

## **441d Operator Training Using Chemcad Dynamic Simulation and Excel**

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Operators are critical in controlling complex chemical processes to meet the safety and product specifications. They are trained to reduce their failure probability in the event of a process excursion. Training them on the actual plant presents substantial risk; any errors may compromise the plant safety. A safe and effective alternative is to train them using software that emulates actual plant operation.

Training software should model the process and its excursions. It should also provide an interface for the operator to observe and control the process simulations. Commercial training software is expensive. This paper discusses an alternative. ChemCAD can be used for the process simulation while Excel can provide the user interface. Simulations in ChemCAD can be dynamically controlled from Excel, using Visual Basic macros. Pseudo-plant data are generated by adding noise to the output from ChemCAD dynamic simulations. They are graphically displayed to the operator. Upsets can be introduced in the process simulations by the instructor without the operator's knowledge. The operator can detect the excursion, respond and view the result of his actions.

This paper illustrates the above idea and its application. Training software is built for the cyclopentadiene dimerization process used in isoprene purification. A fully instrumented model of the process is built in ChemCAD. An interface that aims to resemble the actual distributed control system is built using Excel. Its key features include process flowsheet showing the instantaneous values of the operating conditions, ramp keys that allow the parameters of the control system to be varied and graphical displays of process variable time-traces. Case studies employing this software are presented.