Q&A Session for Webinar with Plant Engineering: Enhance Distillation Column Design and Operation to Meet Sustainability Goals

Frequently Asked Questions

Q: Can you perform column analysis in real time by mapping tags to the simulation?

A: Aspen Plus® or Aspen HYSYS® models can be linked to plant data and run in real time using Aspen OnLine®. Column hydraulic predictions such as percent flooding can be included via calculation tags and reported back to the historian.

Q: Are second generation rate-based models available from a particular Aspen Plus or Aspen HYSYS version?

A: The second generation rate-based distillation model was introduced in Aspen Plus Version 9. This feature is available in all currently supported versions of Aspen Plus and Aspen HYSYS. To access, first select the "rate-based" option. The film discretization options enable users to control how the film is discretized in the liquid and vapor phase. Users can set the number of discrete elements and the discretization pattern (linear or log steps). and many more. AspenTech Inmation™ is really a way to maintain connections to legacy and modern devices.

Q: Is there documentation in Aspen Plus Help for AspenTech's rate-based distillation? Where is the white paper referenced in the webinar?

A: The online help includes details of all the hydraulic correlations except some vendor-specific methods we are not allowed to disclose. White papers are available in our esupport knowledge base. We have published a white paper comparing Aspen Column HydraulicsTM to published data here: https://www.aspentech.com/en/resources/white-papers/column-analysis-in-aspen-plus-and-aspen-hysys---validation-with-experimental-and-plant-data.

Q: How rigorous is the second generation rate-based model compared to the first generation?

A:The second generation rate-based method provides a more accurate modeling of fast reactions by discretizing the vapor-liquid film into small segments. All column models distribute calculations axially. Our second generation models also distribute the film calculations within each axial 'slice'. The film can be discretized in either or both vapor and liquid phases, using linear or logarithm spacing between film elements.

Q: What tray vendors do you have in your database?

A: Koch, Raschig, Sulzer, Montz and many other column vendors can be selected in Aspen Plus and Aspen HYSYS. Alternatively, users can define custom trays and packings. Aspen Plus and Aspen HYSYS also provide options to specify high-capacity tray modifications such as swept-back weirs, picketed weirs, hanging downcomers and others.

Q: How often is the information for specific vendor's equipment updated with new offerings?

A: AspenTech updates the trays and packings based on agreements with the different column vendors. AspenTech recently updated Sulzer packings and added more internals from Montz.

Q: How can the mass transfer be customized for custom compounds? The equilibrium-based model is easy to customize (with binary interaction input)?

A: All good models need to be calibrated against data. Many of the correlations used in the column hydraulics, heat and mass-transfer calculations involve thermodynamic and transport properties including viscosity, density and surface tension. Aspen Plus includes property data regression tools to calibrate thermodynamic and transport property models using experimental data. Aspen Plus also provides access to over five million sets of experimental data for pure components, binary and ternary systems through the NIST Source database.

Q: Where can I access the carbon capture models mentioned in slide 34?

A: These models are available on AspenTech's esupport website and can also be found in the Examples folder inside Aspen Plus and Aspen HYSYS.

Q: How accurate are the models for amine absorber and desorber (stripper) in gas sweetening/CO_2 removal units using amine solution?

A: We deliver calibrated examples for several common carbon, capture, usage and storage (CCUS) amine solvents including piperazine (PZ)-activated mixtures. The models are calibrated against a wide range of loading, heat of solution, heat capacity and other mixture data sets.The acid-gas database includes the binary and electrolyte pair parameters for these systems.

Q: Where can we find example of CCUS amine solvent including PZ-activated mixtures?

A: Examples of carbon capture models can be found in the Resources, Examples, Carbon Capture folder inside Aspen Plus. You can also check the esupport knowledgebase (search key "Sustainability") for more recently published examples including CESAR-1 and potassium carbonate systems.

Q: What proprietary solvents are available for CO_2 capture in Aspen Plus?

A: Many of the proprietary amine-based solvents (MEA, DEA, PZ, MDEA, K2CO3, AMP) and their blends are available in Aspen Plus and Aspen HYSYS. Our generic solvents' models have proven to be useful to jumpstart the evaluation of various solvents when customers have some knowledge of their composition. From the generic example models that we have delivered, DEPG is known to be the main component for selexol, methanol for rectisol, and K2CO3 for benfield. We have also published an example model for CESAR1, an amine blend of AMP and piperazine that is being investigated as a new benchmark solvent.

Q: Has AspenTech used rate-based capability with the conventional refinery process?

A: Rate-based methods are also supported in Aspen HYSYS (general column). The rate-based methods are not supported in specific column models including PETROFRAC in Aspen Plus or the crude column in Aspen HYSYS.

Q: : How does Aspen Plus use the system factor in pressure drop calculations in tray analysis?

A: The system factor is a parameter in the Wallis-Aspen pressure drop for packing. This method uses dimensionless group equations to calculate pressure drops based on liquid and vapor loading, tray geometry and other factors.

Q: How is the system factor applied to calculation of dP in trayed columns in Aspen Plus?

A: Tray pressure drops are calculated based on hydraulic head + orifice pressure drop for sieve holes or valves. Tray pressure drops are not directly influenced by the system foaming factor, which appears in some equations for packing. See Aspen Plus help category “Pressure Drop Calculations for Packing in Column Analysis” for further details. Note that the system foaming factor is mainly used as a derating term to predict downcomer backup, downcomer choke and jet flooding in tray columns.

Q: How can foaming in scrubber column be evaluated in column analysis?

A: Aspen Plus and Aspen HYSYS models include a user-specified foaming factor ranging from 1 (non-foaming) to 0.3 (stable foam systems). The documentation recommends foam factors for particular systems and tray types (see https://esupport.aspentech.com/S_Article?id=000083918). Foam factors influence some design calculations including tray spacing. At a previous AspenTech OPTIMIZE™ user conference, as ApenTech customer presented an application using Aspen Plus in an online model to identify onset of foaming. The solution compared measured pressure drop to the foam-free predictions using column hydraulic analysis.

Q: What numerical methods are used in film discretization in Aspen Plus/Aspen HYSYS?

A: The system allows users to discretize the vapor and liquid film. By default it uses log steps, but users can also select linear steps andset the number of discrete elements. The model uses an equation solver to calculate the transport rates of each volatile component across the phase interface into the bulk phases.

Q: Can Aspen Plus or Aspen HYSYS handle chimney trays or collector trays?

A: We do not currently support chimney trays, collectors, distributors or other non-separation trays. In equilibrium mode, additional trays can be introduced with very low efficiency factors to represent collection trays.

Q: Where can I see the pressure drop per tray results?

A: The pressure drops and pressure profiles are reported in the column hydraulic section results.

Q: Can you size an absorber gas-high viscosity liquid with Aspen Plus? If so, is rate-based better than equilibrium-based?

A: Rate-based models are recommended for packed columns with high-viscosity fluids as they are more likely to experience rate-based limitations. Examples include nitric acid, sulfuric acid, etc.

Q: Can you model disc and donut internals with RADFRAC?

A: We do not have built-in disc and donut trays. Users would need to apply the user-defined tray option to represent these trays or dual-flow trays. We encourage users to discuss the importance of tray and packing data in Aspen Plus and Aspen HYSYS with their column internals vendors.

Q: Does Aspen HYSYS support the acid-gas package in dynamics mode?

A: Starting with version 14, Aspen HYSYS supports the acid-gas fluid package in dynamics mode through a reduced order model (ROM) approach.

Q: Did you compare flooding limits and results with KG TOWER software for instance?

A: We have tested hydraulic predictions in Aspen Plus and Aspen HYSYS against published experimental data (See https://www.aspentech.com/en/resources/white-papers/column-analysis-in-aspen-plus-and-aspen-hysys). We also work directly with the column vendors to continuously improve the parameters and correlations in our hydraulic models.

About Aspen Technology

Aspen Technology, Inc. (NASDAQ: AZPN) is a global software leader helping industries at the forefront of the world's dual challenge meet the increasing demand for resources from a rapidly growing population in a profitable and sustainable manner. AspenTech solutions address complex environments where it is critical to optimize the asset design, operation and maintenance lifecycle. Through our unique combination of deep domain expertise and innovation, customers in capital-intensive industries can run their assets safer, greener, longer and faster to improve their operational excellence.

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