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The Mainspring of Controlling of Low Pressure Steam Drum at Lower Pressure than Its Design for Adjusting the Urea Synthesis Pressure

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Abstract : The pool condenser is in principal a horizontal reactor, containing a bundle of U-tubes for heat exchange, coupling to low pressure steam drum. Condensation of gas takes place in a condensed pool around the tubes of the condenser. The heat of condensation is removed by the generation of low pressure steam on the inner tube side of the bundle. A circulation pump transfers ample boiler feed water to these tubes. The pressure of the steam generated influenced the heat flux. Changing the steam pressure means changing the steam condensate temperature and therefore the temperature difference between the tube side and the shell side. 2NH3 + CO2 ↔ NH2COONH4 + Heat. This reaction is exothermic and according to Le Chatelier's Principle if the heat is not removed enough, it will come back to left side and generate of the gas and so the Urea synthesis pressure will rise. The most principal reasons for high Urea synthesis pressure are non proportional of Ammonia/Dioxide Carbon ratio and too high a pressure in low pressure steam drum. Proportional of Ammonia/Dioxide Carbon ratio is 3.0 and normal pressure for low pressure steam drum is 4.5 bar. As regards these conditions were proportional but we could not control the synthesis pressure the plant endangered, therefore we had to control the steam drum pressure at about 3.5 bar. While we opened the pool condenser, we found the partition plate used to divide inlet and outlet boiler feed water to tubes, was broken partially and so amount of boiler feed water bypass the tubes and the heat was not removed totally and it resulted in the generation of gases and high pressure in synthesis.

Keywords : boiler, pressure, pool condenser, partition plate
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