexibility (see also, process control)	<ul style="list-style-type: none">• What is adjusted to regulate pressure in the distillation tower?• What is adjusted to achieve the desired methanol purity?• How is this system started up for ambient temperature?	<ul style="list-style-type: none">• Which flows are dependent, which independent?
Reliability	<ul style="list-style-type: none">• How much above ground level is the reboiler?• What control is required to prevent damage to the compressor?	<ul style="list-style-type: none">• Materials of construction? (Needed for economics)• What is the equipment most likely to fail?• What is the most critical equipment?
Process control	<ul style="list-style-type: none">• What is the best reactor feed temperature as feed rate and composition change?• How is this best feed temperature achieved?	<ul style="list-style-type: none">• Consider the categories of control objectives (Marlin, Chapter 2)
Monitoring	<ul style="list-style-type: none">• What is measured to monitor the “health” of the compressor?• What is monitored in the reactor?	<ul style="list-style-type: none">• Which variables need to be measured, even though not used for process control or safety automation?