

# Appendix: Stages Summary – All Runs

Columns slice 1/4

run	param_group	param_value	stage	kind	gas in pressure [ kPa ]	gas in temp [ °C ]	gas in enthalpy [ kJ/kg ]	gas out pressure [ kPa ]	gas out temp [ °C ]	gas out enthalpy [ kJ/kg ]	water in temp [ °C ]
default_case	control		HX_1	single_tube	101.325	1981.25	2612.29	101.322	860.869	1014.02	179.886
default_case	control		HX_2	reversal_chamber	101.322	860.869	1014.02	101.322	804.137	938.904	179.886
default_case	control		HX_3	tube_bank	101.322	804.137	938.904	101.274	332.777	349.389	179.886
default_case	control		HX_4	reversal_chamber	101.274	332.777	349.389	101.274	328.165	343.961	179.886
default_case	control		HX_5	tube_bank	101.274	328.165	343.961	101.228	220.508	219.062	179.886
default_case	control		HX_6	economiser	101.228	220.508	219.062	88.8785	152.384	141.687	104.795
drum_pressure_4.0bar	drum_pressure	4	HX_1	single_tube	101.325	1981.25	2612.29	101.322	864.013	1018.2	143.613
drum_pressure_4.0bar	drum_pressure	4	HX_2	reversal_chamber	101.322	864.013	1018.2	101.322	806.98	942.651	143.613
drum_pressure_4.0bar	drum_pressure	4	HX_3	tube_bank	101.322	806.98	942.651	101.275	310.843	323.634	143.613
drum_pressure_4.0bar	drum_pressure	4	HX_4	reversal_chamber	101.275	310.843	323.634	101.275	306.425	318.465	143.613
drum_pressure_4.0bar	drum_pressure	4	HX_5	tube_bank	101.275	306.425	318.465	101.231	189.555	183.755	143.613
drum_pressure_4.0bar	drum_pressure	4	HX_6	economiser	101.231	189.555	183.755	89.5179	138.492	126.054	104.901
drum_pressure_10.0bar	drum_pressure	10	HX_1	single_tube	101.325	1981.25	2612.29	101.322	860.869	1014.02	179.886
drum_pressure_10.0bar	drum_pressure	10	HX_2	reversal_chamber	101.322	860.869	1014.02	101.322	804.137	938.904	179.886
drum_pressure_10.0bar	drum_pressure	10	HX_3	tube_bank	101.322	804.137	938.904	101.274	332.777	349.389	179.886
drum_pressure_10.0bar	drum_pressure	10	HX_4	reversal_chamber	101.274	332.777	349.389	101.274	328.165	343.961	179.886
drum_pressure_10.0bar	drum_pressure	10	HX_5	tube_bank	101.274	328.165	343.961	101.228	220.508	219.062	179.886
drum_pressure_10.0bar	drum_pressure	10	HX_6	economiser	101.228	220.508	219.062	88.8785	152.384	141.687	104.795
drum_pressure_16.0bar	drum_pressure	16	HX_1	single_tube	101.325	1981.25	2612.29	101.322	859.482	1012.17	201.378
drum_pressure_16.0bar	drum_pressure	16	HX_2	reversal_chamber	101.322	859.482	1012.17	101.322	802.962	937.357	201.378
drum_pressure_16.0bar	drum_pressure	16	HX_3	tube_bank	101.322	802.962	937.357	101.274	346.03	365.02	201.378
drum_pressure_16.0bar	drum_pressure	16	HX_4	reversal_chamber	101.274	346.03	365.02	101.273	341.316	359.454	201.378
drum_pressure_16.0bar	drum_pressure	16	HX_5	tube_bank	101.273	341.316	359.454	101.225	239.007	240.286	201.378
drum_pressure_16.0bar	drum_pressure	16	HX_6	economiser	101.225	239.007	240.286	88.4967	160.44	150.775	104.69
excess_air_1.0	excess_air	1	HX_1	single_tube	101.325	2052.16	2735.17	101.323	848.134	1002.25	179.886
excess_air_1.0	excess_air	1	HX_2	reversal_chamber	101.323	848.134	1002.25	101.322	791.07	926.426	179.886
excess_air_1.0	excess_air	1	HX_3	tube_bank	101.322	791.07	926.426	101.279	326.567	343.657	179.886
excess_air_1.0	excess_air	1	HX_4	reversal_chamber	101.279	326.567	343.657	101.279	322.002	338.268	179.886
excess_air_1.0	excess_air	1	HX_5	tube_bank	101.279	322.002	338.268	101.236	218.196	217.375	179.886
excess_air_1.0	excess_air	1	HX_6	economiser	101.236	218.196	217.375	90.0462	150.157	139.778	104.795
excess_air_1.05	excess_air	1.05	HX_1	single_tube	101.325	1981.25	2612.29	101.322	860.869	1014.02	179.886
excess_air_1.05	excess_air	1.05	HX_2	reversal_chamber	101.322	860.869	1014.02	101.322	804.137	938.904	179.886
excess_air_1.05	excess_air	1.05	HX_3	tube_bank	101.322	804.137	938.904	101.274	332.777	349.389	179.886
excess_air_1.05	excess_air	1.05	HX_4	reversal_chamber	101.274	332.777	349.389	101.274	328.165	343.961	179.886

run	param_group	param_value	stage	kind	gas in pressure [ kPa ]	gas in temp [ °C ]	gas in enthalpy [ kJ/kg ]	gas out pressure [ kPa ]	gas out temp [ °C ]	gas out enthalpy [ kJ/kg ]	water in temp [ °C ]
excess_air_1.05	excess_air	1.05	HX_5	tube_bank	101.274	328.165	343.961	101.228	220.508	219.062	179.886
excess_air_1.05	excess_air	1.05	HX_6	economiser	101.228	220.508	219.062	88.8785	152.384	141.687	104.795
excess_air_1.1	excess_air	1.1	HX_1	single_tube	101.325	1915.3	2499.98	101.322	872.375	1024.46	179.886
excess_air_1.1	excess_air	1.1	HX_2	reversal_chamber	101.322	872.375	1024.46	101.322	816.115	950.217	179.886
excess_air_1.1	excess_air	1.1	HX_3	tube_bank	101.322	816.115	950.217	101.269	338.75	354.922	179.886
excess_air_1.1	excess_air	1.1	HX_4	reversal_chamber	101.269	338.75	354.922	101.269	334.099	349.465	179.886
excess_air_1.1	excess_air	1.1	HX_5	tube_bank	101.269	334.099	349.465	101.218	222.78	220.763	179.886
excess_air_1.1	excess_air	1.1	HX_6	economiser	101.218	222.78	220.763	87.637	154.591	143.606	104.795
excess_air_1.15	excess_air	1.15	HX_1	single_tube	101.325	1853.8	2396.93	101.322	882.662	1033.56	179.886
excess_air_1.15	excess_air	1.15	HX_2	reversal_chamber	101.322	882.662	1033.56	101.322	827.011	960.352	179.886
excess_air_1.15	excess_air	1.15	HX_3	tube_bank	101.322	827.011	960.352	101.264	344.477	360.239	179.886
excess_air_1.15	excess_air	1.15	HX_4	reversal_chamber	101.264	344.477	360.239	101.264	339.795	354.762	179.886
excess_air_1.15	excess_air	1.15	HX_5	tube_bank	101.264	339.795	354.762	101.209	225.006	222.465	179.886
excess_air_1.15	excess_air	1.15	HX_6	economiser	101.209	225.006	222.465	86.3183	156.792	145.547	104.795
excess_air_1.2	excess_air	1.2	HX_1	single_tube	101.325	1796.3	2302.05	101.322	891.745	1041.32	179.886
excess_air_1.2	excess_air	1.2	HX_2	reversal_chamber	101.322	891.745	1041.32	101.322	836.83	969.305	179.886
excess_air_1.2	excess_air	1.2	HX_3	tube_bank	101.322	836.83	969.305	101.259	349.949	365.327	179.886
excess_air_1.2	excess_air	1.2	HX_4	reversal_chamber	101.259	349.949	365.327	101.259	345.245	359.837	179.886
excess_air_1.2	excess_air	1.2	HX_5	tube_bank	101.259	345.245	359.837	101.199	227.179	224.156	179.886
excess_air_1.2	excess_air	1.2	HX_6	economiser	101.199	227.179	224.156	84.92	158.95	147.464	104.795
excess_air_1.3	excess_air	1.3	HX_1	single_tube	101.325	1691.83	2133.18	101.322	906.389	1052.91	179.886
excess_air_1.3	excess_air	1.3	HX_2	reversal_chamber	101.322	906.389	1052.91	101.321	853.299	983.692	179.886
excess_air_1.3	excess_air	1.3	HX_3	tube_bank	101.321	853.299	983.692	101.248	360.105	374.762	179.886
excess_air_1.3	excess_air	1.3	HX_4	reversal_chamber	101.248	360.105	374.762	101.248	355.382	369.274	179.886
excess_air_1.3	excess_air	1.3	HX_5	tube_bank	101.248	355.382	369.274	101.178	231.351	227.466	179.886
excess_air_1.3	excess_air	1.3	HX_6	economiser	101.178	231.351	227.466	81.8692	163.161	151.247	104.795
fouling_1	fouling	1	HX_1	single_tube	101.325	1981.25	2612.29	101.322	860.869	1014.02	179.886
fouling_1	fouling	1	HX_2	reversal_chamber	101.322	860.869	1014.02	101.322	804.137	938.904	179.886
fouling_1	fouling	1	HX_3	tube_bank	101.322	804.137	938.904	101.274	332.777	349.389	179.886
fouling_1	fouling	1	HX_4	reversal_chamber	101.274	332.777	349.389	101.274	328.165	343.961	179.886
fouling_1	fouling	1	HX_5	tube_bank	101.274	328.165	343.961	101.228	220.508	219.062	179.886
fouling_1	fouling	1	HX_6	economiser	101.228	220.508	219.062	88.8785	152.384	141.687	104.795
fouling_5	fouling	5	HX_1	single_tube	101.325	1981.25	2612.29	101.322	966.415	1155.73	179.886
fouling_5	fouling	5	HX_2	reversal_chamber	101.322	966.415	1155.73	101.322	898.305	1064	179.886
fouling_5	fouling	5	HX_3	tube_bank	101.322	898.305	1064	101.27	366.218	388.937	179.886
fouling_5	fouling	5	HX_4	reversal_chamber	101.27	366.218	388.937	101.27	360.464	382.107	179.886
fouling_5	fouling	5	HX_5	tube_bank	101.27	360.464	382.107	101.222	233.355	233.792	179.886
fouling_5	fouling	5	HX_6	economiser	101.222	233.355	233.792	88.6468	157.043	146.941	104.795
fouling_10	fouling	10	HX_1	single_tube	101.325	1981.25	2612.29	101.322	1133.97	1385.46	179.886
fouling_10	fouling	10	HX_2	reversal_chamber	101.322	1133.97	1385.46	101.322	1053.16	1273.97	179.886

run	param_group	param_value	stage	kind	gas in pressure [ kPa ]	gas in temp [ °C ]	gas in enthalpy [ kJ/kg ]	gas out pressure [ kPa ]	gas out temp [ °C ]	gas out enthalpy [ kJ/kg ]	water in temp [ °C ]
fouling_10	fouling	10	HX_3	tube_bank	101.322	1053.16	1273.97	101.264	418.238	451.157	179.886
fouling_10	fouling	10	HX_4	reversal_chamber	101.264	418.238	451.157	101.264	410.57	441.932	179.886
fouling_10	fouling	10	HX_5	tube_bank	101.264	410.57	441.932	101.212	254.084	257.656	179.886
fouling_10	fouling	10	HX_6	economiser	101.212	254.084	257.656	88.2647	164.531	155.396	104.795
fuel_flow_0.025kgs	fuel_flow	0.025	HX_1	single_tube	101.325	1981.25	2612.29	101.325	450.07	489.657	179.886
fuel_flow_0.025kgs	fuel_flow	0.025	HX_2	reversal_chamber	101.325	450.07	489.657	101.325	414.551	446.718	179.886
fuel_flow_0.025kgs	fuel_flow	0.025	HX_3	tube_bank	101.325	414.551	446.718	101.323	230.779	230.835	179.886
fuel_flow_0.025kgs	fuel_flow	0.025	HX_4	reversal_chamber	101.323	230.779	230.835	101.323	226.841	226.317	179.886
fuel_flow_0.025kgs	fuel_flow	0.025	HX_5	tube_bank	101.323	226.841	226.317	101.32	188.405	182.448	179.886
fuel_flow_0.025kgs	fuel_flow	0.025	HX_6	economiser	101.32	188.405	182.448	100.557	127.526	113.748	104.795
fuel_flow_0.05kgs	fuel_flow	0.05	HX_1	single_tube	101.325	1981.25	2612.29	101.324	634.566	719.186	179.886
fuel_flow_0.05kgs	fuel_flow	0.05	HX_2	reversal_chamber	101.324	634.566	719.186	101.324	587.494	659.61	179.886
fuel_flow_0.05kgs	fuel_flow	0.05	HX_3	tube_bank	101.324	587.494	659.61	101.314	263.768	268.847	179.886
fuel_flow_0.05kgs	fuel_flow	0.05	HX_4	reversal_chamber	101.314	263.768	268.847	101.313	259.913	264.389	179.886
fuel_flow_0.05kgs	fuel_flow	0.05	HX_5	tube_bank	101.313	259.913	264.389	101.302	197.47	192.759	179.886
fuel_flow_0.05kgs	fuel_flow	0.05	HX_6	economiser	101.302	197.47	192.759	98.3726	132.364	119.173	104.795
fuel_flow_0.075kgs	fuel_flow	0.075	HX_1	single_tube	101.325	1981.25	2612.29	101.324	762.539	884.323	179.886
fuel_flow_0.075kgs	fuel_flow	0.075	HX_2	reversal_chamber	101.324	762.539	884.323	101.323	709.458	815.295	179.886
fuel_flow_0.075kgs	fuel_flow	0.075	HX_3	tube_bank	101.323	709.458	815.295	101.297	300.027	310.989	179.886
fuel_flow_0.075kgs	fuel_flow	0.075	HX_4	reversal_chamber	101.297	300.027	310.989	101.297	295.755	306.003	179.886
fuel_flow_0.075kgs	fuel_flow	0.075	HX_5	tube_bank	101.297	295.755	306.003	101.271	208.897	205.787	179.886
fuel_flow_0.075kgs	fuel_flow	0.075	HX_6	economiser	101.271	208.897	205.787	94.5729	142.11	130.121	104.795
fuel_flow_0.1kgs	fuel_flow	0.1	HX_1	single_tube	101.325	1981.25	2612.29	101.322	860.869	1014.02	179.886
fuel_flow_0.1kgs	fuel_flow	0.1	HX_2	reversal_chamber	101.322	860.869	1014.02	101.322	804.137	938.904	179.886
fuel_flow_0.1kgs	fuel_flow	0.1	HX_3	tube_bank	101.322	804.137	938.904	101.274	332.777	349.389	179.886
fuel_flow_0.1kgs	fuel_flow	0.1	HX_4	reversal_chamber	101.274	332.777	349.389	101.274	328.165	343.961	179.886
fuel_flow_0.1kgs	fuel_flow	0.1	HX_5	tube_bank	101.274	328.165	343.961	101.228	220.508	219.062	179.886
fuel_flow_0.1kgs	fuel_flow	0.1	HX_6	economiser	101.228	220.508	219.062	88.8785	152.384	141.687	104.795
fuel_flow_0.125kgs	fuel_flow	0.125	HX_1	single_tube	101.325	1981.25	2612.29	101.321	940.504	1120.71	179.886
fuel_flow_0.125kgs	fuel_flow	0.125	HX_2	reversal_chamber	101.321	940.504	1120.71	101.32	881.485	1041.5	179.886
fuel_flow_0.125kgs	fuel_flow	0.125	HX_3	tube_bank	101.32	881.485	1041.5	101.243	362.532	384.561	179.886
fuel_flow_0.125kgs	fuel_flow	0.125	HX_4	reversal_chamber	101.243	362.532	384.561	101.243	357.636	378.755	179.886
fuel_flow_0.125kgs	fuel_flow	0.125	HX_5	tube_bank	101.243	357.636	378.755	101.17	231.942	232.169	179.886
fuel_flow_0.125kgs	fuel_flow	0.125	HX_6	economiser	101.17	231.942	232.169	80.8379	162.541	153.148	104.795

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run	param_group	param_value	stage	kind	water in enthalpy [ kJ/kg ]	water in pressure [ kpa ]	water out temp [ °C ]	water out enthalpy [ kJ/kg ]	water out pressure [ kpa ]	gas avg velocity [ m/s ]	water avg velocity [ m/s ]
default_case	control		HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.04104	
default_case	control		HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	2.89824	
default_case	control		HX_3	tube_bank	762.683	1000	179.886	762.683	1000	7.66849	
default_case	control		HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.58457	
default_case	control		HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.23595	
default_case	control		HX_6	economiser	440	1000.06	122.087	513.209	1000	47.0379	0.0339143
drum_pressure_4.0bar	drum_pressure	4	HX_1	single_tube	604.723	400	143.613	604.723	400	5.04975	
drum_pressure_4.0bar	drum_pressure	4	HX_2	reversal_chamber	604.723	400	143.613	604.723	400	2.90601	
drum_pressure_4.0bar	drum_pressure	4	HX_3	tube_bank	604.723	400	143.613	604.723	400	7.5499	
drum_pressure_4.0bar	drum_pressure	4	HX_4	reversal_chamber	604.723	400	143.613	604.723	400	1.52724	
drum_pressure_4.0bar	drum_pressure	4	HX_5	tube_bank	604.723	400	143.613	604.723	400	5.92022	
drum_pressure_4.0bar	drum_pressure	4	HX_6	economiser	440	400.059	117.507	493.347	400	44.677	0.0346423
drum_pressure_10.0bar	drum_pressure	10	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.04104	
drum_pressure_10.0bar	drum_pressure	10	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	2.89824	
drum_pressure_10.0bar	drum_pressure	10	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	7.66849	
drum_pressure_10.0bar	drum_pressure	10	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.58457	
drum_pressure_10.0bar	drum_pressure	10	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.23595	
drum_pressure_10.0bar	drum_pressure	10	HX_6	economiser	440	1000.06	122.087	513.209	1000	47.0379	0.0339143
drum_pressure_16.0bar	drum_pressure	16	HX_1	single_tube	858.61	1600	201.378	858.61	1600	5.03701	
drum_pressure_16.0bar	drum_pressure	16	HX_2	reversal_chamber	858.61	1600	201.378	858.61	1600	2.89492	
drum_pressure_16.0bar	drum_pressure	16	HX_3	tube_bank	858.61	1600	201.378	858.61	1600	7.74227	
drum_pressure_16.0bar	drum_pressure	16	HX_4	reversal_chamber	858.61	1600	201.378	858.61	1600	1.61924	
drum_pressure_16.0bar	drum_pressure	16	HX_5	tube_bank	858.61	1600	201.378	858.61	1600	6.42545	
drum_pressure_16.0bar	drum_pressure	16	HX_6	economiser	440	1600.06	124.898	525.573	1600	48.4471	0.0335987
excess_air_1.0	excess_air	1	HX_1	single_tube	762.683	1000	179.886	762.683	1000	4.82274	
excess_air_1.0	excess_air	1	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	2.74052	
excess_air_1.0	excess_air	1	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	7.24618	
excess_air_1.0	excess_air	1	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.50047	
excess_air_1.0	excess_air	1	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	5.92208	
excess_air_1.0	excess_air	1	HX_6	economiser	440	1000.06	121.307	509.896	1000	44.5365	0.0340082
excess_air_1.05	excess_air	1.05	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.04104	
excess_air_1.05	excess_air	1.05	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	2.89824	
excess_air_1.05	excess_air	1.05	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	7.66849	
excess_air_1.05	excess_air	1.05	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.58457	
excess_air_1.05	excess_air	1.05	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.23595	
excess_air_1.05	excess_air	1.05	HX_6	economiser	440	1000.06	122.087	513.209	1000	47.0379	0.0339143
excess_air_1.1	excess_air	1.1	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.25445	
excess_air_1.1	excess_air	1.1	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.05572	

run	param_group	param_value	stage	kind	water in enthalpy [ kJ/kg ]	water in pressure [ kpa ]	water out temp [ °C ]	water out enthalpy [ kJ/kg ]	water out pressure [ kpa ]	gas avg velocity [ m/s ]	water avg velocity [ m/s ]
excess_air_1.1	excess_air	1.1	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	8.09337	
excess_air_1.1	excess_air	1.1	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.66945	
excess_air_1.1	excess_air	1.1	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.55248	
excess_air_1.1	excess_air	1.1	HX_6	economiser	440	1000.06	122.871	516.542	1000	49.6029	0.0338138
excess_air_1.15	excess_air	1.15	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.46265	
excess_air_1.15	excess_air	1.15	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.21261	
excess_air_1.15	excess_air	1.15	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	8.52006	
excess_air_1.15	excess_air	1.15	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.755	
excess_air_1.15	excess_air	1.15	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.87142	
excess_air_1.15	excess_air	1.15	HX_6	economiser	440	1000.06	123.643	519.822	1000	52.2366	0.0337281
excess_air_1.2	excess_air	1.2	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.66539	
excess_air_1.2	excess_air	1.2	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.36853	
excess_air_1.2	excess_air	1.2	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	8.94779	
excess_air_1.2	excess_air	1.2	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.84112	
excess_air_1.2	excess_air	1.2	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	7.19248	
excess_air_1.2	excess_air	1.2	HX_6	economiser	440	1000.06	124.429	523.163	1000	54.9382	0.0336235
excess_air_1.3	excess_air	1.3	HX_1	single_tube	762.683	1000	179.886	762.683	1000	6.05386	
excess_air_1.3	excess_air	1.3	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.67618	
excess_air_1.3	excess_air	1.3	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	9.80343	
excess_air_1.3	excess_air	1.3	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	2.01463	
excess_air_1.3	excess_air	1.3	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	7.83992	
excess_air_1.3	excess_air	1.3	HX_6	economiser	440	1000.06	126	529.846	1000	60.5665	0.0334087
fouling_1	fouling	1	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.04104	
fouling_1	fouling	1	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	2.89824	
fouling_1	fouling	1	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	7.66849	
fouling_1	fouling	1	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.58457	
fouling_1	fouling	1	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.23595	
fouling_1	fouling	1	HX_6	economiser	440	1000.06	122.087	513.209	1000	47.0379	0.0339143
fouling_5	fouling	5	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.51702	
fouling_5	fouling	5	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.15994	
fouling_5	fouling	5	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	8.22734	
fouling_5	fouling	5	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.67091	
fouling_5	fouling	5	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.48285	
fouling_5	fouling	5	HX_6	economiser	440	1000.06	124.24	522.359	1000	47.8533	0.0338807
fouling_10	fouling	10	HX_1	single_tube	762.683	1000	179.886	762.683	1000	6.04713	
fouling_10	fouling	10	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.58334	
fouling_10	fouling	10	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	9.10952	
fouling_10	fouling	10	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.80505	
fouling_10	fouling	10	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.87137	
fouling_10	fouling	10	HX_6	economiser	440	1000.06	127.751	537.298	1000	49.2072	0.033834

run	param_group	param_value	stage	kind	water in enthalpy [ kJ/kg ]	water in pressure [ kpa ]	water out temp [ °C ]	water out enthalpy [ kJ/kg ]	water out pressure [ kpa ]	gas avg velocity [ m/s ]	water avg velocity [ m/s ]
fuel_flow_0.025kgs	fuel_flow	0.025	HX_1	single_tube	762.683	1000	179.886	762.683	1000	0.863024	
fuel_flow_0.025kgs	fuel_flow	0.025	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	0.462283	
fuel_flow_0.025kgs	fuel_flow	0.025	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	1.41785	
fuel_flow_0.025kgs	fuel_flow	0.025	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	0.329248	
fuel_flow_0.025kgs	fuel_flow	0.025	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	1.38251	
fuel_flow_0.025kgs	fuel_flow	0.025	HX_6	economiser	440	1000.01	119.999	504.345	1000	10.3543	0.00856301
fuel_flow_0.05kgs	fuel_flow	0.05	HX_1	single_tube	762.683	1000	179.886	762.683	1000	2.11419	
fuel_flow_0.05kgs	fuel_flow	0.05	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	1.15876	
fuel_flow_0.05kgs	fuel_flow	0.05	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	3.21495	
fuel_flow_0.05kgs	fuel_flow	0.05	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	0.701922	
fuel_flow_0.05kgs	fuel_flow	0.05	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	2.87371	
fuel_flow_0.05kgs	fuel_flow	0.05	HX_6	economiser	440	1000.02	121.099	509.015	1000	21.2926	0.0171088
fuel_flow_0.075kgs	fuel_flow	0.075	HX_1	single_tube	762.683	1000	179.886	762.683	1000	3.52767	
fuel_flow_0.075kgs	fuel_flow	0.075	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	1.98385	
fuel_flow_0.075kgs	fuel_flow	0.075	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	5.32927	
fuel_flow_0.075kgs	fuel_flow	0.075	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.12402	
fuel_flow_0.075kgs	fuel_flow	0.075	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	4.4983	
fuel_flow_0.075kgs	fuel_flow	0.075	HX_6	economiser	440	1000.03	121.63	511.269	1000	33.4514	0.0255503
fuel_flow_0.1kgs	fuel_flow	0.1	HX_1	single_tube	762.683	1000	179.886	762.683	1000	5.04104	
fuel_flow_0.1kgs	fuel_flow	0.1	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	2.89824	
fuel_flow_0.1kgs	fuel_flow	0.1	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	7.66849	
fuel_flow_0.1kgs	fuel_flow	0.1	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	1.58457	
fuel_flow_0.1kgs	fuel_flow	0.1	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	6.23595	
fuel_flow_0.1kgs	fuel_flow	0.1	HX_6	economiser	440	1000.06	122.087	513.209	1000	47.0379	0.0339143
fuel_flow_0.125kgs	fuel_flow	0.125	HX_1	single_tube	762.683	1000	179.886	762.683	1000	6.62352	
fuel_flow_0.125kgs	fuel_flow	0.125	HX_2	reversal_chamber	762.683	1000	179.886	762.683	1000	3.88021	
fuel_flow_0.125kgs	fuel_flow	0.125	HX_3	tube_bank	762.683	1000	179.886	762.683	1000	10.191	
fuel_flow_0.125kgs	fuel_flow	0.125	HX_4	reversal_chamber	762.683	1000	179.886	762.683	1000	2.07853	
fuel_flow_0.125kgs	fuel_flow	0.125	HX_5	tube_bank	762.683	1000	179.886	762.683	1000	8.07609	
fuel_flow_0.125kgs	fuel_flow	0.125	HX_6	economiser	440	1000.11	122.537	515.12	1000	62.6186	0.0421981

Columns slice 3/4

run	param_group	param_value	stage	kind	pressure drop fric [ kpa ]	pressure drop minor [ kpa ]	pressure drop total [ kpa ]	water pressure drop fric [ kpa ]	water pressure drop minor [ kpa ]	water pressure drop total [ kpa ]	Q conv [ MW ]
default_case	control		HX_1	single_tube	-0.000261857	-0.00224634	-0.0025082				0.108511
default_case	control		HX_2	reversal_chamber	-1.49553e-05	-0.000387573	-0.000402528				0.00945555
default_case	control		HX_3	tube_bank	-0.0290645	-0.0189316	-0.0479961				0.844348
default_case	control		HX_4	reversal_chamber	-7.40724e-06	-0.000211679	-0.000219087				0.00183451
default_case	control		HX_5	tube_bank	-0.0280939	-0.0182614	-0.0463553				0.205944
default_case	control		HX_6	economiser	-8.29672	-4.05233	-12.3491	-0.0559112	-0.000981025	-0.0568922	0.138409
drum_pressure_4.0bar	drum_pressure	4	HX_1	single_tube	-0.000262366	-0.00224634	-0.00250871				0.113506
drum_pressure_4.0bar	drum_pressure	4	HX_2	reversal_chamber	-1.50019e-05	-0.000388613	-0.000403615				0.0100804
drum_pressure_4.0bar	drum_pressure	4	HX_3	tube_bank	-0.0285566	-0.0185978	-0.0471544				0.903819
drum_pressure_4.0bar	drum_pressure	4	HX_4	reversal_chamber	-7.09653e-06	-0.00020402	-0.000211116				0.00199308
drum_pressure_4.0bar	drum_pressure	4	HX_5	tube_bank	-0.0264364	-0.0173027	-0.0437391				0.225418
drum_pressure_4.0bar	drum_pressure	4	HX_6	economiser	-7.85215	-3.86092	-11.7131	-0.0583874	-0.00102521	-0.0594126	0.103227
drum_pressure_10.0bar	drum_pressure	10	HX_1	single_tube	-0.000261857	-0.00224634	-0.0025082				0.108511
drum_pressure_10.0bar	drum_pressure	10	HX_2	reversal_chamber	-1.49553e-05	-0.000387573	-0.000402528				0.00945555
drum_pressure_10.0bar	drum_pressure	10	HX_3	tube_bank	-0.0290645	-0.0189316	-0.0479961				0.844348
drum_pressure_10.0bar	drum_pressure	10	HX_4	reversal_chamber	-7.40724e-06	-0.000211679	-0.000219087				0.00183451
drum_pressure_10.0bar	drum_pressure	10	HX_5	tube_bank	-0.0280939	-0.0182614	-0.0463553				0.205944
drum_pressure_10.0bar	drum_pressure	10	HX_6	economiser	-8.29672	-4.05233	-12.3491	-0.0559112	-0.000981025	-0.0568922	0.138409
drum_pressure_16.0bar	drum_pressure	16	HX_1	single_tube	-0.000261621	-0.00224634	-0.00250796				0.105608
drum_pressure_16.0bar	drum_pressure	16	HX_2	reversal_chamber	-1.49354e-05	-0.000387129	-0.000402064				0.00909572
drum_pressure_16.0bar	drum_pressure	16	HX_3	tube_bank	-0.0293824	-0.0191379	-0.0485203				0.809859
drum_pressure_16.0bar	drum_pressure	16	HX_4	reversal_chamber	-7.59595e-06	-0.00021631	-0.000223906				0.00174211
drum_pressure_16.0bar	drum_pressure	16	HX_5	tube_bank	-0.0290964	-0.0188362	-0.0479326				0.194598
drum_pressure_16.0bar	drum_pressure	16	HX_6	economiser	-8.56306	-4.16568	-12.7287	-0.0550437	-0.000962062	-0.0560058	0.160106
excess_air_1.0	excess_air	1	HX_1	single_tube	-0.000241886	-0.00211718	-0.00235907				0.104704
excess_air_1.0	excess_air	1	HX_2	reversal_chamber	-1.36178e-05	-0.000350013	-0.000363631				0.00896705
excess_air_1.0	excess_air	1	HX_3	tube_bank	-0.0264592	-0.017105	-0.0435642				0.789942
excess_air_1.0	excess_air	1	HX_4	reversal_chamber	-6.74993e-06	-0.000191433	-0.000198183				0.00169925
excess_air_1.0	excess_air	1	HX_5	tube_bank	-0.0256989	-0.0165714	-0.0422704				0.189507
excess_air_1.0	excess_air	1	HX_6	economiser	-7.52855	-3.66147	-11.19	-0.0561612	-0.000986843	-0.0571481	0.13256
excess_air_1.05	excess_air	1.05	HX_1	single_tube	-0.000261857	-0.00224634	-0.0025082				0.108511
excess_air_1.05	excess_air	1.05	HX_2	reversal_chamber	-1.49553e-05	-0.000387573	-0.000402528				0.00945555
excess_air_1.05	excess_air	1.05	HX_3	tube_bank	-0.0290645	-0.0189316	-0.0479961				0.844348
excess_air_1.05	excess_air	1.05	HX_4	reversal_chamber	-7.40724e-06	-0.000211679	-0.000219087				0.00183451
excess_air_1.05	excess_air	1.05	HX_5	tube_bank	-0.0280939	-0.0182614	-0.0463553				0.205944
excess_air_1.05	excess_air	1.05	HX_6	economiser	-8.29672	-4.05233	-12.3491	-0.0559112	-0.000981025	-0.0568922	0.138409
excess_air_1.1	excess_air	1.1	HX_1	single_tube	-0.000282222	-0.00237716	-0.00265938				0.112109
excess_air_1.1	excess_air	1.1	HX_2	reversal_chamber	-1.63454e-05	-0.000426995	-0.00044334				0.00993495

run	param_group	param_value	stage	kind	pressure drop fric [ kpa ]	pressure drop minor [ kpa ]	pressure drop total [ kpa ]	water pressure drop fric [ kpa ]	water pressure drop minor [ kpa ]	water pressure drop total [ kpa ]	Q conv [ MW ]
excess_air_1.1	excess_air	1.1	HX_3	tube_bank	-0.0317855	-0.0208551	-0.0526405				0.898655
excess_air_1.1	excess_air	1.1	HX_4	reversal_chamber	-8.09557e-06	-0.000233044	-0.00024114				0.00197151
excess_air_1.1	excess_air	1.1	HX_5	tube_bank	-0.0305968	-0.0200407	-0.0506375				0.22268
excess_air_1.1	excess_air	1.1	HX_6	economiser	-9.11224	-4.46913	-13.5814	-0.0556276	-0.000974849	-0.0566025	0.14423
excess_air_1.15	excess_air	1.15	HX_1	single_tube	-0.000302926	-0.0025096	-0.00281253				0.115492
excess_air_1.15	excess_air	1.15	HX_2	reversal_chamber	-1.7785e-05	-0.00046822	-0.000486005				0.0104036
excess_air_1.15	excess_air	1.15	HX_3	tube_bank	-0.0346184	-0.0228741	-0.0574925				0.952659
excess_air_1.15	excess_air	1.15	HX_4	reversal_chamber	-8.81452e-06	-0.000255527	-0.000264341				0.0021098
excess_air_1.15	excess_air	1.15	HX_5	tube_bank	-0.033207	-0.0219095	-0.0551165				0.23966
excess_air_1.15	excess_air	1.15	HX_6	economiser	-9.97727	-4.9133	-14.8906	-0.0554122	-0.000969562	-0.0563817	0.149977
excess_air_1.2	excess_air	1.2	HX_1	single_tube	-0.000323918	-0.00264364	-0.00296755				0.118656
excess_air_1.2	excess_air	1.2	HX_2	reversal_chamber	-1.9271e-05	-0.000511184	-0.000530455				0.0108602
excess_air_1.2	excess_air	1.2	HX_3	tube_bank	-0.0375594	-0.0249871	-0.0625465				1.00616
excess_air_1.2	excess_air	1.2	HX_4	reversal_chamber	-9.5636e-06	-0.000279123	-0.000288686				0.00224891
excess_air_1.2	excess_air	1.2	HX_5	tube_bank	-0.0359233	-0.023868	-0.0597913				0.256827
excess_air_1.2	excess_air	1.2	HX_6	economiser	-10.8929	-5.38594	-16.2788	-0.0551056	-0.000963195	-0.0560688	0.155711
excess_air_1.3	excess_air	1.3	HX_1	single_tube	-0.000366579	-0.00291637	-0.00328295				0.124328
excess_air_1.3	excess_air	1.3	HX_2	reversal_chamber	-2.23683e-05	-0.00060204	-0.000624408				0.0117317
excess_air_1.3	excess_air	1.3	HX_3	tube_bank	-0.0437481	-0.0294873	-0.0732354				1.11092
excess_air_1.3	excess_air	1.3	HX_4	reversal_chamber	-1.11499e-05	-0.000329626	-0.000340776				0.00252782
excess_air_1.3	excess_air	1.3	HX_5	tube_bank	-0.0416697	-0.028053	-0.0697227				0.291502
excess_air_1.3	excess_air	1.3	HX_6	economiser	-12.8853	-6.42333	-19.3086	-0.0544629	-0.000950212	-0.0554131	0.167023
fouling_1	fouling	1	HX_1	single_tube	-0.000261857	-0.00224634	-0.0025082				0.108511
fouling_1	fouling	1	HX_2	reversal_chamber	-1.49553e-05	-0.000387573	-0.000402528				0.00945555
fouling_1	fouling	1	HX_3	tube_bank	-0.0290645	-0.0189316	-0.0479961				0.844348
fouling_1	fouling	1	HX_4	reversal_chamber	-7.40724e-06	-0.000211679	-0.000219087				0.00183451
fouling_1	fouling	1	HX_5	tube_bank	-0.0280939	-0.0182614	-0.0463553				0.205944
fouling_1	fouling	1	HX_6	economiser	-8.29672	-4.05233	-12.3491	-0.0559112	-0.000981025	-0.0568922	0.138409
fouling_5	fouling	5	HX_1	single_tube	-0.00029055	-0.00224634	-0.00253689				0.0726315
fouling_5	fouling	5	HX_2	reversal_chamber	-1.65364e-05	-0.000422623	-0.00043916				0.00857954
fouling_5	fouling	5	HX_3	tube_bank	-0.0316113	-0.0202694	-0.0518807				0.923814
fouling_5	fouling	5	HX_4	reversal_chamber	-7.87873e-06	-0.000223221	-0.0002311				0.00212119
fouling_5	fouling	5	HX_5	tube_bank	-0.0294182	-0.0189331	-0.0483512				0.242689
fouling_5	fouling	5	HX_6	economiser	-8.45068	-4.12412	-12.5748	-0.0564279	-0.000977851	-0.0574058	0.155354
fouling_10	fouling	10	HX_1	single_tube	-0.000322589	-0.00224634	-0.00256893				0.0456573
fouling_10	fouling	10	HX_2	reversal_chamber	-1.91369e-05	-0.000479289	-0.000498425				0.00674486
fouling_10	fouling	10	HX_3	tube_bank	-0.0357026	-0.0224194	-0.058122				1.03608
fouling_10	fouling	10	HX_4	reversal_chamber	-8.61892e-06	-0.000241154	-0.000249772				0.0025055
fouling_10	fouling	10	HX_5	tube_bank	-0.0315206	-0.0199934	-0.051514				0.29762
fouling_10	fouling	10	HX_6	economiser	-8.70699	-4.24031	-12.9473	-0.0573099	-0.00097325	-0.0582832	0.182901

run	param_group	param_value	stage	kind	pressure drop fric [ kpa ]	pressure drop minor [ kpa ]	pressure drop total [ kpa ]	water pressure drop fric [ kpa ]	water pressure drop minor [ kpa ]	water pressure drop total [ kpa ]	Q conv [ MW ]
fuel_flow_0.025kgs	fuel_flow	0.025	HX_1	single_tube	-1.49034e-05	-0.000140396	-0.0001553				0.0196037
fuel_flow_0.025kgs	fuel_flow	0.025	HX_2	reversal_chamber	-7.74068e-07	-1.54546e-05	-1.62286e-05				0.00110416
fuel_flow_0.025kgs	fuel_flow	0.025	HX_3	tube_bank	-0.00110702	-0.000874925	-0.00198194				0.0622048
fuel_flow_0.025kgs	fuel_flow	0.025	HX_4	reversal_chamber	-5.16086e-07	-1.09959e-05	-1.1512e-05				0.000194681
fuel_flow_0.025kgs	fuel_flow	0.025	HX_5	tube_bank	-0.00153901	-0.00102091	-0.00255992				0.0160058
fuel_flow_0.025kgs	fuel_flow	0.025	HX_6	economiser	-0.5397	-0.223891	-0.763592	-0.00855037	-6.25129e-05	-0.00861288	0.0306981
fuel_flow_0.05kgs	fuel_flow	0.05	HX_1	single_tube	-6.31864e-05	-0.000561585	-0.000624772				0.0486168
fuel_flow_0.05kgs	fuel_flow	0.05	HX_2	reversal_chamber	-3.39483e-06	-7.74823e-05	-8.08771e-05				0.00346705
fuel_flow_0.05kgs	fuel_flow	0.05	HX_3	tube_bank	-0.0067897	-0.00399551	-0.0107852				0.268511
fuel_flow_0.05kgs	fuel_flow	0.05	HX_4	reversal_chamber	-1.88073e-06	-4.68835e-05	-4.87642e-05				0.000566003
fuel_flow_0.05kgs	fuel_flow	0.05	HX_5	tube_bank	-0.00757478	-0.00423231	-0.0118071				0.0568644
fuel_flow_0.05kgs	fuel_flow	0.05	HX_6	economiser	-2.01006	-0.918957	-2.92902	-0.0170261	-0.000249509	-0.0172756	0.0657968
fuel_flow_0.075kgs	fuel_flow	0.075	HX_1	single_tube	-0.000145602	-0.00126357	-0.00140917				0.0786402
fuel_flow_0.075kgs	fuel_flow	0.075	HX_2	reversal_chamber	-8.08868e-06	-0.000198977	-0.000207066				0.00632981
fuel_flow_0.075kgs	fuel_flow	0.075	HX_3	tube_bank	-0.0160876	-0.00989947	-0.0259871				0.534589
fuel_flow_0.075kgs	fuel_flow	0.075	HX_4	reversal_chamber	-4.16222e-06	-0.000112616	-0.000116778				0.00113357
fuel_flow_0.075kgs	fuel_flow	0.075	HX_5	tube_bank	-0.0161719	-0.0099068	-0.0260787				0.122375
fuel_flow_0.075kgs	fuel_flow	0.075	HX_6	economiser	-4.539	-2.15934	-6.69834	-0.0272303	-0.000556733	-0.0277871	0.101504
fuel_flow_0.1kgs	fuel_flow	0.1	HX_1	single_tube	-0.000261857	-0.00224634	-0.0025082				0.108511
fuel_flow_0.1kgs	fuel_flow	0.1	HX_2	reversal_chamber	-1.49553e-05	-0.000387573	-0.000402528				0.00945555
fuel_flow_0.1kgs	fuel_flow	0.1	HX_3	tube_bank	-0.0290645	-0.0189316	-0.0479961				0.844348
fuel_flow_0.1kgs	fuel_flow	0.1	HX_4	reversal_chamber	-7.40724e-06	-0.000211679	-0.000219087				0.00183451
fuel_flow_0.1kgs	fuel_flow	0.1	HX_5	tube_bank	-0.0280939	-0.0182614	-0.0463553				0.205944
fuel_flow_0.1kgs	fuel_flow	0.1	HX_6	economiser	-8.29672	-4.05233	-12.3491	-0.0559112	-0.000981025	-0.0568922	0.138409
fuel_flow_0.125kgs	fuel_flow	0.125	HX_1	single_tube	-0.000411449	-0.00350991	-0.00392136				0.137868
fuel_flow_0.125kgs	fuel_flow	0.125	HX_2	reversal_chamber	-2.40471e-05	-0.000648589	-0.000672636				0.0127297
fuel_flow_0.125kgs	fuel_flow	0.125	HX_3	tube_bank	-0.0461672	-0.0313611	-0.0775283				1.18557
fuel_flow_0.125kgs	fuel_flow	0.125	HX_4	reversal_chamber	-1.1662e-05	-0.000347084	-0.000358746				0.00264478
fuel_flow_0.125kgs	fuel_flow	0.125	HX_5	tube_bank	-0.0434744	-0.0294919	-0.0729663				0.304469
fuel_flow_0.125kgs	fuel_flow	0.125	HX_6	economiser	-13.5565	-6.77513	-20.3317	-0.107079	-0.00151877	-0.108598	0.176706

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run	param_group	param_value	stage	kind	Q rad [ MW ]	Q total [ MW ]	UA [ MW/K ]	steam capacity [ t/h ]
default_case	control		HX_1	single_tube	2.75285	2.86136	0.00241321	4.55016
default_case	control		HX_2	reversal_chamber	0.125021	0.134477	0.000204414	0.213846
default_case	control		HX_3	tube_bank	0.211055	1.0554	0.00305847	1.67831
default_case	control		HX_4	reversal_chamber	0.00788276	0.00971726	6.4361e-05	0.0154525
default_case	control		HX_5	tube_bank	0.0176618	0.223605	0.00264989	0.355579
default_case	control		HX_6	economiser	0.000113941	0.138523	0.00210994	
drum_pressure_4.0bar	drum_pressure	4	HX_1	single_tube	2.74036	2.85387	0.00232417	4.57702
drum_pressure_4.0bar	drum_pressure	4	HX_2	reversal_chamber	0.125182	0.135263	0.00019378	0.216934
drum_pressure_4.0bar	drum_pressure	4	HX_3	tube_bank	0.204399	1.10822	0.00298778	1.77735
drum_pressure_4.0bar	drum_pressure	4	HX_4	reversal_chamber	0.00726221	0.00925529	5.59182e-05	0.0148436
drum_pressure_4.0bar	drum_pressure	4	HX_5	tube_bank	0.0157511	0.241169	0.00257311	0.386786
drum_pressure_4.0bar	drum_pressure	4	HX_6	economiser	7.30591e-05	0.1033	0.0021835	
drum_pressure_10.0bar	drum_pressure	10	HX_1	single_tube	2.75285	2.86136	0.00241321	4.55016
drum_pressure_10.0bar	drum_pressure	10	HX_2	reversal_chamber	0.125021	0.134477	0.000204414	0.213846
drum_pressure_10.0bar	drum_pressure	10	HX_3	tube_bank	0.211055	1.0554	0.00305847	1.67831
drum_pressure_10.0bar	drum_pressure	10	HX_4	reversal_chamber	0.00788276	0.00971726	6.4361e-05	0.0154525
drum_pressure_10.0bar	drum_pressure	10	HX_5	tube_bank	0.0176618	0.223605	0.00264989	0.355579
drum_pressure_10.0bar	drum_pressure	10	HX_6	economiser	0.000113941	0.138523	0.00210994	
drum_pressure_16.0bar	drum_pressure	16	HX_1	single_tube	2.75906	2.86467	0.00246756	4.5486
drum_pressure_16.0bar	drum_pressure	16	HX_2	reversal_chamber	0.124849	0.133945	0.000211064	0.212682
drum_pressure_16.0bar	drum_pressure	16	HX_3	tube_bank	0.214789	1.02465	0.00310362	1.62697
drum_pressure_16.0bar	drum_pressure	16	HX_4	reversal_chamber	0.00822348	0.00996559	6.9865e-05	0.0158237
drum_pressure_16.0bar	drum_pressure	16	HX_5	tube_bank	0.0187467	0.213345	0.00269848	0.338755
drum_pressure_16.0bar	drum_pressure	16	HX_6	economiser	0.00014374	0.16025	0.00208493	
excess_air_1.0	excess_air	1	HX_1	single_tube	2.85825	2.96296	0.00245683	4.7049
excess_air_1.0	excess_air	1	HX_2	reversal_chamber	0.120672	0.129639	0.000201041	0.205855
excess_air_1.0	excess_air	1	HX_3	tube_bank	0.206475	0.996418	0.00297116	1.58222
excess_air_1.0	excess_air	1	HX_4	reversal_chamber	0.00751616	0.00921541	6.36471e-05	0.0146332
excess_air_1.0	excess_air	1	HX_5	tube_bank	0.0171948	0.206702	0.00257183	0.328223
excess_air_1.0	excess_air	1	HX_6	economiser	0.000115491	0.132676	0.00207206	
excess_air_1.05	excess_air	1.05	HX_1	single_tube	2.75285	2.86136	0.00241321	4.55016
excess_air_1.05	excess_air	1.05	HX_2	reversal_chamber	0.125021	0.134477	0.000204414	0.213846
excess_air_1.05	excess_air	1.05	HX_3	tube_bank	0.211055	1.0554	0.00305847	1.67831
excess_air_1.05	excess_air	1.05	HX_4	reversal_chamber	0.00788276	0.00971726	6.4361e-05	0.0154525
excess_air_1.05	excess_air	1.05	HX_5	tube_bank	0.0176618	0.223605	0.00264989	0.355579
excess_air_1.05	excess_air	1.05	HX_6	economiser	0.000113941	0.138523	0.00210994	
excess_air_1.1	excess_air	1.1	HX_1	single_tube	2.64826	2.76037	0.00236704	4.39604
excess_air_1.1	excess_air	1.1	HX_2	reversal_chamber	0.128953	0.138888	0.000207384	0.221186

run	param_group	param_value	stage	kind	Q_rad [ MW ]	Q_total [ MW ]	UA [ MW/K ]	steam capacity [ t/h ]
excess_air_1.1	excess_air	1.1	HX_3	tube_bank	0.215009	1.11366	0.00314434	1.77357
excess_air_1.1	excess_air	1.1	HX_4	reversal_chamber	0.00823729	0.0102088	6.50494e-05	0.0162581
excess_air_1.1	excess_air	1.1	HX_5	tube_bank	0.0180926	0.240772	0.00272741	0.383443
excess_air_1.1	excess_air	1.1	HX_6	economiser	0.000112463	0.144343	0.00212783	
excess_air_1.15	excess_air	1.15	HX_1	single_tube	2.54481	2.6603	0.00231882	4.24256
excess_air_1.15	excess_air	1.15	HX_2	reversal_chamber	0.13244	0.142844	0.000209943	0.227802
excess_air_1.15	excess_air	1.15	HX_3	tube_bank	0.218319	1.17098	0.00322872	1.86744
excess_air_1.15	excess_air	1.15	HX_4	reversal_chamber	0.00857824	0.010688	6.57094e-05	0.0170449
excess_air_1.15	excess_air	1.15	HX_5	tube_bank	0.0184866	0.258146	0.00280439	0.411683
excess_air_1.15	excess_air	1.15	HX_6	economiser	0.000111001	0.150088	0.00215362	
excess_air_1.2	excess_air	1.2	HX_1	single_tube	2.44283	2.56149	0.002269	4.09102
excess_air_1.2	excess_air	1.2	HX_2	reversal_chamber	0.135461	0.146322	0.000212086	0.233694
excess_air_1.2	excess_air	1.2	HX_3	tube_bank	0.220974	1.22714	0.00331159	1.95989
excess_air_1.2	excess_air	1.2	HX_4	reversal_chamber	0.00890417	0.0111531	6.63389e-05	0.0178129
excess_air_1.2	excess_air	1.2	HX_5	tube_bank	0.0188434	0.27567	0.0028808	0.440281
excess_air_1.2	excess_air	1.2	HX_6	economiser	0.000109584	0.155821	0.00218204	
excess_air_1.3	excess_air	1.3	HX_1	single_tube	2.24441	2.36874	0.00216617	3.79441
excess_air_1.3	excess_air	1.3	HX_2	reversal_chamber	0.140057	0.151788	0.000215127	0.243145
excess_air_1.3	excess_air	1.3	HX_3	tube_bank	0.224302	1.33522	0.0034727	2.13885
excess_air_1.3	excess_air	1.3	HX_4	reversal_chamber	0.00950566	0.0120335	6.74979e-05	0.0192761
excess_air_1.3	excess_air	1.3	HX_5	tube_bank	0.0194439	0.310946	0.00303187	0.498095
excess_air_1.3	excess_air	1.3	HX_6	economiser	0.000106791	0.16713	0.00222599	
fouling_1	fouling	1	HX_1	single_tube	2.75285	2.86136	0.00241321	4.55016
fouling_1	fouling	1	HX_2	reversal_chamber	0.125021	0.134477	0.000204414	0.213846
fouling_1	fouling	1	HX_3	tube_bank	0.211055	1.0554	0.00305847	1.67831
fouling_1	fouling	1	HX_4	reversal_chamber	0.00788276	0.00971726	6.4361e-05	0.0154525
fouling_1	fouling	1	HX_5	tube_bank	0.0176618	0.223605	0.00264989	0.355579
fouling_1	fouling	1	HX_6	economiser	0.000113941	0.138523	0.00210994	
fouling_5	fouling	5	HX_1	single_tube	2.53503	2.60767	0.00209314	4.16361
fouling_5	fouling	5	HX_2	reversal_chamber	0.155643	0.164223	0.000217179	0.262212
fouling_5	fouling	5	HX_3	tube_bank	0.284737	1.20855	0.0029765	1.92967
fouling_5	fouling	5	HX_4	reversal_chamber	0.0101064	0.0122276	6.64956e-05	0.0195236
fouling_5	fouling	5	HX_5	tube_bank	0.0228383	0.265527	0.00250614	0.423963
fouling_5	fouling	5	HX_6	economiser	0.000135176	0.155489	0.00214491	
fouling_10	fouling	10	HX_1	single_tube	2.15072	2.19638	0.00163031	3.53028
fouling_10	fouling	10	HX_2	reversal_chamber	0.19285	0.199595	0.000218054	0.320813
fouling_10	fouling	10	HX_3	tube_bank	0.436991	1.47307	0.00292481	2.36769
fouling_10	fouling	10	HX_4	reversal_chamber	0.0140095	0.016515	7.02767e-05	0.0265449
fouling_10	fouling	10	HX_5	tube_bank	0.0322866	0.329907	0.00235782	0.530264
fouling_10	fouling	10	HX_6	economiser	0.000173795	0.183074	0.00220028	

run	param_group	param_value	stage	kind	Q_rad [ MW ]	Q_total [ MW ]	UA [ MW/K ]	steam capacity [ t/h ]
fuel_flow_0.025kgs	fuel_flow	0.025	HX_1	single_tube	0.930427	0.950031	0.00107711	1.50507
fuel_flow_0.025kgs	fuel_flow	0.025	HX_2	reversal_chamber	0.0181139	0.019218	7.57187e-05	0.0304459
fuel_flow_0.025kgs	fuel_flow	0.025	HX_3	tube_bank	0.0344185	0.0966233	0.000785414	0.153074
fuel_flow_0.025kgs	fuel_flow	0.025	HX_4	reversal_chamber	0.00182759	0.00202227	4.08752e-05	0.00320376
fuel_flow_0.025kgs	fuel_flow	0.025	HX_5	tube_bank	0.00362845	0.0196342	0.000855928	0.0311053
fuel_flow_0.025kgs	fuel_flow	0.025	HX_6	economiser	5.02806e-05	0.0307484	0.000913267	
fuel_flow_0.05kgs	fuel_flow	0.05	HX_1	single_tube	1.64598	1.6946	0.00164661	2.68988
fuel_flow_0.05kgs	fuel_flow	0.05	HX_2	reversal_chamber	0.0498623	0.0533294	0.000122857	0.0846512
fuel_flow_0.05kgs	fuel_flow	0.05	HX_3	tube_bank	0.0812786	0.349789	0.00165993	0.55523
fuel_flow_0.05kgs	fuel_flow	0.05	HX_4	reversal_chamber	0.00342459	0.00399059	4.84255e-05	0.00633438
fuel_flow_0.05kgs	fuel_flow	0.05	HX_5	tube_bank	0.0072543	0.0641187	0.00153097	0.101777
fuel_flow_0.05kgs	fuel_flow	0.05	HX_6	economiser	7.33845e-05	0.0658702	0.00161394	
fuel_flow_0.075kgs	fuel_flow	0.075	HX_1	single_tube	2.24153	2.32017	0.00207141	3.68646
fuel_flow_0.075kgs	fuel_flow	0.075	HX_2	reversal_chamber	0.0863551	0.0926849	0.00016541	0.147265
fuel_flow_0.075kgs	fuel_flow	0.075	HX_3	tube_bank	0.142551	0.67714	0.00238186	1.07589
fuel_flow_0.075kgs	fuel_flow	0.075	HX_4	reversal_chamber	0.00556097	0.00669454	5.65373e-05	0.0106368
fuel_flow_0.075kgs	fuel_flow	0.075	HX_5	tube_bank	0.0121862	0.134561	0.00211278	0.213802
fuel_flow_0.075kgs	fuel_flow	0.075	HX_6	economiser	9.41638e-05	0.101598	0.00189444	
fuel_flow_0.1kgs	fuel_flow	0.1	HX_1	single_tube	2.75285	2.86136	0.00241321	4.55016
fuel_flow_0.1kgs	fuel_flow	0.1	HX_2	reversal_chamber	0.125021	0.134477	0.000204414	0.213846
fuel_flow_0.1kgs	fuel_flow	0.1	HX_3	tube_bank	0.211055	1.0554	0.00305847	1.67831
fuel_flow_0.1kgs	fuel_flow	0.1	HX_4	reversal_chamber	0.00788276	0.00971726	6.4361e-05	0.0154525
fuel_flow_0.1kgs	fuel_flow	0.1	HX_5	tube_bank	0.0176618	0.223605	0.00264989	0.355579
fuel_flow_0.1kgs	fuel_flow	0.1	HX_6	economiser	0.000113941	0.138523	0.00210994	
fuel_flow_0.125kgs	fuel_flow	0.125	HX_1	single_tube	3.20007	3.33794	0.00269907	5.31255
fuel_flow_0.125kgs	fuel_flow	0.125	HX_2	reversal_chamber	0.164529	0.177259	0.000240464	0.28212
fuel_flow_0.125kgs	fuel_flow	0.125	HX_3	tube_bank	0.284575	1.47014	0.00370361	2.33983
fuel_flow_0.125kgs	fuel_flow	0.125	HX_4	reversal_chamber	0.0103476	0.0129923	7.19357e-05	0.0206781
fuel_flow_0.125kgs	fuel_flow	0.125	HX_5	tube_bank	0.023569	0.328038	0.00315911	0.522095
fuel_flow_0.125kgs	fuel_flow	0.125	HX_6	economiser	0.000132789	0.176839	0.00228218	