Feature Benchmarking ...

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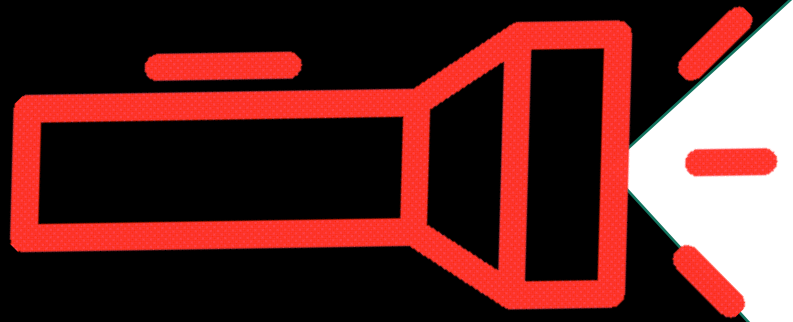
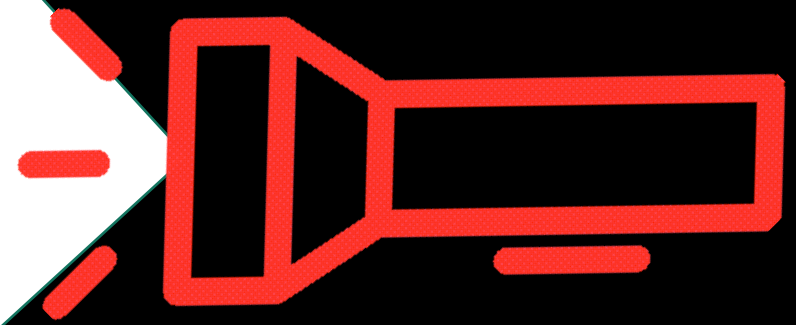


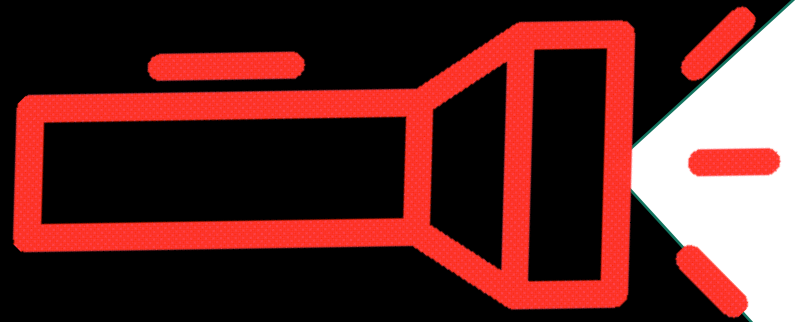
FHinfinity

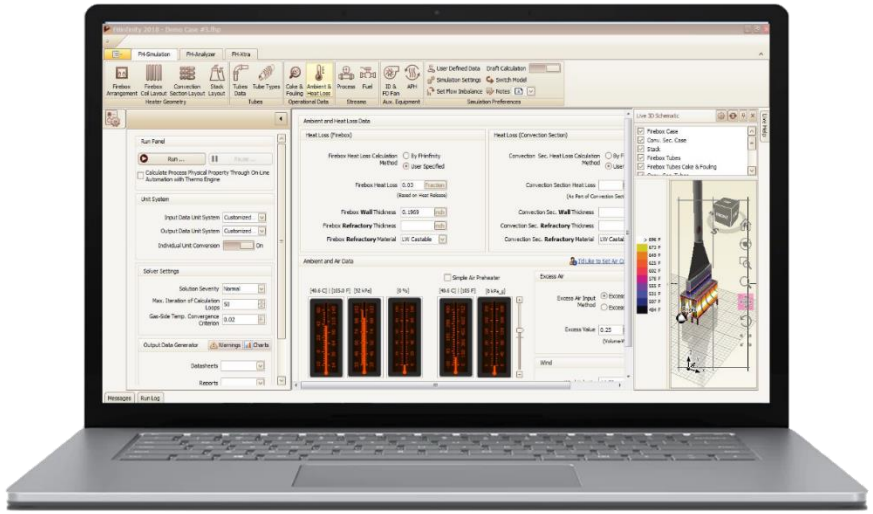
vs.

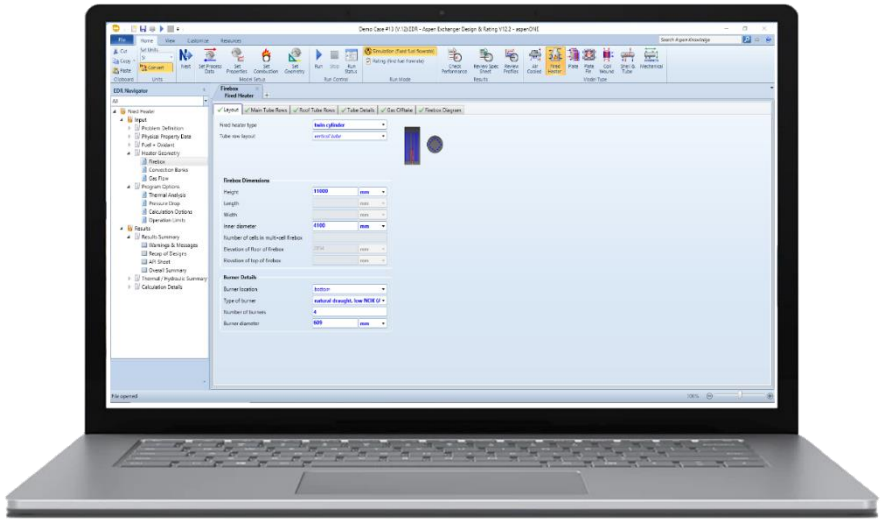
ASPEN EDR.

FiredHeater





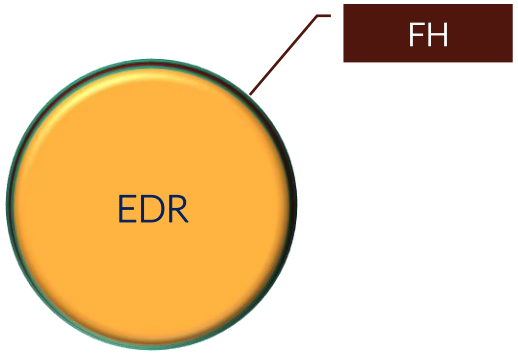




Type of Models

FHinfinity vs. ASPEN EDR

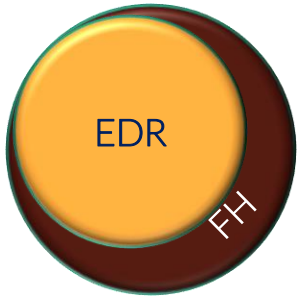
Radiant + Convection	✓	✓
Radiant Only	✓	✓
Convection Section Only	✓	✓
Combustion Only	✓	✓

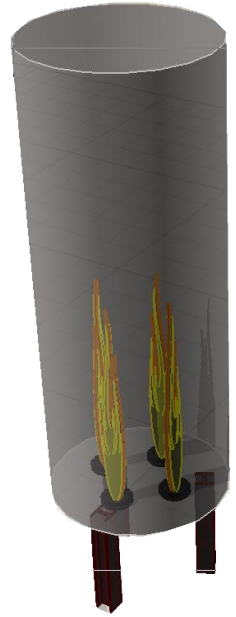


Firebox Type (Cylindrical)

FHinfinity vs. ASPEN EDR

Cylindrical, Vertical Tube	✓	✓
Cylindrical, Vertical Tube (Twin Cell)	✓	✓
Cylindrical, Helical Coil	✓	✓
Cylindrical, Helical Coil (Twin Cell)	✓	✓
Cylindrical, Vertical Tube, Double Row	✓	✗
Cylindrical, Vertical Tube, Double Row (Twin Cell)	✓	✗

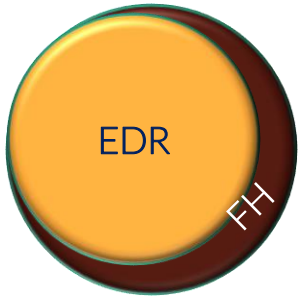


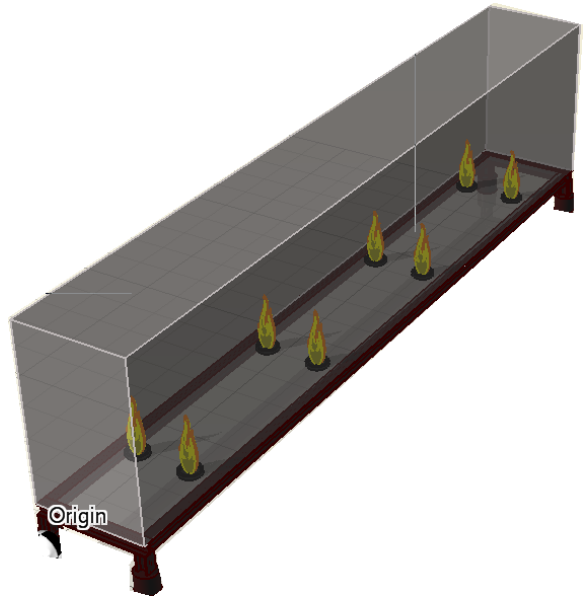


Firebox Type (Cubical)

FHinfinity vs. ASPEN EDR

Cubical, Refractory Back, Vertical Tube (& Twin)	✓	✓
Cubical, Refractory Back, Horizontal Tube (& Twin)	✓	✓
Cubical, Central, Vertical Tube (& Twin)	✓	✓
Cubical, Central, Horizontal Tube (& Twin)	✓	✓
Cubical, Central, Multi Lane, Vertical Tube (& Twin)	✓	✓
Cubical, Central, Multi lane, Horizontal Tube (& Twin)	✓	✓
Cubical, Central, Double Row, Vertical Tube (& Twin)	✓	✓
Cubical, Central, Double Row, Horizontal Tube (& Twin)	✓	✓
Cubical, Refractory Back, Double Row, Vertical Tube (& Twin)	✓	✗
Cubical, Refractory Back, Double Row, Horizontal Tube (& Twin)	✓	✗

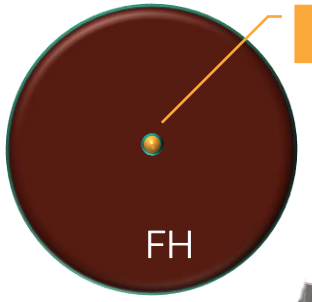


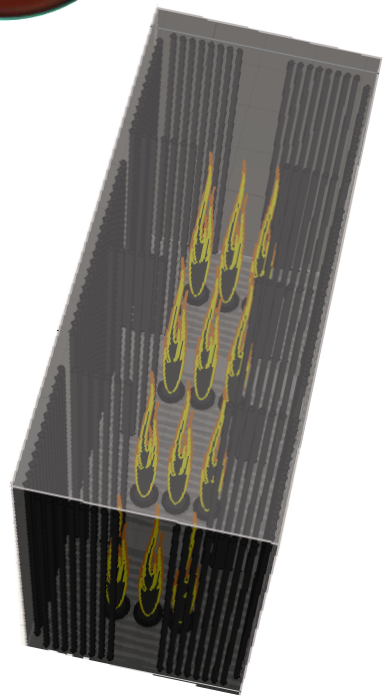


Firebox Type (Box)

FHinfinity vs. ASPEN EDR

Box, 6 Path, 4 Cell	✓	✗
Box, 8 Path, 5 Cell	✓	✗
Box, 12 Path, 7 Cell	✓	✗
Box, 6 Path, 3 Cell	✓	✗
Box, 8 Path, 3 Cell	✓	✗

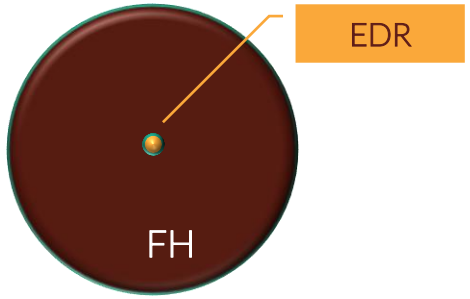


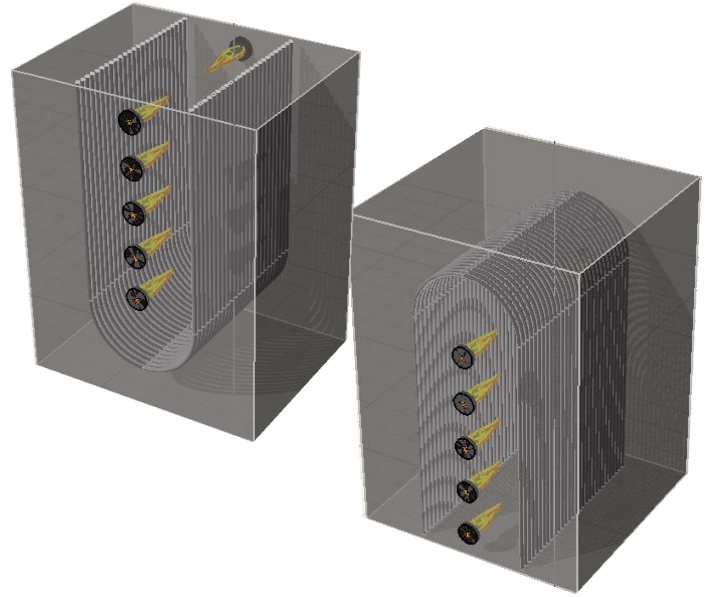


Firebox Type (Arbor / U)

FHinfinity vs. ASPEN EDR

Cubical, Arbor Tube, Single Hoop	✓	✗
Cubical, Arbor Tube, Single Hoop (Twin Cell)	✓	✗
Cubical, Arbor Tube, Double Hoop	✓	✗
Cubical, Arbor Tube, Double Hoop (Twin Cell)	✓	✗
Cubical, U-Tube, Single Hoop	✓	✗
Cubical, U-Tube, Single Hoop (Twin Cell)	✓	✗
Cubical, U-Tube, Double Hoop	✓	✗
Cubical, U-Tube, Double Hoop (Twin Cell)	✓	✗

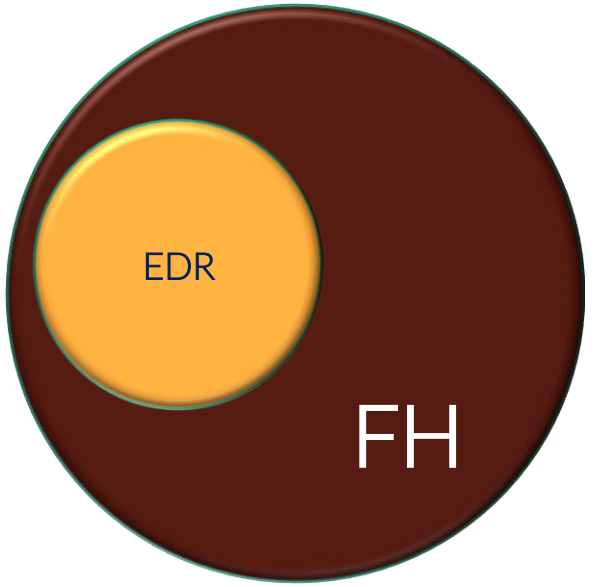




Firebox Type (All Types)

FHinfinity vs. ASPEN EDR

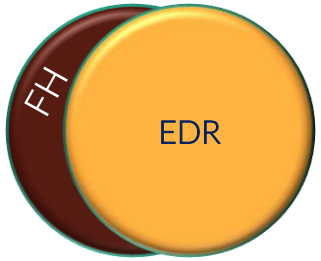
Cylindrical Firebox	6	4
Cubical Firebox	20	16
Box Firebox	5	0
Cubical, Arbor / U	8	0



Type of Roof Tube

FHinfinity vs. ASPEN EDR

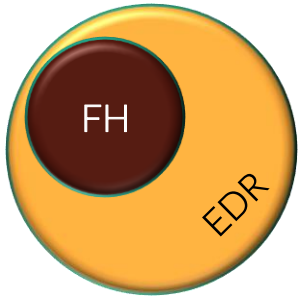
Flat Roof Tube	✓	✓
Hipped Roof Tube	✓	✗
Tube in Parallel to Left / Right Walls	✓	✓
Tube in Parallel to Front/ Rear Walls	✗	✓



Conv. Tube Type

FHinfinity vs. ASPEN EDR

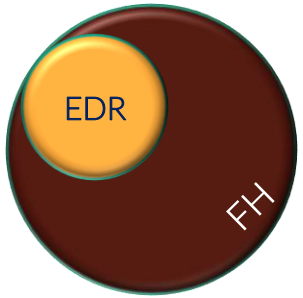
Bare Tube	✓	✓
Solid Finned Tube	✓	✓
Serrated Finned Tube	✗	✓
Circular Studded Tube	✓	✓
Rectangular Studded Tube	✗	✓
Elliptical Studded Tube	✗	✓
Lenticular Studded Tube	✗	✓
Chamfered Studded Tube	✗	✓
Rectangular Plate Finned Tube	✗	✓
Tube in Plate	✗	✓



Associated Equipment

FHinfinity vs. ASPEN EDR

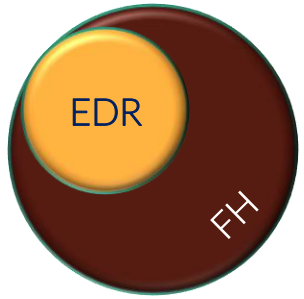
Air Preheater	✓	✓
Forced Draft Fan	✓	✗
Induced Draft Fan	✓	✗
Burner	✓	✗



Firing Orientation

FHinfinity vs. ASPEN EDR

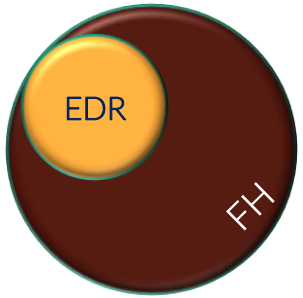
Up-Fired	✓	✓
Down-Fired	✓	✓
Endwall-Fired	✓	✗
Sidewall-Fired (Perpendicular)	✓	✗
Sidewall-Fired (Parallel, Single Level)	✓	✗
Sidewall-Fired (Parallel, Multi Level)	✓	✗



Draft System

FHinfinity vs. ASPEN EDR

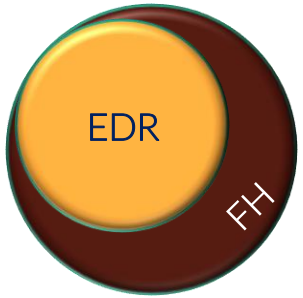
Natural Draft	✓	✓
Forced Draft	✓	✗
Induced Draft	✓	✗
Balanced Draft	✓	✗



Type of Stack

FHinfinity vs. ASPEN EDR

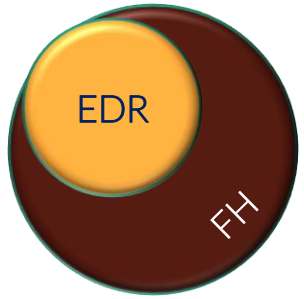
Self-Supported	✓	✓
Ground Supported	✓	✗



Type of Thermo-Engine

FHinfinity vs. ASPEN EDR

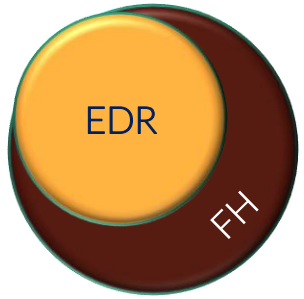
User Data Entry	✓	✓
Automation with Aspen Hysys (Off-Line)	✓	✓
Automation with Aspen Hysys (On-Line)	✓	✗
Automation with Aspen Properties (Off-Line)	✓	✓
Automation with Aspen Properties (On-Line)	✓	✗
Automation with Petro-SIM (Off-Line)	✓	✗
Automation with Petro-SIM (On-Line)	✓	✗
NAFTPack© Proprietary Package (Reactive Sys.)	✓	✗



Steam Injection

FHinfinity vs. ASPEN EDR

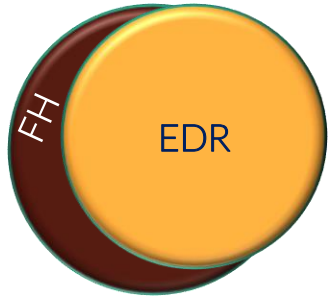
Steam Injection to Firebox	✓	✓
Steam Injection to Convection	✓	✗
Using Mixing Rule for Combined Stream Properties	✓	✓
Using Heat Curve for Combined Stream Properties	✓	✓
Injection of Water	✓	✗
Considering liquid Water in Tubes	✓	✗



Type of Fuel

FHinfinity vs. ASPEN EDR

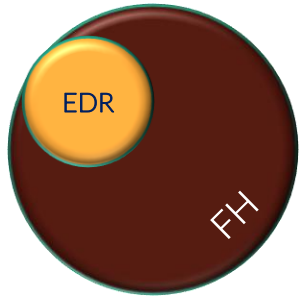
Fuel Oil (+ Atomizing Steam)	✓	✓
Fuel Gas	✓	✓
Combination of Fuel Oil & Fuel Gas	✓	✓
Mixed Fuel Oil	✗	✓
Mixed Fuel Gas	✓	✓
Fuel Gas Vol. Flowrate as Heat Release	✓	✗
Fuel Gas Pressure as Heat Release	✓	✗



Type of Outputs (Datasheets)

FHinfinity vs. ASPEN EDR

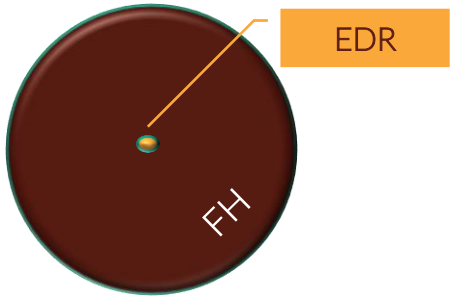
Heater Datasheet	✓	✓
Burner Datasheet	✓	✗
Induced Draft Fan Datasheet	✓	✗
Forced Draft Fan Datasheet	✓	✗
Air Preheater Datasheet	✓	✗



Type of Outputs (Reports)

FHinfinity vs. ASPEN EDR

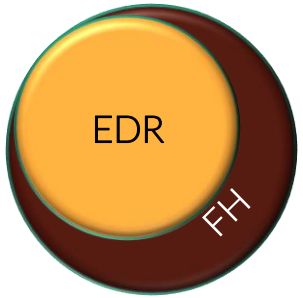
Process Side Hydraulic Report	✓	✗
Heater Draft Report	✓	✗
Heater Geometry Report	✓	✗
Combustion Report	✓	✗
Heat Balance Report	✓	✗
Heat Transfer Data Report	✓	✗
Tube Temperature Report	✓	✗
Duct Element Report	✓	✗
Summary & Miscellaneous Report	✓	✗
Reaction Report	✓	✗



Type of Outputs (Diagrams)

FHinfinity vs. ASPEN EDR

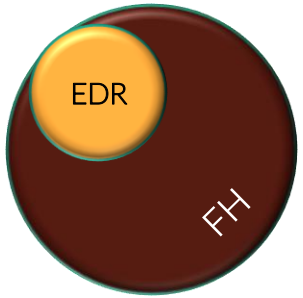
Process Side Temperature	✓	✓
Process Side Pressure	✓	✓
Process Side Vapor Fraction	✓	✓
Process Side Flow Regime	✓	✓
Process Side Heat Transfer Region	✓	✗
Process Side HTC	✓	✓
Process Side Mass Flux	✓	✗
Process Side Reynolds No.	✓	✗
Process Side Velocity	✓	✓
Process Side Sonic Velocity	✓	✗



Type of Outputs (Diagrams-Cont.)

FHinfinity vs. ASPEN EDR

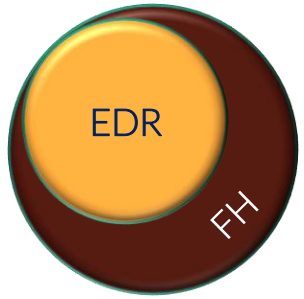
Gas Side Temperature	✓	✓
Gas Side Pressure	✓	✗
Gas Side Draft	✓	✗
Gas Side Composition	✓	✗
Gas Side Velocity	✓	✗
Gas Side HTC	✓	✓
Gas Side Mass Flux	✓	✗
Gas Side Reynolds No.	✓	✗
Flame Heat Release	✓	✗



Type of Outputs (Diagrams-Cont.)

FHinfinity vs. ASPEN EDR

Mean Heat Flux	✓	✓
Peak Heat Flux	✓	✓
Heat Absorption Rate	✓	✗
Heat Absorption Rate Accumulated	✓	✗
Mean Tube Metal Temperature	✓	✓
Peak Tube Metal Temperature	✓	✓
Mean Tube Skin Temperature	✓	✗
Peak Tube Skin Temperature	✓	✗



Non-Functional Options

FHinfinity vs. ASPEN EDR

	FHinfinity	ASPEN EDR
FIREBOX RADIATION MODEL	❑ Well-Stirred ❑ Long Furnace	❑ Well-Stirred ❑ Long Furnace
BARE TUBE GAS SIDE HTC	❑ ESDU Method ❑ Schweppe Method ❑ Zukauskas Method	❑ ESDU Method
FINNED TUBE GAS SIDE HTC	❑ PFR Method ❑ Escoa Method ❑ Schmidt Method ❑ VDI-Warmeatlas Method	❑ PFR Method ❑ Escoa Method ❑ HTFS3A Method
STUDDED TUBE GAS SIDE HTC	❑ Henry Method	❑ Henry Method

Non-Functional Options (Cont.)

FHinfinity vs. ASPEN EDR

	FHinfinity	ASPEN EDR
PROCESS SIDE HTC	❑ API-560 ❑ FHinfinity Method	❑ API-560 ❑ HTFS Method
GAS EMISSIVITY	❑ Taylor's 4 Grey Gas Model ❑ Leckner Method	❑ Taylor's 4 Grey Gas Model
PROCESS SIDE PRESS. DROP (2-PHASE)	❑ FHinfinity Mixed Model ❑ Homogeneous ❑ Chisholm Model ❑ FHinfinity Separated Model ❑ User Defined Mixed Model	❑ Mixed Model
RADIATION MODEL	❑ Gray Gas Model ❑ Non-Gray Gas Model	❑ Gray Gas Model

FHinfinity© Special Tools

A) FH-Analyzers

FHinfinity© Special Tools

B) FH-Xtra

FHinfinity© Special Options

A) Functional Items

- Transfer Line Simulation
- Simulation of ID / FD Fan
- Simulation with Path Flow Imbalance
- IZ / FZ Duct Simulation
- Considering Coke / Fouling in Tubes
- Damper Emulation
- Air Leakage & Tramp Air Calculations
- Burner Gas-Side/Air Side Capacity Curve

FHinfinity© Special Options

A) Non-Functional Items

- Fuel Oil Characterization
- Post Dry-Out HTC Consideration
- Mist / Dispersed Flow Consideration
- Affect of Gas Side Fouling on Draft & HTC
- Considering Coke / Fouling in Tubes
- Stack & Duct Temperature Loss Calc.
- Multi Layer Refractory Calculation
- Affect of Wind on Draft & HTC

Final Result

FHinfinity© is the undisputed champion of process furnace simulation, setting a new global standard that others can only dream of matching

The End

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