

1. Stream Table

Table S1. Stream table

Stream Name	Air Feed	Air Feed1	Air Feed 2	Air Feed 3
Source	INPUT	P-22	P-22	P-22
Destination	P-19	P-23	P-25	P-27
Stream Properties				
Temperature (°C)	25.00	30.00	30.00	30.00
Pressure (bar)	1.01	3.01	3.01	3.01
Component Flowrates (kg/batch)				
N2	642911.34	197.12	1995.23	16531.68
O2	194368.70	59.59	603.21	4997.95
TOTAL (kg/batch)	837280.05	256.71	2598.44	21529.63
TOTAL (L/batch)	710095057.51	74438.25	753463.56	6242902.60

Stream Name	Barium Carbonate	Ca(OH)2	Ca(OH)2 Feed 4	Air Feed 4
Source	INPUT	INPUT	P-18	P-22
Destination	P-43	P-16	P-29	P-29
Stream Properties				
Temperature (°C)	25.00	30.00	30.00	30.00
Pressure (bar)	1.01	1.01	1.01	3.01
Component Flowrates (kg/batch)				
BaCO3	2329.19	0.00	0.00	0.00
Ca(OH)2	0.00	14847.50	14825.00	0.00
N2	0.00	0.00	0.00	624187.32
O2	0.00	0.00	0.00	188707.95
Water	9316.74	0.00	44475.00	0.00
TOTAL (kg/batch)	11645.93	14847.50	59300.00	812895.26
TOTAL (L/batch)	9892.12	6410.38	51194.52	235713549.74

Stream Name	Fermentation Water	Fresh Water	GAS1	GAS2
Source	INPUT	INPUT	P-23	P-25
Destination	P-10	P-80	OUTPUT	OUTPUT
Stream Properties				
Temperature (°C)	25.00	25.00	30.00	30.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
CO2	0.00	0.00	2.52	23.96
N2	0.00	0.00	197.31	1997.16
O2	0.00	0.00	57.69	585.02
Water	194428.84	62932.58	0.00	0.00
TOTAL (kg/batch)	194428.84	62932.58	257.52	2606.14
TOTAL (L/batch)	195463.95	63267.62	221479.81	2241802.82

Table S1. Stream table (continued)

Stream Name	GAS3	GAS4	Glucose Feed	HCl
Source	P-27	P-29	INPUT	INPUT
Destination	OUTPUT	OUTPUT	P-5	P-60
Stream Properties				
Temperature (°C)	30.00	30.00	25.00	25.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
CO2	49.60	10551.04	0.00	0.00
DPn	0.00	0.00	71.85	0.00
Glucose	0.00	0.00	25223.26	0.00
HCl(aq)	0.00	0.00	0.00	1685.27
Maltose	0.00	0.00	627.84	0.00
Maltotriose	0.00	0.00	460.73	0.00
N2	16547.77	624407.26	0.00	0.00
O2	4967.76	174978.60	0.00	0.00
Soluble Protein	0.00	0.00	3.16	0.00
Solubles	0.00	0.00	1.60	0.00
Water	0.00	0.00	10779.21	1685.27
TOTAL (kg/batch)	21565.13	809936.89	37167.64	3370.53
TOTAL (L/batch)	18584280.31	696461888.22	32871.88	3807.48
Stream Name	inoculum	NaOH	Product	Water1
Source	INPUT	INPUT	P-77	P-15
Destination	P-23	P-59	OUTPUT	P-23
Stream Properties				
Temperature (°C)	30.00	25.00	35.00	30.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	0.00	0.01	0.00
Biomass	0.01	0.00	0.00	0.00
Calcium Succina	0.00	0.00	0.00	0.00
Glucose	0.00	0.00	0.00	0.00
Malonic Acid C	0.00	0.00	18364.03	0.00
MalonicAcid	0.00	0.00	2.80	0.00
NaOH(aq)	0.00	1744.21	0.00	0.00
Water	0.99	1744.21	966.68	185.54
TOTAL (kg/batch)	1.00	3488.42	19333.51	185.54
TOTAL (L/batch)	1.01	2665.10	12982.84	186.87
Stream Name	Water 2	Water 3	Water 4	YPD
Source	P-15	P-15	P-15	INPUT
Destination	P-25	P-27	P-29	P-9
Stream Properties				
Temperature (°C)	30.00	30.00	30.00	25.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
Diammonium Phos	0.00	0.00	0.00	2.41
Glucose	0.00	0.00	0.00	2.41
Water	1700.80	15000.00	133000.00	115.98
Yeast Extact	0.00	0.00	0.00	1.20
TOTAL (kg/batch)	1700.80	15000.00	133000.00	122.00
TOTAL (L/batch)	1712.99	15107.54	133953.50	120.37

Table S1. Stream table (continued)

Stream Name	YPD Feed 1	YPD Feed 2	YNB	Sulfuric Acid
Source	P-13	P-13	INPUT	INPUT
Destination	P-23	P-25	P-1	P-39
Stream Properties				
Temperature (°C)	26,95	26,95	25,00	25,00
Pressure (bar)	1,01	1,01	1,01	1,01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0,00	0,00	0,03	0,00
Amm. Sulfate	0,00	0,00	762,07	0,00
Biotin	0,00	0,00	0,00	0,00
CaCl2	0,00	0,00	15,24	0,00
Calcium Pantoth	0,00	0,00	0,06	0,00
CuSO4	0,00	0,00	0,01	0,00
Diammonium Phos	0,24	2,17	0,00	0,00
DPn	0,02	0,21	0,00	0,00
FeCl3	0,00	0,00	0,03	0,00
Folic Acid	0,00	0,00	0,00	0,00
Glucose	8,38	76,82	0,00	0,00
H3BO3	0,00	0,00	0,08	0,00
Inositol	0,00	0,00	0,30	0,00
KH2PO4	0,00	0,00	152,41	0,00
KI	0,00	0,00	0,02	0,00
Maltose	0,20	1,86	0,00	0,00
Maltotriose	0,15	1,36	0,00	0,00
MgSO4	0,00	0,00	76,21	0,00
MnSO4	0,00	0,00	0,06	0,00
NaCl	0,00	0,00	15,24	0,00
Niacin	0,00	0,00	0,06	0,00
Pyridoxine hydr	0,00	0,00	0,06	0,00
Riboflavin	0,00	0,00	0,03	0,00
Sodium Molybdat	0,00	0,00	0,03	0,00
Soluble Protein	0,00	0,01	0,00	0,00
Solubles	0,00	0,00	0,00	0,00
Sulfuric Acid	0,00	0,00	0,00	20.421,84
Thiamine hydroc	0,00	0,00	0,06	0,00
Water	14,89	136,48	0,00	61.265,53
Yeast Extact	0,12	1,09	0,00	0,00
ZnSO4	0,00	0,00	0,06	0,00
TOTAL (kg/batch)	24,00	220,00	1.022,06	81.687,37
TOTAL (L/batch)	22,64	207,52	497,26	82.013,54

Table S1. Stream table (continued)

Stream Name	S-101	S-102	S-103	S-104
Source	P-32	P-7	P-23	P-81
Destination	P-33	P-8	P-24	P-82
Stream Properties				
Temperature (°C)	30.04	30.00	30.00	39.87
Pressure (bar)	3.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.03	0.00	0.00	0.00
Amm Sulfate	376.48	0.00	0.00	0.00
Biomass	976.30	0.00	1.19	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	49.57	0.00	0.00	0.00
CaCl2	15.24	0.00	0.00	0.00
Calcium Malonat	1308.68	0.00	0.00	0.00
Calcium Pantoth	0.06	0.00	0.00	0.00
Calcium Succina	24.11	0.00	0.00	0.00
CaMalonate Crys	33911.38	0.00	0.00	0.00
CuSO4	0.01	0.00	0.00	0.00
Diammonium Phos	0.56	0.00	0.06	0.00
DPn	0.00	71.85	0.00	0.00
Ethyl Alcohol	10.66	0.00	0.05	0.00
FeCl3	0.03	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	6.60	25223.26	4.43	0.00
H3BO3	0.08	0.00	0.00	0.00
Inositol	0.30	0.00	0.00	0.00
KH2PO4	152.41	0.00	0.00	0.00
KI	0.02	0.00	0.00	0.00
MalonicAcid	0.00	0.00	1.01	0.00
Maltose	0.00	627.84	0.00	0.00
Maltotriose	0.00	460.73	0.00	0.00
MgSO4	76.21	0.00	0.00	0.00
MnSO4	0.06	0.00	0.00	0.00
NaCl	15.24	0.00	0.00	0.00
Niacin	0.06	0.00	0.00	0.00
Pyridoxine hydr	0.06	0.00	0.00	0.00
Riboflavin	0.03	0.00	0.00	0.00
Sodium Molybdat	0.03	0.00	0.00	0.00
Soluble Protein	3.16	3.16	0.00	0.00
Solubles	1.60	1.60	0.00	0.00
Succinic Acid	0.00	0.00	0.11	0.00
Thiamine hydroc	0.06	0.00	0.00	0.00
Water	216667.95	10779.21	203.11	432319.81
Yeast Extact	0.28	0.00	0.03	0.00
ZnSO4	0.06	0.00	0.00	0.00
TOTAL (kg/batch)	253597.32	37167.64	209.98	432319.81
TOTAL (L/batch)	242332.99	33215.77	210.35	437002.19

Table S1. Stream table (continued)

Stream Name	S-105	S-106	S-107	S-108
Source	P-1	P-84	P-38	P-3
Destination	P-2	P-37	P-35	P-4
Stream Properties				
Temperature (°C)	25.00	30.00	33.28	25.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.03	0.00	0.00	0.03
Amm Sulfate	762.07	0.00	10.48	762.07
Biomass	0.00	0.00	25.68	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	1.38	0.00
CaCl2	15.24	0.00	0.42	15.24
Calcium Malonat	0.00	0.00	34.61	0.00
Calcium Pantothe	0.06	0.00	0.00	0.06
Calcium Succina	0.00	0.00	0.67	0.00
CaMalonate Crys	0.00	0.00	356.65	0.00
CuSO4	0.01	0.00	0.00	0.01
Diammonium Phos	0.00	0.00	0.02	0.00
Ethyl Alcohol	0.00	0.00	0.30	0.00
FeCl3	0.03	0.00	0.00	0.03
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	0.00	0.18	0.00
H3BO3	0.08	0.00	0.00	0.08
Inositol	0.30	0.00	0.01	0.30
KH2PO4	152.41	0.00	4.24	152.41
KI	0.02	0.00	0.00	0.02
MgSO4	76.21	0.00	2.12	76.21
MnSO4	0.06	0.00	0.00	0.06
NaCl	15.24	0.00	0.42	15.24
Niacin	0.06	0.00	0.00	0.06
Pyridoxine hydr	0.06	0.00	0.00	0.06
Riboflavin	0.03	0.00	0.00	0.03
Sodium Molybdat	0.03	0.00	0.00	0.03
Soluble Protein	0.00	0.00	0.09	0.00
Solubles	0.00	0.00	0.04	0.00
Thiamine hydroc	0.06	0.00	0.00	0.06
Water	2785.01	54047.14	54233.12	2785.01
Yeast Extact	0.00	0.00	0.01	0.00
ZnSO4	0.06	0.00	0.00	0.06
TOTAL (kg/batch)	3807.07	54047.14	54670.45	3807.07
TOTAL (L/batch)	3351.98	54434.62	54976.26	3351.98

Table S1. Stream table (continued)

Stream Name	S-109	S-110	S-111	S-112
Source	P-84	P-2	INPUT	P-10
Destination	P-54	P-3	P-1	P-11
Stream Properties				
Temperature (°C)	30.00	25.00	25.00	30.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.03	0.00	0.00
Amm Sulfate	0.00	762.07	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
CaCl ₂	0.00	15.24	0.00	0.00
Calcium Pantoic	0.00	0.06	0.00	0.00
CuSO ₄	0.00	0.01	0.00	0.00
FeCl ₃	0.00	0.03	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
H ₃ BO ₃	0.00	0.08	0.00	0.00
Inositol	0.00	0.30	0.00	0.00
KH ₂ PO ₄	0.00	152.41	0.00	0.00
KI	0.00	0.02	0.00	0.00
MgSO ₄	0.00	76.21	0.00	0.00
MnSO ₄	0.00	0.06	0.00	0.00
NaCl	0.00	15.24	0.00	0.00
Niacin	0.00	0.06	0.00	0.00
Pyridoxine hydr	0.00	0.06	0.00	0.00
Riboflavin	0.00	0.03	0.00	0.00
Sodium Molybdat	0.00	0.03	0.00	0.00
Thiamine hydroc	0.00	0.06	0.00	0.00
Water	80092.33	2785.01	2785.01	194428.84
ZnSO ₄	0.00	0.06	0.00	0.00
TOTAL (kg/batch)	80092.33	3807.07	2785.01	194428.84
TOTAL (L/batch)	80666.53	3351.98	2799.84	195822.74

Table S1. Stream table (continued)

Stream Name	S-113	S-114	S-115	S-116
Source	P-16	P-19	P-4	P-8
Destination	P-17	P-20	P-27	P-12
Stream Properties				
Temperature (°C)	30.00	40.00	25.00	30.00
Pressure (bar)	1.01	3.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	0.00	77.24	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	14847.50	0.00	0.00	0.00
CaCl2	0.00	0.00	1.54	0.00
Calcium Pantothe	0.00	0.00	0.01	0.00
CuSO4	0.00	0.00	0.00	0.00
DPn	0.00	0.00	0.00	0.24
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	0.00	0.00	82.79
H3BO3	0.00	0.00	0.01	0.00
Inositol	0.00	0.00	0.03	0.00
KH2PO4	0.00	0.00	15.45	0.00
KI	0.00	0.00	0.00	0.00
Maltose	0.00	0.00	0.00	2.06
Maltotriose	0.00	0.00	0.00	1.51
MgSO4	0.00	0.00	7.72	0.00
MnSO4	0.00	0.00	0.01	0.00
N2	0.00	642911.34	0.00	0.00
NaCl	0.00	0.00	1.54	0.00
Niacin	0.00	0.00	0.01	0.00
O2	0.00	194368.70	0.00	0.00
Pyridoxine hydr	0.00	0.00	0.01	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdat	0.00	0.00	0.00	0.00
Soluble Protein	0.00	0.00	0.00	0.01
Solubles	0.00	0.00	0.00	0.01
Thiamine hydroc	0.00	0.00	0.01	0.00
Water	44542.50	0.00	282.26	35.38
ZnSO4	0.00	0.00	0.01	0.00
TOTAL (kg/batch)	59390.00	837280.05	385.85	122.00
TOTAL (L/batch)	51272.22	250793074.40	339.73	109.03

Table S1. Stream table (continued)

Stream Name	S-117	S-118	S-119	S-120
Source	P-17	P-31	P-11	P-34
Destination	P-18	P-32	P-14	P-35
Stream Properties				
Temperature (°C)	30.00	30.02	30.00	31.41
Pressure (bar)	1.01	2.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.03	0.00	0.00
Amm Sulfate	0.00	376.48	0.00	38.38
Biomass	0.00	976.30	0.00	94.07
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	14847.50	49.57	0.00	5.05
CaCl2	0.00	15.24	0.00	1.55
Calcium Malonat	0.00	1308.68	0.00	126.78
Calcium Pantothe	0.00	0.06	0.00	0.01
Calcium Succina	0.00	24.11	0.00	2.46
CaMalonate Crys	0.00	33911.38	0.00	35668.33
CuSO4	0.00	0.01	0.00	0.00
Diammonium Phos	0.00	0.56	0.00	0.06
Ethyl Alcohol	0.00	10.66	0.00	1.09
FeCl3	0.00	0.03	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	6.60	0.00	0.67
H3BO3	0.00	0.08	0.00	0.01
Inositol	0.00	0.30	0.00	0.03
KH2PO4	0.00	152.41	0.00	15.54
KI	0.00	0.02	0.00	0.00
MgSO4	0.00	76.21	0.00	7.77
MnSO4	0.00	0.06	0.00	0.01
NaCl	0.00	15.24	0.00	1.55
Niacin	0.00	0.06	0.00	0.01
Pyridoxine hydr	0.00	0.06	0.00	0.01
Riboflavin	0.00	0.03	0.00	0.00
Sodium Molybdat	0.00	0.03	0.00	0.00
Soluble Protein	0.00	3.16	0.00	0.32
Solubles	0.00	1.60	0.00	0.16
Thiamine hydroc	0.00	0.06	0.00	0.01
Water	44542.50	216667.95	194428.84	24145.83
Yeast Extact	0.00	0.28	0.00	0.03
ZnSO4	0.00	0.06	0.00	0.01
TOTAL (kg/batch)	59390.00	253597.32	194428.84	60109.74
TOTAL (L/batch)	51272.22	242331.20	195822.74	47614.98

Table S1. Stream table (continued)

Stream Name	S-121	S-122	S-123	S-124
Source	P-8	P-64	P-34	P-14
Destination	P-27	P-67	P-45	P-16
Stream Properties				
Temperature (°C)	30.00	45.61	31.41	30.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.03	0.00
Amm Sulfate	0.00	4.48	393.87	0.00
BaCO3	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	965.45	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	51.86	0.00
CaCl2	0.00	0.00	15.95	0.00
Calcium Malonat	0.00	0.00	1301.06	0.00
Calcium Pantothe	0.00	0.00	0.06	0.00
Calcium Succina	0.00	0.29	25.22	0.00
CaMalonate Crys	0.00	0.00	360.29	0.00
CuSO4	0.00	0.00	0.01	0.00
Diammonium Phos	0.00	0.00	0.58	0.00
DPn	0.09	0.00	0.00	0.00
Ethyl Alcohol	0.00	0.00	11.15	0.00
FeCl3	0.00	0.00	0.03	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	30.98	0.05	6.90	0.00
H3BO3	0.00	0.00	0.08	0.00
Inositol	0.00	0.00	0.32	0.00
KH2PO4	0.00	0.00	159.46	0.00
KI	0.00	0.00	0.02	0.00
MalonicAcid	0.00	19860.88	0.00	0.00
Maltose	0.77	0.00	0.00	0.00
Maltotriose	0.57	0.00	0.00	0.00
MgSO4	0.00	0.00	79.73	0.00
MnSO4	0.00	0.00	0.06	0.00
NaCl	0.00	0.00	15.95	0.00
Niacin	0.00	0.00	0.06	0.00
Pyridoxine hydr	0.00	0.00	0.06	0.00
Riboflavin	0.00	0.00	0.03	0.00
Sodium Molybdat	0.00	0.00	0.03	0.00
Soluble Protein	0.00	0.00	3.31	0.00
Solubles	0.00	0.00	1.67	0.00
Thiamine hydroc	0.00	0.00	0.06	0.00
Water	13.24	213842.60	247801.11	44542.50
Yeast Extact	0.00	0.00	0.29	0.00
ZnSO4	0.00	0.00	0.06	0.00
TOTAL (kg/batch)	45.64	233708.30	251194.77	44542.50
TOTAL (L/batch)	40.79	229709.43	252116.50	44861.83

Table S1. Stream table (continued)

Stream Name	S-125	S-126	S-127	S-128
Source	P-12	P-14	P-36	P-38
Destination	P-13	P-15	P-37	P-39
Stream Properties				
Temperature (°C)	26.95	30.00	33.36	33.28
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	0.00	15.13	4.65
Biomass	0.00	0.00	37.08	11.40
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	1.99	0.61
CaCl2	0.00	0.00	0.61	0.19
Calcium Malonat	0.00	0.00	49.97	15.37
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succina	0.00	0.00	0.97	0.30
CaMalonate Crys	0.00	0.00	35664.73	35308.08
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phos	2.41	0.00	0.02	0.01
DPn	0.24	0.00	0.00	0.00
Ethyl Alcohol	0.00	0.00	0.43	0.13
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	85.20	0.00	0.27	0.08
H3BO3	0.00	0.00	0.00	0.00
Inositol	0.00	0.00	0.01	0.00
KH2PO4	0.00	0.00	6.12	1.88
KI	0.00	0.00	0.00	0.00
Maltose	2.06	0.00	0.00	0.00
Maltotriose	1.51	0.00	0.00	0.00
MgSO4	0.00	0.00	3.06	0.94
MnSO4	0.00	0.00	0.00	0.00
NaCl	0.00	0.00	0.61	0.19
Niacin	0.00	0.00	0.00	0.00
Pyridoxine hydr	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdat	0.00	0.00	0.00	0.00
Soluble Protein	0.01	0.00	0.13	0.04
Solubles	0.01	0.00	0.06	0.02
Thiamine hydroc	0.00	0.00	0.00	0.00
Water	151.36	149886.34	24271.14	24085.17
Yeast Extact	1.20	0.00	0.01	0.00
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	244.00	149886.34	60052.38	59429.08
TOTAL (L/batch)	230.16	150960.90	47628.01	47151.10

Table S1. Stream table (continued)

Stream Name	S-129	S-130	S-131	S-132
Source	P-82	P-8	P-24	P-25
Destination	P-58	P-29	P-25	P-26
Stream Properties				
Temperature (°C)	39.87	30.00	30.03	30.00
Pressure (bar)	1.01	1.01	2.01	1.01
Component Flowrates (kg/batch)				
Biomass	0.00	0.00	1.19	12.34
Diammonium Phos	0.00	0.00	0.06	0.56
DPn	0.00	71.52	0.00	0.00
Ethyl Alcohol	0.00	0.00	0.05	0.50
Glucose	0.00	25109.50	4.43	43.37
MalonicAcid	0.00	0.00	1.01	10.89
Maltose	0.00	625.00	0.00	0.00
Maltotriose	0.00	458.65	0.00	0.00
Soluble Protein	0.00	3.15	0.00	0.01
Solubles	0.00	1.59	0.00	0.01
Succinic Acid	0.00	0.00	0.11	1.19
Water	228508.27	10730.59	203.11	2056.46
Yeast Extact	0.00	0.00	0.03	0.28
TOTAL (kg/batch)	228508.27	37000.00	209.98	2125.59
TOTAL (L/batch)	230983.20	33065.95	210.35	2129.22

Table S1. Stream table (continued)

Stream Name	S-133	S-134	S-135	S-136
Source	P-26	P-27	P-28	P-29
Destination	P-27	P-28	P-29	P-30
Stream Properties				
Temperature (°C)	30.03	30.00	30.03	30.00
Pressure (bar)	2.01	1.01	2.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.03
Amm Sulfate	0.00	68.13	68.13	376.48
Biomass	12.34	35.10	35.10	976.30
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	2.38	2.38	49.57
CaCl2	0.00	1.54	1.54	15.24
Calcium Malonat	0.00	37.09	37.09	1308.68
Calcium Pantoth	0.00	0.01	0.01	0.06
Calcium Succina	0.00	1.66	1.66	24.11
CaMalonate Crys	0.00	0.00	0.00	33911.38
CuSO4	0.00	0.00	0.00	0.01
Diammonium Phos	0.56	0.56	0.56	0.56
Ethyl Alcohol	0.50	0.54	0.54	10.66
FeCl3	0.00	0.00	0.00	0.03
Folic Acid	0.00	0.00	0.00	0.00
Glucose	43.37	0.03	0.03	6.60
H3BO3	0.00	0.01	0.01	0.08
Inositol	0.00	0.03	0.03	0.30
KH2PO4	0.00	15.45	15.45	152.41
KI	0.00	0.00	0.00	0.02
MalonicAcid	10.89	0.00	0.00	0.00
MgSO4	0.00	7.72	7.72	76.21
MnSO4	0.00	0.01	0.01	0.06
NaCl	0.00	1.54	1.54	15.24
Niacin	0.00	0.01	0.01	0.06
Pyridoxine hydr	0.00	0.01	0.01	0.06
Riboflavin	0.00	0.00	0.00	0.03
Sodium Molybdat	0.00	0.00	0.00	0.03
Soluble Protein	0.01	0.01	0.01	3.16
Solubles	0.01	0.01	0.01	1.60
Succinic Acid	1.19	0.00	0.00	0.00
Thiamine hydroc	0.00	0.01	0.01	0.06
Water	2056.46	17460.41	17460.41	216667.95
Yeast Extact	0.28	0.28	0.28	0.28
ZnSO4	0.00	0.01	0.01	0.06
TOTAL (kg/batch)	2125.59	17632.54	17632.54	253597.32
TOTAL (L/batch)	2129.24	17697.37	17697.54	220394.49

Table S1. Stream table (continued)

Stream Name	S-137	S-138	S-139	S-140
Source	P-30	P-79	P-58	P-33
Destination	P-31	P-67	P-60	P-34
Stream Properties				
Temperature (°C)	30.02	16.28	39.87	30.64
Pressure (bar)	2.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.03	0.01	0.00	0.04
Amm Sulfate	376.48	93.32	0.00	432.25
BaCO3	0.00	0.00	0.00	0.00
Biomass	976.30	0.00	0.00	1059.53
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	49.57	0.00	0.00	56.91
CaCl2	15.24	0.00	0.00	17.50
Calcium Malonat	1308.68	0.00	0.00	1427.84
Calcium Pantothe	0.06	0.00	0.00	0.07
Calcium Succina	24.11	5.98	0.00	27.68
CaMalonate Crys	33911.38	0.00	0.00	36028.62
CuSO4	0.01	0.00	0.00	0.01
Diammonium Phos	0.56	0.00	0.00	0.64
Ethyl Alcohol	10.66	0.00	0.00	12.24
FeCl3	0.03	0.00	0.00	0.04
Folic Acid	0.00	0.00	0.00	0.00
Glucose	6.60	1.03	0.00	7.57
H3BO3	0.08	0.00	0.00	0.09
Inositol	0.30	0.00	0.00	0.35
KH2PO4	152.41	0.00	0.00	174.99
KI	0.02	0.00	0.00	0.02
Malonic Acid C	0.00	71.64	0.00	0.00
MalonicAcid	0.00	31176.16	0.00	0.00
MgSO4	76.21	0.00	0.00	87.50
MnSO4	0.06	0.00	0.00	0.07
NaCl	15.24	0.00	0.00	17.50
Niacin	0.06	0.00	0.00	0.07
Pyridoxine hydr	0.06	0.00	0.00	0.07
Riboflavin	0.03	0.00	0.00	0.04
Sodium Molybdat	0.03	0.00	0.00	0.04
Soluble Protein	3.16	0.00	0.00	3.63
Solubles	1.60	0.00	0.00	1.83
Thiamine hydroc	0.06	0.00	0.00	0.07
Water	216667.95	27006.05	38761.13	271946.94
Yeast Extact	0.28	0.00	0.00	0.32
ZnSO4	0.06	0.00	0.00	0.07
TOTAL (kg/batch)	253597.32	58354.19	38761.13	311304.51
TOTAL (L/batch)	242331.20	47263.10	39180.95	299653.26

Table S1. Stream table (continued)

Stream Name	S-141	S-142	S-143	S-144
Source	P-39	P-21	P-58	P-44
Destination	P-40	P-22	P-61	P-61
Stream Properties				
Temperature (°C)	50.00	30.00	39.87	45.10
Pressure (bar)	1.01	3.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	4.65	0.00	0.00	4.52
BaCO3	0.00	0.00	0.00	0.00
Biomass	11.40	0.00	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.61	0.00	0.00	0.60
CaCl2	0.19	0.00	0.00	0.18
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succinate	0.30	0.00	0.00	0.29
CaSO4	26997.11	0.00	0.00	0.00
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phosphate	0.01	0.00	0.00	0.01
Ethyl Alcohol	0.13	0.00	0.00	0.00
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.08	0.00	0.00	0.08
H3BO3	0.00	0.00	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
KH2PO4	1.88	0.00	0.00	1.83
KI	0.00	0.00	0.00	0.00
Malonic Acid	20635.61	0.00	0.00	20050.03
MgSO4	0.94	0.00	0.00	0.92
MnSO4	0.00	0.00	0.00	0.00
N2	0.00	642911.34	0.00	0.00
NaCl	0.19	0.00	0.00	0.18
Niacin	0.00	0.00	0.00	0.00
O2	0.00	194368.70	0.00	0.00
Pyridoxine hydrate	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdate	0.00	0.00	0.00	0.00
Soluble Protein	0.04	0.00	0.00	0.04
Solubles	0.02	0.00	0.00	0.02
Sulfuric Acid	972.47	0.00	0.00	0.00
Thiamine hydrochloride	0.00	0.00	0.00	0.00
Water	92491.59	0.00	149630.30	200298.56
Yeast Extract	0.00	0.00	0.00	0.00
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	141117.25	837280.05	149630.30	220357.26
TOTAL (L/batch)	118295.53	242784354.15	151250.92	216072.74

Table S1. Stream table (continued)

Stream Name	S-145	S-146	S-147	S-148
Source	P-37	P-36	P-42	P-43
Destination	P-38	P-33	P-43	P-44
Stream Properties				
Temperature (°C)	32.05	33.36	43.93	44.01
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	15.13	33.73	4.60	4.60
BaCO3	0.00	0.00	0.00	0.00
BaSO4	0.00	0.00	0.00	2754.68
Biomass	37.08	82.67	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	1.99	4.44	0.61	0.61
CaCl2	0.61	1.37	0.19	0.19
CaCO3	0.00	0.00	0.00	215.71
Calcium Malonat	49.97	111.41	0.00	0.00
Calcium Pantothe	0.00	0.01	0.00	0.00
Calcium Succinate	0.97	2.16	0.29	0.29
CaMalonate Crys	35664.73	360.25	0.00	0.00
CaSO4	0.00	0.00	293.41	0.00
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phos	0.02	0.05	0.01	0.01
Ethyl Alcohol	0.43	0.95	0.13	0.00
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.27	0.59	0.08	0.08
H3BO3	0.00	0.01	0.00	0.00
Inositol	0.01	0.03	0.00	0.00
KH2PO4	6.12	13.65	1.86	1.86
KI	0.00	0.00	0.00	0.00
MalonicAcid	0.00	0.00	20382.31	20382.31
MgSO4	3.06	6.83	0.93	0.93
MnSO4	0.00	0.01	0.00	0.00
NaCl	0.61	1.37	0.19	0.19
Niacin	0.00	0.01	0.00	0.00
Pyridoxine hydr	0.00	0.01	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdate	0.00	0.00	0.00	0.00
Soluble Protein	0.13	0.28	0.04	0.04
Solubles	0.06	0.14	0.02	0.02
Sulfuric Acid	0.00	0.00	946.25	0.00
Thiamine hydroc	0.00	0.01	0.00	0.00
Water	78318.28	54107.81	194127.53	203618.07
Yeast Extract	0.01	0.02	0.00	0.00
ZnSO4	0.00	0.01	0.00	0.00
TOTAL (kg/batch)	114099.53	54727.80	215758.45	226979.59
TOTAL (L/batch)	102091.84	54982.50	210998.04	220250.48

Table S1. Stream table (continued)

Stream Name	S-149	S-150	S-151	S-152
Source	P-75	INPUT	P-44	P-48
Destination	P-76	P-76	P-56	P-52
Stream Properties				
Temperature (°C)	15.00	25.00	45.10	70.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.01	0.00	0.00	0.03
Amm Sulfate	97.80	0.00	0.07	384.57
BaCO3	0.00	0.00	0.00	0.00
BaSO4	0.00	0.00	2754.68	0.00
Biomass	0.00	0.00	0.00	9.65
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	0.01	50.63
CaCl2	0.00	0.00	0.00	15.57
CaCO3	0.00	0.00	215.71	0.00
Calcium Malonat	0.00	0.00	0.00	1550.98
Calcium Pantothe	0.00	0.00	0.00	0.06
Calcium Succinat	6.26	0.00	0.00	24.63
CuSO4	0.00	0.00	0.00	0.01
Diammonium Phos	0.00	0.00	0.00	0.57
Ethyl Alcohol	0.00	0.00	0.00	10.89
FeCl3	0.00	0.00	0.00	0.03
Folic Acid	0.00	0.00	0.00	0.00
Glucose	1.08	0.00	0.00	6.74
H3BO3	0.00	0.00	0.00	0.08
Inositol	0.00	0.00	0.00	0.31
KH2PO4	0.00	0.00	0.03	155.69
KI	0.00	0.00	0.00	0.02
Malonic Acid C	18436.59	0.00	0.00	0.00
MalonicAcid	32672.10	0.00	332.29	0.00
MgSO4	0.00	0.00	0.02	77.85
MnSO4	0.00	0.00	0.00	0.06
NaCl	0.00	0.00	0.00	15.57
Niacin	0.00	0.00	0.00	0.06
Pyridoxine hydr	0.00	0.00	0.00	0.06
Riboflavin	0.00	0.00	0.00	0.03
Sodium Molybdat	0.00	0.00	0.00	0.03
Soluble Protein	0.00	0.00	0.00	3.23
Solubles	0.00	0.00	0.00	1.63
Thiamine hydroc	0.00	0.00	0.00	0.06
Water	20770.22	10767.59	3319.51	20790.57
Yeast Extract	0.00	0.00	0.00	0.28
ZnSO4	0.00	0.00	0.00	0.06
TOTAL (kg/batch)	71984.07	10767.59	6622.33	23099.97
TOTAL (L/batch)	53777.61	10824.92	4271.49	22672.16

Table S1. Stream table (continued)

Stream Name	S-153	S-154	S-155	S-156
Source	P-58	P-64	P-76	P-43
Destination	P-59	P-65	OUTPUT	OUTPUT
Stream Properties				
Temperature (°C)	39.87	45.61	16.09	44.01
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	0.64	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Calcium Succina	0.00	0.04	0.00	0.00
CO2	0.00	0.00	0.00	424.60
Ethyl Alcohol	0.00	0.00	0.00	0.13
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	0.07	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
MalonicAcid	0.00	2837.26	0.00	0.00
N2	0.00	0.00	11.58	0.00
Niacin	0.00	0.00	0.00	0.00
O2	0.00	0.00	3.50	0.00
Pyridoxine hydr	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Soluble Protein	0.00	0.04	0.00	0.00
Solubles	0.00	0.02	0.00	0.00
Thiamine hydroc	0.00	0.00	0.00	0.00
Water	40116.83	30548.84	0.00	0.00
Yeast Extact	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	40116.83	33386.92	15.08	424.72
TOTAL (L/batch)	40551.33	32815.63	12407.61	251155.80

Table S1. Stream table (continued)

Stream Name	S-157	S-158	S-159	S-160
Source	P-82	P-35	P-48	P-76
Destination	P-65	P-36	P-45	P-77
Stream Properties				
Temperature (°C)	39.87	32.15	119.76	20.00
Pressure (bar)	1.01	1.01	5.07	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	48.86	0.00	0.01
Biomass	0.00	119.75	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	6.43	0.00	0.00
CaCl2	0.00	1.98	0.00	0.00
Calcium Malonat	0.00	161.38	0.00	0.00
Calcium Pantothe	0.00	0.01	0.00	0.00
Calcium Succina	0.00	3.13	0.00	0.00
CaMalonate Crys	0.00	36024.98	0.00	0.00
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phos	0.00	0.07	0.00	0.00
Ethyl Alcohol	0.00	1.38	0.00	0.00
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	0.86	0.00	0.00
H3BO3	0.00	0.01	0.00	0.00
Inositol	0.00	0.04	0.00	0.00
KH2PO4	0.00	19.78	0.00	0.00
KI	0.00	0.00	0.00	0.00
Malonic Acid C	0.00	0.00	0.00	18364.03
MalonicAcid	0.00	0.00	0.00	2.80
MgSO4	0.00	9.89	0.00	0.00
MnSO4	0.00	0.01	0.00	0.00
NaCl	0.00	1.98	0.00	0.00
Niacin	0.00	0.01	0.00	0.00
Pyridoxine hydr	0.00	0.01	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdat	0.00	0.00	0.00	0.00
Soluble Protein	0.00	0.41	0.00	0.00
Solubles	0.00	0.21	0.00	0.00
Thiamine hydroc	0.00	0.01	0.00	0.00
Water	16693.46	78378.95	167974.31	3582.56
Yeast Extact	0.00	0.04	0.00	0.00
ZnSO4	0.00	0.01	0.00	0.00
TOTAL (kg/batch)	16693.46	114780.18	167974.31	21949.40
TOTAL (L/batch)	16874.26	102575.12	174943.25	15467.12

Table S1. Stream table (continued)

Stream Name	S-161	S-162	S-163	S-164
Source	P-65	P-76	P-42	P-66
Destination	P-66	P-79	P-54	OUTPUT
Stream Properties				
Temperature (°C)	43.63	20.00	43.93	44.32
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.64	8.40	0.54	0.04
BaCO3	0.00	0.00	0.00	0.00
Biomass	0.00	0.00	48.61	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	0.07	0.00
CaCl2	0.00	0.00	0.02	0.00
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succinate	0.04	0.54	0.03	0.00
CaSO4	0.00	0.00	34.66	0.00
CaSO4*2H2O	0.00	0.00	33793.96	0.00
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phosphate	0.00	0.00	0.00	0.00
Ethyl Alcohol	0.00	0.00	0.02	0.00
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.07	0.09	0.01	0.03
H3BO3	0.00	0.00	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
KH2PO4	0.00	0.00	0.22	0.00
KI	0.00	0.00	0.00	0.00
Malonic Acid C	0.00	54.12	0.00	0.00
Malonic Acid	2837.26	2806.67	2407.53	189.15
MgSO4	0.00	0.00	0.11	0.00
MnSO4	0.00	0.00	0.00	0.00
NaCl	0.00	0.00	0.02	0.00
Niacin	0.00	0.00	0.00	0.00
Pyridoxine hydrate	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdate	0.00	0.00	0.00	0.00
Soluble Protein	0.04	0.00	0.00	0.04
Solubles	0.02	0.00	0.00	0.02
Sulfuric Acid	0.00	0.00	111.77	0.00
Thiamine hydrochloride	0.00	0.00	0.00	0.00
Water	47242.30	8971.06	22930.07	3149.42
Yeast Extract	0.00	0.00	0.00	0.00
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	50080.37	11840.89	59327.65	3338.70
TOTAL (L/batch)	49687.90	10856.75	39535.45	3313.40

Table S1. Stream table (continued)

Stream Name	S-165	S-166	S-167	S-168
Source	P-54	P-55	P-55	P-41
Destination	P-55	P-41	OUTPUT	P-42
Stream Properties				
Temperature (°C)	34.06	35.66	35.66	42.90
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.54	0.42	0.13	5.14
BaCO3	0.00	0.00	0.00	0.00
Biomass	48.61	37.21	11.40	48.61
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.07	0.05	0.02	0.68
CaCl2	0.02	0.02	0.01	0.21
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succina	0.03	0.03	0.01	0.33
CaSO4	34.66	26.53	8.13	328.07
CaSO4*2H2O	33793.96	33.79	33760.16	33793.96
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phos	0.00	0.00	0.00	0.01
Ethyl Alcohol	0.02	0.01	0.00	0.14
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.01	0.01	0.00	0.09
H3BO3	0.00	0.00	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
KH2PO4	0.22	0.17	0.05	2.08
KI	0.00	0.00	0.00	0.00
MalonicAcid	2407.53	1842.73	564.80	22789.84
MgSO4	0.11	0.08	0.03	1.04
MnSO4	0.00	0.00	0.00	0.00
NaCl	0.02	0.02	0.01	0.21
Niacin	0.00	0.00	0.00	0.00
Pyridoxine hydr	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdat	0.00	0.00	0.00	0.00
Soluble Protein	0.00	0.00	0.00	0.04
Solubles	0.00	0.00	0.00	0.02
Sulfuric Acid	111.77	85.55	26.22	1058.02
Thiamine hydroc	0.00	0.00	0.00	0.00
Water	103022.40	78853.50	24168.90	217057.60
Yeast Extact	0.00	0.00	0.00	0.00
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	139419.98	80880.11	58539.87	275086.10
TOTAL (L/batch)	120226.25	80935.14	39354.27	250438.30

Table S1. Stream table (continued)

Stream Name	S-169	S-170	S-171	S-172
Source	P-59	P-60	P-61	P-70
Destination	P-61	P-61	OUTPUT	P-74
Stream Properties				
Temperature (°C)	38.94	38.96	39.54	52.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.01
Amm Sulfate	0.00	0.00	0.00	97.80
BaCO3	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	0.60	0.00
CaCl2	0.00	0.00	0.18	0.00
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succinate	0.00	0.00	0.00	6.26
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phosphate	0.00	0.00	0.01	0.00
FeCl3	0.00	0.00	0.00	0.00
Glucose	0.00	0.00	0.00	1.08
H3BO3	0.00	0.00	0.00	0.00
HCl(aq)	0.00	1685.27	1685.27	0.00
KH2PO4	0.00	0.00	1.83	0.00
KI	0.00	0.00	0.00	0.00
Malonic Acid	0.00	0.00	0.00	51108.69
MgSO4	0.00	0.00	0.92	0.00
MnSO4	0.00	0.00	0.00	0.00
NaCl	0.00	0.00	0.18	0.00
NaOH(aq)	1744.21	0.00	1744.21	0.00
Sodium Molybdate	0.00	0.00	0.00	0.00
Water	41861.04	40446.40	231937.74	20770.22
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	43605.25	42131.67	235370.94	71984.07
TOTAL (L/batch)	43214.55	43214.55	237692.03	55000.81

Table S1. Stream table (continued)

Stream Name	S-173	S-174	S-175	S-176
Source	P-61	P-66	P-63	P-4
Destination	P-62	P-63	P-64	P-29
Stream Properties				
Temperature (°C)	45.10	44.32	44.96	25.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.03
Amm Sulfate	4.52	0.60	5.12	684.83
BaCO3	0.00	0.00	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
CaCl2	0.00	0.00	0.00	13.70
Calcium Pantothe	0.00	0.00	0.00	0.06
Calcium Succinate	0.29	0.04	0.33	0.00
CuSO4	0.00	0.00	0.00	0.01
FeCl3	0.00	0.00	0.00	0.03
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.08	0.04	0.12	0.00
H3BO3	0.00	0.00	0.00	0.07
Inositol	0.00	0.00	0.00	0.27
KH2PO4	0.00	0.00	0.00	136.97
KI	0.00	0.00	0.00	0.01
Malonic Acid	20050.03	2648.11	22698.14	0.00
MgSO4	0.00	0.00	0.00	68.48
MnSO4	0.00	0.00	0.00	0.06
NaCl	0.00	0.00	0.00	13.70
Niacin	0.00	0.00	0.00	0.06
Pyridoxine hydrate	0.00	0.00	0.00	0.06
Riboflavin	0.00	0.00	0.00	0.03
Sodium Molybdate	0.00	0.00	0.00	0.03
Soluble Protein	0.04	0.00	0.04	0.00
Solubles	0.02	0.00	0.02	0.00
Thiamine hydrochloride	0.00	0.00	0.00	0.06
Water	200298.56	44092.88	244391.44	2502.74
Yeast Extract	0.00	0.00	0.00	0.00
ZnSO4	0.00	0.00	0.00	0.06
TOTAL (kg/batch)	220353.54	46741.67	267095.22	3421.22
TOTAL (L/batch)	216071.02	46387.62	262458.26	3012.25

Table S1. Stream table (continued)

Stream Name	S-185	S-186	S-188	S-189
Source	P-73	P-78	INPUT	P-67
Destination	P-80	P-79	P-85	P-68
Stream Properties				
Temperature (°C)	45.19	15.01	25.00	41.11
Pressure (bar)	1.13	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.01	0.00	0.01
Amm Sulfate	0.00	84.92	0.00	97.80
BaCO3	0.00	0.00	0.00	0.00
Calcium Succina	0.00	5.44	0.00	6.26
Glucose	0.00	0.94	0.00	1.08
Malonic Acid C	0.00	17.51	0.00	71.64
MalonicAcid	0.00	28369.50	0.00	51037.05
N2	0.00	0.00	153649.84	0.00
O2	0.00	0.00	46452.32	0.00
Water	220078.42	18034.99	0.00	240848.65
TOTAL (kg/batch)	220078.42	46513.30	200102.16	292062.49
TOTAL (L/batch)	222899.55	36398.12	169706125.87	277198.05
Stream Name	S-190	S-191	S-192	S-193
Source	P-85	P-77	P-78	P-51
Destination	P-86	OUTPUT	OUTPUT	P-80
Stream Properties				
Temperature (°C)	26.64	70.00	15.01	38.80
Pressure (bar)	1.03	1.01	1.01	1.30
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	0.00	4.47	0.00
BaCO3	0.00	0.00	0.00	0.00
Calcium Succina	0.00	0.00	0.29	0.00
Glucose	0.00	0.00	0.05	0.00
Malonic Acid C	0.00	0.00	0.92	0.00
MalonicAcid	0.00	0.00	1493.13	0.00
N2	153649.84	80453.83	0.00	0.00
O2	46452.32	24323.27	0.00	0.00
Water	0.00	2410.21	949.21	221231.77
TOTAL (kg/batch)	200102.16	107187.31	2448.07	221231.77
TOTAL (L/batch)	167338292.85	106040247.10	1915.69	223540.04

Table S1. Stream table (continued)

Stream Name	S-194	S-195	S-196	S-197
Source	P-48	P-5	P-6	P-52
Destination	P-49	P-6	P-7	P-53
Stream Properties				
Temperature (°C)	70.00	25.00	30.00	30.00
Pressure (bar)	0.31	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.03
Amm Sulfate	0.00	0.00	0.00	384.57
Biomass	0.00	0.00	0.00	9.65
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	0.00	50.63
CaCl2	0.00	0.00	0.00	15.57
Calcium Malonat	0.00	0.00	0.00	135.18
Calcium Pantothe	0.00	0.00	0.00	0.06
Calcium Succina	0.00	0.00	0.00	24.63
CaMalonate Crys	0.00	0.00	0.00	1774.73
CuSO4	0.00	0.00	0.00	0.01
Diammonium Phos	0.00	0.00	0.00	0.57
DPn	0.00	71.85	71.85	0.00
Ethyl Alcohol	0.00	0.00	0.00	10.89
FeCl3	0.00	0.00	0.00	0.03
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	25223.26	25223.26	6.74
H3BO3	0.00	0.00	0.00	0.08
Inositol	0.00	0.00	0.00	0.31
KH2PO4	0.00	0.00	0.00	155.69
KI	0.00	0.00	0.00	0.02
Maltose	0.00	627.84	627.84	0.00
Maltotriose	0.00	460.73	460.73	0.00
MgSO4	0.00	0.00	0.00	77.85
MnSO4	0.00	0.00	0.00	0.06
NaCl	0.00	0.00	0.00	15.57
Niacin	0.00	0.00	0.00	0.06
Pyridoxine hydr	0.00	0.00	0.00	0.06
Riboflavin	0.00	0.00	0.00	0.03
Sodium Molybdat	0.00	0.00	0.00	0.03
Soluble Protein	0.00	3.16	3.16	3.23
Solubles	0.00	1.60	1.60	1.63
Thiamine hydroc	0.00	0.00	0.00	0.06
Water	53257.46	10779.21	10779.21	20431.64
Yeast Extact	0.00	0.00	0.00	0.28
ZnSO4	0.00	0.00	0.00	0.06
TOTAL (kg/batch)	53257.46	37167.64	37167.64	23099.97
TOTAL (L/batch)	270911872.33	33128.97	33215.77	22228.13

Table S1. Stream table (continued)

Stream Name	S-198	S-199	S-200	S-201
Source	P-53	P-53	P-49	P-50
Destination	P-33	OUTPUT	P-50	P-51
Stream Properties				
Temperature (°C)	33.86	33.86	40.00	40.03
Pressure (bar)	1.01	1.01	0.30	1.30
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.03	0.00	0.00
Amm Sulfate	22.04	362.53	0.00	0.00
Biomass	0.55	9.10	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	2.90	47.73	0.00	0.00
CaCl2	0.89	14.68	0.00	0.00
Calcium Malonat	7.75	127.43	0.00	0.00
Calcium Pantothe	0.00	0.06	0.00	0.00
Calcium Succina	1.41	23.22	0.00	0.00
CaMalonate Crys	1756.98	17.75	0.00	0.00
CuSO4	0.00	0.01	0.00	0.00
Diammonium Phos	0.03	0.54	0.00	0.00
Ethyl Alcohol	0.62	10.26	0.00	0.00
FeCl3	0.00	0.03	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.39	6.35	0.00	0.00
H3BO3	0.00	0.07	0.00	0.00
Inositol	0.02	0.29	0.00	0.00
KH2PO4	8.92	146.77	0.00	0.00
KI	0.00	0.01	0.00	0.00
MgSO4	4.46	73.38	0.00	0.00
MnSO4	0.00	0.06	0.00	0.00
NaCl	0.89	14.68	0.00	0.00
Niacin	0.00	0.06	0.00	0.00
Pyridoxine hydr	0.00	0.06	0.00	0.00
Riboflavin	0.00	0.03	0.00	0.00
Sodium Molybdat	0.00	0.03	0.00	0.00
Soluble Protein	0.18	3.04	0.00	0.00
Solubles	0.09	1.54	0.00	0.00
Thiamine hydroc	0.00	0.06	0.00	0.00
Water	1171.18	19260.46	53257.46	53257.46
Yeast Extact	0.02	0.27	0.00	0.00
ZnSO4	0.00	0.06	0.00	0.00
TOTAL (kg/batch)	2979.38	20120.58	53257.46	53257.46
TOTAL (L/batch)	2346.51	19911.06	53836.92	53837.43

Table S1. Stream table (continued)

Stream Name	S-203	S-204	S-205	S-206
Source	P-80	P-46	P-45	P-45
Destination	P-81	P-47	P-46	P-51
Stream Properties				
Temperature (°C)	39.87	86.03	86.04	38.41
Pressure (bar)	1.01	1.01	1.01	5.07
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.03	0.03	0.00
Amm Sulfate	0.00	393.87	393.87	0.00
Biomass	0.00	965.45	965.45	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	51.86	51.86	0.00
CaCl2	0.00	15.95	15.95	0.00
Calcium Malonat	0.00	1588.48	1301.06	0.00
Calcium Pantothe	0.00	0.06	0.06	0.00
Calcium Succina	0.00	25.22	25.22	0.00
CaMalonate Cry	0.00	0.00	360.29	0.00
CuSO4	0.00	0.01	0.01	0.00
Diammonium Phos	0.00	0.58	0.58	0.00
Ethyl Alcohol	0.00	11.15	11.15	0.00
FeCl3	0.00	0.03	0.03	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	6.90	6.90	0.00
H3BO3	0.00	0.08	0.08	0.00
Inositol	0.00	0.32	0.32	0.00
KH2PO4	0.00	159.46	159.46	0.00
KI	0.00	0.02	0.02	0.00
MgSO4	0.00	79.73	79.73	0.00
MnSO4	0.00	0.06	0.06	0.00
NaCl	0.00	15.95	15.95	0.00
Niacin	0.00	0.06	0.06	0.00
Pyridoxine hydr	0.00	0.06	0.06	0.00
Riboflavin	0.00	0.03	0.03	0.00
Sodium Molybdat	0.00	0.03	0.03	0.00
Soluble Protein	0.00	3.31	3.31	0.00
Solubles	0.00	1.67	1.67	0.00
Thiamine hydroc	0.00	0.06	0.06	0.00
Water	504242.77	247873.97	247801.11	167974.31
Yeast Extact	0.00	0.29	0.29	0.00
ZnSO4	0.00	0.06	0.06	0.00
TOTAL (kg/batch)	504242.77	251194.77	251194.77	167974.31
TOTAL (L/batch)	509704.13	257259.98	257233.36	169702.63

Table S1. Stream table (continued)

Stream Name	S-207	S-208	S-209	S-210
Source	P-72	P-47	P-47	P-56
Destination	P-73	OUTPUT	P-48	P-57
Stream Properties				
Temperature (°C)	40.03	86.03	86.03	31.01
Pressure (bar)	1.13	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.03	0.00
Amm Sulfate	0.00	9.30	384.57	0.07
BaCO3	0.00	0.00	0.00	0.00
BaSO4	0.00	0.00	0.00	2754.68
Biomass	0.00	955.80	9.65	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	1.22	50.63	0.01
CaCl2	0.00	0.38	15.57	0.00
CaCO3	0.00	0.00	0.00	215.71
Calcium Malonat	0.00	37.50	1550.98	0.00
Calcium Pantothe	0.00	0.00	0.06	0.00
Calcium Succina	0.00	0.60	24.63	0.00
CuSO4	0.00	0.00	0.01	0.00
Diammonium Phos	0.00	0.01	0.57	0.00
Ethyl Alcohol	0.00	0.26	10.89	0.00
FeCl3	0.00	0.00	0.03	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	0.16	6.74	0.00
H3BO3	0.00	0.00	0.08	0.00
Inositol	0.00	0.01	0.31	0.00
KH2PO4	0.00	3.76	155.69	0.03
KI	0.00	0.00	0.02	0.00
MalonicAcid	0.00	0.00	0.00	332.29
MgSO4	0.00	1.88	77.85	0.02
MnSO4	0.00	0.00	0.06	0.00
NaCl	0.00	0.38	15.57	0.00
Niacin	0.00	0.00	0.06	0.00
Pyridoxine hydr	0.00	0.00	0.06	0.00
Riboflavin	0.00	0.00	0.03	0.00
Sodium Molybdat	0.00	0.00	0.03	0.00
Soluble Protein	0.00	0.08	3.23	0.00
Solubles	0.00	0.04	1.63	0.00
Thiamine hydroc	0.00	0.00	0.06	0.00
Water	79310.03	5851.63	242022.34	56298.12
Yeast Extract	0.00	0.01	0.28	0.00
ZnSO4	0.00	0.00	0.06	0.00
TOTAL (kg/batch)	79310.03	6863.03	244331.74	59600.94
TOTAL (L/batch)	80173.71	6961.79	250298.19	57630.05

Table S1. Stream table (continued)

Stream Name	S-211	S-215	S-212	S-213
Source	P-57	P-20	P-57	P-84
Destination	OUTPUT	P-21	P-41	P-56
Stream Properties				
Temperature (°C)	33.39	30.00	33.39	30.00
Pressure (bar)	1.01	3.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	0.00	0.00	0.07	0.00
BaCO3	0.00	0.00	0.00	0.00
BaSO4	2754.68	0.00	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Ca(OH)2	0.00	0.00	0.01	0.00
CaCl2	0.00	0.00	0.00	0.00
CaCO3	215.71	0.00	0.00	0.00
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succinate	0.00	0.00	0.00	0.00
CuSO4	0.00	0.00	0.00	0.00
Diammonium Phosphate	0.00	0.00	0.00	0.00
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	0.00	0.00	0.00
H3BO3	0.00	0.00	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
KH2PO4	0.00	0.00	0.03	0.00
KI	0.00	0.00	0.00	0.00
Malonic Acid	20.78	0.00	311.51	0.00
MgSO4	0.00	0.00	0.01	0.00
MnSO4	0.00	0.00	0.00	0.00
N2	0.00	642911.34	0.00	0.00
NaCl	0.00	0.00	0.00	0.00
Niacin	0.00	0.00	0.00	0.00
O2	0.00	194368.70	0.00	0.00
Pyridoxine hydrate	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdate	0.00	0.00	0.00	0.00
Soluble Protein	0.00	0.00	0.00	0.00
Solubles	0.00	0.00	0.00	0.00
Thiamine hydrochloride	0.00	0.00	0.00	0.00
Water	3520.63	0.00	52777.50	52978.61
Yeast Extract	0.00	0.00	0.00	0.00
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	6511.80	837280.05	53089.14	52978.61
TOTAL (L/batch)	4254.41	242784354.15	53425.53	53358.43

Table S1. Stream table (continued)

Stream Name	S-214	S-216	S-217	S-218
Source	P-62	P-68	P-81	P-82
Destination	P-63	P-73	OUTPUT	P-83
Stream Properties				
Temperature (°C)	45.10	48.11	39.87	39.87
Pressure (bar)	1.01	1.64	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.00	0.00	0.00
Amm Sulfate	4.52	0.00	0.00	0.00
BaCO3	0.00	0.00	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
Calcium Succina	0.29	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.08	0.00	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
MalonicAcid	20050.03	0.00	0.00	0.00
Niacin	0.00	0.00	0.00	0.00
Pyridoxine hydr	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Soluble Protein	0.04	0.00	0.00	0.00
Solubles	0.02	0.00	0.00	0.00
Thiamine hydroc	0.00	0.00	0.00	0.00
Water	200298.56	140768.39	71922.96	187118.08
Yeast Extact	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	220353.54	140768.39	71922.96	187118.08
TOTAL (L/batch)	216071.02	142726.30	72701.95	189144.73

Table S1. Stream table (continued)

Stream Name	S-219	S-220	S-221	S-222
Source	P-83	P-68	P-4	P-77
Destination	P-84	P-69	OUTPUT	OUTPUT
Stream Properties				
Temperature (°C)	30.00	68.42	25.00	35.00
Pressure (bar)	1.01	1.01	1.01	1.01
Component Flowrates (kg/batch)				
4-Aminobenzoic	0.00	0.01	0.00	0.00
Amm Sulfate	0.00	97.80	0.00	0.00
BaCO3	0.00	0.00	0.00	0.00
Biotin	0.00	0.00	0.00	0.00
CaCl2	0.00	0.00	0.00	0.00
Calcium Pantothe	0.00	0.00	0.00	0.00
Calcium Succinate	0.00	6.26	0.00	0.00
CuSO4	0.00	0.00	0.00	0.00
FeCl3	0.00	0.00	0.00	0.00
Folic Acid	0.00	0.00	0.00	0.00
Glucose	0.00	1.08	0.00	0.00
H3BO3	0.00	0.00	0.00	0.00
Inositol	0.00	0.00	0.00	0.00
KH2PO4	0.00	0.00	0.00	0.00
KI	0.00	0.00	0.00	0.00
Malonic Acid C	0.00	71.64	0.00	0.00
MalonicAcid	0.00	51037.05	0.00	0.00
MgSO4	0.00	0.00	0.00	0.00
MnSO4	0.00	0.00	0.00	0.00
N2	0.00	0.00	0.00	73196.01
NaCl	0.00	0.00	0.00	0.00
Niacin	0.00	0.00	0.00	0.00
O2	0.00	0.00	0.00	22129.05
Pyridoxine hydr	0.00	0.00	0.00	0.00
Riboflavin	0.00	0.00	0.00	0.00
Sodium Molybdate	0.00	0.00	0.00	0.00
Thiamine hydrochloride	0.00	0.00	0.00	0.00
Water	187118.08	240848.65	0.00	205.68
ZnSO4	0.00	0.00	0.00	0.00
TOTAL (kg/batch)	187118.08	292062.49	0.00	95530.74
TOTAL (L/batch)	188459.57	280391.05	0.00	83845176.52

Table S1. Stream table (continued)

Stream Name	S-223	S-224	S-225	S-228
Source	P-86	P-87	P-86	P-9
Destination	P-87	P-77	P-77	P-12
Stream Properties				
Temperature (°C)	26.64	145.00	26.64	25.00
Pressure (bar)	1.03	1.03	1.03	1.01
Component Flowrates (kg/batch)				
Diammonium Phos	0.00	0.00	0.00	2.41
Glucose	0.00	0.00	0.00	2.41
N2	80453.83	80453.83	73196.01	0.00
O2	24323.27	24323.27	22129.05	0.00
Water	0.00	0.00	0.00	115.98
Yeast Extact	0.00	0.00	0.00	1.20
TOTAL (kg/batch)	104777.10	104777.10	95325.06	122.00
TOTAL (L/batch)	87621347.32	122213898.54	79716945.53	121.22

2. REACTIONS

Table S2. Fermentation Reactions (Mass Stoichiometry)

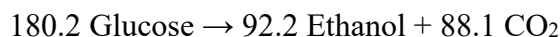
Malonic Acid Production



Succinic Acid Production



Ethanol Production

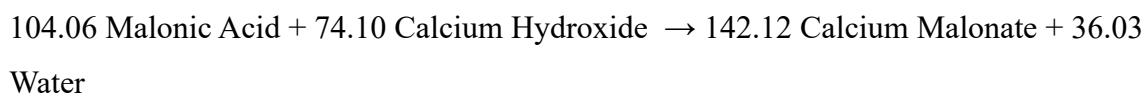


Biomass Growth

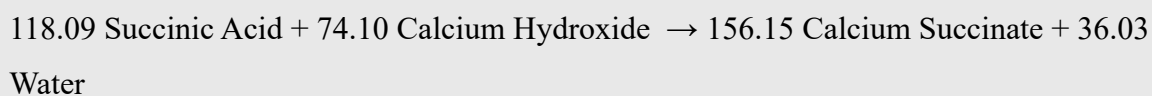


Table S3. Neutralization and Crystallization Reactions (Mass Stoichiometry)

Malonic Acid Neutralization



Succinic Acid Neutralization

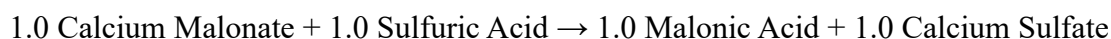


Calcium Malonate Crystallization



Table S4 Downstream Processing Reactions (Molar Stoichiometry)

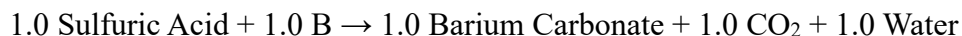
Calcium Malonate Neutralization



Calcium Sulfate Crystallization



Sulfuric Acid Neutralization



Double Replacement Reaction

