

## Dynamic Process Monitoring of an Ammonia Synthesis Fixed-Bed Reactor

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**Abstract :** This study involves the modeling and monitoring of an ammonia synthesis fixed-bed reactor using partial least squares (PLS) and its variants. The process exhibits complex dynamic behavior due to the presence of heat recycling and feed quench. One limitation of static PLS model in this situation is that it does not take account of the process dynamics and hence dynamic PLS was used. Although it showed, superior performance to static PLS in terms of prediction, the monitoring scheme was inappropriate hence adaptive PLS was considered. A limitation of adaptive PLS is that non-conforming observations also contribute to the model, therefore, a new adaptive approach was developed, robust adaptive dynamic PLS. This approach updates a dynamic PLS model and is robust to non-representative data. The developed methodology showed a clear improvement over existing approaches in terms of the modeling of the reactor and the detection of faults.

**Keywords :** ammonia synthesis fixed-bed reactor, dynamic partial least squares modeling, recursive partial least squares, robust modeling

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