

University of Idaho Department of Chemical Engineering
 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:30:23

Input File Name: g3.dat

Start Iteration Loop
 Flow = 3.000 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 95.00
 T Out Guess = 71.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density= 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	58.0 136.4	25.8 78.5	41985.	23648. 4165.	10358. 1824.	5988. 1055.
	Dittus-Boelter T film Pr.33 = 4353. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 4165.					
	Nusselt Ent. = 5507.					
	Sieder-Tate = 4685.					
	Sleicher-Rouse = 4463.					
	Petukhov-Popov = 4689. T V					
	McAdams T bulk = 4062. 73.3 20.72					
	McAdams T film = 4844. 104.8					
2	60.9 141.6	31.5 88.7	46095.	24763. 4361.	10561. 1860.	6165. 1086.
	Dittus-Boelter T film Pr.33 = 4534. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 4361.					
	Nusselt Ent. = 5735.					
	Sieder-Tate = 4916.					
	Sleicher-Rouse = 4720.					
	Petukhov-Popov = 4900. T V					
	McAdams T bulk = 4318. 83.6 20.72					
	McAdams T film = 5036. 112.6					
3	63.8 146.8	36.9 98.4	50568.	25895. 4561.	10774. 1897.	6344. 1117.
	Dittus-Boelter T film Pr.33 = 4717. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 4561.					
	Nusselt Ent. = 5968.					
	Sieder-Tate = 5150.					

			Sleicher-Rouse =	4978.		
			Petukhov-Popov =	5108.	T	V
			McAdams T bulk =	4564.	93.5	20.72
			McAdams T film =	5224.	120.2	
4	66.7	42.1	55399.	27037.	10997.	6526.
	152.0	107.8		4762.	1937.	1149.
			Dittus-Boelter T film Pr.33 =	4902.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	4762.		
			Nusselt Ent. =	6202.		
			Sieder-Tate =	5386.		
			Sleicher-Rouse =	5233.		
			Petukhov-Popov =	5312.	T	V
			McAdams T bulk =	4801.	103.1	20.72
			McAdams T film =	5407.	127.6	
5	69.5	47.1	60568.	28182.	11229.	6710.
	157.1	116.8		4963.	1978.	1182.
			Dittus-Boelter T film Pr.33 =	5087.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	4963.		
			Nusselt Ent. =	6435.		
			Sieder-Tate =	5623.		
			Sleicher-Rouse =	5484.		
			Petukhov-Popov =	5510.	T	V
			McAdams T bulk =	5029.	112.3	20.72
			McAdams T film =	5583.	134.7	
6	72.2	51.8	66042.	29321.	11472.	6895.
	162.0	125.3		5164.	2020.	1214.
			Dittus-Boelter T film Pr.33 =	5270.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	5164.		
			Nusselt Ent. =	6666.		
			Sieder-Tate =	5858.		
			Sleicher-Rouse =	5727.		
			Petukhov-Popov =	5702.	T	V
			McAdams T bulk =	5246.	121.0	20.73
			McAdams T film =	5753.	141.5	

Flow Rate = 3.000 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 51.8 Degrees C 125.3 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	58.0	136.4	25.8	78.5
23.333	60.9	141.6	31.5	88.7
35.000	63.8	146.8	36.9	98.4
46.667	66.7	152.0	42.1	107.8
58.333	69.5	157.1	47.1	116.8
70.000	72.2	162.0	51.8	125.3

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 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:30:45

Input from KEYBOARD for Case Number: 2

Start Iteration Loop
 Flow = 2.000 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 75.00
 T Out Guess = 55.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density = 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	66.6 151.8	27.8 82.0	28416.	17223. 3033.	10990. 1936.	5382. 948.
	Dittus-Boelter T film Pr.33 = 3298. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 3033.					
	Nusselt Ent. = 4173.					
	Sieder-Tate = 3485.					
	Sleicher-Rouse = 3207.					
	Petukhov-Popov = 3359. T V					
	McAdams T bulk = 2967. 75.0 13.81					
	McAdams T film = 3654. 113.4					
2	69.7 157.4	35.2 95.4	32203.	18311. 3225.	11246. 1981.	5605. 987.
	Dittus-Boelter T film Pr.33 = 3468. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 3225.					
	Nusselt Ent. = 4387.					
	Sieder-Tate = 3707.					
	Sleicher-Rouse = 3455.					
	Petukhov-Popov = 3562. T V					
	McAdams T bulk = 3212. 88.7 13.81					
	McAdams T film = 3826. 123.1					
3	72.8 163.0	42.3 108.1	36435.	19420. 3420.	11521. 2029.	5831. 1027.
	Dittus-Boelter T film Pr.33 = 3640. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 3420.					
	Nusselt Ent. = 4604.					
	Sieder-Tate = 3931.					

			Sleicher-Rouse =	3702.		
			Petukhov-Popov =	3761.	T	V
			McAdams T bulk =	3446.	101.8	13.81
			McAdams T film =	3993.	132.4	
4	75.9	48.9	41082.	20534.	11819.	6061.
	168.6	120.1		3616.	2082.	1067.
			Dittus-Boelter T film Pr.33 =	3811.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	3616.		
			Nusselt Ent. =	4821.		
			Sieder-Tate =	4156.		
			Sleicher-Rouse =	3944.		
			Petukhov-Popov =	3954.	T	V
			McAdams T bulk =	3667.	114.1	13.81
			McAdams T film =	4154.	141.3	
5	78.9	55.2	46092.	21639.	12140.	6293.
	174.0	131.3		3811.	2138.	1108.
			Dittus-Boelter T film Pr.33 =	3978.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	3811.		
			Nusselt Ent. =	5033.		
			Sieder-Tate =	4379.		
			Sleicher-Rouse =	4176.		
			Petukhov-Popov =	4138.	T	V
			McAdams T bulk =	3874.	125.7	13.81
			McAdams T film =	4307.	149.9	
6	81.9	61.0	51372.	22717.	12486.	6525.
	179.4	141.8		4001.	2199.	1149.
			Dittus-Boelter T film Pr.33 =	4139.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	4001.		
			Nusselt Ent. =	5236.		
			Sieder-Tate =	4594.		
			Sleicher-Rouse =	4396.		
			Petukhov-Popov =	4310.	T	V
			McAdams T bulk =	4069.	136.5	13.81
			McAdams T film =	4452.	157.9	

Flow Rate = 2.000 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 61.0 Degrees C 141.8 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	66.6	151.8	27.8	82.0
23.333	69.7	157.4	35.2	95.4
35.000	72.8	163.0	42.3	108.1
46.667	75.9	168.6	48.9	120.1
58.333	78.9	174.0	55.2	131.3
70.000	81.9	179.4	61.0	141.8

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 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
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Date: Jan 29, 2009 Time: 23:32:39

Input from KEYBOARD for Case Number: 3

Start Iteration Loop
 Flow = 1.000 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 85.00
 T Out Guess = 65.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density= 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	81.0 177.8	31.8 89.3	14662.	10044. 1769.	12378. 2180.	4172. 735.
	Dittus-Boelter T film Pr.33 = 2053. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1769.					
	Nusselt Ent. = 2597.					
	Sieder-Tate = 2100.					
	Sleicher-Rouse = 1852.					
	Petukhov-Popov = 1916. T V					
	McAdams T bulk = 1740. 78.6 6.89					
	McAdams T film = 2248. 128.2					
2	83.9 182.9	42.8 109.1	17754.	11015. 1940.	12740. 2244.	4468. 787.
	Dittus-Boelter T film Pr.33 = 2192. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1940.					
	Nusselt Ent. = 2773.					
	Sieder-Tate = 2290.					
	Sleicher-Rouse = 2071.					
	Petukhov-Popov = 2094. T V					
	McAdams T bulk = 1951. 99.2 6.90					
	McAdams T film = 2381. 141.1					
3	86.9 188.4	52.9 127.3	21368.	12005. 2114.	13171. 2320.	4768. 840.
	Dittus-Boelter T film Pr.33 = 2329. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 2114.					
	Nusselt Ent. = 2946.					
	Sieder-Tate = 2482.					

			Sleicher-Rouse =	2285.		
			Petukhov-Popov =	2266.	T	V
			McAdams T bulk =	2146.	118.2	6.90
			McAdams T film =	2507.	153.3	
4	90.0	62.1	25398.	12978.	13678.	5069.
	193.9	143.7		2286.	2409.	893.
			Dittus-Boelter T film Pr.33 =	2458.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	2286.		
			Nusselt Ent. =	3110.		
			Sieder-Tate =	2668.		
			Sleicher-Rouse =	2485.		
			Petukhov-Popov =	2426.	T	V
			McAdams T bulk =	2324.	135.5	6.90
			McAdams T film =	2624.	164.7	
5	93.0	70.1	29629.	13890.	14273.	5365.
	199.4	158.3		2446.	2514.	945.
			Dittus-Boelter T film Pr.33 =	2574.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	2446.		
			Nusselt Ent. =	3256.		
			Sieder-Tate =	2840.		
			Sleicher-Rouse =	2664.		
			Petukhov-Popov =	2567.	T	V
			McAdams T bulk =	2484.	151.0	6.90
			McAdams T film =	2732.	175.2	
6	95.8	77.2	33769.	14701.	14961.	5648.
	204.5	171.0		2589.	2635.	995.
			Dittus-Boelter T film Pr.33 =	2671.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	2589.		
			Nusselt Ent. =	3379.		
			Sieder-Tate =	2991.		
			Sleicher-Rouse =	2815.		
			Petukhov-Popov =	2685.	T	V
			McAdams T bulk =	2625.	164.6	6.90
			McAdams T film =	2830.	184.6	

Flow Rate = 1.000 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 77.2 Degrees C 171.0 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	81.0	177.8	31.8	89.3
23.333	83.9	182.9	42.8	109.1
35.000	86.9	188.4	52.9	127.3
46.667	90.0	193.9	62.1	143.7
58.333	93.0	199.4	70.1	158.3
70.000	95.8	204.5	77.2	171.0

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 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:33: 8

Input from KEYBOARD for Case Number: 4

Start Iteration Loop
 Flow = 0.900 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 92.00
 T Out Guess = 35.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density= 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	83.0 181.4	32.5 90.5	13265.	9255. 1630.	12624. 2223.	3981. 701.
	Dittus-Boelter T film Pr.33 = 1908. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1630.					
	Nusselt Ent. = 2414.					
	Sieder-Tate = 1943.					
	Sleicher-Rouse = 1708.					
	Petukhov-Popov = 1761. T V					
	McAdams T bulk = 1604. 79.2 6.20					
	McAdams T film = 2086. 130.3					
2	85.8 186.4	44.1 111.3	16240.	10202. 1797.	13007. 2291.	4285. 755.
	Dittus-Boelter T film Pr.33 = 2042. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1797.					
	Nusselt Ent. = 2583.					
	Sieder-Tate = 2127.					
	Sleicher-Rouse = 1921.					
	Petukhov-Popov = 1934. T V					
	McAdams T bulk = 1809. 100.9 6.21					
	McAdams T film = 2212. 143.7					
3	88.8 191.8	54.6 130.3	19740.	11166. 1966.	13470. 2372.	4594. 809.
	Dittus-Boelter T film Pr.33 = 2173. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1966.					
	Nusselt Ent. = 2749.					
	Sieder-Tate = 2312.					

				Sleicher-Rouse =	2129.		
				Petukhov-Popov =	2101.	T	V
				McAdams T bulk =	1998.	120.8	6.21
				McAdams T film =	2332.	156.3	
4	91.8	64.1	23637.	12107.	14023.		4902.
	197.2	147.4		2132.	2470.		863.
				Dittus-Boelter T film Pr.33 =	2295.	BTU/Ft2	F
				Dittus-Boelter T bulk Pr.4 =	2132.		
				Nusselt Ent. =	2903.		
				Sieder-Tate =	2491.		
				Sleicher-Rouse =	2321.		
				Petukhov-Popov =	2254.	T	V
				McAdams T bulk =	2168.	138.9	6.21
				McAdams T film =	2443.	168.0	
5	94.7	72.4	27683.	12977.	14682.		5201.
	202.5	162.3		2285.	2586.		916.
				Dittus-Boelter T film Pr.33 =	2401.	BTU/Ft2	F
				Dittus-Boelter T bulk Pr.4 =	2285.		
				Nusselt Ent. =	3037.		
				Sieder-Tate =	2653.		
				Sleicher-Rouse =	2489.		
				Petukhov-Popov =	2387.	T	V
				McAdams T bulk =	2320.	154.8	6.21
				McAdams T film =	2545.	178.7	
6	97.5	79.5	31553.	13732.	15453.		5484.
	207.5	175.2		2418.	2722.		966.
				Dittus-Boelter T film Pr.33 =	2488.	BTU/Ft2	F
				Dittus-Boelter T bulk Pr.4 =	2418.		
				Nusselt Ent. =	3147.		
				Sieder-Tate =	2792.		
				Sleicher-Rouse =	2626.		
				Petukhov-Popov =	2495.	T	V
				McAdams T bulk =	2451.	168.7	6.21
				McAdams T film =	2634.	188.1	

Flow Rate = 0.900 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 79.5 Degrees C 175.2 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	83.0	181.4	32.5	90.5
23.333	85.8	186.4	44.1	111.3
35.000	88.8	191.8	54.6	130.3
46.667	91.8	197.2	64.1	147.4
58.333	94.7	202.5	72.4	162.3
70.000	97.5	207.5	79.5	175.2

University of Idaho Department of Chemical Engineering
 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:34: 7

Input from KEYBOARD for Case Number: 5

Start Iteration Loop
 Flow = 0.800 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 85.00
 T Out Guess = 35.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density= 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	85.1 185.2	33.2 91.8	11861.	8447. 1488.	12913. 2274.	3768. 664.
			Dittus-Boelter T film Pr.33 =	1758.	BTU/Ft2 F	
			Dittus-Boelter T bulk Pr.4 =	1488.		
			Nusselt Ent. =	2224.		
			Sieder-Tate =	1780.		
			Sleicher-Rouse =	1562.		
			Petukhov-Popov =	1603.	T V	
			McAdams T bulk =	1466.	79.9 5.51	
			McAdams T film =	1918.	132.6	
2	87.8 190.1	45.5 113.8	14704.	9364. 1649.	13319. 2346.	4080. 719.
			Dittus-Boelter T film Pr.33 =	1886.	BTU/Ft2 F	
			Dittus-Boelter T bulk Pr.4 =	1649.		
			Nusselt Ent. =	2385.		
			Sieder-Tate =	1958.		
			Sleicher-Rouse =	1769.		
			Petukhov-Popov =	1770.	T V	
			McAdams T bulk =	1663.	102.8 5.51	
			McAdams T film =	2037.	146.5	
3	90.7 195.3	56.5 133.8	18070.	10298. 1814.	13821. 2434.	4396. 774.
			Dittus-Boelter T film Pr.33 =	2009.	BTU/Ft2 F	
			Dittus-Boelter T bulk Pr.4 =	1814.		
			Nusselt Ent. =	2542.		
			Sieder-Tate =	2136.		

			Sleicher-Rouse =	1968.		
			Petukhov-Popov =	1931.	T	V
			McAdams T bulk =	1843.	123.8	5.52
			McAdams T film =	2150.	159.6	
4	93.7	66.3	21808.	11201.	14435.	4710.
	200.7	151.4		1973.	2542.	830.
			Dittus-Boelter T film Pr.33 =	2122.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1973.		
			Nusselt Ent. =	2685.		
			Sieder-Tate =	2305.		
			Sleicher-Rouse =	2150.		
			Petukhov-Popov =	2077.	T	V
			McAdams T bulk =	2005.	142.6	5.52
			McAdams T film =	2254.	171.6	
5	96.6	74.8	25627.	12019.	15173.	5011.
	205.9	166.7		2117.	2672.	883.
			Dittus-Boelter T film Pr.33 =	2218.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	2117.		
			Nusselt Ent. =	2806.		
			Sieder-Tate =	2457.		
			Sleicher-Rouse =	2305.		
			Petukhov-Popov =	2201.	T	V
			McAdams T bulk =	2147.	159.1	5.52
			McAdams T film =	2348.	182.5	
6	99.2	82.0	29174.	12709.	16051.	5292.
	210.7	179.7		2238.	2827.	932.
			Dittus-Boelter T film Pr.33 =	2293.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	2238.		
			Nusselt Ent. =	2901.		
			Sieder-Tate =	2582.		
			Sleicher-Rouse =	2428.		
			Petukhov-Popov =	2298.	T	V
			McAdams T bulk =	2269.	173.2	5.52
			McAdams T film =	2430.	191.9	

Flow Rate = 0.800 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 82.0 Degrees C 179.7 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	85.1	185.2	33.2	91.8
23.333	87.8	190.1	45.5	113.8
35.000	90.7	195.3	56.5	133.8
46.667	93.7	200.7	66.3	151.4
58.333	96.6	205.9	74.8	166.7
70.000	99.2	210.7	82.0	179.7

University of Idaho Department of Chemical Engineering
 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:34:42

Input from KEYBOARD for Case Number: 6

Start Iteration Loop
 Flow = 0.700 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 88.00
 T Out Guess = 35.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density= 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	87.4 189.4	34.1 93.4	10449.	7616. 1341.	13257. 2335.	3530. 622.
			Dittus-Boelter T film Pr.33 =	1601.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1341.		
			Nusselt Ent. =	2025.		
			Sieder-Tate =	1611.		
			Sleicher-Rouse =	1414.		
			Petukhov-Popov =	1442.	T	V
			McAdams T bulk =	1323.	80.7	4.82
			McAdams T film =	1742.	135.0	
2	90.0 194.1	47.1 116.7	13141.	8499. 1497.	13691. 2411.	3848. 678.
			Dittus-Boelter T film Pr.33 =	1721.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1497.		
			Nusselt Ent. =	2178.		
			Sieder-Tate =	1782.		
			Sleicher-Rouse =	1612.		
			Petukhov-Popov =	1602.	T	V
			McAdams T bulk =	1511.	105.0	4.82
			McAdams T film =	1854.	149.6	
3	92.8 199.1	58.7 137.7	16350.	9395. 1655.	14243. 2508.	4172. 735.
			Dittus-Boelter T film Pr.33 =	1837.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1655.		
			Nusselt Ent. =	2324.		
			Sieder-Tate =	1951.		

			Sleicher-Rouse =	1802.		
			Petukhov-Popov =	1755.	T	V
			McAdams T bulk =	1682.	127.2	4.83
			McAdams T film =	1960.	163.2	
4	95.7	68.9	19892.	10251.	14933.	4489.
	204.3	156.0		1805.	2630.	791.
			Dittus-Boelter T film Pr.33 =	1940.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1805.		
			Nusselt Ent. =	2454.		
			Sieder-Tate =	2110.		
			Sleicher-Rouse =	1972.		
			Petukhov-Popov =	1893.	T	V
			McAdams T bulk =	1834.	146.8	4.83
			McAdams T film =	2056.	175.6	
5	98.5	77.5	23436.	11009.	15776.	4789.
	209.3	171.6		1939.	2779.	843.
			Dittus-Boelter T film Pr.33 =	2024.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1939.		
			Nusselt Ent. =	2560.		
			Sieder-Tate =	2248.		
			Sleicher-Rouse =	2112.		
			Petukhov-Popov =	2006.	T	V
			McAdams T bulk =	1966.	163.8	4.83
			McAdams T film =	2141.	186.5	
6	101.0	84.7	26602.	11623.	16795.	5062.
	213.8	184.5		2047.	2958.	891.
			Dittus-Boelter T film Pr.33 =	2087.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	2047.		
			Nusselt Ent. =	2640.		
			Sieder-Tate =	2359.		
			Sleicher-Rouse =	2218.		
			Petukhov-Popov =	2092.	T	V
			McAdams T bulk =	2077.	178.0	4.83
			McAdams T film =	2215.	195.9	

Flow Rate = 0.700 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 84.7 Degrees C 184.5 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	87.4	189.4	34.1	93.4
23.333	90.0	194.1	47.1	116.7
35.000	92.8	199.1	58.7	137.7
46.667	95.7	204.3	68.9	156.0
58.333	98.5	209.3	77.5	171.6
70.000	101.0	213.8	84.7	184.5

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 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:35:11

Input from KEYBOARD for Case Number: 7

Start Iteration Loop
 Flow = 0.600 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 89.00
 T Out Guess = 38.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density = 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	89.9 193.9	35.1 95.2	9028.	6758. 1190.	13675. 2408.	3260. 574.
			Dittus-Boelter T film Pr.33 =	1436.	BTU/Ft2 F	
			Dittus-Boelter T bulk Pr.4 =	1190.		
			Nusselt Ent. =	1816.		
			Sieder-Tate =	1436.		
			Sleicher-Rouse =	1262.		
			Petukhov-Popov =	1276.	T V	
			McAdams T bulk =	1175.	81.6 4.13	
			McAdams T film =	1558.	137.7	
2	92.4 198.3	48.9 120.0	11545.	7599. 1338.	14147. 2492.	3584. 631.
			Dittus-Boelter T film Pr.33 =	1548.	BTU/Ft2 F	
			Dittus-Boelter T bulk Pr.4 =	1338.		
			Nusselt Ent. =	1958.		
			Sieder-Tate =	1597.		
			Sleicher-Rouse =	1450.		
			Petukhov-Popov =	1428.	T V	
			McAdams T bulk =	1353.	107.6 4.13	
			McAdams T film =	1662.	153.0	
3	95.1 203.1	61.2 142.1	14566.	8449. 1488.	14765. 2600.	3912. 689.
			Dittus-Boelter T film Pr.33 =	1654.	BTU/Ft2 F	
			Dittus-Boelter T bulk Pr.4 =	1488.		
			Nusselt Ent. =	2092.		
			Sieder-Tate =	1756.		

			Sleicher-Rouse =	1629.		
			Petukhov-Popov =	1573.	T	V
			McAdams T bulk =	1513.	131.1	4.14
			McAdams T film =	1759.	167.1	
4	97.8	71.7	17868.	9249.	15554.	4230.
	208.1	161.1		1629.	2739.	745.
			Dittus-Boelter T film Pr.33 =	1745.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1629.		
			Nusselt Ent. =	2208.		
			Sieder-Tate =	1902.		
			Sleicher-Rouse =	1784.		
			Petukhov-Popov =	1700.	T	V
			McAdams T bulk =	1654.	151.6	4.14
			McAdams T film =	1847.	179.8	
5	100.5	80.5	21072.	9933.	16541.	4524.
	212.8	176.9		1749.	2913.	797.
			Dittus-Boelter T film Pr.33 =	1816.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1749.		
			Nusselt Ent. =	2298.		
			Sieder-Tate =	2026.		
			Sleicher-Rouse =	1907.		
			Petukhov-Popov =	1801.	T	V
			McAdams T bulk =	1773.	169.0	4.14
			McAdams T film =	1923.	190.9	
6	102.8	87.6	23791.	10461.	17750.	4782.
	217.0	189.7		1842.	3126.	842.
			Dittus-Boelter T film Pr.33 =	1867.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1842.		
			Nusselt Ent. =	2361.		
			Sieder-Tate =	2119.		
			Sleicher-Rouse =	1995.		
			Petukhov-Popov =	1874.	T	V
			McAdams T bulk =	1872.	183.3	4.14
			McAdams T film =	1987.	200.2	

Flow Rate = 0.600 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 87.6 Degrees C 189.7 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	89.9	193.9	35.1	95.2
23.333	92.4	198.3	48.9	120.0
35.000	95.1	203.1	61.2	142.1
46.667	97.8	208.1	71.7	161.1
58.333	100.5	212.8	80.5	176.9
70.000	102.8	217.0	87.6	189.7

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 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:35:39

Input from KEYBOARD for Case Number: 8

Start Iteration Loop
 Flow = 0.500 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 92.00
 T Out Guess = 38.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density = 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	92.7 198.8	36.3 97.3	7595.	5867. 1033.	14204. 2502.	2953. 520.
	Dittus-Boelter T film Pr.33 = 1261. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1033.					
	Nusselt Ent. = 1595.					
	Sieder-Tate = 1251.					
	Sleicher-Rouse = 1106.					
	Petukhov-Popov = 1105. T V					
	McAdams T bulk = 1022. 82.7 3.44					
	McAdams T film = 1364. 140.7					
2	94.9 202.9	51.1 124.0	9907.	6657. 1172.	14724. 2593.	3279. 577.
	Dittus-Boelter T film Pr.33 = 1363. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1172.					
	Nusselt Ent. = 1725.					
	Sieder-Tate = 1401.					
	Sleicher-Rouse = 1282.					
	Petukhov-Popov = 1248. T V					
	McAdams T bulk = 1187. 110.7 3.44					
	McAdams T film = 1458. 156.8					
3	97.4 207.4	64.0 147.3	12699.	7451. 1312.	15432. 2718.	3608. 635.
	Dittus-Boelter T film Pr.33 = 1458. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 1312.					
	Nusselt Ent. = 1844.					
	Sieder-Tate = 1548.					

				Sleicher-Rouse =	1446.		
				Petukhov-Popov =	1382.	T	V
				McAdams T bulk =	1335.	135.6	3.45
				McAdams T film =	1546.	171.5	
4	100.0	74.9	15703.	8180.	16362.		3921.
	212.1	166.9		1441.	2882.		691.
				Dittus-Boelter T film Pr.33 =	1536.	BTU/Ft2	F
				Dittus-Boelter T bulk Pr.4 =	1441.		
				Nusselt Ent. =	1943.		
				Sieder-Tate =	1680.		
				Sleicher-Rouse =	1584.		
				Petukhov-Popov =	1497.	T	V
				McAdams T bulk =	1462.	157.1	3.45
				McAdams T film =	1624.	184.6	
5	102.4	83.8	18490.	8776.	17551.		4200.
	216.4	182.8		1546.	3091.		740.
				Dittus-Boelter T film Pr.33 =	1594.	BTU/Ft2	F
				Dittus-Boelter T bulk Pr.4 =	1546.		
				Nusselt Ent. =	2016.		
				Sieder-Tate =	1786.		
				Sleicher-Rouse =	1686.		
				Petukhov-Popov =	1584.	T	V
				McAdams T bulk =	1567.	174.9	3.45
				McAdams T film =	1690.	195.6	
6	104.5	90.7	20696.	9206.	19031.		4436.
	220.1	195.3		1621.	3352.		781.
				Dittus-Boelter T film Pr.33 =	1631.	BTU/Ft2	F
				Dittus-Boelter T bulk Pr.4 =	1621.		
				Nusselt Ent. =	2063.		
				Sieder-Tate =	1861.		
				Sleicher-Rouse =	1754.		
				Petukhov-Popov =	1642.	T	V
				McAdams T bulk =	1652.	189.1	3.45
				McAdams T film =	1743.	204.6	

Flow Rate = 0.500 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 90.7 Degrees C 195.3 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	92.7	198.8	36.3	97.3
23.333	94.9	202.9	51.1	124.0
35.000	97.4	207.4	64.0	147.3
46.667	100.0	212.1	74.9	166.9
58.333	102.4	216.4	83.8	182.8
70.000	104.5	220.1	90.7	195.3

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 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:36:20

Input from KEYBOARD for Case Number: 9

Start Iteration Loop
 Flow = 0.400 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 95.00
 T Out Guess = 38.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density = 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	95.6 204.1	37.8 100.0	6147.	4935. 869.	14903. 2625.	2597. 457.
				Dittus-Boelter T film Pr.33 = 1073. BTU/Ft2 F		
				Dittus-Boelter T bulk Pr.4 = 869.		
				Nusselt Ent. = 1357.		
				Sieder-Tate = 1056.		
				Sleicher-Rouse = 944.		
				Petukhov-Popov = 928. T V		
				McAdams T bulk = 861. 84.0 2.75		
				McAdams T film = 1157. 144.0		
2	97.6 207.8	53.7 128.7	8215.	5660. 997.	15492. 2729.	2920. 514.
				Dittus-Boelter T film Pr.33 = 1164. BTU/Ft2 F		
				Dittus-Boelter T bulk Pr.4 = 997.		
				Nusselt Ent. = 1473.		
				Sieder-Tate = 1193.		
				Sleicher-Rouse = 1105.		
				Petukhov-Popov = 1059. T V		
				McAdams T bulk = 1011. 114.3 2.75		
				McAdams T film = 1241. 161.0		
3	100.0 211.9	67.4 153.4	10724.	6383. 1124.	16329. 2876.	3244. 571.
				Dittus-Boelter T film Pr.33 = 1246. BTU/Ft2 F		
				Dittus-Boelter T bulk Pr.4 = 1124.		
				Nusselt Ent. = 1576.		
				Sieder-Tate = 1325.		

			Sleicher-Rouse =	1251.		
			Petukhov-Popov =	1180.	T	V
			McAdams T bulk =	1143.	141.1	2.76
			McAdams T film =	1318.	176.5	
4	102.3	78.7	13350.	7024.	17468.	3544.
	216.2	173.6		1237.	3077.	624.
			Dittus-Boelter T film Pr.33 =	1309.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1237.		
			Nusselt Ent. =	1656.		
			Sieder-Tate =	1440.		
			Sleicher-Rouse =	1367.		
			Petukhov-Popov =	1280.	T	V
			McAdams T bulk =	1254.	163.5	2.76
			McAdams T film =	1384.	189.8	
5	104.4	87.5	15632.	7515.	18958.	3797.
	220.0	189.4		1324.	3339.	669.
			Dittus-Boelter T film Pr.33 =	1352.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1324.		
			Nusselt Ent. =	1710.		
			Sieder-Tate =	1526.		
			Sleicher-Rouse =	1446.		
			Petukhov-Popov =	1351.	T	V
			McAdams T bulk =	1344.	181.5	2.76
			McAdams T film =	1439.	200.8	
6	106.2	94.1	17272.	7839.	20839.	3998.
	223.1	201.3		1381.	3670.	704.
			Dittus-Boelter T film Pr.33 =	1377.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1381.		
			Nusselt Ent. =	1742.		
			Sieder-Tate =	1581.		
			Sleicher-Rouse =	1494.		
			Petukhov-Popov =	1395.	T	V
			McAdams T bulk =	1413.	195.4	2.76
			McAdams T film =	1481.	209.2	

Flow Rate = 0.400 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 94.1 Degrees C 201.3 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	95.6	204.1	37.8	100.0
23.333	97.6	207.8	53.7	128.7
35.000	100.0	211.9	67.4	153.4
46.667	102.3	216.2	78.7	173.6
58.333	104.4	220.0	87.5	189.4
70.000	106.2	223.1	94.1	201.3

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 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:38: 6

Input from KEYBOARD for Case Number: 10

Start Iteration Loop
 Flow = 0.300 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 98.00
 T Out Guess = 40.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density= 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	98.8 209.9	39.6 103.4	4680.	3949. 695.	15891. 2799.	2179. 384.
	Dittus-Boelter T film Pr.33 = 869. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 695.					
	Nusselt Ent. = 1099.					
	Sieder-Tate = 847.					
	Sleicher-Rouse = 774.					
	Petukhov-Popov = 742. T V					
	McAdams T bulk = 690. 85.7 2.06					
	McAdams T film = 933. 147.8					
2	100.6 213.0	57.1 134.7	6450.	4591. 809.	16588. 2921.	2490. 438.
	Dittus-Boelter T film Pr.33 = 947. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 809.					
	Nusselt Ent. = 1198.					
	Sieder-Tate = 968.					
	Sleicher-Rouse = 915.					
	Petukhov-Popov = 858. T V					
	McAdams T bulk = 821. 119.0 2.06					
	McAdams T film = 1005. 166.0					
3	102.6 216.7	71.6 160.9	8599.	5222. 920.	17633. 3106.	2797. 493.
	Dittus-Boelter T film Pr.33 = 1013. BTU/Ft2 F					
	Dittus-Boelter T bulk Pr.4 = 920.					
	Nusselt Ent. = 1281.					
	Sieder-Tate = 1082.					

			Sleicher-Rouse =	1037.		
			Petukhov-Popov =	963.	T	V
			McAdams T bulk =	934.	147.8	2.07
			McAdams T film =	1069.	182.2	
4	104.6	83.1	10741.	5751.	19111.	3068.
	220.3	181.5		1013.	3366.	540.
			Dittus-Boelter T film Pr.33 =	1060.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1013.		
			Nusselt Ent. =	1341.		
			Sieder-Tate =	1175.		
			Sleicher-Rouse =	1127.		
			Petukhov-Popov =	1045.	T	V
			McAdams T bulk =	1027.	171.2	2.07
			McAdams T film =	1123.	195.8	
5	106.4	91.6	12422.	6118.	21097.	3280.
	223.4	196.8		1077.	3716.	578.
			Dittus-Boelter T film Pr.33 =	1088.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1077.		
			Nusselt Ent. =	1376.		
			Sieder-Tate =	1238.		
			Sleicher-Rouse =	1182.		
			Petukhov-Popov =	1098.	T	V
			McAdams T bulk =	1098.	189.2	2.07
			McAdams T film =	1165.	206.3	
6	107.7	97.6	13478.	6331.	23628.	3432.
	225.8	207.7		1115.	4161.	604.
			Dittus-Boelter T film Pr.33 =	1102.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	1115.		
			Nusselt Ent. =	1395.		
			Sieder-Tate =	1274.		
			Sleicher-Rouse =	1210.		
			Petukhov-Popov =	1127.	T	V
			McAdams T bulk =	1150.	202.3	2.07
			McAdams T film =	1196.	214.0	

Flow Rate = 0.300 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 97.6 Degrees C 207.7 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	98.8	209.9	39.6	103.4
23.333	100.6	213.0	57.1	134.7
35.000	102.6	216.7	71.6	160.9
46.667	104.6	220.3	83.1	181.5
58.333	106.4	223.4	91.6	196.8
70.000	107.7	225.8	97.6	207.7

University of Idaho Department of Chemical Engineering
 DOUBLE PIPE HEAT EXCHANGER Prediction Program Rel. 2/8/92
 Ch. E. 434 Laboratory D. C. Drown

Date: Jan 29, 2009 Time: 23:38:46

Input from KEYBOARD for Case Number: 11

Start Iteration Loop
 Flow = 0.200 GPM
 Inlet Temperature = 20.00 C

Steam Temperature = 109.93 T Wall Guess = 102.00
 T Out Guess = 45.00

Steam Pressure = 7.00 PSIG + Temperature = 229.870 Deg F
 H Vaporization = 958.84 BTU/LB Density = 0.051467 LB/FT3
 Barometric Pressure = 13.7291 PSIA

Steam Pressure = 7.00 PSIG + Temperature = 109.926 Deg C
 H Vaporization = 2230366. J/Kg Density = 0.8244 Kg/M3
 Fouling - Inside = .0000000 Outside = .0000000
 Temperature Convergence to 0.010 Degrees

N	T Wall C	T Out C	Re No.	H Inside Watts / Sq. Meter	H Outside BTU / Sq. Feet	U
	Units = F	F				
1	102.3 216.2	42.3 108.1	3186.	2883. 508.	17471. 3077.	1673. 295.
	Dittus-Boelter T film Pr.33 =			642.	BTU/Ft2 F	
	Dittus-Boelter T bulk Pr.4 =			508.		
			Nusselt Ent. =	812.		
			Sieder-Tate =	620.		
			Sleicher-Rouse =	591.		
			Petukhov-Popov =	543.	T	V
			McAdams T bulk =	505.	88.0	1.37
			McAdams T film =	686.	152.1	
2	103.7 218.6	61.6 142.8	4581.	3415. 602.	18362. 3234.	1955. 344.
	Dittus-Boelter T film Pr.33 =			703.	BTU/Ft2 F	
	Dittus-Boelter T bulk Pr.4 =			602.		
			Nusselt Ent. =	889.		
			Sieder-Tate =	718.		
			Sleicher-Rouse =	705.		
			Petukhov-Popov =	639.	T	V
			McAdams T bulk =	611.	125.5	1.38
			McAdams T film =	743.	172.0	
3	105.3 221.6	77.0 170.7	6254.	3921. 691.	19790. 3485.	2225. 392.
	Dittus-Boelter T film Pr.33 =			751.	BTU/Ft2 F	
	Dittus-Boelter T bulk Pr.4 =			691.		
			Nusselt Ent. =	950.		
			Sieder-Tate =	809.		

			Sleicher-Rouse =	796.		
			Petukhov-Popov =	724.	T	V
			McAdams T bulk =	701.	156.8	1.38
			McAdams T film =	792.	189.2	
4	106.9	88.4	7773.	4305.	21912.	2443.
	224.3	191.2		758.	3859.	430.
			Dittus-Boelter T film Pr.33 =	780.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	758.		
			Nusselt Ent. =	987.		
			Sieder-Tate =	875.		
			Sleicher-Rouse =	855.		
			Petukhov-Popov =	783.	T	V
			McAdams T bulk =	770.	180.9	1.38
			McAdams T film =	831.	202.6	
5	108.1	96.2	8781.	4533.	24825.	2591.
	226.5	205.2		798.	4372.	456.
			Dittus-Boelter T film Pr.33 =	795.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	798.		
			Nusselt Ent. =	1006.		
			Sieder-Tate =	914.		
			Sleicher-Rouse =	885.		
			Petukhov-Popov =	816.	T	V
			McAdams T bulk =	819.	198.2	1.38
			McAdams T film =	859.	212.4	
6	108.9	101.4	9300.	4643.	28570.	2683.
	228.0	214.4		818.	5032.	473.
			Dittus-Boelter T film Pr.33 =	801.	BTU/Ft2	F
			Dittus-Boelter T bulk Pr.4 =	818.		
			Nusselt Ent. =	1014.		
			Sieder-Tate =	932.		
			Sleicher-Rouse =	898.		
			Petukhov-Popov =	831.	T	V
			McAdams T bulk =	853.	209.8	1.38
			McAdams T film =	879.	218.9	

Flow Rate = 0.200 GPM Steam Pressure = 7.00 PSIG

Temperature IN = 20.0 Degrees C 68.0 F
 Temperature OUT = 101.4 Degrees C 214.4 F
 Steam Temperature = 109.9 Degrees C 229.9 F

Length Inches	Wall Temp.		Temp. Water Out	
	C	F	C	F
11.667	102.3	216.2	42.3	108.1
23.333	103.7	218.6	61.6	142.8
35.000	105.3	221.6	77.0	170.7
46.667	106.9	224.3	88.4	191.2
58.333	108.1	226.5	96.2	205.2
70.000	108.9	228.0	101.4	214.4