Saturated steam data

T [°C]	T [K]	P [Pa·10^{-4}]	v' [m^3/kg] (liquid)	v'' [m^3/kg] (sat. steam)	h' [kJ/kg] (liquid)	h'' [kJ/kg] (sat. steam)	Δh^{vap} [kJ/kg] (= h'' - h')
0	273,15	0,061076	0,0010002	206,3	0,000	2500,776	2500,776
1	274,15	0,065656	0,0010001	192,6	4,229	2502,450	2498,264
2	275,15	0,070539	0,0010001	179,9	8,415	2504,544	2496,170
3	276,15	0,075747	0,0010001	168,2	12,644	2506,218	2493,658
4	277,15	0,081287	0,0010001	157,3	16,831	2508,312	2491,565
5	278,15	0,087191	0,0010001	147,2	21,060	2509,987	2489,053
6	279,15	0,093477	0,0010001	137,8	25,246	2511,661	2486,541
7	280,15	0,100126	0,0010001	129,1	29,433	2513,755	2484,447
8	281,15	0,107206	0,0010002	121,0	33,662	2515,429	2481,935
9	282,15	0,114728	0,0010003	113,4	37,849	2517,523	2479,842
10	283,15	0,122711	0,0010004	106,42	42,035	2519,198	2477,330
11	284,15	0,131174	0,0010005	99,91	46,222	2521,291	2475,236
12	285,15	0,140157	0,0010006	93,84	50,409	2522,966	3472,724
13	286,15	0,149669	0,0010007	88,18	54,596	2525,059	2470,631
14	287,15	0,159741	0,0010008	82,90	58,783	2526,734	2468,119
15	288,15	0,170410	0,0010010	77,97	62,969	2528,409	2465,607
16	289,15	0,181698	0,0010011	73,39	67,156	2530,083	2463,094
17	290,15	0,193642	0,0010013	69,10	71,343	2531,758	2460,582
18	291,15	0,206234	0,0010015	65,09	75,530	2533,433	2458,070
19	292,15	0,219571	0,0010016	61,34	79,717	2535,526	2455,977
20	293,15	0,233692	0,0010018	57,84	83,903	2537,201	2453,465
21	294,15	0,248599	0,0010021	54,56	88,090	2538,876	2450,953
22	295,15	0,264289	0,0010023	51,50	92,277	2540,969	2448,859
23	296,15	0,280764	0,0010025	48,62	94,464	2542,644	2446,347
24	297,15	0,298220	0,0010028	45,93	100,609	2544,737	2444,254
25	298,15	0,316657	0,0010030	43,40	104,796	2546,412	2441,742
26	299,15	0,335976	0,0010033	41,04	108,982	2548,086	2439,230
27	300,15	0,356374	0,0010036	38,82	113,169	2550,180	2437,136
28	301,15	0,377850	0,0010038	36,73	117,356	2551,855	2434,624
29	302,15	0,400406	0,0010041	34,77	121,501	2553,948	2432,531
30	303,15	0,424138	0,0010044	32,93	125,688	2555,623	2430,019
31	304,15	0,449145	0,0010047	31,20	129,875	2557,716	2427,925
32	305,15	0,475328	0,0010051	29,57	134,061	2559,391	2425,413
33	306,15	0,502885	0,0010054	28,04	138,248	2561,066	2422,901
34	307,15	0,531815	0,0010057	26,60	142,435	2563,159	2420,808
35	308,15	0,562215	0,0010061	25,24	146,580	2564,834	2418,296
36	309,15	0,593989	0,0010064	23,97	150,767	2566,508	2415,784
37	310,15	0,627429	0,0010068	22,77	154,953	2568,602	2413,690
38	311,15	0,662439	0,0010071	21,63	159,140	2570,277	2411,178
39	312,15	0,699116	0,0010075	20,56	163,327	2571,951	2408,666
40	313,15	0,737460	0,0010079	19,55	167,514	2573,626	2406,154

T [°C]	T [K]	P [Pa·10^{-4}]	v' [m^3/kg] (liquid)	v'' [m^3/kg] (sat. steam)	h' [kJ/kg] (liquid)	h'' [kJ/kg] (sat. steam)	Δh^{vap} [kJ/kg] (= h'' - h')
41	314,15	0,777765	0,0010083	18,59	171,659	2575,301	2403,642
42	315,15	0,819836	0,0010087	17,69	175,846	2576,975	2401,130
43	316,15	0,863868	0,0010091	16,84	180,032	2578,650	2398,618
44	317,15	0,909959	0,0010095	16,04	184,219	2580,744	2396,524
45	318,15	0,958208	0,0010099	15,28	188,406	2582,418	2394,012
46	319,15	1,008516	0,0010103	14,56	192,593	2584,512	2391,919
47	320,15	1,061178	0,0010108	13,88	196,780	2586,186	2389,407
48	321,15	1,116193	0,0010112	13,23	200,925	2587,861	2386,895
49	322,15	1,173562	0,0010116	12,62	205,111	2589,954	2384,801
50	323,15	1,233480	0,0010121	12,04	209,298	2591,629	2382,289
51	324,15	1,296047	0,0010126	11,50	213,485	2593,304	2379,777
52	325,15	1,361163	0,0010130	10,98	217,672	2594,979	2377,265
53	326,15	1,429221	0,0010135	10,49	221,859	2597,072	2375,172
54	327,15	1,500123	0,0010140	10,02	226,003	2598,747	2372,660
55	328,15	1,573967	0,0010145	9,578	230,190	2600,421	2370,147
56	329,15	1,650950	0,0010150	9,158	234,377	2602,096	2367,635
57	330,15	1,731168	0,0010155	8,757	238,564	2604,190	2365,542
58	331,15	1,814623	0,0010160	8,380	242,751	2605,864	2363,030
59	332,15	1,901509	0,0010166	8,020	246,937	2607,539	2360,518
60	333,15	1,991731	0,0010171	7,678	251,124	2609,214	2358,006
61	334,15	2,085874	0,0010177	7,353	255,311	2610,888	2355,494
62	335,15	2,183941	0,0010182	7,043	259,498	2612,563	2352,982
63	336,15	2,284949	0,0010188	6,749	263,685	2614,238	2350,470
64	337,15	2,390861	0,0010193	6,468	267,871	2615,913	2347,957
65	338,15	2,500696	0,0010199	6,201	272,058	2617,587	2345,445
66	339,15	2,614453	0,0010205	5,947	276,245	2619,262	2342,933
67	340,15	2,733113	0,0010210	5,705	280,432	2621,355	2340,840
68	341,15	2,855696	0,0010216	5,475	284,619	2623,030	2338,328
69	342,15	2,984164	0,0010222	5,255	288,805	2624,705	2335,816
70	343,15	3,116553	0,0010228	5,045	292,992	2626,380	2333,304
71	344,15	3,253846	0,0010234	4,846	297,179	2628,054	2330,792
72	345,15	3,396043	0,0010240	4,655	301,408	2629,729	2328,279
73	346,15	3,543143	0,0010246	4,473	305,595	2631,404	2325,767
74	347,15	3,696126	0,0010252	4,299	309,781	2633,079	2323,255
75	348,15	3,854994	0,0010258	4,133	313,968	2634,753	2320,743
76	349,15	4,018765	0,0010264	3,975	318,155	2636,428	2318,231
77	350,15	4,189401	0,0010270	3,824	322,342	2638,103	2315,719
78	351,15	4,364940	0,0010277	3,679	326,570	2639,777	2313,207
79	352,15	4,547344	0,0010283	3,540	330,757	2641,452	2310,695
80	353,15	4,735631	0,0010290	3,408	334,944	2643,127	2308,183

T [°C]	T [K]	P [Pa·10^{-4}]	v' [m^3/kg] (liquid)	v'' [m^3/kg] (sat. steam)	h' [kJ/kg] (liquid)	h'' [kJ/kg] (sat. steam)	Δh^{vap} [kJ/kg] (= h'' - h')
81	354,15	4,930784	0,0010297	3,282	339,131	2644,802	2305,671
82	355,15	5,132801	0,0010304	3,161	343,359	2646,476	2303,159
83	356,15	5,341682	0,0010310	3,045	347,546	2648,151	2300,647
84	357,15	5,557429	0,0010317	2,934	351,733	2649,826	2298,135
85	358,15	5,780040	0,0010324	2,828	355,962	2651,500	2295,622
86	359,15	6,010496	0,0010331	2,727	360,149	2653,175	2293,110
87	360,15	6,248797	0,0010338	2,629	364,377	2654,850	2290,598
88	361,15	6,494944	0,0010345	2,536	368,564	2656,106	2287,668
89	362,15	6,748937	0,0010352	2,447	372,751	2657,781	2285,155
90	363,15	7,010774	0,0010359	2,361	376,979	2659,455	2282,643
91	364,15	7,280457	0,0010366	2,279	381,166	2661,130	2280,131
92	365,15	7,560927	0,0010373	2,200	385,395	2662,386	2277,201
93	366,15	7,849243	0,0010381	2,124	389,582	2664,061	2274,688
94	367,15	8,146384	0,0010388	2,052	393,810	2666,154	2272,176
95	368,15	8,452352	0,0010396	1,982	398,039	2667,829	2269,664
96	369,15	8,769106	0,0010404	1,915	402,226	2669,504	2267,152
97	370,15	9,094687	0,0010412	1,851	406,455	2671,178	2264,640
98	371,15	9,430075	0,0010420	1,789	410,683	2672,853	2262,128
99	372,15	9,778211	0,0010427	1,730	414,912	2674,109	2259,197
100	373,15	10,13223	0,0010435	1,673	419,099	2675,784	2256,685
101	374,15	10,49998	0,0010443	1,618	423,327	2677,459	2254,173
102	375,15	10,87754	0,0010450	1,566	427,514	2678,715	2251,242
103	376,15	11,26686	0,0010458	1,515	431,743	2680,389	2248,730
104	377,15	11,66795	0,0010466	1,466	435,971	2681,645	2245,800
105	378,15	12,07983	0,0010474	1,419	440,200	2683,320	2243,287
106	379,15	12,50446	0,0010482	1,374	444,429	2684,995	2240,775
107	380,15	12,94086	0,0010490	1,331	448,657	2686,670	2237,845
108	381,15	13,39000	0,0010498	1,289	452,886	2688,344	2235,333
109	382,15	13,85189	0,0010507	1,249	457,115	2689,600	2232,402
110	383,15	14,32653	0,0010515	1,210	461,343	2691,275	2229,890
111	384,15	14,81393	0,0010523	1,173	465,572	2692,950	2227,378
112	385,15	15,31603	0,0010532	1,137	469,801	2694,206	2224,447
113	386,15	15,83186	0,0010540	1,102	474,029	2695,881	2221,935
114	387,15	16,36141	0,0010549	1,069	478,258	2697,137	2219,004
115	388,15	16,90568	0,0010558	1,036	482,529	2698,811	2216,492
116	389,15	17,46466	0,0010567	1,005	486,757	2700,486	2213,561
117	390,15	18,03835	0,0010576	0,9754	490,986	2702,161	2211,049
118	391,15	18,62773	0,0010585	0,9465	495,257	2703,417	2208,118
119	392,15	19,23280	0,0010594	0,9186	499,485	2704,673	2205,188
120	393,15	19,85356	0,0010603	0,8017	503,672	2706,348	2202,675

T [°C]	T [K]	P [Pa·10^{-4}]	v' [m^3/kg] (liquid)	v'' [m^3/kg] (sat. steam)	h' [kJ/kg] (liquid)	h'' [kJ/kg] (sat. steam)	Δh^{vap} [kJ/kg] (= h'' - h')
121	394,15	20,49100	0,0010612	0,8657	507,859	2707,604	2199,745
122	395,15	21,14412	0,0010621	0,8407	512,046	2708,860	2196,814
123	396,15	21,81489	0,0010630	0,8164	516,651	2710,953	2194,302
124	397,15	22,50332	0,0010640	0,7930	520,838	2712,209	2191,371
125	398,15	23,20842	0,0010649	0,7704	525,025	2713,465	2188,440
126	399,15	23,93215	0,0010658	0,7486	529,222	2714,721	2185,510
127	400,15	24,67353	0,0010668	0,7276	533,398	2716,396	2182,998
128	401,15	25,43355	0,0010677	0,7074	537,585	2717,652	2180,067
129	402,15	26,21318	0,0010687	0,6880	542,191	2719,327	2177,136
130	403,15	27,01144	0,0010697	0,6683	546,377	2720,583	2174,205
131	404,15	27,82931	0,0010707	0,6499	550,564	2721,839	2171,274
132	405,15	28,66778	0,0010717	0,6321	554,751	2723,095	2168,344
133	406,15	29,52782	0,0010727	0,6148	558,938	2724,351	2165,413
134	407,15	30,41042	0,0010737	0,5981	563,543	2726,025	2162,482
135	408,15	31,30283	0,0010747	0,5820	567,730	2727,282	2159,551
136	409,15	32,22465	0,0010757	0,5664	571,917	2728,538	2156,621
137	410,15	33,16609	0,0010767	0,5512	576,104	2729,794	2153,690
138	411,15	34,13695	0,0010777	0,5366	580,709	2731,468	2150,759
139	412,15	35,12742	0,0010788	0,5224	584,896	2732,724	2147,828
140	413,15	36,13751	0,0010798	0,5087	589,083	2733,980	2144,898
141	414,15	37,16720	0,0010808	0,4953	593,270	2735,236	2141,967
142	415,15	38,22632	0,0010819	0,4824	597,875	2736,911	2139,036
143	416,15	39,31486	0,0010829	0,4699	602,062	2738,167	2136,105
144	417,15	40,41320	0,0010840	0,4579	606,249	2739,005	2132,756
145	418,15	41,55078	0,0010851	0,4461	610,435	2740,261	2129,825
146	419,15	42,70796	0,0010862	0,4347	615,041	2741,517	2126,476
147	420,15	43,89457	0,0010873	0,4237	619,228	2742,773	2123,545
148	421,15	45,10078	0,0010884	0,4130	623,415	2744,029	2120,614
149	422,15	46,33642	0,0010895	0,4026	628,020	2745,285	2117,265
150	423,15	47,60148	0,0010906	0,3926	632,207	2746,541	2114,334

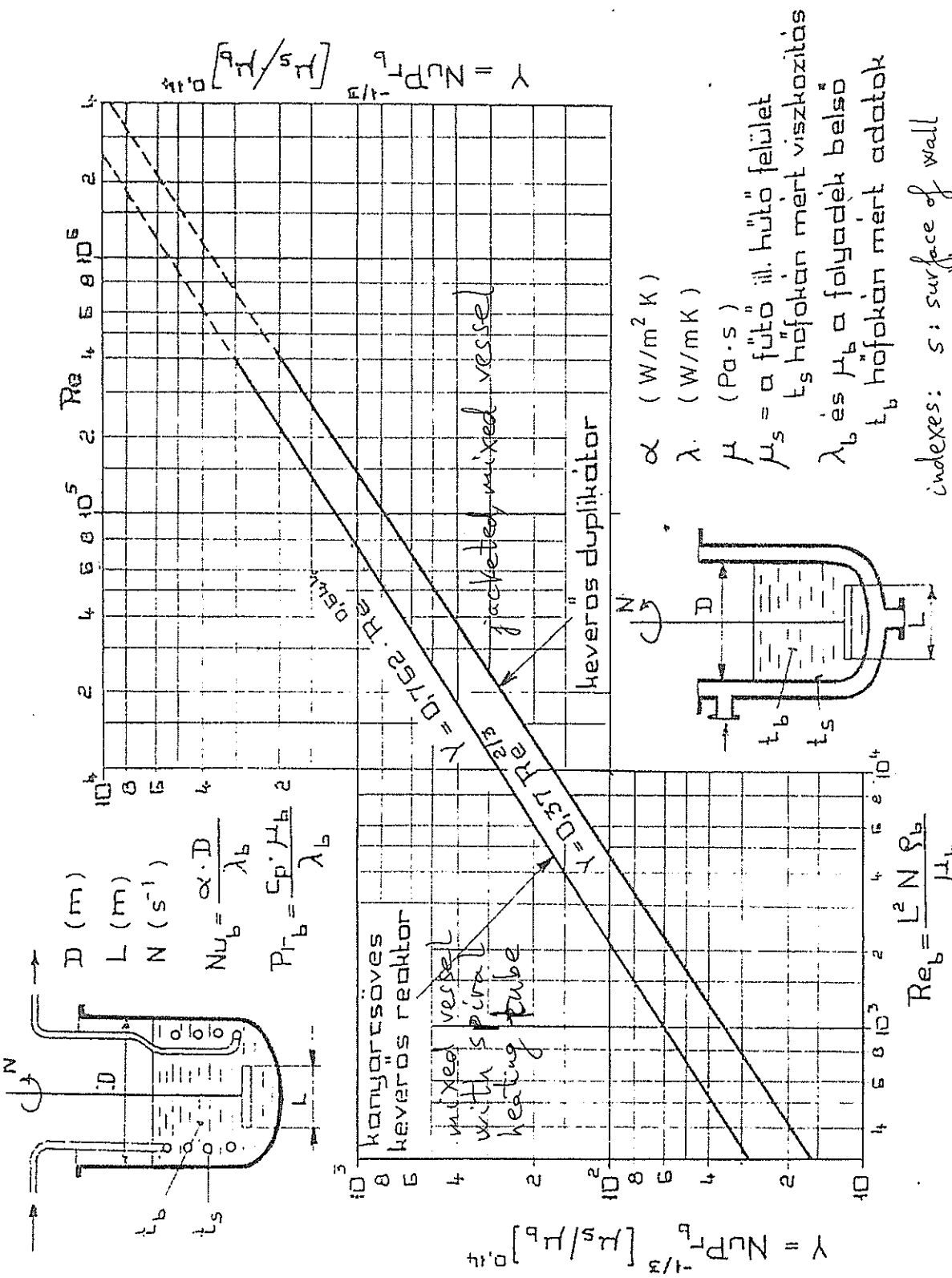
Heat transport diagram for fuild in pipe (Y – Re plot)

t: temperature
D: diameter of tube
v: velocity
ϱ: density
μ: dynamic viscosity
ν: kinematic viscosity
λ: heat conductivity

α_L: mean film coefficient over tube length L

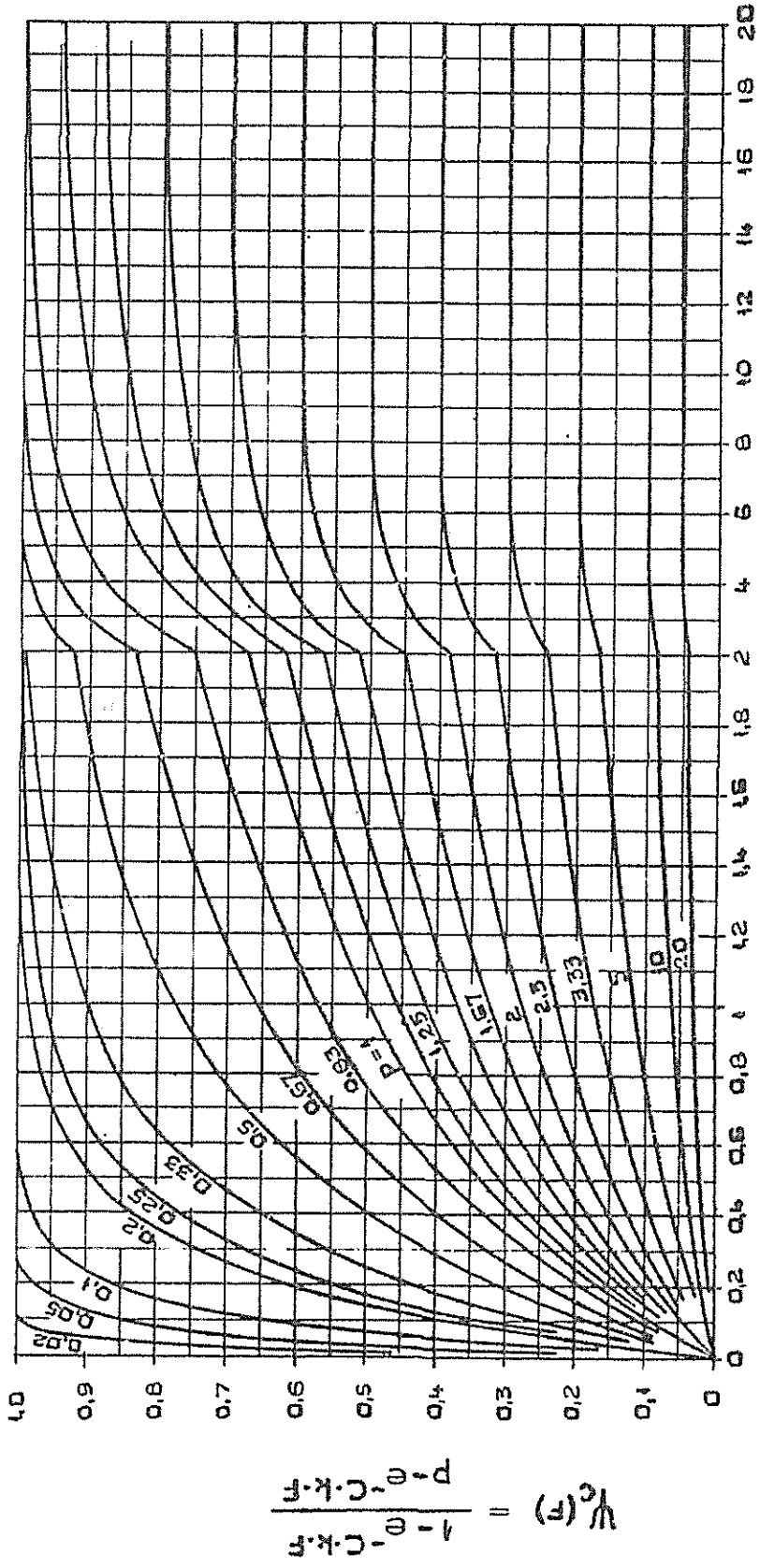
$Re_b = \frac{D_e v_b \varrho_b}{\mu_b}$

index b: bulk
s: surface of wall
f: film
e: equivalent
kanyar: spiral
egyenes: straight



Heat transport in mixed and jacketed reactor

Ψ_P function of co-current heat exchange



Ψ_C function of counter-current heat exchange