

APPENDIX C

Input to Flowsheet Simulation

This appendix contains the input that was entered for alkylation model in the Flowsheet Simulation program. The tables here list units, streams, measured variables, unmeasured variables, plant parameters and enthalpy coefficients.

Naming Convention

The alkylation process model developed in this study is made up of a large number of variables and quantities. So, a naming convention was adopted that was designed to be as intuitive as possible. The names of data (variables, parameters etc.) in the alkylation model are a set of upper and lower case letters. The first group of upper-case letters and numbers represent the unit or stream to which the variables belong. For example, a variable named FHC32 belongs the stream named HC32. The next group of letters represents the physical quantity it represents. For example, 'F' represents flow rate, 'x' represents mass fraction, 'xx' represents mole fraction, etc. The number at the end of the name, if any, represents the component. So, the name x2HC32 stands for the mass fraction of component 2 in the stream HC32.

Units

The units for physical quantities were chosen based on the units in which they were available, and the units that would make the numbers easier to tackle. To this end, consistency was maintained as much as possible. The units of most variables are listed in the following table.

Quantity	Units
Mass Flow Rate	metric ton/min
Mass Fraction	metric ton/metric ton
Mole Fraction	mole/mole
Volumetric Flow Rate	m ³ /min
Concentration	mole/m ³
Temperature	Degree Kelvin
Enthalpy	MJ/min
Space Velocity	1/min
Pressure	kPa
Heat Transfer Coefficient	MJ/(m ² .K.min)

Appendix C.1: List of process units

Name	Description
5C-631	Settler I
5C-632	Acid Settler II
5C-633	Acid Settler III
5C-634	Settler IV
C-601	Saturate Deisobutanizer
C-603	Depropanizer
C-606A	Alkylate Deisobutanizer-A
C-606C	Alkylate Deisobutanizer-C
C-606D	Alkylate Deisobutanizer-D
C-607	Isobutane Accumulator Pot
C-614A	Suction Trap
C-614B	Flash Drum
C-615	Refrigerant Accumulator
C-616	Economizer Drum
C-623	Reactor I
C-625	Stratco Reactor Set II
C-627	Stratco Reactor III
C-629	Stratco Reactor IV
E-601	Saturate Deisobutanizer Feed Bottoms Exchanger
E-602	Saturate Depropanizer Reboiler
E-603	n-Butane Cooler
E-605	Saturate Deisobutanizer Overhead Condenser
E-609A	Isobutane Cooler
E-610-53	Depropanizer Feed Bottom Exchanger
E-611	Depropanizer Bottoms Cooler
E-612	Depropanizer Reboiler
E-613	Depropanizer Overhead Condenser
E-616	Alkylate Deisobutanizer Feed Bottoms Exchanger
E-617-20	Alkylate Cooler
E-621-24	Alky Deisobutanizer Overhead Condenser
E-626	Isobutane Cooler
E-627,647	n-Butane Condenser and Cooler
E-628	Olefin Feed Effluent Exchanger
E-629,30	Isobutane Feed Effluent Exchanger
E-633	Isobutane chiller
E-634-56	Refrigerant Partial Condenser
E-640	Economizer Feed Cooler
E-641-44	Depropanizer Charge Condenser
E-695	Alky Deisobutanizer Reboiler
E-696	Alky Deisobutanizer Side Reboiler
E-6XX	Contacto Heat Exchangers
K-601	Refrigerant Compressor
M-1	Mixer
M-11	Mixer for the Acid

M-13	Mixer
M-15	Mixer
M-17	Mixer
M-2	Mixer
M-24	Mixer
M-25	Mixer
M-28	Mixer
M-29	Mixer
M-3	Mixer
M-30	Mixer
M-31	Mixer
M-32	Mixer
M-34	Mixer
M-36	Mixer
M-4	Mixer
M-7	Mixer
S-11	Splitter
S-19	Splitter
S-2	Splitter
S-23	Splitter
S-27	Splitter
S-33	Splitter
S-34	Splitter
S-37	Splitter
S-38	Splitter
S-39	Splitter
S-40	Splitter
S-41	Splitter
S-42	Splitter
S-5	Splitter
S-7	Splitter
SC-35	Splitter

Appendix C.2: List of process streams

Name ¹	Description	SourceUn	DestUnit
AC02	Acid Make-up		M-7
AC05	Return From Settler I	5C-631	M-7
AC07	Acid Recycle to the Reactor I	M-7	C-623
AC09	Products from Reactor I	C-623	5C-631
AC12	Acid to the Reactor II	5C-631	M-11
AC15	Return From Settler II	5C-632	M-11
AC18	Acid Recycle to the Reactor II	M-11	C-625
AC20	Products from Reactor II	C-625	5C-632
AC23	Acid to the Reactor III	5C-632	M-13
AC26	Return From Settler III	5C-633	M-13
AC29	Acid Recycle to the Reactor	M-13	C-627
AC31	Products from Reactor III	C-627	5C-633
AC34	Acid to the Reactor IV	5C-633	M-17
AC37	Return From Settler IV	5C-634	M-17
AC40	Acid Recycle to the Reactor	M-17	C-629
AC42	Products from Reactor IV	C-629	5C-634
AC45	Spent Acid	5C-634	
C301	Vapor from Suction Trap	C-614A	M-25
C302	Vapor from Flash Drum	C-614B	M-25
C303	Combined Vapor Stream to Refrigeration Section	M-25	K-601
C306	Compressor Discharge	K-601	E-634-56
C307	Compressor Discharge (after E-634-56)	E-634-56	C-615
C308	Liquid from Refrigerant Accumulator	C-615	E-640
C309	Feed to Economizer Drum	E-640	C-616
C310	Vapor from Economizer Drum	C-616	K-601
C311	Liquid from Economizer Drum	C-616	C-614A
C312	Vapor from Refrigerant Accumulator	C-615	E-641-44
C315	Feed to Depropanizer	E-641-44	E-610-53
C316	Depropanizer Charge	E-610-53	C-603
C317	Depropanizer Bottoms	C-603	E-610-53
C318	Depropanizer Bottoms (after E-610-53)	E-610-53	E-611
C319	Depropanizer Bottoms (after E-611)	E-611	S-34
C320	Depropanizer Bottoms to Storage	S-34	
C321	Depropanizer Bottoms to Reaction Zone	S34	M24

¹ Stream names starting with 'AC' represent acid streams and those starting with 'HC' represent hydrocarbon streams in reaction zone; Names starting with 'C3' represent streams in depropanizer zone, and those starting with 'C4' represent streams in deisobutanizer zone. Prefix 'SC' represent the streams in the saturate deisobutanizer zone.

C322	Depropanizer Bottoms to Deisobutanizer Reflux	S34	C-06
C323	Depropanizer Reboiler Inlet	C-03	E-12
C324	Depropanizer Reboiler Outlet	E-12	C-03
C325	Depropanizer Overhead	C-03	E-13
C326	Depropanizer Condenser Outlet	E-13	C-04
C328	To Fuel Gas Storage	S-33	
C329	Depropanizer Reflux	S-33	C-603
C401	Liquid from Suction Trap	C-614A	E-628
C402	Liquid from Suction Trap (after E-628)	E-628	E-629,30
C403	Deisobutanizer Feed	E-29	E-16
C404	Deisobutanizer Charge	E-16	M33
C405	Deisobutanizer Bottoms	C-06D	E-16
C406	Deisobutanizer Bottoms (after E-616)	E-616	E-617-20
C407	To Alkylate Storage	E-617-20	
C408	Deisobutanizer Reboiler Inlet	C-606D	E-695
C409	Deisobutanizer Reboiler Outlet	E-695	C-606D
C410	Deisobutanizer Side Reboiler Inlet	S-42	E-696
C411	Deisobutanizer Side Reboiler Outlet	E-696	M-34
C412	Deisobutanizer Side Stream	S-41	E-627,647
C413	To N-butane Storage	E-627,647	
C414	Deisobutanizer Overhead	C-606A	E-621-24
C415	Deisobutanizer Overhead Condenser Outlet	E-621-24	C-607
C417	Isobutane Recycle	M-36	C-607
C418	Combined Isobutane Recycle	C-607	E-626
C419	Combined Isobutane Recycle (after E-626)	E-626	M-24
C425	Liquid Flow from C-606C	C-606C	S-42
C426	Liquid Flow from C-606C less Side Reboiler Inlet	S-42	C-606D
C427	Vapor Flow from C-606D less Side Reboiler Outlet	M-34	C-606C
C428	Vapor Flow from C-606D	C-606D	M-34
C430	Liquid Flow from C-606A to C-606C	C-606A	C-606C
C431	Vapor Flow from C-606C	C-606C	S-41
C432	Vapor Flow from C-606C less Side Stream	S-41	C-606A
HC01	Olefin Feed		E-628
HC02	Olefins (after E-628)	E-628	M-1
HC03	Recycle Isobutane	M-24	E-629,30
HC04	Recycle Isobutane (after E-629,30)	E-629,30	E-633
HC05	Recycle Isobutane (after E-633)	E-633	M-1
HC06	Olefin and Isobutane	M-1	S-5

HC07	Feed to Reactor I	S-5	C-623
HC08	Feed to Reactors II, III, IV	S-5	S-7
HC11	Feed to Reactor II	S-7	C-625
HC14	Feed to Reactor III	S-11	C-627
HC15	Feed to Reactors III, IV	S-7	S-11
HC16	Feed to Reactor IV	S-11	C-629
HC22	Hydrocarbon Stream from Acid Settler IV	5C-634	M-15
HC23	Hydrocarbon Stream from Acid Settler III	5C-633	M-15
HC24	Hydrocarbon Stream from Acid Settlers III and IV	M-15	M-4
HC25	Hydrocarbon Stream from Acid Settler II	5C-632	M-4
HC26	Hydrocarbon Stream from Acid Settlers II, III and IV	M-4	M-3
HC27	Hydrocarbon Stream from Acid Settler I	5C-631	M-3
HC28	Hydrocarbon Stream from Acid Settlers I, II, III and IV	M-3	S-2
HC29	Hydrocarbon Stream to Feed/Effluent Exchangers	S-2	E-633
HC30	Hydrocarbon Stream (after E-633)	E-633	M-2
HC31	Hydrocarbon Stream to STFD	M-2	C-614A
HC32	Recycle flow from STFD	C-614B	S-19
HC33	Refrigerant Recycle to Reactors I and II	S-19	S-23
HC34	Refrigerant Recycle to Reactor I	S-23	C-623
HC38	Refrigerant Recycle to Reactor II	S-23	C-625
HC40	Refrigerant Recycle to Reactors III and IV	S-19	S-27
HC41	Refrigerant Recycle to Reactor III	S-19	C-627
HC45	Refrigerant Recycle to Reactor IV	S-19	C-629
R1	Effluent Refrigerant into Reactor tubes	S-2	E-6XX
R29	Effluent Refrigerant from Reactor tubes	E-6XX	M-2
SC401	Saturate from Storage		E-601
SC402	Saturate Charge	E-601	C-601
SC403	SatDIB Bottoms	C-601	E-601
SC404	SatDIB Bottoms (after E-601)	E-601	E-603
SC405	To N-butane Storage	E-603	
SC406	SatDIB Reboiler Inlet	C-601	E-602
SC407	SatDIB Reboiler Outlet	E-602	C-601
SC408	SatDIB Overhead	C-601	E-605
SC409	SatDIB Condenser Outlet	E-605	SC-35
SC411	SatDIB Reflux	SC-35	C-601

SC412	Distillate Isobutane	SC-35	E-609A
SC413	Isobutane Product	E-609A	M-36
SC414	Make-up Isobutane		M-36

Appendix C.3: Measured values (initial points)

Variable Name	Initial Point	Lower Bound	Upper Bound
FAC02	0.155	0.09	0.16
FAC12	0.155	0.01	0.9
FAC23	0.155	0.01	0.9
FAC34	0.155	0.01	0.9
FAC45	0.155	0.01	0.9
FC308	3.196	1	6
FC316	1.7	0.1	1.8
FC320	0.043	0.01	1.5
FC322	1.5	0.1	1.6
FC328	0.047	0.01	1
FC329	0.665	0.1	3
FC403	2.302	0.1	5
FC407	0.911	0.75	5
FC412	0.042	0.01	1
FC417	0.139	0.1	2
FHC01	0.87	0.795	1.5
FHC32	1.943	0.5	5
FSC402	0.484	0.1	4
FSC405	0.344	0	3
FSC411	1.273	0.1	3.2
FSC413	0.139	0.1	0.5
FstmE612	0.142	0.1	1
PC302	101.847	101	187
PC310	261.214	230	360
PC601	625	600	625
PC603	1703.728	1600	1800
QHC07	1.739	0.1	5
QHC11	1.743	0.1	5
QHC14	1.739	0.1	5
QHC16	1.739	0.1	5
QHC34	1.079	0.1	5
QHC38	0.581	0.1	5
QHC41	0.857	0.1	5
QHC45	0.862	0.1	5
TAC09	280.004	280	300
TAC12	280.004	280	300
TAC23	280	280	300
TAC31	280.105	280	300
TAC34	280.105	280	300
TAC42	281.963	280	300
TAC45	281.963	280	300
TC303	280.411	260	300
TC306	349.007	320	368

TC307	328.661	300	330
TC308	328.661	270	350
TC315	308.238	300	320
TC316	345.659	335	370
TC317	359	300	420
TC321	301.113	250	350
TC324	359	359	385
TC325	322.937	300	360
TC404	305	305	325
TC405	410	410	440
TC407	302.95	298	350
TC408	405	405	440
TC410	363.414	345	369
TC414	336.829	300	368
TC418	305.918	301	350
TC419	303.525	298	310
THC32	259.254	250	310
TSC402	324.98	310	340
TSC403	336.03	320	350
TSC405	301.256	300	360
TSC408	318.852	300	330
TSC413	300	295	350
x11AC12	0.971	0.88	0.999
x11AC23	0.944	0.88	0.999
x11AC34	0.917	0.88	0.999
x11AC45	0.89	0.88	0.999
x1C316	0.119	0.01	0.5
x1C325	1	0.5	1
x1C417	0.02	0.02	0.2
x1HC32	0.023	0	0.1
x1SC402	0.006	0	0.1
x1SC403	0.0000081	0	0.1
x1SC408	0.02	0	0.1
x2SC402	0.009	0	0.1
x2SC403	0.012	0	0.1
x2SC408	0.00031	0	0.1
x3C316	0.79	0.5	1
x3C325	0.00000166	0	0.1
x3C417	0.967	0.35	1
x3HC32	0.774	0.1	1
x3SC402	0.293	0.2	0.42
x3SC403	0.021	0	0.1
x3SC408	0.967	0.5	1
x4C316	0.08	0.001	0.2
x4C417	0.013	0.001	0.4
x4HC32	0.127	0	0.5
x4SC402	0.562	0.48	0.7

x4SC403	0.784	0.5	1
x4SC408	0.013	0	0.1
x5C316	0.006	0	0.01
x5C417	0	0	0.15
x5HC32	0.03	0	2.5
x5SC402	0.052	0	0.1
x5SC403	0.073	0	0.1
x5SC408	0	0	0.1
x6SC402	0.071	0	0.1
x6SC403	0.1	0	0.12
x6SC408	0	0	0.1
x7HC32	0.046	0	2
x7SC402	0.007	0	0.1
x7SC403	0.01	0	0.1
x7SC408	0	0	0.1
xx1C322	0.12	0	0.12
xx1C414	0.079	0	0.08
xx1HC01	0.09	0	0.5
xx2HC01	0.13	0.1	0.6
xx3C317	0.792	0.5	1
xx3C322	0.792	0.5	1
xx3C407	0.00000975	0	0.1
xx3C412	0.000875	0	0.15
xx3C414	0.818	0.5	1
xx3HC01	0.013	0	0.55
xx4C317	0.08	0	0.2
xx4C322	0.08	0	0.2
xx4C407	0.083	0.01	0.3
xx4C412	0.867	0.5	1
xx4C414	0.094	0	0.2
xx4HC01	0.107	0	0.3
xx5C407	0.158	0.01	0.5
xx5C412	0.061	0	0.1
xx5C414	0.001	0	0.1
xx7C414	0.008	0	0.008

Appendix C.4: Unmeasured variables (initial points)

Unmeasured	Initial Point	Lower Bound	Upper Bound
C10pC623	0.0000338	0	0.5
C10pC625	0.0000735	0	0.5
C10pC627	0.000214	0	0.5
C10pC629	0.000152	0	0.5
C2C623	0.015	0	0.1
C2C625	0.015	0	0.1
C2C627	0.015	0	0.1
C2C629	0.015	0	0.1
C3C623	3.85	0	6
C3C625	2.584	0	6
C3C627	1.5	0	6
C3C629	1.801	0	6
C3pC623	1.173	0	10
C3pC625	1.198	0	10
C3pC627	1.215	0	10
C3pC629	1.19	0	10
C4pC623	0.027	0	1
C4pC625	0.041	0	1
C4pC627	0.071	0	1
C4pC629	0.058	0	1
C5pC623	0.000408	0	0.1
C5pC625	0.00091	0	0.1
C5pC627	0.003	0	0.1
C5pC629	0.002	0	0.1
C7pC623	0.0000378	0	0.1
C7pC625	0.000179	0	0.1
C7pC627	0.001	0	0.1
C7pC629	0.000743	0	0.1
C8pC623	0.001	0	0.1
C8pC625	0.003	0	0.1
C8pC627	0.01	0	0.1
C8pC629	0.007	0	0.1
C9pC623	0.419	0	10
C9pC625	0.625	0	10
C9pC627	1.074	0	10
C9pC629	0.895	0	10
CHXC623	13.606	2.5	15
CHXC625	14.201	2.5	15
CHXC627	14.702	2.5	15
CHXC629	14.035	2.5	15
CiC10pC623	0	0	1
CiC10pC625	0	0	1
CiC10pC627	0	0	1

CiC10pC629	0	0	1
CiC11pC623	0.0000132	0	0.1
CiC11pC625	0.000042	0	0.1
CiC11pC627	0.000202	0	0.1
CiC11pC629	0.000121	0	0.1
CiC4eC623	0.003	0	0.1
CiC4eC625	0.003	0	0.1
CiC4eC627	0.003	0	0.1
CiC4eC629	0.003	0	0.1
CiC5eC623	0.000594	0	0.1
CiC5eC625	0.00085	0	0.1
CiC5eC627	0.001	0	0.1
CiC5eC629	0.001	0	0.1
CiC8eC623	0.018	0	0.3
CiC8eC625	0.026	0	0.3
CiC8eC627	0.044	0	0.3
CiC8eC629	0.037	0	0.3
Cost	148.943	-10000	10000
dTE601	10.516	5	50
dTE602	78.57	5	90
dTE603	10.825	5	50
dTE605	22.741	5	50
dTE609A	10	5	20
dTE610	13.533	5	50
dTE611	16.018	5	50
dTE612	55.6	10	90
dTE613	25	4	25
dTE616	98.994	10	120
dTE617	33.53	5	50
dTE621A	28.414	5	50
dTE621B	25.722	5	40
dTE626	11.674	5	50
dTE627A	55	5	55
dTE627B	31.592	5	50
dTE628	10.806	5	60
dTE629	16.246	5	80
dTE633	11.452	5	50
dTE634	19.324	5	20
dTE640	25.062	5	50
dTE641	16.152	5	50
dTE695A	76	5	90
dTE695B	48	5	60
dTE696A	51.186	10	90
dTE696B	30.593	10	90
dTE6XX	1	1	50
Earnings	176.97	-10000	10000
f1C601	0.001	0	0.1

f1C603	0.765	0	1
f1C606A	0.001	0	1
f2C601	0.99	0.5	1
f3C601	0.05	0.05	1
f3C603	1	0	1
f3C606A	0.000997	0	1
f4C601	0.994	0.95	1
f4C603	1	0	1
f4C606A	0.898	0	1
f5C601	1	0.5	1
f5C603	1	0.5	1
f5C606A	0.989	0.5	1
f6C601	1	0.5	1
f7C601	1	0.5	1
f7C603	1	0.5	1
f7C606A	0.999	0.5	1
FAC05	6.653	0.1	20
FAC07	6.808	0.1	20
FAC09	8.428	0.01	20
FAC15	8.574	0.1	20
FAC18	8.729	0.1	20
FAC20	10.065	0.01	20
FAC26	18.057	0.1	20
FAC29	18.212	0.1	20
FAC31	19.705	0.01	20
FAC37	14.803	0.1	20
FAC40	14.958	0.1	20
FAC42	16.454	0.01	20
FC301	3.643	1	6
FC302	0.428	0.1	5
FC303	4.071	2	6
FC306	4.896	0.1	15
FC307	4.896	0.0001	15
FC309	3.196	0.0001	10
FC310	0.825	0.0001	3
FC311	2.371	0	8
FC312	1.7	0.0001	5
FC315	1.7	0.0001	5
FC317	1.653	0.1	3
FC318	1.653	0.0001	3
FC319	1.653	0.0001	3
FC321	0.11	0	5
FC323	0.712	0.5	3
FC324	0.712	0.5	3
FC325	0.712	0.5	3
FC326	0.712	0.01	3
FC401	2.302	0.1	5

FC402	2.302	0.1	5
FC404	2.302	0	5
FC405	0.911	0.1	2
FC406	0.911	0	5
FC408	3.271	0	10
FC409	3.271	0	10
FC410	0.833	0.1	10
FC411	0.833	0	10
FC413	0.042	0	1
FC414	2.883	0.1	5
FC415	2.883	0	10
FC418	3.023	0.1	5
FC419	3.023	0.0001	10
FC425	3.767	1	10
FC426	2.934	0	5
FC427	2.856	0	10
FC428	2.023	0	5
FC430	3.767	1	10
FC431	2.856	0	10
FC432	2.814	1	5
FcwE603	0.199	0.1	20
FcwE605	0.949	0.1	15
FcwE609A	0.083	0.01	1
FcwE611	2.139	0.1	20
FcwE613	1.618	0.1	15
FcwE617	1.551	1	25
FcwE621A	5.225	0.1	10
FcwE621B	6.898	0.1	20
FcwE626	0.724	0.1	20
FcwE627A	0.55	0.1	10
FcwE627B	0.536	0.1	30
FcwE634	7.241	4	60
FcwE640	0.4	0.4	50
FcwE641A	4.111	0.1	30
FcwE641B	0.881	0.1	10
FHC02	0.87	0.01	5
FHC03	3.132	1	10
FHC04	3.132	1	10
FHC05	3.132	1	10
FHC06	4.002	1	12
FHC07	1	1	5
FHC08	3.002	1	5
FHC11	1.002	1	5
FHC14	1	1	5
FHC15	2	1	5
FHC16	1	1	5
FHC22	1.496	1	6

FHC23	1.493	1	6
FHC24	2.989	1	6
FHC25	1.336	1	6
FHC26	4.325	1	6
FHC27	1.62	1	10
FHC28	5.945	1	12
FHC29	0.679	0	12
FHC30	0.679	0	12
FHC31	5.945	0	12
FHC33	0.954	0	1
FHC34	0.62	0	1
FHC38	0.334	0	1
FHC40	0.989	0	1
FHC41	0.493	0	1
FHC45	0.496	0	1
FIHC28	3.019	1	10
FIHC29	0.345	0	12
FIHC30	0.198	0	12
FIHC31	2.302	0	12
FIR1	2.675	0	10
FIR29	2.105	0	12
FmC302	0.007	0	0.1
FmC308	0.055	0.0001	0.5
FmC310	0.015	0	0.8
FmC311	0.04	0	0.5
FmC312	0.03	0	0.1
FmC317	0.029	0.001	0.1
FmC322	0.027	0	1
FmC323	0.013	0	0.4
FmC325	0.016	0.01	1
FmC405	0.011	0	0.1
FmC407	0.011	0	0.1
FmC408	0.04	0	2
FmC409	0.04	0	0.2
FmC412	0.000684	0	0.1
FmC414	0.05	0.0001	0.1
FmC425	0.056	0	2
FmC427	0.045	0	0.2
FmC428	0.032	0	0.1
FmC430	0.058	0	0.2
FmC431	0.047	0	1
FmC432	0.046	0	0.1
FmHC01	0.012	0	0.1
FmHC32	0.033	0	0.1
FmIHC28	0.047	0.01	0.2
FmIHC29	0.005	0	0.1
FmIHC30	0.003	0	0.1

FmIR1	0.042	0	0.2
FmIR29	0.032	0	0.1
FmSC403	0.006	0.001	0.1
FmSC406	0.023	0	0.1
FmSC408	0.024	0	1
FmvHC28	0.051	0	0.2
FmvHC29	0.006	0	0.1
FmvHC30	0.008	0	0.1
FmvR1	0.045	0	0.2
FmvR29	0.055	0	0.1
FR1	5.266	0	12
FR29	5.266	0	12
FSC401	0.484	0.1	5
FSC403	0.344	0.1	3
FSC404	0.344	0.1	3
FSC406	1.412	0	3
FSC407	1.412	0	3
FSC408	1.412	0.05	3.2
FSC409	1.412	0.05	3.2
FSC412	0.139	0.102	1
FSC414	0	0	0.5
FstmE602	0.401	0.234	1
FstmE695A	0.409	0	10
FstmE695B	0.1	0.1	10
FstmE696A	0.111	0.01	10
FstmE696B	0.019	0.01	10
FvHC28	2.926	0	8
FvHC29	0.334	0	12
FvHC30	0.481	0	12
FvHC31	3.643	0	12
FvR1	2.592	0	12
FvR29	3.162	0	12
h1C601	1.083	0.8	2
h1C603	-0.308	-3	1
h1C606A	0.988	0	10
h2C601	0.551	0.395	5
h3C601	3.047	0.5	6
h3C603	0.237	0	1
h3C606A	-65	-65	-35
h4C601	0.576	0.45	2
h4C603	0.303	0	1
h4C606A	0	-10	1
h5C601	0.893	0.5	1.5
h5C603	0.4	0	1.5
h5C606A	0.484	-5	2
h6C601	0.919	0.5	3
h7C601	0.963	0.5	1.5

h7C603	0.466	0	1.5
h7C606A	0.548	0	1
hAC02	9.363	0	10000
hAC05	345.67	10	10000
hAC07	355.032	10	10000
hAC09	1238.893	10	10000
hAC12	8.054	0	10000
hAC15	381.455	10	10000
hAC18	389.509	10	10000
hAC20	1095.317	10	10000
hAC23	6.896	0	10000
hAC26	712.123	10	10000
hAC29	719.019	10	10000
hAC31	1498.7	10	10000
hAC34	6.108	0	10000
hAC37	550.6	10	10000
hAC40	556.708	10	10000
hAC42	1479.085	10	10000
hacAC09	400.225	10	10000
hacAC20	404.239	10	10000
hacAC31	725.831	10	10000
hacAC42	698.262	10	10000
hC301	3202.309	10	10000
hC302	362.16	0	5000
hC303	3564.469	0.0001	10000
hC306	4694.871	0.0001	10000
hC307	3144.814	0.0001	10000
hC308	2047.223	0.0001	10000
hC309	2011.834	0.0001	10000
hC310	732.158	0.0001	5000
hC311	1279.676	0.001	10000
hC312	1592.117	0.0001	10000
hC312liq	1097.591	0	10000
hC315	1007.31	0.0001	10000
hC316	1177.087	0.0001	10000
hC317	1206.034	0.0001	10000
hC318	1036.258	0.0001	10000
hC319	948.614	0.0001	10000
hC321	63.005	0	5000
hC322	861.064	0.0001	5000
hC323	519.83	0	10000
hC324	824.202	0.0001	10000
hC325	576.997	0.0001	10000
hC326	469.229	0.0001	5000
hC329	437.948	0.0001	5000
hC401	1191.06	0	5000
hC402	1195.852	10	10000

hC403	1256.207	0.0001	10000
hC404	1308.674	0.0001	10000
hC405	732.132	0.0001	5000
hC406	679.665	0.0001	5000
hC407	494.768	0.0001	5000
hC408	2583.757	0.0001	10000
hC408vap	3369.113	10	10000
hC409	3561.113	0.0001	10000
hC410	589.132	0.0001	10000
hC410vap	826.439	10	10000
hC411	866.516	10	10000
hC412	41.665	0.0001	5000
hC412liq	30.115	1	1000
hC413	23.373	0.0001	5000
hC414	2726.349	0.0001	10000
hC414liq	1918.758	10	10000
hC415	1687.138	0.0001	5000
hC417	79.433	0.0001	5000
hC418	1766.572	0.0001	10000
hC419	1748.594	0.0001	10000
hC425	2663.701	10	10000
hC426	2074.569	10	5000
hC427	2889.353	0	10000
hC428	2022.838	10	10000
hC430	2637.618	10	10000
hC431	2855.907	10	10000
hC432	2814.242	10	10000
hC623	54.051	10	5000
hC625	10	10	5000
hC627	10	10	5000
hC629	151.308	10	5000
hHC01	454.527	0	5000
hHC02	449.735	0	5000
hHC03	1811.6	1	10000
hHC04	1751.245	10	10000
hHC05	1699.117	10	10000
hHC06	2148.851	10	10000
hHC07	536.914	10	5000
hHC11	538.109	10	5000
hHC14	536.914	10	5000
hHC16	536.914	10	5000
hHC29	469.914	20	10000
hHC30	522.042	20	10000
hHC31	4393.369	100	10000
hHC32	917.516	0	5000
hHC34	292.895	0	5000
hHC38	157.699	0	5000

hHC41	232.767	0	5000
hHC45	234.155	0	5000
hIHC29	177.154	0	10000
hIHC30	100.685	0	10000
hIHC31	1191.06	20	10000
hIR1	1374.506	0	10000
hIR29	1077.84	10	10000
hR1	3645.969	0	10000
hR29	3871.327	20	10000
hSC401	298.275	10	10000
hSC402	301.683	10	10000
hSC403	223.217	10	10000
hSC404	219.81	10	10000
hSC405	193.288	10	10000
hSC406	915.321	0.1	10000
hSC407	1775.662	10	10000
hSC408	921.092	10	10000
hSC409	872.425	10	5000
hSC411	786.391	10	5000
hSC412	86.033	10	10000
hSC413	79.433	10	10000
hSC414	0	0	500
hvHC29	292.759	10	10000
hvHC30	421.357	10	10000
hvHC31	3202.309	20	10000
hvR1	2271.462	0	10000
hvR29	2793.488	10	10000
K1C323	2.018	1	3
K1C325	1	0.5	2
K1C408	7.956	1	15
K1C414	2.523	1	4
K1C428	4.259	0	10
K1C430	3.799	1	6
K1C601	2.666	1.5	3
K1C603	1.267	1	3
K1C606A	1.812	1	3
K1C606C	4.173	1	7
K1C614B	2.98	2	3.5
K1C615_A	2.404	0.5	4
K1C616_A	2.852	0.5	5
K1E633	4.427	1	5.5
K1E6XX	3.982	1	5.5
K1SC406	3.576	2	5
K1SC408	2.493	1.5	3.5
K2C601	0.784	0.5	1
K2E633	1.253	0.2	1.5
K2E6XX	1.127	0.2	1.5

K2SC406	1.122	0.5	1.2
K2SC408	0.723	0.5	1
K3C323	0.887	0.5	1.5
K3C325	0.401	0.01	1.5
K3C408	3.836	1	6
K3C414	1.052	0.5	3
K3C428	1.897	0	5
K3C430	1.668	1	5
K3C601	1.067	0.5	2
K3C603	0.525	0.5	1
K3C606A	0.723	0.5	3
K3C606C	1.851	1	5
K3C614B	0.93	0.6	1.5
K3C615_A	0.981	0.1	2
K3C616_A	1.021	0.1	2
K3E633	1.492	0.3	2
K3E6XX	1.342	0.3	3
K3SC406	1.488	1	2
K3SC408	0.989	0.7	1.5
K4C323	0.673	0.5	1
K4C325	0.29	0.03	1
K4C408	3.023	1	5
K4C414	0.776	0.5	2
K4C428	1.45	0	5
K4C430	1.266	0.5	3
K4C601	0.769	0.2	1
K4C603	0.386	0.1	1
K4C606A	0.52	0.1	3
K4C606C	1.413	1	4
K4C614B	0.58	0.5	1
K4C615_A	0.708	0.05	1.5
K4C616_A	0.686	0.05	1.5
K4E633	0.978	0.2	1.5
K4E6XX	0.88	0.2	1.5
K4SC406	1.096	0.8	1.5
K4SC408	0.709	0.5	1
K5C323	0.308	0.1	0.6
K5C325	0.12	0.1	0.6
K5C408	1.509	0.5	3
K5C414	0.335	0.1	2
K5C428	0.673	0	2
K5C430	0.579	0.2	1.5
K5C601	0.317	0.1	0.5
K5C603	0.165	0.01	0.5
K5C606A	0.213	0.1	1
K5C606C	0.653	0.1	1.2
K5C614B	0.162	0.05	0.8

K5C615_A	0.272	0.002	1
K5C616_A	0.225	0.002	1
K5E633	0.334	0.05	1
K5E6XX	0.301	0.05	1
K5SC406	0.472	0.1	0.6
K5SC408	0.289	0.2	0.6
K6C601	0.247	0.1	1
K6SC406	0.375	0	0.5
K6SC408	0.224	0.1	0.5
K7C323	0.12	0.1	0.3
K7C325	0.04	0.001	0.2
K7C408	0.674	0.1	1
K7C414	0.12	0.05	1
K7C428	0.268	0	2
K7C430	0.226	0	1
K7C601	0.105	0.01	0.5
K7C603	0.058	0.01	0.5
K7C606A	0.071	0.05	0.5
K7C614B	0.039	0.001	0.1
K7C615_A	0.103	0.001	1
K7C616_A	0.068	0.011	1
K7E633	0.081	0.01	0.1
K7E6XX	0.073	0.01	0.1
K7SC406	0.168	0.1	0.3
K7SC408	0.095	0.05	0.2
Kp1C601	3.197	1	5
Kp1C603	1.79	1	3
Kp1C606A	2.282	1	5
Kp1C606D	6.131	1	12
Kp2C601	0.979	0.5	1.5
Kp3C601	1.311	1	2
Kp3C603	0.775	0.5	1.5
Kp3C606A	0.939	0.5	3
Kp3C606D	2.859	1	5
Kp4C601	0.958	0.5	1.5
Kp4C603	0.584	0.2	1
Kp4C606A	0.688	0.1	3
Kp4C606D	2.23	1	5
Kp5C601	0.406	0.1	1
Kp5C603	0.263	0.1	0.5
Kp5C606A	0.292	0.1	1
Kp5C606D	1.082	1	5
Kp6C601	0.32	0.1	1
Kp7C601	0.141	0.01	1
Kp7C603	0.1	0.01	0.3
Kp7C606A	0.102	0.05	0.5
Kp7C606D	0.462	0.1	5

kWad1	171.048	50	300
kWad2	288.952	105	355
LpC601	1.757	1	5
LpC603	2.365	1	10
LpC606A	2.651	0.5	5
PC303	101	101	140
PC306	870	650	900
PC307	800	600	850
PC308	800	600	800
PC309	780	580	780
PC311	261.214	260	400
PC312	800	600	850
PHC30	121.513	101	140
PHC32	101.847	101	200
PR29	135.084	101	140
Profit	20	10	10000
Q2HC07	0.035	0	1
Q2HC11	0.035	0	1
Q2HC14	0.035	0	1
Q2HC16	0.035	0	1
qFp1C606A	0.007	0	1
qFp3C606A	0.00098	0	0.1
qFp4C606A	0.865	0	1
qFp5C606A	0.6	0	1
qFp7C606A	0.278	0	1
qS1C606A	0.796	0	1
qS3C606A	0.509	0	1
qS4C606A	0.046	0	0.5
qS5C606A	0.027	0	0.55
qS7C606A	0.008	0	0.16
r10C623	0	0	0.1
r10C625	0	0	0.1
r10C627	0.00000137	0	0.1
r10C629	0.00000117	0	0.1
r2C623	0.009	0	0.832
r2C625	0.009	0	0.832
r2C627	0.009	0	0.832
r2C629	0.009	0	0.832
r3C623	0.01	0	0.15
r3C625	0.01	0	0.15
r3C627	0.01	0	0.15
r3C629	0.01	0	0.15
r4C623	0.001	0	0.03
r4C625	0.001	0	0.03
r4C627	0.001	0	0.03
r4C629	0.001	0	0.03
r5C623	0.00000781	0	0.3

r5C625	0.0000117	0	0.3
r5C627	0.0000201	0	0.3
r5C629	0.0000167	0	0.3
r7C623	0	0	0.05
r7C625	0	0	0.05
r7C627	0	0	0.05
r7C629	0	0	0.05
r8C623	0.00000817	0	0.1
r8C625	0.0000121	0	0.1
r8C627	0.0000203	0	0.1
r8C629	0.000017	0	0.1
r9C623	0.009	0	0.1
r9C625	0.009	0	0.1
r9C627	0.009	0	0.1
r9C629	0.009	0	0.1
rho2HC07	650	610	650
rho2HC11	650	610	650
rho2HC14	650	610	650
rho2HC16	650	610	650
rhoAC09	1700	1500	1700
rhoAC20	1700	1500	1700
rhoAC31	1700	1500	1700
rhoAC42	1700	1500	1700
riC10C623	0	0	0.3
riC10C625	0	0	0.3
riC10C627	0	0	0.3
riC10C629	0	0	0.3
riC11C623	0	0	0.1
riC11C625	0	0	0.1
riC11C627	0.00000114	0	0.1
riC11C629	0	0	0.1
sf1S34	0.026	0.0001	1
sf2S34	0.066	0	1
sfS11	0.5	0.1	0.8
sfS19	0.491	0.1	0.8
sfS2	0.886	0.1	1
sfS23	0.65	0.1	0.8
sfS27	0.499	0.1	0.8
sfS41	0.985	0.0001	1
sfS42	0.779	0.0001	1
sfS5	0.25	0.1	0.5
sfS7	0.334	0.1	0.8
Sm1C601	2.57	1	5
Sm1C603	0.539	0.05	1
Sm1C606A	2.422	0.1	5
Sm1C606D	2.936	1	5
Sm2C601	0.787	0.5	1

Sm3C601	1.054	0.5	2
Sm3C603	0.233	0.001	0.5
Sm3C606A	0.997	0.1	5
Sm3C606D	1.308	1	10
Sm4C601	0.77	0.4	1.5
Sm4C603	0.176	0.01	0.5
Sm4C606A	0.73	0.1	5
Sm4C606D	1	0.5	5
Sm5C601	0.326	0.1	0.6
Sm5C603	0.079	0.01	0.5
Sm5C606A	0.31	0.05	5
Sm5C606D	0.464	0.1	5
Sm6C601	0.257	0.1	1
Sm7C601	0.113	0.01	0.2
Sm7C603	0.03	0.001	0.2
Sm7C606A	0.108	0.001	5
Sm7C606D	0.185	0.1	5
Sn1C601	2.958	1	5
Sn1C603	1.358	1	3
Sn1C606A	3.483	1	20
Sn2C601	0.87	0.5	1.5
Sn3C601	1.184	0.5	1.5
Sn3C603	0.562	0.5	1.5
Sn3C606A	1.39	1	15
Sn4C601	0.853	0.5	1
Sn4C603	0.413	0.2	1
Sn4C606A	1	0.8	10
Sn5C601	0.351	0.1	0.8
Sn5C603	0.177	0.1	0.4
Sn5C606A	0.41	0.3	10
Sn6C601	0.274	0.1	1
Sn7C601	0.117	0.01	0.5
Sn7C603	0.062	0.01	0.5
Sn7C606A	0.136	0.1	5
TAC02	276	276	290
TAC05	280.004	273	300
TAC07	279.99	273	300
TAC15	280	273	300
TAC18	280.063	273	300
TAC20	280	280	300
TAC26	280.105	273	300
TAC29	280.224	273	300
TAC37	281.963	273	300
TAC40	281.981	273	300
TC301	282.932	200	300
TC302	259.254	250	290
TC309	324.429	270	350

TC310	288.704	200	310
TC311	288.704	270	310
TC312	328.661	300	369
TC318	321.965	250	365
TC319	301.113	250	400
TC320	301.113	250	400
TC322	301.113	250	400
TC323	359	300	420
TC326	322.937	300	360
TC328	322.937	300	360
TC329	322.937	300	375
TC401	282.932	260	300
TC402	283.85	270	305
TC403	295.279	280	320
TC406	388.5	298	400
TC409	461	400	461
TC411	404.6	300	418
TC412	363.414	330	405
TC413	301	250	350
TC415	305.99	250	400
TC417	299.989	275	350
TC425	363.414	300	410
TC426	363.414	300	410
TC427	375.65	360	405
TC428	365.245	300	405
TC430	358.683	300	400
TC431	363.414	300	405
TC432	363.414	350	400
TcwotE609A	308.852	298	320
TcwotE621A	326.829	298	355
TcwotE621B	298	298	325
TcwotE627A	295	295	360
TcwotE627B	293	293	310
TcwotE641A	318.661	295	360
TcwotE641B	314.429	295	325
TcwoutE603	321.814	296.836	350
TcwoutE605	302.221	298	320
TcwoutE611	299.764	295	350
TcwoutE613	305.874	298	320
TcwoutE617	318.399	295	350
TcwoutE626	295.918	295	310
TcwoutE634	341.007	295	360
TcwoutE640	311.08	295	330
THC01	295.504	295	370
THC02	292.932	275	302
THC03	303.279	290	360
THC04	295.426	280	310

THC05	288.522	270	300
THC06	289.396	273	300
THC07	289.396	273	300
THC11	289.396	273	300
THC14	289.396	273	300
THC16	289.396	273	300
THC22	281.963	273	290
THC23	280.105	273	290
THC24	281.035	273	290
THC25	280	273	290
THC26	280.715	273	290
THC27	280.004	273	290
THC28	280.522	270	290
THC29	280.522	270	290
THC30	280.522	250	300
THC31	282.932	260	310
THC34	259.254	250	310
THC38	259.254	250	310
THC41	259.254	250	310
THC45	259.254	250	310
TmC601	330.505	315	360
TmC603	352.33	350	375
TmC606A	331.841	327	370
TmC606D	387.623	370	400
TmK601	306.796	273	333
TnC601	321.916	310	340
TnC603	334.298	320	375
TnC606A	320.914	310	370
TR1	280.522	270	290
TR29	280.522	260	300
TSC401	322.219	280	350
TSC404	332.219	310	365
TSC406	336.03	320	360
TSC407	336.03	320	400
TSC409	318.852	308	360
TSC411	318.852	308	375
TSC412	318.852	308	360
TSC414	320	275	320
Utilities	8.027	-10000	10000
VFC614B	0.181	0.1	0.8
VFC615	0.347	0.001	0.6
VFC616	0.258	0.05	1
VFM3	0.492	0	0.55
VpC601	1.412	1	5
VpC603	0.712	0.01	3
VpC606A	2.814	0.1	10
x10AC09	0	0	0.1

x10AC20	0	0	0.1
x10AC31	0	0	0.1
x10AC42	0	0	0.1
x11AC02	0.998	0.97	0.998
x11AC05	0.971	0.89	0.999
x11AC07	0.972	0.89	0.999
x11AC09	0.784	0	1
x11AC15	0.944	0.89	0.999
x11AC18	0.944	0.89	0.999
x11AC20	0.819	0	1
x11AC26	0.917	0.89	0.999
x11AC29	0.917	0.89	0.999
x11AC31	0.848	0	1
x11AC37	0.89	0.89	0.999
x11AC40	0.89	0.89	0.999
x11AC42	0.809	0	1
x12AC02	0.002	0.002	0.03
x12AC05	0.029	0.001	0.11
x12AC07	0.028	0.001	0.11
x12AC09	0.023	0	0.1
x12AC12	0.029	0.001	0.12
x12AC15	0.056	0.001	0.11
x12AC18	0.056	0.001	0.11
x12AC20	0.049	0	0.1
x12AC23	0.056	0.001	0.12
x12AC26	0.083	0.001	0.11
x12AC29	0.083	0.001	0.11
x12AC31	0.077	0	0.1
x12AC34	0.083	0.001	0.12
x12AC37	0.11	0.001	0.11
x12AC40	0.11	0.001	0.11
x12AC42	0.1	0	0.1
x12AC45	0.11	0.001	0.12
x1AC09	0.009	0	0.1
x1AC20	0.007	0	0.1
x1AC31	0.004	0	0.1
x1AC42	0.004	0	0.1
x1C301	0.068	0	0.2
x1C302	0.069	0	0.2
x1C303	0.068	0.05	0.22
x1C306	0.072	0	0.5
x1C307	0.072	0	0.5
x1C308	0.048	0	0.4
x1C309	0.048	0	0.5
x1C310	0.094	0	0.5
x1C311	0.031	0	0.2
x1C312	0.119	0	1

x1C315	0.119	0.0001	1
x1C317	0.094	0	0.3
x1C318	0.094	0.0001	0.3
x1C319	0.094	0.0001	0.1
x1C320	0.094	0	0.1
x1C321	0.094	0.0001	0.1
x1C322	0.094	0	0.15
x1C323	0.094	0	0.2
x1C324	0.094	0	0.3
x1C326	1	0.4	1
x1C328	1	0.4	1
x1C329	1	0.4	1
x1C401	0.015	0	0.2
x1C402	0.015	0	0.2
x1C403	0.015	0	0.2
x1C404	0.015	0	0.2
x1C405	0	0	0.01
x1C406	0	0	0.01
x1C407	0	0	0.01
x1C408	0	0	1
x1C409	0	0	0.01
x1C410	0.0001	0.0001	1
x1C411	0.0001	0	0.1
x1C412	0.000463	0	0.05
x1C413	0.000463	0	0.1
x1C414	0.061	0	0.25
x1C415	0.061	0	0.2
x1C418	0.059	0	0.3
x1C419	0.059	0.0001	0.2
x1C425	0.0001	0	0.1
x1C426	0.0001	0	0.1
x1C427	0.000132	0	1
x1C428	0.000145	0	0.1
x1C430	0.0000468	0	0.1
x1C431	0.000463	0	0.1
x1C432	0.000463	0	0.1
x1HC01	0.055	0.001	0.3
x1HC02	0.055	0	0.3
x1HC03	0.06	0.0001	0.2
x1HC04	0.06	0	0.2
x1HC05	0.06	0	0.2
x1HC06	0.059	0	0.2
x1HC07	0.059	0	0.2
x1HC08	0.059	0	0.2
x1HC11	0.059	0	0.2
x1HC14	0.059	0	0.2
x1HC15	0.059	0	0.2

x1HC16	0.059	0	0.2
x1HC22	0.047	0	0.5
x1HC23	0.047	0	0.5
x1HC24	0.047	0	0.5
x1HC25	0.05	0	0.5
x1HC26	0.048	0	0.5
x1HC27	0.045	0	0.5
x1HC28	0.019	0	0.2
x1HC29	0.019	0	0.2
x1HC30	0.012	0	0.2
x1HC31	0.015	0	0.1
x1HC33	0.023	0	0.1
x1HC34	0.023	0	0.1
x1HC38	0.023	0	0.1
x1HC40	0.023	0	0.1
x1HC41	0.023	0	0.1
x1HC45	0.023	0	0.1
x1R1	0.019	0	0.1
x1R29	0.015	0	0.2
x1SC401	0.006	0	0.1
x1SC404	0.000081	0	0.1
x1SC405	0.000081	0	0.1
x1SC406	0.000081	0	0.1
x1SC407	0.000081	0	0.1
x1SC409	0.02	0	0.1
x1SC411	0.02	0	0.1
x1SC412	0.02	0	0.1
x1SC413	0.02	0	0.1
x1SC414	0.1	0	0.1
x2AC09	0	0	1
x2AC20	0	0	1
x2AC31	0	0	1
x2AC42	0	0	1
x2C301	0	0	0.01
x2C417	0.00031	0	0.1
x2C418	0.000922	0	0.1
x2C419	0.000922	0	0.1
x2HC01	0.1	0.1	0.7
x2HC02	0.1	0.1	1
x2HC03	0.000889	0	0.1
x2HC04	0.000889	0	0.1
x2HC05	0.000889	0	0.1
x2HC06	0.022	0	0.15
x2HC07	0.022	0	0.15
x2HC08	0.022	0	0.15
x2HC11	0.022	0	0.15
x2HC14	0.022	0	0.15

x2HC15	0.022	0	0.15
x2HC16	0.022	0	0.15
x2HC22	0	0	0.1
x2HC23	0	0	0.1
x2HC24	0	0	0.1
x2HC25	0	0	0.1
x2HC26	0	0	0.1
x2HC27	0	0	0.1
x2HC28	0	0	0.1
x2HC29	0	0	0.1
x2HC30	0	0	0.1
x2HC31	0	0	0.1
x2R1	0	0	0.1
x2R29	0	0	0.1
x2SC401	0.009	0	0.1
x2SC404	0.012	0	0.1
x2SC405	0.012	0	0.1
x2SC406	0.012	0	0.1
x2SC407	0.012	0	0.1
x2SC409	0.00031	0	0.1
x2SC411	0.00031	0	0.1
x2SC412	0.00031	0	0.1
x2SC413	0.00031	0	0.1
x2SC414	0.1	0	0.1
x3AC09	0.132	0	0.7
x3AC20	0.088	0	0.7
x3AC31	0.051	0	0.7
x3AC42	0.062	0	0.7
x3C301	0.781	0.5	1
x3C302	0.71	0.45	1
x3C303	0.774	0.5	0.8
x3C306	0.78	0	1
x3C307	0.78	0	1
x3C308	0.775	0	1
x3C309	0.775	0.2	0.8
x3C310	0.812	0	1
x3C311	0.762	0	1
x3C312	0.79	0	1
x3C315	0.79	0.0001	1
x3C317	0.813	0.5	1
x3C318	0.813	0.0001	1
x3C319	0.813	0.0001	1
x3C320	0.813	0.0001	1
x3C321	0.813	0.0001	1
x3C322	0.813	0	1
x3C323	0.813	0.5	0.95
x3C324	0.813	0.5	0.95

x3C326	0.00000166	0	0.5
x3C328	0.00000166	0	0.5
x3C329	0.00000166	0	0.5
x3C401	0.51	0	1
x3C402	0.51	0	0.8
x3C403	0.51	0.0001	1
x3C404	0.51	0.0001	1
x3C405	0.00000694	0	0.1
x3C406	0.00000694	0	0.01
x3C407	0.00000694	0	0.01
x3C408	0.00000694	0	1
x3C409	0.00000694	0	0.01
x3C410	0.000406	0.0001	0.1
x3C411	0.000406	0.0001	0.2
x3C412	0.000834	0	0.1
x3C413	0.000834	0	0.1
x3C414	0.83	0.5	1
x3C415	0.83	0	1
x3C418	0.837	0.0001	1
x3C419	0.837	0.0001	1
x3C425	0.000406	0	0.1
x3C426	0.000406	0.0001	0.1
x3C427	0.000533	0	1
x3C428	0.000586	0	0.3
x3C430	0.000634	0	0.1
x3C431	0.000834	0	0.1
x3C432	0.000834	0	0.1
x3HC01	0.01	0.01	0.6
x3HC02	0.01	0	0.5
x3HC03	0.836	0.1	1
x3HC04	0.836	0.1	1
x3HC05	0.836	0.1	1
x3HC06	0.656	0.3	1
x3HC07	0.656	0.3	1
x3HC08	0.656	0.3	1
x3HC11	0.656	0.3	1
x3HC14	0.656	0.3	1
x3HC15	0.656	0.3	1
x3HC16	0.656	0.3	1
x3HC22	0.677	0.1	0.9
x3HC23	0.677	0.1	0.9
x3HC24	0.677	0.1	0.9
x3HC25	0.665	0.1	0.9
x3HC26	0.673	0.1	0.9
x3HC27	0.684	0.1	0.9
x3HC28	0.568	0.1	0.6
x3HC29	0.568	0.1	0.6

x3HC30	0.446	0.1	0.6
x3HC31	0.51	0.1	0.6
x3HC33	0.774	0.1	1
x3HC34	0.774	0.1	1
x3HC38	0.774	0.1	1
x3HC40	0.774	0.1	1
x3HC41	0.774	0.1	1
x3HC45	0.774	0.1	1
x3R1	0.568	0	0.6
x3R29	0.516	0.1	0.6
x3SC401	0.293	0.2	0.4
x3SC404	0.021	0	0.1
x3SC405	0.021	0	0.1
x3SC406	0.021	0	0.1
x3SC407	0.021	0	0.1
x3SC409	0.967	0.5	1
x3SC411	0.967	0.5	1
x3SC412	0.967	0.5	1
x3SC413	0.967	0.5	1
x3SC414	0.5	0.5	1
x4AC09	0.02	0	0.2
x4AC20	0.014	0	0.2
x4AC31	0.008	0	0.2
x4AC42	0.01	0	0.2
x4C301	0.105	0	0.5
x4C302	0.073	0	0.5
x4C303	0.101	0.05	0.2
x4C306	0.099	0	0.8
x4C307	0.099	0	0.8
x4C308	0.108	0	0.5
x4C309	0.108	0	0.4
x4C310	0.084	0	0.3
x4C311	0.117	0	0.5
x4C312	0.08	0	1
x4C315	0.08	0.0001	0.3
x4C317	0.082	0	0.2
x4C318	0.082	0.0001	0.3
x4C319	0.082	0.0001	0.3
x4C320	0.082	0.0001	0.3
x4C321	0.082	0.0001	0.3
x4C322	0.082	0	0.4
x4C323	0.082	0.01	0.25
x4C324	0.082	0.01	0.25
x4C325	0	0	0.1
x4C326	0	0	0.1
x4C328	0	0	0.1
x4C329	0	0	0.1

x4C401	0.104	0.001	0.5
x4C402	0.104	0.001	0.5
x4C403	0.104	0.0001	0.3
x4C404	0.104	0.0001	0.3
x4C405	0.059	0.0001	0.2
x4C406	0.059	0	0.2
x4C407	0.059	0.01	0.3
x4C408	0.059	0	0.2
x4C409	0.059	0	0.3
x4C410	0.527	0.0001	1
x4C411	0.527	0	1
x4C412	0.826	0.5	1
x4C413	0.826	0.0001	1
x4C414	0.095	0.01	0.25
x4C415	0.095	0.0001	0.3
x4C418	0.092	0.0001	0.3
x4C419	0.092	0.0001	0.3
x4C425	0.527	0	1
x4C426	0.527	0.0001	1
x4C427	0.676	0	1
x4C428	0.738	0	1
x4C430	0.641	0.5	1
x4C431	0.826	0.0001	1
x4C432	0.826	0.5	1
x4HC01	0.085	0	0.25
x4HC02	0.085	0	0.25
x4HC03	0.091	0	0.3
x4HC04	0.091	0	0.5
x4HC05	0.091	0	0.5
x4HC06	0.09	0	0.4
x4HC07	0.09	0	0.4
x4HC08	0.09	0	0.4
x4HC11	0.09	0	0.4
x4HC14	0.09	0	0.4
x4HC15	0.09	0	0.4
x4HC16	0.09	0	0.4
x4HC22	0.105	0	0.5
x4HC23	0.105	0	0.5
x4HC24	0.105	0	0.5
x4HC25	0.102	0	0.5
x4HC26	0.104	0	0.5
x4HC27	0.106	0	0.5
x4HC28	0.109	0	0.5
x4HC29	0.109	0	0.3
x4HC30	0.096	0	0.3
x4HC31	0.104	0	0.3
x4HC33	0.127	0	0.5

x4HC34	0.127	0	0.5
x4HC38	0.127	0	0.5
x4HC40	0.127	0	0.5
x4HC41	0.127	0	0.5
x4HC45	0.127	0	0.5
x4R1	0.109	0	0.3
x4R29	0.105	0.01	0.3
x4SC401	0.562	0.5	0.7
x4SC404	0.784	0.48	1
x4SC405	0.784	0.48	1
x4SC406	0.784	0.7	1
x4SC407	0.784	0.7	1
x4SC409	0.013	0	0.1
x4SC411	0.013	0	0.1
x4SC412	0.013	0	0.1
x4SC413	0.013	0	0.1
x4SC414	0.1	0	0.1
x5AC09	0.006	0	0.1
x5AC20	0.004	0	0.1
x5AC31	0.002	0	0.1
x5AC42	0.003	0	0.1
x5C301	0.019	0	0.2
x5C302	0.005	0	0.1
x5C303	0.017	0	0.1
x5C306	0.015	0	0.6
x5C307	0.015	0	0.6
x5C308	0.021	0	0.2
x5C309	0.021	0	0.2
x5C310	0.006	0	0.1
x5C311	0.026	0	0.2
x5C312	0.006	0	0.4
x5C315	0.006	0.0001	0.1
x5C317	0.006	0	0.1
x5C318	0.006	0.0001	0.1
x5C319	0.006	0.0001	0.1
x5C320	0.006	0	0.1
x5C321	0.006	0.0001	0.1
x5C322	0.006	0	0.1
x5C323	0.006	0.002	0.1
x5C324	0.006	0.002	0.1
x5C325	0	0	0.01
x5C326	0	0	0.01
x5C328	0	0	0.01
x5C329	0	0	0.01
x5C401	0.054	0	0.5
x5C402	0.054	0	0.5
x5C403	0.054	0.0001	0.2

x5C404	0.054	0	0.2
x5C405	0.14	0	0.2
x5C406	0.14	0	0.2
x5C407	0.14	0	0.2
x5C408	0.14	0	0.2
x5C409	0.14	0	0.3
x5C410	0.099	0.0001	1
x5C411	0.099	0	1
x5C412	0.072	0	0.1
x5C413	0.072	0	0.3
x5C414	0.001	0	0.1
x5C415	0.001	0	0.1
x5C418	0.001	0	0.1
x5C419	0.001	0.0001	0.1
x5C425	0.099	0	1
x5C426	0.099	0.0001	1
x5C427	0.086	0	1
x5C428	0.08	0	0.4
x5C430	0.088	0	0.1
x5C431	0.072	0	0.2
x5C432	0.072	0	0.1
x5HC01	0.15	0	0.15
x5HC02	0.15	0	0.15
x5HC03	0.001	0	0.1
x5HC04	0.001	0	0.3
x5HC05	0.001	0	0.3
x5HC06	0.034	0	0.3
x5HC07	0.034	0	0.3
x5HC08	0.034	0	0.3
x5HC11	0.034	0	0.3
x5HC14	0.034	0	0.3
x5HC15	0.034	0	0.3
x5HC16	0.034	0	0.3
x5HC22	0.033	0	0.5
x5HC23	0.033	0	0.5
x5HC24	0.033	0	0.5
x5HC25	0.033	0	0.5
x5HC26	0.033	0	0.5
x5HC27	0.032	0	0.5
x5HC28	0.049	0	0.5
x5HC29	0.049	0.01	0.3
x5HC30	0.058	0	0.3
x5HC31	0.054	0	0.3
x5HC33	0.03	0	2.5
x5HC34	0.03	0	2.5
x5HC38	0.03	0	2.5
x5HC40	0.03	0	2.5

x5HC41	0.03	0	2.5
x5HC45	0.03	0	2.5
x5R1	0.049	0	0.3
x5R29	0.054	0.01	0.4
x5SC401	0.052	0.008	0.1
x5SC404	0.073	0	0.1
x5SC405	0.073	0	0.1
x5SC406	0.073	0.01	0.1
x5SC407	0.073	0.01	0.1
x5SC409	0	0	0.1
x5SC411	0	0	0.1
x5SC412	0	0	0.1
x5SC413	0	0	0.1
x5SC414	0	0	0.1
x6SC401	0.071	0	0.1
x6SC404	0.1	0	0.12
x6SC405	0.1	0	0.1
x6SC406	0.1	0	0.1
x6SC407	0.1	0	0.1
x6SC409	0	0	0.1
x6SC411	0	0	0.1
x6SC412	0	0	0.1
x6SC413	0	0	0.1
x6SC414	0.1	0	0.1
x7AC09	0.02	0	0.1
x7AC20	0.015	0	0.1
x7AC31	0.008	0	0.1
x7AC42	0.01	0	0.1
x7C301	0.027	0	0.1
x7C302	0.144	0	0.3
x7C303	0.039	0	0.1
x7C306	0.033	0	0.8
x7C307	0.033	0	0.8
x7C308	0.048	0	0.3
x7C309	0.048	0	0.3
x7C310	0.005	0	0.2
x7C311	0.064	0	1
x7C312	0.005	0	0.5
x7C315	0.005	0	0.01
x7C316	0.005	0	0.01
x7C317	0.005	0	0.1
x7C318	0.005	0	0.15
x7C319	0.005	0	0.15
x7C320	0.005	0	0.1
x7C321	0.005	0	0.1
x7C322	0.005	0	0.1
x7C323	0.005	0	0.02

x7C324	0.005	0	0.1
x7C325	0	0	0.2
x7C326	0	0	0.2
x7C328	0	0	0.2
x7C329	0	0	0.1
x7C401	0.316	0	1
x7C402	0.316	0	0.6
x7C403	0.316	0.0001	1
x7C404	0.316	0.0001	1
x7C405	0.801	0.0001	1
x7C406	0.801	0.001	1
x7C407	0.801	0.01	1
x7C408	0.801	0	1
x7C409	0.801	0	1
x7C410	0.374	0.0001	1
x7C411	0.374	0	1
x7C412	0.101	0	0.2
x7C413	0.101	0	0.3
x7C414	0.012	0	0.1
x7C415	0.012	0	0.1
x7C417	0.00031	0.0001	0.08
x7C418	0.011	0.0001	0.1
x7C419	0.011	0	0.1
x7C425	0.374	0.2	1
x7C426	0.374	0.0001	1
x7C427	0.238	0	1
x7C428	0.181	0	0.5
x7C430	0.271	0	0.35
x7C431	0.101	0	0.3
x7C432	0.101	0	0.3
x7HC01	0.6	0	0.6
x7HC02	0.6	0	0.6
x7HC03	0.01	0	0.1
x7HC04	0.01	0	0.25
x7HC05	0.01	0	0.25
x7HC06	0.139	0	0.3
x7HC07	0.139	0	0.3
x7HC08	0.139	0	0.3
x7HC11	0.139	0	0.3
x7HC14	0.139	0	0.3
x7HC15	0.139	0	0.3
x7HC16	0.139	0	0.3
x7HC22	0.138	0	0.5
x7HC23	0.139	0	0.5
x7HC24	0.139	0	0.5
x7HC25	0.15	0	0.5
x7HC26	0.142	0	0.5

x7HC27	0.131	0	0.5
x7HC28	0.255	0	0.5
x7HC29	0.255	0.1	0.5
x7HC30	0.389	0.1	0.5
x7HC31	0.316	0.1	0.6
x7HC33	0.046	0	2
x7HC34	0.046	0	2
x7HC38	0.046	0	2
x7HC40	0.046	0	2
x7HC41	0.046	0	2
x7HC45	0.046	0	2
x7R1	0.255	0	0.5
x7R29	0.31	0.1	0.6
x7SC401	0.007	0	0.1
x7SC404	0.01	0	0.12
x7SC405	0.01	0	0.12
x7SC406	0.01	0	0.01
x7SC407	0.01	0	0.1
x7SC409	0	0	0.1
x7SC411	0	0	0.1
x7SC412	0	0	0.1
x7SC413	0	0	0.1
x7SC414	0.1	0	0.1
x8AC09	0.00000448	0	0.1
x8AC20	0.00000554	0	0.1
x8AC31	0.00000475	0	0.1
x8AC42	0.00000478	0	0.1
x9AC09	0.005	0	0.3
x9AC20	0.005	0	0.3
x9AC31	0.002	0	0.3
x9AC42	0.003	0	0.3
xAC02	0.5	0.4	1
xAC05	0.498	0.4	1
xAC07	0.498	0.4	1
xAC09	0.482	0.4	1
xAC12	0.498	0.4	1
xAC15	0.496	0.4	1
xAC18	0.496	0.4	1
xAC20	0.485	0.4	1
xAC23	0.496	0.4	1
xAC26	0.494	0.4	1
xAC29	0.494	0.4	1
xAC31	0.488	0.4	1
xAC34	0.494	0.4	1
xAC37	0.492	0.4	1
xAC40	0.492	0.4	1
xAC42	0.484	0.4	1

xiC10AC09	0	0	1
xiC10AC20	0	0	1
xiC10AC31	0	0	1
xiC10AC42	0	0	1
xiC11AC09	0	0	1
xiC11AC20	0	0	1
xiC11AC31	0	0	1
xiC11AC42	0	0	1
xM1C606D	0.000485	0	0.5
xM3C606D	0.000334	0	0.5
xM4C606D	0.55	0	0.65
xM5C606D	0.104	0	0.5
xM7C606D	0.346	0	1
xx1C302	0.093	0	0.25
xx1C308	0.063	0	0.5
xx1C310	0.12	0	0.5
xx1C311	0.042	0	0.3
xx1C312	0.151	0	1
xx1C323	0.12	0	0.2
xx1C325	1	0.4	1
xx1C405	0	0	0.01
xx1C408	0	0	1
xx1C425	0.000153	0	1
xx1C428	0.000207	0	1
xx1C430	0.0000689	0	0.5
xx1C431	0.00064	0	0.1
xx1HC28	0.027	0.01	0.2
xx1HC29	0.027	0	0.2
xx1HC30	0.018	0.01	0.2
xx1HC32	0.031	0	0.1
xx1R1	0.027	0	0.2
xx1R29	0.023	0	0.1
xx1SC406	0.0000111	0	0.2
xx1SC408	0.026	0	0.1
xx2HC28	0	0	0.1
xx2HC29	0	0	0.1
xx2HC30	0	0	0.1
xx2R1	0	0	0.1
xx2R29	0	0	0.1
xx2SC406	0.013	0	0.1
xx2SC408	0.000319	0	1
xx3C302	0.729	0.5	1
xx3C308	0.779	0	1
xx3C310	0.791	0	1
xx3C311	0.774	0	1
xx3C312	0.764	0	1
xx3C323	0.792	0.5	0.92

xx3C325	0.0000126	0	0.5
xx3C405	0.00000975	0	0.1
xx3C408	0.00000975	0	1
xx3C425	0.000473	0	1
xx3C428	0.000633	0	1
xx3C430	0.000709	0	0.1
xx3C431	0.000875	0	0.5
xx3C432	0.000875	0	0.15
xx3HC28	0.621	0.2	0.8
xx3HC29	0.621	0.1	0.8
xx3HC30	0.515	0.1	0.6
xx3HC32	0.784	0.3	1
xx3R1	0.621	0.1	0.8
xx3R29	0.578	0.1	0.6
xx3SC406	0.021	0	0.1
xx3SC408	0.961	0.5	1
xx4C302	0.075	0	0.5
xx4C308	0.109	0	0.5
xx4C310	0.082	0	0.3
xx4C311	0.119	0	0.5
xx4C312	0.077	0	0.15
xx4C323	0.08	0.08	0.28
xx4C325	0	0	0.05
xx4C405	0.083	0.0001	0.2
xx4C408	0.083	0	0.3
xx4C409	0.083	0.0001	0.3
xx4C425	0.613	0	1
xx4C427	0.746	0	1
xx4C428	0.797	0	1
xx4C430	0.716	0.5	1
xx4C431	0.867	0.0001	1
xx4C432	0.867	0.5	1
xx4HC28	0.12	0.01	0.3
xx4HC29	0.12	0.01	0.3
xx4HC30	0.11	0.01	0.3
xx4HC32	0.129	0	0.5
xx4R1	0.12	0	0.3
xx4R29	0.117	0.01	0.3
xx4SC406	0.814	0.6	1
xx4SC408	0.012	0	0.05
xx5C302	0.004	0	0.1
xx5C308	0.017	0	0.8
xx5C310	0.005	0	0.1
xx5C311	0.021	0	0.1
xx5C312	0.005	0	0.3
xx5C323	0.005	0.001	0.15
xx5C325	0	0	0.001

xx5C405	0.158	0.0001	0.2
xx5C408	0.158	0	0.3
xx5C425	0.093	0	1
xx5C428	0.07	0	1
xx5C430	0.079	0	1
xx5C431	0.061	0	1
xx5HC28	0.044	0.01	0.3
xx5HC29	0.044	0	0.3
xx5HC30	0.054	0	0.3
xx5HC32	0.025	0	0.2
xx5R1	0.044	0	0.3
xx5R29	0.049	0	0.3
xx5SC406	0.061	0	0.15
xx5SC408	0	0	0.1
xx6SC406	0.084	0	0.1
xx6SC408	0	0	1
xx7C302	0.1	0	0.2
xx7C308	0.033	0	0.1
xx7C310	0.003	0	0.1
xx7C311	0.044	0	0.3
xx7C312	0.003	0	0.1
xx7C323	0.004	0.002	0.1
xx7C325	0	0	0.1
xx7C405	0.759	0.0001	1
xx7C408	0.759	0	1
xx7C425	0.293	0	1
xx7C428	0.132	0	1
xx7C430	0.204	0	1
xx7C431	0.071	0	1
xx7HC28	0.188	0.1	0.4
xx7HC29	0.188	0	0.5
xx7HC30	0.303	0.1	0.5
xx7HC32	0.031	0	0.2
xx7R1	0.188	0.1	0.5
xx7R29	0.234	0.1	0.5
xx7SC406	0.007	0	0.1
xx7SC408	0	0	0.1
y1HC28	0.077	0.05	0.5
y1HC29	0.077	0.05	0.5
y1HC30	0.062	0.05	0.5
y1HC31	0.068	0.05	0.4
y1R1	0.077	0	0.5
y1R29	0.069	0.05	0.5
y2HC28	0	0	0.1
y2HC29	0	0	0.1
y2HC30	0	0	0.1
y2HC31	0	0	0.1

y2R1	0	0	0.1
y2R29	0	0	0.1
y3HC28	0.789	0.2	0.9
y3HC29	0.789	0.1	0.9
y3HC30	0.771	0.1	0.85
y3HC31	0.781	0.1	0.85
y3R1	0.789	0.1	0.9
y3R29	0.783	0.1	0.85
y4HC28	0.1	0	0.5
y4HC29	0.1	0	0.3
y4HC30	0.108	0.01	0.4
y4HC31	0.105	0	0.3
y4R1	0.1	0	0.3
y4R29	0.104	0	0.5
y5HC28	0.015	0	0.2
y5HC29	0.015	0	0.2
y5HC30	0.022	0	0.2
y5HC31	0.019	0	0.2
y5R1	0.015	0	0.2
y5R29	0.018	0	0.2
y7HC28	0.019	0.01	0.5
y7HC29	0.019	0	0.1
y7HC30	0.037	0	0.1
y7HC31	0.027	0	0.2
y7R1	0.019	0	0.1
y7R29	0.026	0	0.2
yy1HC28	0.1	0.1	0.5
yy1HC29	0.1	0.1	0.6
yy1HC30	0.081	0.05	0.6
yy1R1	0.1	0.1	0.6
yy1R29	0.09	0.05	0.6
yy2HC28	0	0	0.1
yy2HC29	0	0	0.1
yy2HC30	0	0	0.1
yy2R1	0	0	0.1
yy2R29	0	0	0.1
yy3HC28	0.777	0.1	0.9
yy3HC29	0.777	0.1	0.8
yy3HC30	0.768	0.1	0.8
yy3R1	0.777	0.1	0.8
yy3R29	0.775	0.1	0.8
yy4HC28	0.098	0.01	0.3
yy4HC29	0.098	0.01	0.3
yy4HC30	0.108	0.01	0.3
yy4R1	0.098	0	0.3
yy4R29	0.103	0.01	0.3
yy5HC28	0.012	0.001	0.2

yy5HC29	0.012	0	0.2
yy5HC30	0.018	0	0.1
yy5R1	0.012	0	0.2
yy5R29	0.015	0	0.2
yy7HC28	0.013	0	0.2
yy7HC29	0.013	0	0.2
yy7HC30	0.025	0	0.1
yy7R1	0.013	0	0.1
yy7R29	0.017	0	0.2

Appendix C.5: Parameters

Plant	Initial Point	Lower_Bound	Upper_Bound
deltaPE634	70	50	70
deltaPE640	20	15	30
FE601	0.5	0.5	1
FE603	1	0.5	1
FE609A	0.5	0.5	1
FE610	1	0.5	1
FE611	0.5	0.5	1
FE616	0.5	0.5	1
FE617	1	0.5	1
FE621A	0.722	0.5	1
FE621B	1	0.5	1
FE626	0.5	0.5	1
FE627A	0.5	0.5	1
FE627B	0.5	0.5	1
FE628	0.5	0.5	1
FE629	0.5	0.5	1
FE634	1	0.5	1
FE640	0.5	0.5	1
FE641	0.5	0.5	1
hstmE602	2145	2135	2145
hstmE612	2145	2135	2145
hstmE695	1920	1900	1920
hstmE696	2145	2135	2145
PC606A	900	870	900
PC606C	890	890	910
PC606D	900	893	900
PE633	145	130	145
qC601	1	0.5	1
qC603	1	0.5	1
qC606A	0.5	0	0.5
RC601	9.141	7.5	15
RC603	14	1	14
sfC631	0.977	0.8	1
sfC632	0.982	0.8	1
sfC633	0.991	0.8	1
sfC634	0.99	0.8	1
Tcwin	290	290	294
UE601	0.008	0.008	0.02
UE602	0.016	0.010	0.03
UE603	0.025	0.025	0.036
UE605	0.045	0.04	0.05
UE609A	0.04	0.04	0.054
UE610	0.083	0.01	0.1

UE611	0.099	0.01	0.1
UE612	0.013	0.01	0.02
UE613	0.02	0.015	0.03
UE616	0.01	0.01	0.1
UE617	0.052	0.01	0.1
UE621A	0.114	0.01	0.2
UE621B	0.078	0.01	0.2
UE626	0.01	0.01	0.1
UE627A	0.01	0.01	0.1
UE627B	0.01	0.01	0.1
UE628	0.01	0.01	0.1
UE629	0.01	0.01	0.1
UE633	0.016	0.01	0.1
UE634	0.021	0.01	0.1
UE640	0.01	0.01	0.1
UE641	0.084	0.01	0.1
UE695A	0.033	0.01	0.1
UE695B	0.039	0.01	0.1
UE696A	0.012	0.01	0.1
UE696B	0.01	0.01	0.1
UE6XX	0.031	0.01	0.1

Appendix C.6: Coefficient values to calculate the enthalpy of gas phase

Component	a1	a2	a3	a4	a5
1	28.277	1.16e-01	1.9597e-04	-2.3271e-07	6.867e-11
2	30.11	1.71e-01	1.01e-04	-1.812e-07	5.732e-11
3	6.772	3.4147e-01	-1.0271e-04	-3.685e-08	2.043e-11
4	20.056	2.815e-01	-1.314e-05	-9.4571e-08	3.415e-11
5	-0.881	4.75e-01	-2.479e-04	6.751e-08	-8.534e-12
6	26.671	3.234e-01	4.282e-05	-1.664e-07	5.604e-11
7	-7.197	6.009e-01	-3.409e-04	9.521e-08	-1.029e-11
8	-3.249	6.663e-01	-3.383e-04	6.0489e-08	2.5385e-12
9	-3.367	7.5824e-01	-3.8216e-04	5.736e-08	8.0178e-12
10	51.299	5.356e-01	1.696e-04	-4.023e-07	1.3567e-10

Appendix C.7: Coefficient values to calculate the enthalpy of liquid phase

Component	a1	a2	a3	a4
1	59.642	3.283e-1	-1.5377e-03	3.6539e-06
2	50.000	5.1e-01	-2.02e-03	2.56e-06
3	71.791	4.8472e-01	-2.0519e-03	4.0634e-06
4	62.873	5.8913e-01	-2.3558e-03	4.2257e-06
5	91.474	4.4852e-01	-1.6859e-03	3.1342e-06
6	80.641	6.2195e-01	-2.2682e-03	3.7423e-06
7	110.129	5.0521e-01	-1.7675e-03	3.066e-06
8	118.184	7.1284e-01	-2.3129e-03	3.4493e-06
9	134.965	8.1458e-01	-2.5182e-03	3.5416e-06
10	129.481	1.1045	-3.2083e-03	4.0849e-06

Appendix C.8: Constants

Reactor Section Constants

Name	Value	Unit
klav	120000	per minute
Vr	87.06	m ³
k1	6770	m ³ /kmole/min
k2	1.38E+10	"
k3	4.97E+09	"
k4	1.93E+09	"
k5	1.42E+09	"
k6	5.37E+09	"
k7	4.29E+09	"
k8	4.72E+09	"
k9	1210000	1/min
k10	3.96E+14	m ³ /kmole/min
k11	4.01E+14	"
k12	19971000	1/min
k13	4.02E+16	m ³ /kmole/min
k14	96770000	"
k15	8.45E+15	"
k16	8.01E+16	"
k17	2.14E+08	1/min
k18	3.78E+09	m ³ /kmole/min
k19	1.23E+15	"
VaC623	46.1	Vol of acid (m ³)
Ha	0.53	

Heat Exchanger Areas

Name	Value	Unit
AE601	81	m2
AE602	365	"
AE603	98	"
AE605	428	"
AE609A	33	"
AE610	150.5	m2
AE611	110.55	m2
AE612	263.84	m2
AE613	431.07	m2
AE616	106	m2
AE617	106	m2
AE621A	346	m2
AE626	308	m2
AE627A	42	m2
AE628	88.7	m2
AE629	743	m2
AE633	284	m2
AE634	3820	m2
AE640	282.42	m2
AE641	133.8	m2
AE695A	310	m2
AE696A	393	m2
AE6XX	7360	m2
AE621B	115	m2
AE627B	41	m2
AE696B	131	m2
AE695B	103	m2