

## METHOD OF LINES TO NON-LINEAR PARTIAL REACTOR MODEL EQUATIONS

<sup>1</sup>WORDU, A. A; and <sup>2</sup>OBOHO, E. O

Department of Chemical; Petrochemical Engineering  
Rivers State University; Nkpolu-Oroworukwo  
Port Harcourt, Rivers State - NIGERIA  
E-mail: wordu.animia@ust.edu.ng

### ABSTRACT

The partial reactor model equations under study evolved with stringent constraints from continuous regeneration reactor plant for upgrade of hydro treated feed naphtha into reformat gasoline. Appropriate rate of feed conversion per time was generated from the principles of material and energy balance maintaining a two-dimensional homogeneous constraint. The partial models were converted to a set of ordinary differential equations applying method of lines MOL of finite difference approximation of the spatial derivatives and integrated with respect to time domain using Mat-lab ode-solver-23. The model results gave the following deviations on reactor R3 outlet stood at naphthene 8.09, paraffin 0.03, aromatics -2.20 and temperature, 0.39. The deviations were most credible and plausible at minimal values suggestive of optimality of the reactors. Finally, open loop sensitivity analysis showed temperature, pressure and catalyst activity are the major variables to striking a balance economically.

**Keywords:** Reactor-model-equations, method of lines MOL; chemical species, Continuous-catalyst-regenerator-reactors.