DWSIM Simulation Project

Topic of Simulation:

- Sulphuric Acid Proces

Group Members & Contribution:

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Description:

Started with liquid Sulfur and Oxygen, combustion using conversion reactor, conversion to SO3 using 1 PFR which simulated reaction kinetics and 1 downstream conversion reactor for residual conversion, followed by downstream separations and absorption reaction to form pure H2SO4 (liquid) as product.

Reaction Kinetics:

Under 'Reactions Manager', the reaction used for SO2 → SO3 is the one labelled 'New hetcat', a heterogeneous catalytic type reaction.

Rate law is of the form:

Numerator: (775*exp(-22000/(1.98*T)))*R1*R2*(1-(P1/R2/(R1^0.5)/(10^(500/T-4.743)))^2)

Denominator: (R1+0.8*P1)

Where R1 = partial pressure of O2, R2 = partial pressure of SO2, P1 = partial pressure of SO3

The kinetics was as proposed by G. K. Boreskov.

<u>Reference</u>:

Kinetics and effectiveness factor for SO₂ oxidation on an industrial vanadium catalyst, H. Livbjerg , J. Villadsen, Chem. Engg. Sci., Volume 27, **21-38**, (1972)

Relevant areas in the paper: Table 1 entry 3, Eqns 6 ,7,8, Tables 5 and 8 for calculation of rate constant expression