

FIHR[™]



Software for the simulation, troubleshooting and operations of gas or oil fired process heaters.

Overview

FIHR[™] is a simulation program for fireboxes and convection sections of fired process heaters. In simulation mode, it can used for troubleshooting, such as identification of tube burnout, and operation, to identify the best operating conditions given changes in feedstock or product specifications.

Key performance variables, such as product and metal temperatures are presented graphically, to enable rapid evaluation of operational changes, including the effect of flame shape and heat release.

Features

Operating Modes

The following operating modes are available, providing specific capabilities based on the task being performed:

- Simulation
- Burner rating

Technical Summary

- Process Applications
 - Single-phase liquids or gases or boiling liquids for all or part of their duty
 - Both pure component (isothermal) liquids and mixtures
 - Up to 10 streams may pass through several different parts of the heater and the firebox stream may be pre-heated in the convection section tube banks
 - User can specify process- and gas-side fouling, in any section
- Calculations Methods
 - Calculates the process outlet conditions for all process streams in the heater, in addition calculating the flue gas draft
 - A 'burner rating' mode calculates the required fuel flowrate for a defined outlet condition of the main firebox process
 - Firebox radiation modeled by 'well stirred' (single zone) or 'long furnace' (up to 20 longitudinal zones) methods. HTFS[®] models for typical industrial burner heat release
 - Considers radiation heat transfer in the tube banks
 - Circumferential heat flux and peak tube wall temperature based on API 530
- Geometry
 - Cylindrical fireboxes containing vertical hairpin tubes or a refractory backed helical coil
 - Cabin fireboxes (single or twin), with vertical or horizontal tubes, which may be wall-mounted or centrally located, (in single or double rows) with firing on both sides
 - Open or ducted flue gas systems with an air pre-heater with ID and FD fans if required
 - May also be used for a standalone convection section or heat recovery train
 - Up to 9 convection section tube banks with plain or extended (fins or studs) surfaces
 - Tubes of different diameter and separation; tubes with U-bends inside or outside the firebox
 - Extensive help, including firebox and tube bank diagrams to aid input

View Run Summary	EDDATA DENS	STUR, DATAS							. D X		
Forg End Tex	Find Seat	340	6	Dot alled Ress	dis - Pike						- 12 2
						199					
	IS IMATER INC.		Vag. 2	-	-	-					
T INFORTANT -	SEE DIER HAN	UAL FOR BOTE	· ITER								
1			TTI 20-5	m-1 ***		-					
and the second second					-						-
*************	*********	**********	******	_3 F							
***TERPERATURES									-		
THE PARAMETERS I	(CIANT			- 1 E	-						
CYLINDER FI	REPAR CON	VECTION SECTO	CON NO			-		100	1		
No.of forms +		· saut 10	3 7					-	-		
Effact mey	10.4L %	19.51 %	ry.								
Solution Eccor Toin 7	B. 0606 %	0.0101 %	-	28-3		-					
F/8 1442.2 1			95.5	200-1		-		-	-	•	-
1 \$16.6 5	82.7 254.5	0 244.04 5	100-5		-						
3 602.7 1			159.8 4	240-		-					
3 916.9 1			69.0.1			-		-			
DATA DENOS JTHR	DATA TR. SYN	CHURCEPHE		240-	1 1 1	1 1			1 1 1		1 1
			_	*				1			11
the of least			Merry								
											Ret er
			Heat								Return
			Heat	ance of Conv	ection Banks		API Ste	et (Jbart)			Retar
of enance of the l	ipph-og		Heat	ance of Coars				rt (short) rtics Flor 2	lystem		Retar
of mance of the I collegation - First	ipst-og		Heat Perform Conferen	ation - Corre	ection Backs		College	tion - Flor 3			-
of mance of the I collegation - First	ipst-og		Heat Perform Conferen		ection Backs		College				
of mance of the I forfacention - First forfacention - Proc	ivebou un nu. Ehada	Pressure	Heat Perform Configu Details	Convection I	ection Backs Banks	tean and i	Configer Details	nion - Phe 3 Farebout - Zo			-
of mance of the I forfacention - First forfacention - Proc	ivebou un nu. Ehada	Pressure	Heat Perform Configu Details	Convection I	ection Backs Banks Rans 1	tean wall	Configur Datale	rice - Phy 5 Farbox - Zo Phos			
information - First Indication - First Indication - Proc	ivebou un nu. Ehada	Pressure change Der	Heat Perform Configu Details	Convection I	ection Backs Banks	tean wall teap. deg c	Configer Details	rice - Phy 5 Farbox - Zo Phos			
Information - First Indication - First Indication - Proc Indication Exce Exce	integ an Each Freesoure	chappe	Heat Perform Configu Details	Specific enthelpy	ection Backs Banks Rans 1	tenp.	Conficer Drink Heat tr.coeff.	rice - Phy 5 Farbox - Zo Phos			
nfinance d'Or J Sederation - Fiel Sederation - Free Sole 1006 2006	intes E Pade Freesoure Dar	Change Der	Heat Perform Confarm Details Temp- deg C	Specific enthalpy k3/kg	Range Range Range H Quality	tenp.	Conficer Drink Heat tr.coeff.	rice - Phy 5 Farbox - Zo Phos			
nfinnance of De J Colligation - First Indigention - Proc Indigention - Proc SODS Top of Firstbox 1 /20 Tailet	retos 22 Pressure 1.992	Change Der	Heat Perform Confere Details Temp. deg C 244.03	Specific enthelpy HJ/Kg -837.3	Russ 1 quality 0.0334	temp. dep C	Configur Drink Heat tr.coatt. W/MC H	Fice Pattern			
nfinance d'De l Coloration - Fact Indication - Proc Indication - Proc Sobo Sobo Top of Firebos 1 /10 Inlet 1 /10 Basa	Freesoure Der 3.991 2.991 3.991	Change Der 0.00000 -0.00013	Heat Perform Conferen Details Temp- deg C 244.03 244.21	Specific enthelpy x3/kg -027.2 -026.7	Ranks Ranks Quality 0.0224 0.0337	temp. dep C	Configure Drink Er.costf. W/MC H	Fire Parts			
nfinance (10x) Infiguration - Farth Infiguration - Pro- Tube/Gas 2008 Top of Firebos 1 /10 Inlet 1 /10 Basa 1 / 9 Beaa	rrhog 22 Freasure Dar 3,991 3,992 3,993	0.00900 -0.00013 -0.00045	Heat Perform Confirm Details Temps deg C 244.03 244.03 244.71	Convertion I Specifin enthalpy XJ/Kg -037.2 -035.0	Rans 1 quality 0.0224 0.0237 0.0246	temp. dep C 199.13 311.29	Configur Details tr.ocett. W/mc H 705.4 715.7	Fice Port			
nfinance (TDe 1 Infiguration - Fact Infiguration - Free South Sout	Freesoury Der 3,991 3,992 3,992 3,993 3,993 3,993	Change Dat 0.00000 -0.00013 -0.00045 -0.00083	Heat Perform Configur Details Temp- deg C 244.03 244.03 244.23 244.23	Beetfin Enthalpy 80/89 -807.2 -836.7 -836.7 -832.7	Rans 1 quality 0.0334 0.0337 0.0346 0.0359	tesp. dep C 199.13 311.29 322.61	Configur Details Ex-conff. W/mc H 705.4 715.7 725.8	Fine Post			
nf manor (FDr) ordportion - First ordportion - First ordportion - Pros Tuber/Gas 5056 Top of Firstbox 1 /10 Thiet 1 /20 Bean 1 / 3 Bean 1 / 5 Bean	225 225 226 226 227 228 228 228 228 228 228 228 228 228	CBADGE DBE 0.00000 -0.00013 -0.00045 -0.00083 -0.00124	Heat Perform Configur Details Temp. deg C 244.03 244.21 244.21 244.25 244.25	Convectors I Specific enthelpy x0/x0 -837.2 -836.7 -635.0 -822.7 -825.9	Rans 1 quality 0.0334 0.034 0.034 0.034 0.034 0.0350 0.0374	tesp. dep C 199.13 311.29 322.61 337.27	Configur Drink - Ex.coeff. W/m2 # 705.4 715.7 715.8 735.7	Pine patters			
nfinance (TDe 1 Infiguration - Fact Infiguration - Free South Southern - Free Southern Southe	Freesoury Der 3,991 3,992 3,992 3,993 3,993 3,993	Change Dat 0.00000 -0.00013 -0.00045 -0.00083	Heat Preferen Conferen Details United Details	Beetfin Enthalpy 80/89 -807.2 -836.7 -836.7 -832.7	Rans 1 quality 0.0334 0.0337 0.0346 0.0359	tesp. dep C 199.13 311.29 322.61	Configure Drinkh - Banat tr.osett. W/m2 E 705.4 715.7 725.8 735.7 757.7	Fine Post			
Information - First Verfageration - First Verfageration - First Verfageration - First Scott Top of Firstbox 5 /10 Tailet 1 /10 Team 1 / 9 Team 1 / 9 Team 1 / 7 Team 1 / 7 Team	Pressure Bar 3.991 3.991 3.992 3.992 3.993 3.993 3.993 3.993 3.993	CBADGE DBE 0.00000 -0.00013 -0.00045 -0.00083 -0.00134 -0.00167	Heat Perform Configur Details Temp. deg C 244.03 244.21 244.21 244.25 244.25	Convectors J Description Presention J Presention J Pre	Rame 1 quality 0.0334 0.0346 0.0370 0.0346 0.0378	tesp. dep C 199.13 311.29 322.61 337.27 356.87	Configure Drink tr.cooff. W/m2 E 705.4 715.7 725.8 735.7 757.7 775.8	Firebox - Zo Firebox - Zo Pitters saturing saturing saturing saturing saturing			
off-musics (T22) officiation - Feel infication - Feel infication - Free Society - Free Society - Free 1 / 10 Mean 1 / 9 Mean 1 / 5 Mean 1 / 6 Mean 1 / 5 Mean	Pressure Dat 3.991 3.991 3.992 3.993 3.993 3.995 3.995 3.995 3.995 3.995 3.995	CBADGE DBE 0.00000 =0.00013 -0.00045 =0.00083 =0.00184 =0.00187 =0.00182	Heat Perfecta Conface Details Details deg C 244.05 244.21 244.25 244.29 244.29 244.29 244.29 244.29	Decific Enthelpy 80/80 -837.5 -836.7 -838.0 -832.7 -838.9 -832.7 -829.9 -822.7	Rans 1 quality 0.0334 0.0346 0.0350 0.0350 0.0350 0.0350 0.0414	temp. deg C 299.13 311.29 322.61 337.17 356.87 394.23	Configure Details tr.00022. Wind H 708.4 715.7 755.8 755.7 757.7 758.8 815.0	Pice Pice patters manular manular manular manular manular			
Antiparties - (The Society of the second sec	200 200 Pressure Der 3.991 3.992 3.992 3.992 3.995 3.965 3.965 3.965 3.965 3.965 3.965 3.965 3.965 3.965	0.00000 -0.00013 -0.00045 -0.00045 -0.00045 -0.00147 -0.00147 -0.00147 -0.00147 -0.00147 -0.00147 -0.00340	Ecol Perfector Conferen Details Details derg C 244.05 244.25 244.25 244.25 244.25 244.25 244.25 244.26 244.24 246.34 246.34	Convectors Convectors EntEntpr #07.5 -837.5 -837.5 -835.0 -832.7 -832.7 -826.7	Cton Backs Ress 1 quality 0.0334 0.0346 0.0374 0.0346 0.0374 0.0346 0.0374 0.0346 0.0374 0.0442 0.0442 0.0461 0.0558	temp. deg c 199.13 311.29 322.61 337.47 384.87 384.82 423.01 406.63 593.04	Configure Details Er.costf. W/m2 # 705.4 715.7 755.8 735.7 757.7 757.7 757.7 757.7 757.7 815.0 615.0 615.0	Pice - Fire 3 Ferbur - Zo Pice patters sessiar sessiar sessiar sessiar sessiar sessiar sessiar			
Antiparation - Field Antiparation - Field Antiparation - Field Antiparation - Field States St	222 223 225 226 227 227 227 227 227 227 227 227 227	CBADRE Def 0.00000 -0.00013 -0.00013 -0.00013 -0.00124 -0.00124 -0.00125 -0.00012 -0.00012 -0.00012 -0.00010	Ecology Perform Configure Details deeg C 244.03 244.21 244.23 244.23 244.24 245.24 245.40 247.16 240.44 255.00 259.05	Convertion 3 Specifin estbalpy x0/kg -837.2 -836.7 -835.0 -832.7 -829.9 -822.7 -822.7 -822.7 -822.7 -822.7 -810.7 -810.7 -810.7 -810.7 -815.6	The second secon	temp. deg C 289.13 311.29 322.61 337.17 384.07 384.02 423.91 406.63	Configure Details Er.costf. W/m2 # 705.4 715.7 755.8 735.7 757.7 757.7 757.7 757.7 757.7 815.0 615.0 615.0	Pine Pine patters manular manular manular manular manular			
Antiperation - First Antiperation - First Antiperation - Pro- Scote Scote 1 / 10 Tailet 1 / 10 Mean 1 / 2 Mean 1 / 5 Mean 1 / 5 Mean 1 / 5 Mean 1 / 1 Mean	Entropy 200 200 Entropy 200 Entropy 200 En	0.00000 -0.00013 -0.00045 -0.00045 -0.00045 -0.00147 -0.00147 -0.00147 -0.00147 -0.00147 -0.00147 -0.00340	Ecol Perfector Conferen Details Details derg C 244.05 244.25 244.25 244.25 244.25 244.25 244.25 244.26 244.24 246.34 246.34	Convertion 3 Specifin estbalgy x0/kg -837.2 -836.7 -835.0 -832.7 -829.9 -826.7 -829.9 -826.7 -829.7 -820.	Cton Backs Ress 1 quality 0.0334 0.0346 0.0374 0.0346 0.0374 0.0346 0.0374 0.0346 0.0374 0.0442 0.0442 0.0461 0.0558	temp. deg c 199.13 311.29 322.61 337.47 384.87 384.82 423.01 406.63 593.04	Configure Details Er.costf. W/m2 # 705.4 715.7 755.8 735.7 757.7 757.7 757.7 757.7 757.7 815.0 615.0 615.0	Pice - Fire 3 Ferbur - Zo Pice patters sessiar sessiar sessiar sessiar sessiar sessiar sessiar			
Antiparton - First Antiparton - First Antiparton - First Antiparton - First South So	22 23 24 25 25 25 25 25 25 25 25 25 25 25 25 25	CB8005 DHF 0.00000 -0.00013 -0.00045 -0.00083 -0.00124 -0.00167 -0.00124 -0.00167 -0.00128 -0.00160 -0.00184 -0.00460 -0.00469	Ecol Perform Configue Details - Details - deng C 244.05 244.23 244.24 244.24 244.24 244.24 244.24 244.24 244.24 244.20 247.16 240.34 24	Converting 1 Specific entbalpy 80/Xg -827.5 -824.7 -825.7 -824.7 -825.7 -824.7 -825.7 -824.7 -825.	Russ Russ <thrus< th=""> Russ Russ R</thrus<>	temp. deg c 199.13 311.29 322.61 337.47 384.87 384.82 423.01 406.63 593.04	Configure Details Er.costf. W/m2 # 705.4 715.7 755.8 735.7 757.7 757.7 757.7 757.7 757.7 815.0 615.0 615.0	Pice - Fire 3 Ferbur - Zo Pice patters sessiar sessiar sessiar sessiar sessiar sessiar sessiar			
Antiparation - First Antiparation - First Antiparation - Pro- Sond Sond Sond Top of Fitebos 1 /10 Talet 1 /10 Mean 1 / 9 Mean 2 / 9 Mean 2 / 1 Mean 2 / 1 Mean 1 / 1 Mean 2 / 1 Mean 2 / 1 Mean 1 / 1 Mean 1 / 1 Mean 1 / 1 Mean 2 / 1 Mean 1 / 1 Mean 1 / 1 Mean 2 / 1 Mean 1 / 1 Mean	226 227 228 228 229 23991 23991 23992 2399 239992 239992 239992 239992 239992 23992	286095 DBF 0.00000 -0.00013 -0.00045 -0.00124 -0.00167 -0.00167 -0.00342 -0.00342 -0.00342 -0.00349 -0.00460 -0.00499 -0.00561	Ecal Perform Conficer Details Temp: deg C 244.05 244.05 244.21 244.25 244.25 244.24 245.10 254.05 254.05 254.05 254.05	aton - Converting Converting enthalpy x0/xg -827.2 -828.7 -828.9 -822.7 -828.9 -822.7 -828.9 -824.7 -828.9 -824.7 -829.9 -824.7 -849.9	C.C.234 C.C.234 C.C.234 C.C.237 C.C.238 C.C.248 C.C.24	temp. deg C 299.13 311.29 322.61 337.47 384.87 384.22 423.01 406.63 593.04 860.50	Cushaa Datah Too.4 705.4 705.4 705.4 725.8 725.8 725.7 7	non - Pin 3 Freing - Zo Pine patters sanular sanular sanular sanular sanular sanular sanular sanular			
Information The I Configuration - First Infiguration - First State - First Table - First	202 203 205 205 205 205 205 205 205 205 205 205	288095 DHF 0.00005 -0.00013 -0.00045 -0.00045 -0.00167 -0.00167 -0.00167 -0.00167 -0.00169 -0.00169 -0.00469 -0.00561 -0.00561	Ecal Perform Confloar Details Temps derg C 244,05 244,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 245,24 244,25 2	2010 - Convector 1 Convector 1 2010 - Convector 1 2	Russ Russ <thruss< th=""> Russ Russ <thr< td=""><td>temp. dep C 198.13 311.29 322.41 337.27 384.22 423.91 406.63 599.04 660.50 039.30</td><td>Configure Datable Reset t2.00025. Vise 8 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 755.7 8 70.8 8 15.0 8 15.0 8 15.0 8 15.0 8 15.0 10 10 10 10 10 10 10 10 10 10 10 10 10</td><td>non - Pine 3 Ferdum - 20 Filos patters manular manular manular manular manular manular manular manular manular manular manular manular</td><td></td><td></td><td></td></thr<></thruss<>	temp. dep C 198.13 311.29 322.41 337.27 384.22 423.91 406.63 599.04 660.50 039.30	Configure Datable Reset t2.00025. Vise 8 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 735.7 755.7 8 70.8 8 15.0 8 15.0 8 15.0 8 15.0 8 15.0 10 10 10 10 10 10 10 10 10 10 10 10 10	non - Pine 3 Ferdum - 20 Filos patters manular manular manular manular manular manular manular manular manular manular manular manular			
Offensors (Tor) Conference on the conference	226 227 228 228 229 23991 24992 24992 24992 24992 249992 249992 249992 249992 249992 24992	286095 DBF 0.50000 -0.00013 -0.00013 -0.00013 -0.00124 -0.00167 -0.00167 -0.00016 -0.000362 -0.000362 -0.000362 -0.000459 -0.000459	Ecal Perfection Conficent Details Temp: derg C 244.05 244.25 244.25 244.25 244.24 245.46 255.40 255.	2010 h - Converting Converting enthalpy #0/Kg -837.2 -8356.7 -835.0 -822.7 -7 -835.0 -822.7 -7 -835.0 -7 -835.0 -7 -7 -835.0 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7	Runne 1 -quality -quality 0.0234 -quality 0.0234 0.0237 0.0234 0.0258 0.0259 0.0590 0.0442 0.0598 0.0649 0.0696 0.0696	temp. deg C 299.13 311.29 323.41 337.47 384.32 425.91 406.63 598.04 660.50 039.30 039.90	Cushaa Datah Baat Er.coeff. Wim H 705.4 725.8 725.8 725.7 725.7 757.7 757.7 757.7 835.0 641.5 845.0 641.5 849.0 849.2 859.0	non - Pier 3 Ferbox - Zo Piero -			
Defenses (1) 2 Coderates - Fred Coderates - Fred Coderates - Fred ED06 Filter (1) 5 /10 Filter 5 /10 Filter 5 /10 Filter 1 / 9 Hean 1 / 9 He	222 223 224 225 225 225 225 225 225 225 225 225	CBADGE DBF 0.00000 -0.00015 -0.00045 -0.00045 -0.00187 -0.00187 -0.00187 -0.00187 -0.00180 -0.00180 -0.00499 -0.00499 -0.00499 -0.00491 -0.000491 -0.00491 -	Ecal Perform Confice Details Temp: deg C 244.05 244.21 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.45 251.65 251.65 252.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.55 254.55 255.55 254.55 255	2010 - Convector 1 Convector 1 2010 - Convector 1 2	Reserve Control guality Reserve Reserve guality Guality Guality	temp. deg C 288.13 311.29 337.17 384.22 337.27 384.22 423.91 406.63 593.04 660.50 038.90 394.91	Configure Datable Exact Content Vise E 705.4 735.7 7	non - Pine 2 Freihun - Zo Faiters Patters manular manular manular manular manular manular manular manular manular manular churn churn			
Top of Firshet 1 /10 Tanan 1 / 9 Rean 1 / 9 Rean 1 / 9 Rean 1 / 7 Rean 1 / 6 Rean 1 / 6 Rean 1 / 6 Rean 1 / 6 Rean 1 / 1 Rean 1 / 1 Rean 1 / 1 Rean 1 / 2 Rean 1 / 2 Rean 2 / 2 Rean 2 / 2 Rean	223 223 Freesource Dear 3,991 3,990 3,900 3,990	CBARGE DBF 0.00000 -0.00045 -0.00045 -0.00045 -0.00167 -0.00167 -0.00164 -0.00164 -0.00169 -0.000499 -0.00499 -0.000499 -0.00041 -0.00045	Heat Perform Conference Details Temp: derg C 244.05 244.05 244.21 244.71 245.30 247.15 246.04 240.04 254.00 254.05 254.04 254.04 254.05 254.04 254.05 254.04 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 254.05 255.05	Labor - Converting Converting Entrating 807.2 -827.2 -828.7 -858.0 -822.7 -828.7 -829.7 -828.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -7 -827.7 -7 -827.7 -7 -827.7 -7 -827.7 -7 -827.7 -7 -827.7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7	Control Darks Rmss 1 quality quality quality 0.0034 0.0337 0.0374 0.0374 0.0374 0.0414 0.0401 0.0401 0.0402 0.0401 0.0402 0.0401 0.0596 0.0596 0.0596 0.0596 0.0594	6489- 489-13 311-29 322-61 337-27 384-22 423-91 406-63 593.04 860.50 039-50 594-91 495-27 436-74	Configure Details Er.coeff. Wrine # 708.4 715.7 739.7 739.7 739.7 739.7 815.0 641.5 809.2 859.0 979.7 854.6	rion - Pine 3 Ferbox - Zo Pine pattern manular			
Information - Field Variation - Strate Variation - Strate Variation - Strate	223 223 224 225 225 225 225 225 225 225 225 225	CBADGE DBF 0.00000 -0.00015 -0.00045 -0.00045 -0.00187 -0.00187 -0.00187 -0.00187 -0.00180 -0.00499 -0.00499 -0.00499 -0.00499 -0.00491 -0.000491 -0.00491 -	Ecal Perform Confice Details Temp: deg C 244.05 244.21 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.25 244.45 251.65 251.65 252.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.61 259.65 254.55 254.55 255.55 254.55 255	Labor - Converting Converting Entrating 807.2 -827.2 -828.7 -858.0 -822.7 -828.7 -829.7 -828.7 -829.7 -828.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -829.7 -7 -827.7 -829.7 -7 -827.7 -7 -827.7 -7 -827.7 -7 -827.7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7 -7	Reserve Control guality Reserve Reserve guality Guality Guality	temp. deg C 288.13 311.29 337.17 384.22 337.27 384.22 423.91 406.63 593.04 660.50 038.90 394.91	Configure Details - Er.cooff. Wrine R 705.4 705.7 757.7 8 50.8 8 8 8 50.8 8 50.8 8 8 8 50.8 8 50.8 8 8 8 50.8 8 50.8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	non - Pine 2 Freihun - Zo Faiters Patters manular manular manular manular manular manular manular manular manular manular churn churn			

METALS & MINING **POLYMERS** CONSUMER PACKAGED GOODS POWER & UTILITIES PULP & PAPER POLYMI PETROLEUM ENGINEERING & CONSTRUCTION CHEMICALS **PHARMACEUTICALS** POWER CHEMIC PULP & PAPER SEMICONDUCTORS **PETROLEUM** POWER CONSUMER PACKAGED GOODS CONSTRUCTI **CHEMICALS** PETROLEUM PHARMACEUTICALS ENGINEERING & CONSTRUCTION CHEMICALS ENGINEER

- Output
 - Summary of heater performance
 - API fired heater datasheet
 - Detailed thermal analysis of each part of the heater including, estimate of maximum metal temperatures, process-side film and tube wall temperatures
 - Graphical output of process and flue gas temperature, heat transfer rate, process temperature, tube metal temperature profiles, heat transfer coefficient variation and draft
- Program integration link to HYSYS[®] and Aspen Plus[™]

Benefits

- Improved design FIHR is a comprehensive, easy-to-use tool for the design of fired process heaters. Its use enables the more efficient design of new heaters and cost-effective revamp studies. It can also augment or replace in-house tools that are difficult to use and expensive to maintain and update.
- Improved process operations Links to process simulators allow the effect of phenomena such as pre-heat exchanger fouling, to be properly evaluated. Major operational savings can be made with the use of a comprehensive heater model based on sound firebox radiation modeling providing a rational basis for day-to-day optimization of plant performance with changing product specifications, feedstock changes. The rigorous modeling of FIHR is vital for proper investment appraisal where retrofit process modifications are proposed to optimize product yields.
- Increased engineering efficiency In many processes, operation of fired heaters can be a limiting step, as these are often run at the practical limit of firebox tube temperature. In a reactor charge heater, one customer was able to use FIHR to explore a range of fouling assumptions. He developed a relationship between stack temperature and a safe working limit for the tubes and was able to predict the throughput reduction with time. This enabled the cleaning cycle to be optimized for throughput versus downtime and decoke costs, resulting in savings of several hundred thousand dollars.

put Data		Fuel 1	Fuel 2	Fuel 3	Fuel 4
Start up	Mass or Molar Compositions	default (mass +	Molar flows/f -	Molar flows/f -	default (mass -
Slat-up Firebox Model Firebox Geometry Firebox Processes Tube Bank Geome Tube Bank Proces	Methane	1 10 1	0.7	0.05	
	Ethane		0.15		
	Propane		0.105		
	Butanes		0.035		
	Pentanes				
Combustion	Hexanes				
Burners+Comb	Cyclohexane				
CHONS Fuel	Benzene				
Gaseous Fuel	Ethene				
0 xidents	Piopene				
Combustion Pr	Butenes				
Fuel (old)	Pentenes				
User Defi. Fue Draught Calculatio Process Options Physical Properties Results Full Results	Butadienes				
	Acetylene				
	Hydrogen			0.25	
	Hydrogen sulphide				
	Ammonia				
	Oxygen	1.1			-
	Nitrogen		0.009	0.4	
	Argon				
	Water vapour				

FIRR-TR_SYN_CRUD e Edit Vew Input P		Indow Help					لم
		L X #			2 49		
HITS Data Browser					_ D ×	a firebox Layout	
Frebox Tube Layout	- III IE SLU	nks = £1 de	- « » N+			11	0
Pout Data Startup Pout Data Startup Startup Fields Gesently Fields Gesently Fields Gesently Fields Table 1 Fields Table 1	Tube Orientation in Ver Frechos No. of Tuber in a Pach Tuber study time from from from from to from from from to from from to Cold Diameters	Sod høber n n n n	 No of Paths throw Pactors Tuber Tubo Path Leave 3 I a whit Tuber to well chearance Include U band in Head Transfer Ale 	FBHR default			
TFS Data Browser						_ [D] ×	i
Fuels	. III 18 SL U	a • 🔢 💠	+ « » N+				
Startup Startup Fiebox Model Fiebox Geome	Fuel Type Identifies * Fuel Flowiate Fuel Temperature	Units kg/h 12	Fuel 1 Fuel NorthSeaGar Gime 600 200 20 20		Fuel 4 • Not yet set •	ŧ	not to scale as tube separ
nel colculations started Viput of strated togon	4 E	2.0001-0020/0011	10-RAY-2003 09:57		BISTINITING OF	1 20 1	
		*					



worldwide headquarters

Aspen Technology, Inc. Ten Canal Park Cambridge, MA 02141-2201 USA

[phone] + 1 617 949 1000 **[fax]** + 1 617 949 1030 [world wide web] www.aspentech.com [e-mail] info@aspentech.com

Copyright © 2004. AspenTech, FIHR, Aspen Plus, HTFS, HYSYS and the aspen leaf logo are trademarks or registered trademarks of Aspen Technology, Inc., Cambridge, Massachusetts USA. All rights reserved. All other brand and product names are trademarks or registered trademarks of their respective companies. PB 164 02/18/04

