aspentech | Study Guide

Aspen Plus® with Aspen Shell & Tube Exchanger®

Study Guide for Certification

Aspen Knowledge™ | Learn. Apply. Succeed.

Prove Your Credibility

An Aspen Plus Certified demonstrates skills required to build models and interpret results using Aspen Plus with Aspen Exchanger Design and Rating (EDR). This person will also demonstrate skills in advanced topics such as convergence, troubleshooting, and heat exchanger design using the EDR interface.

Practice

AspenTech training is highly recommended though not required.

This guide contains 100% coverage of all objectives for the certification exam. You can use it as both a study tool and an on-the job reference

(read pages 2-12).

Get Certified

In-person and remote testing are available. Please make sure that you select the correct Location/Time Zone.

After passing the exam you will receive an email to post your certificate and digital badge on social media, which is a cross-industry recognition of technical skills you may share on LinkedIn, as well as in your email signature. View the instructions on how to post your credentials on LinkedIn profile.

Exam Scope for Aspen Plus with EDR

- ☐ Properties Environment
- ☐ Simulation Environment
- ☐ Convergence
- ☐ Reporting
- ☐ Calculation Models
- ☐ Physical Properties
- ☐ Geometry
- ☐ Results
- ☐ Documentation

Grading

Grade	Weight
Multiple choice questions	40%
Lab task	60%
Total	100%

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SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Explore Properties Environment	Startup Template	**Select** a startup template to begin a new simulation
	Component List	**Create** a component list
		Identify the different component databases available
	Physical Property Method	**List** the steps to establish physical properties
		Identify issues involved in the choice of a property method
		Define a property method
		Identify the different property methods available
		Explain the need for Henry's components
	Reporting	**Summarize** the different types of physical property data
		List the built-in analyses used for reporting physical properties
		Retrieve pure component properties from built in property databases
Explore Simulation Environment	Unit Sets	**Recognize** the default unit sets
		Customize unit sets
	Manipulate Flowsheet	**Explain** how unit operation models are organized
		Add unit operations to the flowsheet from the model palette
		Connect material streams to unit operation blocks
		Configure and customize flowsheet user preferences, options and default settings
	Unit Operations	
	Mixer/Splitters	**Explain** when to use the **SSplit** block in a flowsheet
	Separators	**Identify** the key differences in the three separator blocks **Flash2**, **Flash3** and **Decanter**

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Explore Simulation Environment	Separators	**List** which unit operation blocks can be used to specify how the components split to the outlet streams
		Configure a component splitter to separate component steams based on split fractions specified
	Exchangers	**Identify** the heat exchanger model used to model convective or radiant heat transfer across a surface
		Select the heat exchanger model that can be integrated with Aspen Exchanger Design and Rating (EDR) tools
		Explain how to specify a Heater block outlet stream to the dew point condition
		Recognize how the use of a Heat stream connected to a Heater block affects the input specifications
		Perform rigorous heat transfer calculations using EDR
	Columns	**List** the column unit operations that incorporate shortcut methods for Vapor/Liquid calculations
		Identify which unit operation block is used for most distillation column models
		Determine parameters required to solve a column Identify different types of column specifications available in RadFrac
		Identify different types of column specifications available in RadFrac
		Explain the function of the Column Analysis tool
		List the types of rigorous vapor-liquid fractionation operations that RadFrac can simulate
		Build different types of column using RadFrac and manipulate the column specifications to meet the process objective
		Plot temperature and composition results vs stage for a column
		Explain how to account for non-equilibrium stages in Rad-Frac

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR ASPEN PLUS
Explore Simulation Environment	Columns	**Describe** the difference between On-Stage and Above-Stage
	Reactors	**List** the classes of reactor unit operations available in Aspen Plus
		Describe the characteristics of balanced based reactor models
		Explain how heat of reaction is calculated in Aspen Plus
		Identify which reactor models allow both equilibrium and kinetic based reactions
		Identify the option in RGibbs to insure both vapor and liquid phases are considered
		Summarize the options for entering custom reaction kinetics
		List the options for entering reaction data for a reversible reaction
		Identify the reactor models that require a Reaction ID to describe reactions
		Recognize which reaction model type that allows a mixture of Power Law, Equilibrium, LHHW and Custom reactions
		Build a Reaction ID to be used in a kinetic based reactor
	Pressure Changers	**List** situations where pressure changer blocks need to be included in a flowsheet
		Explain the difference between design and rating specifications for pump and compressor
		Describe the options for entering performance curve data for pump and compressor models
		Build a simple flowsheet for an expander/compressor
		Identify the main difference between the pipe and pipeline unit operation

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Explore Simulation Environment	Manipulators	**List** unit operations models that manipulate streams
		Build a flowsheet the duplicates a feed stream that is processed in different types of process units
	User Models	**List** the options to write custom unit operation models
		Identify the unit operation block that is a container for simulation objects such as streams, unit operations, etc.
Convergence	Control Panel	**Analyze** error and warning messages
		Recognize simulation sequence
		Identify automatically generated convergence blocks
		Identify tear streams
		Explain the concept of error/tolerance
	Convergence Methods	**Configure** the default tear convergence settings to increase maximum number of iterations
		List the variables tested for tear stream convergence
		List the default convergence methods
		Describe the purpose of the Secant method bracketing strategy
	Tear Stream	**Specify** a tear stream for a convergence block
		Illustrate reconciling of a tear stream

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Convergence	Convergence Results	**Specify** a tighter global flash tolerance
		Analyze the pattern of the graphical convergence history using the convergence monitor
		Identify the number of iterations made to reach convergence
		Illustrate the reduction of simulation time by reconciling a block
	Troubleshooting	**Recognize** the various troubleshooting tips in the Help documentation
		Troubleshoot the prepared simulations using common methods
Documentation	General	**Use** the Help menu
Explore Simulation Environment	Analysis Tools	
	Sensitivity	**List** steps to create a new sensitivity
		Identify variables that can be defined as manipulated variables
		Analyze sensitivity results to find optimal operating conditions
		Identify if a design specification solution is feasible using sensitivity
		Recognize case studies
		Plot the results of a sensitivity block
		Explain tabulated Fortran expressions

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Explore Simulation Environment	Design Specification	**Develop** a design specification to get desired results
		Explain why design specification produces iteration
		List the approaches to view design specification results
		Analyze convergence issue caused by design specifications
		Troubleshoot convergence issue by changing default settings
	Calculators	**Develop** a calculator block with either Fortran syntax or Excel functions
		Recognize basic Fortran syntax and Excel functions
		Explain the use of parameters and local parameters
		Identify import variables and export variables
		Define location of a calculator block in an execution sequence
		Resolve errors caused by a calculator
Reporting	Stream Summary	**Customize** stream summary tables and save as new templates
		List steps to create new templates
		Explain how to add additional physical properties to the stream summary
		Explain the use for all options in Edit Stream Summary Template window
		Send stream summary to Excel and to Flowsheet (linked with Aspen Plus)
		Describe Import/Export user stream templates features

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Reporting	Custom Tables	**Create** custom tables
		Use custom tables on the flowsheet (as icon)
	Global Data	**Display** global stream data on flowsheets
		Display user-defined global stream data on flowsheets
		Explain how to change global stream data displayed decimal digits
	Property Sets	**List** steps to create new property sets
		Explain the use of property qualifiers
		List where to use property sets
	Model Summary	**Customize** odel Summary table
		Send Model Summary table to Excel (linked with Aspen Plus)
	Miscellaneous	**Use** Check Status to check detailed information about errors or warning
		Report control panel messages in History file
		Report printable text file of input data and simulation results

SCOPE	TECHNICAL CONTENT	COMPETENCY OBJECTIVE FOR EDR
Calculation Modes	General Options	**Identify** the available calculation modes
		Identify where in the UI to select/change the calculation mode
	Design mode	**Identify** required inputs and expected outputs
		Identify the two options for optimization (area or cost)
		Define area ratio
		Identify key variables considered in the design algorithm (area ratio, pressure ratio, TEMA limits for rho-V2 and unsupported length, vibration)
		Identify how to enter process and/or geometry limits
	Rating Mode	**Identify** required inputs and expected outputs
		Interpret area ratio results
	Simulation Mode	**Identify** required inputs and expected outputs
		Interpret area ratio results
	Find Fouling	**Identify** required inputs and expected outputs
		Interpret area ratio results
	Overall	**Identify**, for a given problem statement, the applicable calculation mode and the required input
Physical Properties	Physical Property Packages	**Identify** the different physical property packages options (B-JAC, COMThermo, Aspen Properties, User Specified)
		Identify external sources to import properties (PSF, HYSYS or A+, Aspen Properties file)
	Property Methods	**Identify** categories of property methods (Ideal, EOS, Activity models) and general application for each

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Physical Properties	Overall	**Explain** the importance of the temperature range/# of points and pressure levels in physical properties calculation
		Identify, for a given problem statement, the applicable physical property package and the appropriate property method
Geometry	Basic configuration	**Identify** key options that are always selected by the user (not changed by EDR): TEMA type, hot fluid location, exchanger orientation, baffle type, etc.
		Identify applications for different shell types
		Identify arguments to be considered during hot fluid location selection (high pressure, hazardous fluid, fouling)
	Geometry	**Recognize** key geometry (tube ID/OD, shell ID/OD, # of tubes, # passes, tube pitch, pattern, tube length)
		Identify EDR standards for geometry (TEMA, ASME, most common commercial dimensions)
		Identify Non-TEMA configurations (double pipe, hairpin)
Results	Warning/Messages	**Identify** the types of messages displayed by EDR and its importance (errors, warnings, advisories, notes)
		Interpret, given a particular file, the error/warning messages
		Develop, given your previous interpretation, some modifications that could potentially help fixing the error/warning messages
	TEMA sheet	**Recognize**, from a list of outputs, which could be found in the TEMA sheet
		Explain how to export TEMA sheet to Excel
	Thermal	**Interpret**, for a given simulation, area ratio value

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Results	Thermal	**State**, for a given simulation, the effective mean temperature difference
		State, for a given simulation, the tube side and shell side overall film coefficients
		Interpret, given a simulation, which side represents the greater contribution to the overall HTC
Results	Hydraulic	**Identify** the three contributions to the overall pressure drop (frictional, momentum change, gravitational)
		State, given a simulation, pressure drop on each side
		Identify, given the same file, which pressure drop mechanism has the greater contribution on each side
		Identify, given the same file, which part of the exchanger represents the greater contribution to pressure on each side
		Identify on which part of the exchanger the highest velocity is achieved on each side
		Identify, given a simulation, if there are Rho-V2 TEMA limits violations
	Mechanical	**Identify** the two types of vibration analyzed and reported by EDR
		Identify, within a provided list, which factors or mechanisms can influence the vibration assessment
		Analyze, the vibration assessment in a given simulation and develop a plan to fix such vibration issues
		Identify, within the tube layout of a given simulation, the tubes analyzed for the vibration assessment
		Identify, within the setting plan of a given simulation, the inlet and outlet nozzles for both sides

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Results	Mechanical	**Identify**, given a simulation, a geometry parameter calculated by the program (instead of being specified)
		State, given a simulation, the total cost of the unit (all shells)
	Calculation Details	**Interpret**, given a simulation, what information could be retrieved from the temperature profile of each side (in which region a phase change is taking place, slope close to zero)
Documentation	Help Guide	**State** the definition of a given concept by searching it in the Help Guide
	HTFS Research Network	**Navigate** to a HTFS Design Report and state the title

About Aspen Technology

Aspen Technology (AspenTech) is a leading software supplier for optimizing asset performance. Our products thrive in complex, industrial environments where it is critical to optimize the asset design, operation and maintenance lifecycle. AspenTech uniquely combines decades of process modeling expertise with machine learning. Our purpose-built software platform automates knowledge work and builds sustainable competitive advantage by delivering high returns over the entire asset lifecycle. As a result, companies in capital-intensive industries can maximize uptime and push the limits of performance, running their assets safer, greener, longer and faster. Visit AspenTech.com to find out more.