

Ethanolamines/Glycol Ethers In Plant Training (IPT)

Section Number :12
Issue Number :1.3
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Revision Date :12-23-97
Section Test :12

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Ethanolamines Reactor Oxide System Control Module R-201 And R-202

1.0 Answers:

1. **State the significance of the aqua ammonia/ethylene oxide ratio.**
The aqua ammonia/ethylene oxide ratio ensures that there is enough ammonia to react all of the ethylene oxide entering the reactor. It also determines the product mix.
2. **State what a high ratio will do to the product distribution.**
A high ratio will make more Monoethanolamine in the crude mixture.
3. **State the lowest ratio we can run R-201.**
1.6.
4. **State the purpose of changing the aqua ammonia concentration.**
The purpose of changing the aqua ammonia concentration is to introduce more or less catalyst (water) into R-201.
5. **State how changing the aqua ammonia concentration affects R-201 and the product distribution.**
A low concentration (more water) increases the reaction rate and move the reaction more to the front of the reactor. A high concentration (less water) decreases the reaction rate and moves the reaction more to the middle of the reactor. It has the same effect as changing the ratio but on a much smaller scale.
6. **State the maximum allowable temperature on R-201 tube or reaction side. State the minimum allowable temperature.**
The maximum allowable temperature is 125 degrees c. The minimum allowable temperature is a temperature high enough to ensure that all oxide is reacted prior to exiting R-201.
7. **State how you would know if any unreacted ethylene oxide were exiting R-201.**
You would know by a large temperature differential between R-201 and R-202. This temperature usually runs between 5 and 10 degrees C. A large temperature differential means ethylene oxide is exiting R-201.

8. **State what a hot spot is and what you would do if one developed in R-201.**
A hot spot is when the reacting liquid phase in R-201 turns into a vapor phase and causes an increase in temperature. Trip the ethylene oxide to R-201, block in the oxide controller and allow the aqua ammonia to flow through the reactor to eliminate the vapor.
9. **State what purpose water serves in the reactor feed.**
It acts as a catalyst (aiding the reaction).
10. **State what temperature R-201 shell must be prior to the addition of oxide. State how this temperature is achieved.**
At least 60 degrees
30 pound steam on the shell.
11. **State why water is circulated on the shell side of R-201.**
To achieve a consistent temperature across the shell.
12. **State how R-201 temperature and pressure are associated. By lowering the pressure on the shell side of the reactor**
The tube side cools and the reaction rate slows moving the reaction to the rear of the system. By increasing the shell pressure the tube side heats up and the reaction rate increases and moves to the front of the system.
13. **State the function of R-202.**
R-202 ensures that any oxide that exited R-201 has time to react (extends reactor residence time).
14. **State what would happen if R-201 temperature ran too high.**
The liquid on the tube side would vaporize causing a hot spot. If this happens the flow meters will drop to zero and the reactor will trip on low aqua ammonia flow.
15. **State how R-201 temperature is controlled.**
Manually by increasing or decreasing the shell pressure or by allowing the VAX computer to control the differential across R-202 in the same manner.
16. **Explain the purpose of E-201A and how it functions.**
E-201A condenses condensate vapor from the shell boil up that in turn cools the tube side reaction. Removes the heat of reaction.
17. **State why ejectors are used on R-201 shell.**
Ejectors lower the pressure on the shell side of R-201 allowing the condensate to boil more easily which in turn cools the reaction. It enables a cooler reaction.
18. **State the maximum amount of oxide you would allow in R-202.**
None.

19. **How do you know what the maximum and minimum flows are for P-212A/B and P-201A/B?**
By checking the pump curve sheet for that particular pump.
20. **Demonstrate the process of swapping Sundyne pumps from a control board viewpoint**

Revisions

Revision No. 1	06-18-93	Yearly Review
Revision No. 2	12-18-94	Yearly Review
Revision No.3	12-23-97	Yearly Review