1035-93-1135 **Elaine T. Hale*** (ehale@rice.edu), Rice University, 6100 Main Street, MS 134, Houston, TX 77005-1892. *A Numerical Comparison of Three State Estimation Schemes Applied to a Nonlinear Stochastic System.*

Nonlinearity and stochasticity are common attributes of chemical systems. This paper focuses on a gasoline blending process, in which the quality of the final product is a nonlinear function of the proportions and qualities of five blend components. Stochasticity arises from the measurement process, and, more significantly, from variations in the component qualities [2].

This work investigates the predictive power of three state estimation schemes applied to the "true" gasoline blending process as simulated in Matlab. This process is a stochastic discrete-time state-space model with a linear state equation and a nonlinear output equation. The first two schemes are derived by simplifying the original model to a time invariant or time-varying linear system and applying a Kalman filter. The third scheme uses the full nonlinear model and an unscented Kalman filter [1]. This work also addresses the estimation of model covariances directly from product quality and component proportion data.

[1] S. J. Julier and J. K. Uhlmann. Unscented filtering and nonlinear estimation. Proc. of the IEEE, 92(3):401-422, 2004. [2] Y. Zhang, D. Monder and J. F. Forbes. Real-time optimization under parametric uncertainty: a probability constrained approach. J. Process Control, 12:373-389, 2002. (Received September 18, 2007)