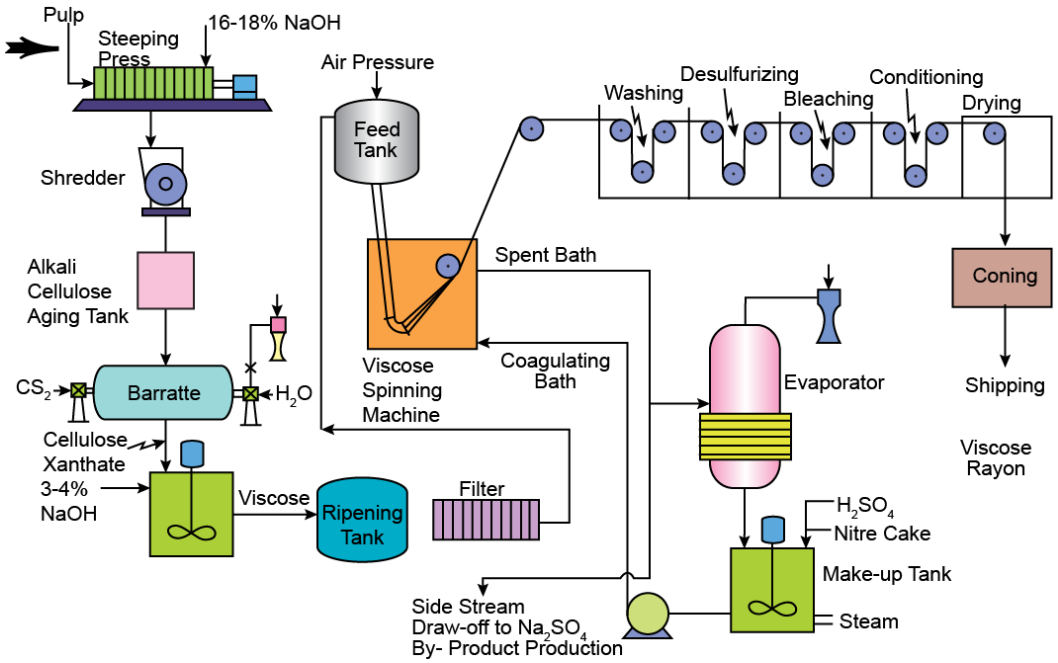
Viscose / Rayon production: Analysis of Sulfuric Acid and Zinc Sulfate

Viscose / Rayon is worldwide produced with a world production of more than 4 million tons per year. The raw material is cellulose, one of the most useable natural polymers (wood pulp). In the first production step the wood pulp is immersed in sodium hydroxide to convert it to alkaline cellulose. After pressing and shredding the alkaline cellulose is aged to depolymerize. A solution of carbon disulfide is added to form cellulose xanthate. The crumbs are dissolved in sodium hydroxide to obtain a viscous solution called "viscose". After ripening, filtering and degassing the viscose solution is pumped under pressure through metal spinnerets submerged in a spin bath. The bath contains sulfuric acid (to acidify the cellulose xanthate), sodium sulfate (for rapid coagulation) and zinc sulfate (to cross link the cellulose molecules). By changing various process conditions and addition of chemicals all different kind of viscose fibers are made. The final steps are drawing, washing and bleaching. To optimize the wet spinning process it is crucial to measure the acid and zinc concentration by online measurement. Metrohm Applikon is offering several options for measuring the chemical components in the spin bath. The ADI 2045TI Process Analyzer is integrated to measure the sulfuric acid and zinc concentration simultaneously. The ADI 2016 is dedicated to measure one of the parameters. Both Analyzers play vital roles in closed loop control to increase product throughput and yield while minimizing chemical consumption.



Schematic: example of viscose / rayon production (source NPTEL)

Application: H_2SO4 and $ZnSO_4$ are analysed using a potentiometric titration and colorimetric measurement techniques. Results are automatically validated against a known standard solution to guarantee pre-set control limits.

Typical Range: H_2SO_4: 0-180 g/L, $ZnSO_4$: 2.4-2.8 g/L

Keywords: viscose, rayon, pulp, spinning bath, sulfuric acid, zinc sulfate, online analysis,
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