APPENDIX G : MATERIAL BALANCE DATA SHEETS

Detailed material balance sheets are contained here. Table G1 provides definitions and clarifications. Tables G2-G11 contain the data for each of the runs.

TABLE G1 : DEFINITIONS

VARIABLE	DEFINITION
Temperature (°F)	Reactor Temperature
Pressure (psig)	Reactor Pressure
Reactor Level (inches on Tape)	Slurry level in reactor as measured on the tape (213" is 100% of max level)
Space Velocity (sL/hr-kg oxide)	Space velocity of reactor feed gas, catalyst weight is on as-charged basis
Catalyst Proportion (% Al2O3)	The weight % alumina in the alumina/S3-86 mix
Catalyst Weight (lb)	Total amount of catalyst in reactor, as-charged basis
Slurry Concentration (wt %)	the weight % of catalyst in the catalyst/oil mix, as-charged basis
Inlet Superficial Vel. (ft/sec)	Gas velocity of reactor feed, based on cross-sectional area of reactor
Outlet Superficial Vel. (ft/sec)	Gas velocity of reactor effluent, based on cross-sectional area of reactor
Gas Holdup (vol %)	The volume % vapor in the slurry
CO Conversion (%)	The amount of CO in the reactor feed which is consumed in reaction (%)
Syngas Conversion (%)	The amount of CO+H2 in the reactor feed which is consumed in reaction
Eq. Productivity (gmoles/hr-kg)	Productivity of MeOH plus twice the productivity of DME
MeOH Make (Ton/day)	Amount of MeOH produced in the reactor
DME Make (Ton/day)	Amount of DME produced in the reactor
Stream Designation	
Fresh Feed	Flow of material into the plant
Recycle	The flow which combines with Fresh Feed to form the Reactor Feed
Reactor Feed	Recycle flow plus Fresh Feed flow, flow to reactor
Reactor Out	Vapor flow from the 27.14, reactor effluent less oil
22.10 Sep Vap	Vapor from 22.10 separator, sent to DME/CO2 section
22.11 Liq	Liquid flow from 22.11 flash pot, sent to day tank, exits plant
22.11 Vap	Flash gas generated when 22.10 liquid is sent to 22.11, exits plant
Plant Purge	Plant purge, same composition as Recycle, exits plant
DME Product	Liquid from the 22.14 separator, generally vaporized as rejected as gas
Flow (lb mole/hr)	Flow of designated stream in molar units
MW	Molecular weight of designated stream
Flow (lb/hr)	Flow of designated stream in mass units

TABLE G2
MATERIAL BALANCE FOR RUN AF-R1.1

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	5711	**Gas Holdup (vol %)**	33.2
Start Date	5/5 20:00	**Catalyst Proportion (% Al2O3)**	0	**CO Conversion (%)**	18.1
End date	5/6 17:00	**Catalyst Weight (lb)**	479.4	**Syngas Conversion (%)**	31.4
TOS (hr)	108 to 129	**Slurry Concentration (wt %)**	30.7	**Eq. Productivity (gmoles/hr-kg)**	21.8
Temperature (°F)	480.1	**Inlet Superficial Vel. (ft/sec)**	0.24	**MeOH Make (Ton/day)**	4.0
Pressure (psig)	750	**Outlet Superficial Vel. (ft/sec)**	0.20	**DME Make (Ton/day)**	0.0
Reactor Level (Inches on Tape)	154				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	53.21	24.19	35.50	21.53	24.19	0.00	3.64	24.19	0.00
Carbon Monoxide	40.80	57.23	50.80	50.77	57.23	0.00	23.27	57.23	0.00
Carbon Dioxide	5.80	17.74	13.13	16.34	17.74	0.00	68.32	17.74	0.00
Nitrogen	0.16	0.54	0.39	0.48	0.54	0.00	0.27	0.54	100.00
Methane	0.03	0.26	0.18	0.20	0.26	0.00	0.26	0.26	0.00
Water	0.00	0.00	0.01	0.08	0.00	0.76	0.00	0.00	0.00
Methanol	0.00	0.04	0.00	10.42	0.04	97.36	4.18	0.04	0.00
Other Oxygenates	0.00	0.00	0.00	0.19	0.00	1.85	0.00	0.00	0.00
Dimethyl Ether	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.00	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	45.20	76.15	122.26	100.14	89.65	10.60	0.01	13.50	0.00
MW	15.10	24.53	20.86	25.47	24.53	32.41	38.14	24.53	28.01
Flow (lb/hr)	682.66	1868.06	2550.72	2550.72	2199.22	343.70	0.34	331.14	0.00

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	48.16	49.30	-2.4
Carbon	21.07	20.96	0.5
Oxygen	23.68	23.23	1.9
Nitrogen	0.14	0.15	-2.0
Total	93.06	93.64	-0.6

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	87.68	86.90	0.9
Carbon	78.38	78.28	0.1
Oxygen	94.23	94.35	-0.1
Nitrogen	0.94	0.95	-1.2
Total	261.23	260.49	0.3

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	0.00	0.00	9.6
MeOH	10.43	10.34	0.9
H2O	0.07	0.08	-10.3
CO2	0.30	-0.22	174.5
Total	10.81	10.20	5.7

TABLE G3
MATERIAL BALANCE FOR RUN AF-R1.2

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	8866	**Gas Holdup (vol %)**	47.7
Start Date	5/3 3:00	**Catalyst Proportion (% Al2O3)**	0	**CO Conversion (%)**	16.8
End date	5/5 13:00	**Catalyst Weight (lb)**	479.4	**Syngas Conversion (%)**	29.0
TOS (hr)	43 to 101	**Slurry Concentration (wt %)**	30.3	**Eq. Productivity (gmoles/hr-kg)**	32.0
Temperature (°F)	480.3	**Inlet Superficial Vel. (ft/sec)**	0.37	**MeOH Make (Ton/day)**	5.9
Pressure (psig)	750	**Outlet Superficial Vel. (ft/sec)**	0.31	**DME Make (Ton/day)**	0.0
Reactor Level (Inches on Tape)	210				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	55.41	25.04	35.35	22.65	25.04	0.00	3.64	25.04	0.00
Carbon Monoxide	39.48	56.64	50.83	50.71	56.64	0.00	23.27	56.64	0.00
Carbon Dioxide	4.91	17.02	12.93	15.67	17.02	0.00	68.33	17.02	0.00
Nitrogen	0.17	0.68	0.50	0.60	0.68	0.00	0.26	0.68	100.00
Methane	0.02	0.30	0.21	0.25	0.30	0.00	0.26	0.30	0.00
Water	0.01	0.01	0.03	0.10	0.01	0.93	0.00	0.01	0.00
Methanol	0.00	0.31	0.16	9.89	0.31	97.64	4.18	0.31	0.00
Other Oxygenates	0.00	0.00	0.00	0.14	0.00	1.41	0.00	0.00	0.00
Dimethyl Ether	0.00	0.00	0.00	0.00	0.00	0.02	0.05	0.00	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	61.63	127.02	189.80	158.26	142.51	15.84	0.11	15.49	0.00
MW	14.39	24.20	20.87	25.03	24.20	32.28	38.14	24.20	28.01
Flow (lb/hr)	886.98	3074.27	3961.24	3961.24	3449.06	511.26	4.20	374.80	0.00

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	68.36	71.64	-4.8
Carbon	27.37	27.61	-0.9
Oxygen	30.39	30.22	0.6
Nitrogen	0.21	0.21	-0.4
Total	126.33	129.68	-2.7

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	137.07	137.44	-0.3
Carbon	121.72	121.61	0.1
Oxygen	145.91	145.98	0.0
Nitrogen	1.88	1.89	-0.4
Total	406.59	406.92	-0.1

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	0.00	0.00	1.2
MeOH	15.35	15.62	-1.8
H2O	0.12	0.15	-28.2
CO2	0.26	-0.39	250.2
Total	15.73	15.38	2.2

TABLE G4
MATERIAL BALANCE FOR RUN AF-R1.3

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	9137	**Gas Holdup (vol %)**	46.9 to 44.7
Start Date	5/6 21:00	**Catalyst Proportion (% Al2O3)**	0	**CO Conversion (%)**	16.4
End date	5/7 6:00	**Catalyst Weight (lb)**	479.4	**Syngas Conversion (%)**	28.2
TOS (hr)	133 to 142	**Slurry Concentration (wt %)**	34.2 to 37.0	**Eq. Productivity (gmoles/hr-kg)**	33.0
Temperature (°F)	481.0	**Inlet Superficial Vel. (ft/sec)**	0.38	**MeOH Make (Ton/day)**	6.1
Pressure (psig)	751	**Outlet Superficial Vel. (ft/sec)**	0.32	**DME Make (Ton/day)**	0.0
Reactor Level (inches on Tape)	170 to 140				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	56.67	24.89	34.65	22.40	24.89	0.00	3.65	24.89	0.00
Carbon Monoxide	38.53	56.52	51.02	50.71	56.52	0.00	23.34	56.52	0.00
Carbon Dioxide	4.53	17.17	13.33	15.88	17.17	0.00	68.52	17.17	0.00
Nitrogen	0.18	0.81	0.61	0.72	0.81	0.00	0.27	0.81	100.00
Methane	0.08	0.29	0.22	0.26	0.29	0.00	0.26	0.29	0.00
Water	0.00	0.00	0.02	0.10	0.00	0.90	0.00	0.00	0.00
Methanol	0.00	0.32	0.16	9.81	0.32	97.69	3.97	0.32	0.00
Other Oxygenates	0.00	0.00	0.00	0.12	0.00	1.39	0.00	0.00	0.00
Dimethyl Ether	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	58.90	136.25	195.61	164.45	149.12	14.88	0.02	12.87	0.00
MW	14.00	24.27	21.12	25.12	24.27	32.27	38.15	24.27	28.01
Flow (lb/hr)	824.40	3306.13	4130.54	4130.54	3618.49	480.25	0.84	312.37	0.00

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	66.95	66.35	0.9
Carbon	25.41	24.62	3.1
Oxygen	28.04	26.75	4.6
Nitrogen	0.21	0.21	2.2
Total	120.61	117.93	2.2

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	138.58	141.41	-2.0
Carbon	126.61	126.54	0.1
Oxygen	152.29	152.20	0.1
Nitrogen	2.38	2.36	0.6
Total	419.87	422.51	-0.6

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	0.00	0.00	-6.3
MeOH	15.82	14.60	7.7
H2O	0.12	0.13	-8.0
CO2	0.04	-0.46	1416.6
Total	15.98	14.28	10.7

TABLE G5
MATERIAL BALANCE FOR RUN AF-R2.1

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	5409	**Gas Holdup (vol %)**	n/a
Start Date	5/9 0:00	**Catalyst Proportion (% Al2O3)**	6.6	**CO Conversion (%)**	28.6
End date	5/9 17:00	**Catalyst Weight (lb)**	484.6	**Syngas Conversion (%)**	39.0
TOS (hr)	184 to 201	**Slurry Concentration (wt %)**	n/a	**Eq. Productivity (gmoles/hr-kg)**	27.1
Temperature (°F)	480.7	**Inlet Superficial Vel. (ft/sec)**	0.23	**MeOH Make (Ton/day)**	2.1
Pressure (psig)	751	**Outlet Superficial Vel. (ft/sec)**	0.18	**DME Make (Ton/day)**	2.1
Reactor Level (inches on Tape)	210				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	48.43	24.08	35.38	20.92	22.56	0.00	1.66	24.08	0.44
Carbon Monoxide	47.83	54.57	51.35	47.30	51.21	0.00	11.56	54.57	4.55
Carbon Dioxide	3.53	18.28	11.51	19.05	20.05	1.71	48.42	18.28	41.71
Nitrogen	0.19	0.94	0.58	0.79	0.87	0.00	0.10	0.94	0.04
Methane	0.01	0.16	0.10	0.13	0.15	0.00	0.08	0.16	0.00
Water	0.01	0.00	0.00	0.14	0.02	2.00	0.08	0.00	0.22
Methanol	0.00	0.00	0.00	5.96	0.26	84.72	3.98	0.00	9.36
Other Oxygenates	0.00	0.00	0.00	0.07	0.00	1.13	0.00	0.00	0.02
Dimethyl Ether	0.00	1.98	1.07	5.64	4.87	10.45	34.12	1.98	43.65
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	53.68	63.21	117.06	90.79	84.21	5.62	0.02	14.14	6.86
MW	15.99	25.01	20.84	26.87	26.22	33.71	41.61	25.01	42.79
Flow (lb/hr)	858.14	1581.07	2439.21	2439.21	2208.25	189.33	0.92	353.68	293.67

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	52.02	52.41	-0.8
Carbon	27.58	26.90	2.4
Oxygen	29.47	28.63	2.9
Nitrogen	0.20	0.27	-33.3
Total	109.27	108.22	1.0

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	90.85	91.46	-0.7
Carbon	76.21	76.16	0.1
Oxygen	88.32	88.29	0.0
Nitrogen	1.37	1.43	-4.5
Total	256.74	257.34	-0.2

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	3.86	3.87	0.0
MeOH	5.41	5.42	-0.1
H2O	0.12	0.13	-6.0
CO2	3.82	3.65	4.6
Total	13.22	13.06	1.2

TABLE G6
MATERIAL BALANCE FOR RUN AF-R2.2

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	8817	**Gas Holdup (vol %)**	46.4
Start Date	5/10 9:00	**Catalyst Proportion (% Al2O3)**	6.6	**CO Conversion (%)**	21.7
End date	5/11 12:00	**Catalyst Weight (lb)**	484.6	**Syngas Conversion (%)**	31.7
TOS (hr)	217 TO 244	**Slurry Concentration (wt %)**	30	**Eq. Productivity (gmoles/hr-kg)**	36.1
Temperature (°F)	481.0	**Inlet Superficial Vel. (ft/sec)**	0.37	**MeOH Make (Ton/day)**	4.0
Pressure (psig)	750	**Outlet Superficial Vel. (ft/sec)**	0.30	**DME Make (Ton/day)**	2.0
Reactor Level (inches on Tape)	210				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	52.00	25.88	35.52	23.40	25.21	0.00	2.20	25.88	0.46
Carbon Monoxide	45.06	54.78	51.18	49.03	53.04	0.00	14.04	54.78	4.11
Carbon Dioxide	2.68	16.52	11.42	16.19	17.18	1.49	49.11	16.52	37.05
Nitrogen	0.20	0.70	0.51	0.62	0.66	0.00	0.15	0.70	0.03
Methane	0.00	0.19	0.13	0.16	0.17	0.00	0.09	0.19	0.00
Water	0.07	0.00	0.00	0.14	0.03	2.01	0.09	0.00	0.56
Methanol	0.00	0.00	0.00	6.59	0.35	88.61	4.88	0.00	13.53
Other Oxygenates	0.00	0.00	0.00	0.06	0.00	0.82	0.00	0.00	0.08
Dimethyl Ether	0.00	1.93	1.23	3.81	3.35	7.08	29.45	1.93	44.17
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	68.77	121.45	190.82	156.00	144.70	10.83	0.01	17.61	5.64
MW	14.92	24.25	20.81	25.46	24.80	33.14	40.77	24.25	42.28
Flow (lb/hr)	1025.80	2945.30	3971.10	3971.10	3589.00	358.99	0.36	427.06	238.34

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	71.61	73.38	-2.5
Carbon	32.82	32.86	-0.1
Oxygen	34.71	34.56	0.5
Nitrogen	0.27	0.25	8.9
Total	139.42	141.05	-1.2

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	150.70	151.77	-0.7
Carbon	124.41	124.39	0.0
Oxygen	143.61	143.59	0.0
Nitrogen	1.94	1.93	0.7
Total	420.66	421.68	-0.2

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	3.59	3.60	-0.1
MeOH	10.29	10.37	-0.8
H2O	0.22	0.25	-14.6
CO2	3.46	3.32	4.0
Total	17.56	17.54	0.1

TABLE G7
MATERIAL BALANCE FOR RUN AF-R2.3

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	5503	**Gas Holdup (vol %)**	31.1
Start Date	5/11 16:00	**Catalyst Proportion (% Al2O3)**	6.6	**CO Conversion (%)**	26.8
End date	5/12 16:00	**Catalyst Weight (lb)**	484.6	**Syngas Conversion (%)**	37.6
TOS (hr)	248 TO 272	**Slurry Concentration (wt %)**	30	**Eq. Productivity (gmoles/hr-kg)**	26.4
Temperature (°F)	480.7	**Inlet Superficial Vel. (ft/sec)**	0.23	**MeOH Make (Ton/day)**	2.3
Pressure (psig)	751	**Outlet Superficial Vel. (ft/sec)**	0.18	**DME Make (Ton/day)**	1.9
Reactor Level (inches on Tape)	153				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	48.83	23.59	35.03	20.79	22.36	0.00	1.66	23.59	0.43
Carbon Monoxide	47.10	55.35	51.63	48.22	52.28	0.00	11.56	55.35	4.52
Carbon Dioxide	3.80	18.32	11.75	18.71	19.73	1.88	48.42	18.32	41.37
Nitrogen	0.20	0.61	0.41	0.52	0.58	0.00	0.10	0.61	0.04
Methane	0.01	0.18	0.11	0.15	0.17	0.00	0.08	0.18	0.00
Water	0.06	0.00	0.00	0.13	0.05	1.77	0.08	0.00	0.25
Methanol	0.00	0.00	0.00	6.42	0.45	86.34	3.98	0.00	10.02
Other Oxygenates	0.00	0.00	0.00	0.07	0.00	0.92	0.00	0.00	0.03
Dimethyl Ether	0.00	1.94	1.06	4.99	4.38	9.10	34.12	1.94	43.35
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	53.79	65.24	119.09	93.34	86.70	7.04	0.11	15.81	5.65
MW	15.92	25.14	20.96	26.75	26.14	33.53	41.61	25.14	42.71
Flow (lb/hr)	856.38	1640.01	2496.39	2496.39	2265.98	236.06	4.58	397.42	241.26

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	52.61	55.49	-5.5
Carbon	27.39	28.14	-2.8
Oxygen	29.46	30.18	-2.4
Nitrogen	0.21	0.20	7.5
T	109.67	114.01	-4.0

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	91.59	91.90	-0.3
Carbon	78.14	78.07	0.1
Oxygen	90.74	90.80	-0.1
Nitrogen	0.97	0.97	0.4
Total	261.44	261.74	-0.1

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	3.39	3.41	-0.4
MeOH	5.99	6.74	-12.5
H2O	0.12	0.14	-21.5
CO2	3.47	3.32	4.3
Total	12.97	13.61	4.9

TABLE G8
MATERIAL BALANCE FOR RUN AF-R2.4

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	8986	**Gas Holdup (vol %)**	45.3 to 43.8
Start Date	5/12 20:00	**Catalyst Proportion (% Al2O3)**	6.6	**CO Conversion (%)**	20.9
End date	5/13 4:00	**Catalyst Weight (lb)**	484.6	**Syngas Conversion (%)**	30.8
TOS (hr)	276 to 284	**Slurry Concentration (wt %)**	32.4 to 34.3	**Eq. Productivity (gmoles/hr-kg)**	35.7
Temperature (°F)	480.5	**Inlet Superficial Vel. (ft/sec)**	0.38	**MeOH Make (Ton/day)**	4.0
Pressure (psig)	750	**Outlet Superficial Vel. (ft/sec)**	0.31	**DME Make (Ton/day)**	1.9
Reactor Level (inches on Tape)	182 to 162				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	51.63	26.17	35.66	23.78	25.50	0.00	2.20	26.17	0.45
Carbon Monoxide	45.36	55.34	51.64	49.78	53.79	0.00	14.04	55.34	4.07
Carbon Dioxide	2.73	15.77	10.92	15.46	16.28	1.49	49.11	15.77	36.67
Nitrogen	0.19	0.59	0.43	0.52	0.58	0.00	0.15	0.59	0.03
Methane	0.01	0.19	0.14	0.17	0.18	0.00	0.09	0.19	0.00
Water	0.07	0.00	0.00	0.04	0.04	2.01	0.09	0.00	0.61
Methanol	0.00	0.00	0.00	6.58	0.42	88.61	4.88	0.00	14.30
Other Oxygenates	0.00	0.00	0.00	0.06	0.00	0.82	0.00	0.00	0.09
Dimethyl Ether	0.00	1.94	1.22	3.61	3.21	7.08	29.45	1.94	43.77
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	70.51	123.24	194.47	159.61	148.69	11.01	0.04	20.40	5.05
MW	15.02	24.06	20.69	25.21	24.56	33.14	40.77	24.06	42.18
Flow (lb/hr)	1059.03	2964.97	4023.99	4023.99	3651.26	364.83	1.80	490.69	213.16

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	72.93	74.24	-1.8
Carbon	33.92	34.30	-1.1
Oxygen	35.89	36.28	-1.1
Nitrogen	0.27	0.24	8.5
Total	143.01	145.07	-1.4

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	153.94	154.25	-0.2
Carbon	126.65	126.65	0.0
Oxygen	145.26	145.27	0.0
Nitrogen	1.68	1.66	0.9
Total	427.53	427.84	-0.1

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	3.39	3.39	0.1
MeOH	10.51	10.52	-0.1
H2O	0.06	0.25	-295.8
CO2	3.44	3.31	3.8
Total	17.40	17.47	-0.4

TABLE G9
MATERIAL BALANCE FOR RUN AF-R3.1

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	5934	**Gas Holdup (vol %)**	35.1
Start Date	5/14 0:00	**Catalyst Proportion (% Al2O3)**	19.3	**CO Conversion (%)**	31.0
End date	5/14 16:00	**Catalyst Weight (lb)**	449.3	**Syngas Conversion (%)**	38.6
TOS (hr)	304 to 320	**Slurry Concentration (wt %)**	24.8	**Eq. Productivity (gmoles/hr-kg)**	30.0
Temperature (°F)	481.6	**Inlet Superficial Vel. (ft/sec)**	0.23	**MeOH Make (Ton/day)**	0.8
Pressure (psig)	750	**Outlet Superficial Vel. (ft/sec)**	0.18	**DME Make (Ton/day)**	3.1
Reactor Level (Inches on Tape)	210				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	45.66	26.56	35.60	23.08	23.99	0.00	1.27	26.56	0.46
Carbon Monoxide	50.16	52.48	51.39	45.58	46.95	0.00	7.45	52.48	4.45
Carbon Dioxide	3.88	17.49	11.08	19.99	20.21	2.50	37.70	17.49	42.59
Nitrogen	0.21	1.18	0.70	0.99	1.08	0.00	0.35	1.18	0.07
Methane	0.01	0.15	0.10	0.12	0.12	0.00	0.03	0.15	0.00
Water	0.09	0.00	0.01	0.30	0.09	7.51	0.18	0.00	0.23
Methanol	0.00	0.00	0.00	2.35	0.35	78.10	3.19	0.00	5.03
Other Oxygenates	0.00	0.00	0.00	0.06	0.00	1.00	0.00	0.00	0.00
Dimethyl Ether	0.00	2.14	1.12	7.54	7.21	10.89	49.83	2.14	47.18
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	56.48	62.66	119.07	92.62	90.81	2.00	0.09	17.41	10.75
MW	16.75	24.27	20.72	26.64	26.30	33.07	42.79	24.27	43.38
Flow (lb/hr)	946.20	1520.87	2467.07	2467.07	2388.19	66.08	3.77	422.50	466.14

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	51.69	52.55	-1.7
Carbon	30.52	30.91	-1.3
Oxygen	32.76	33.04	-0.9
Nitrogen	0.24	0.43	-80.5
Tc	115.21	116.93	-1.5

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	93.28	94.68	-1.5
Carbon	77.17	77.12	0.1
Oxygen	88.92	88.76	0.2
Nitrogen	1.67	1.83	-9.1
Total	261.04	262.38	-0.5

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	5.65	5.67	-0.4
MeOH	2.18	2.17	0.3
H2O	0.27	0.18	33.2
CO2	5.32	5.48	-3.1
Total	13.41	13.50	-0.7

TABLE G10
MATERIAL BALANCE FOR RUN AF-R3.2

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	9445	**Gas Holdup (vol %)**	46.0
Start Date	5/15 6:00	**Catalyst Proportion (% Al2O3)**	19.3	**CO Conversion (%)**	20.6
End date	5/16 8:00	**Catalyst Weight (lb)**	449.3	**Syngas Conversion (%)**	26.8
TOS (hr)	334 TO 360	**Slurry Concentration (wt %)**	28.3	**Eq. Productivity (gmoles/hr-kg)**	33.4
Temperature (°F)	482.1	**Inlet Superficial Vel. (ft/sec)**	0.37	**MeOH Make (Ton/day)**	1.7
Pressure (psig)	752	**Outlet Superficial Vel. (ft/sec)**	0.31	**DME Make (Ton/day)**	2.9
Reactor Level (inches on Tape)	213				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	47.52	29.56	35.91	27.30	28.16	0.00	1.27	29.56	0.49
Carbon Monoxide	48.91	51.61	50.68	47.56	49.09	0.00	7.45	51.61	3.49
Carbon Dioxide	3.24	15.76	11.35	16.34	16.86	1.97	37.70	15.76	32.69
Nitrogen	0.22	0.55	0.42	0.50	0.51	0.00	0.35	0.55	0.00
Methane	0.02	0.13	0.09	0.11	0.11	0.00	0.03	0.13	0.00
Water	0.09	0.00	0.00	0.29	0.08	7.20	0.18	0.00	0.18
Methanol	0.00	0.00	0.00	2.81	0.34	79.87	3.19	0.00	7.09
Other Oxygenates	0.00	0.00	0.00	0.01	0.00	0.34	0.00	0.00	0.00
Dimethyl Ether	0.00	2.39	1.54	5.09	4.86	10.62	49.83	2.39	56.06
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	65.73	123.45	189.52	160.46	155.82	4.56	0.07	24.93	7.43
MW	16.17	23.26	20.76	24.52	24.26	32.84	42.79	23.26	43.47
Flow (lb/hr)	1062.55	2871.76	3934.31	3934.31	3779.48	149.85	2.83	579.92	323.13

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	62.64	64.09	-2.3
Carbon	34.29	34.41	-0.3
Oxygen	36.47	35.90	1.6
Nitrogen	0.29	0.27	4.7
Total	133.68	134.67	-0.7

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	154.33	156.32	-1.3
Carbon	123.58	123.57	0.0
Oxygen	142.00	141.91	0.1
Nitrogen	1.61	1.60	0.7
Total	421.51	423.40	-0.4

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	5.25	5.25	-0.2
MeOH	4.50	4.22	6.2
H2O	0.46	0.35	25.2
CO2	4.71	4.32	8.3
Total	14.92	14.14	5.2

TABLE G11
MATERIAL BALANCE FOR RUN AF-R3.3

Balance Period:		**Space Velocity (sL/hr-kg oxide)**	5951	**Gas Holdup (vol %)**	31.8
Start Date	5/16 12:00	**Catalyst Proportion (% Al2O3)**	19.3	**CO Conversion (%)**	28.2
End date	5/17 9:00	**Catalyst Weight (lb)**	449.3	**Syngas Conversion (%)**	35.7
TOS (hr)	364 TO 385	**Slurry Concentration (wt %)**	29.5	**Eq. Productivity (gmoles/hr-kg)**	27.9
Temperature (°F)	481.8	**Inlet Superficial Vel. (ft/sec)**	0.23	**MeOH Make (Ton/day)**	1.0
Pressure (psig)	752	**Outlet Superficial Vel. (ft/sec)**	0.19	**DME Make (Ton/day)**	2.7
Reactor Level (inches on Tape)	156				

	Fresh Feed	Recycle	Reactor Feed	Reactor Out	22.10 Sep Vap	22.11 Liq	22.11 Vap	Plant Purge	DME Product
Hydrogen	45.81	27.33	35.76	24.12	24.87	0.00	1.36	27.33	0.57
Carbon Monoxide	49.66	52.37	51.19	46.23	47.94	0.00	7.80	52.37	4.47
Carbon Dioxide	4.27	17.52	11.45	19.31	19.79	2.38	40.21	17.52	41.79
Nitrogen	0.19	0.53	0.36	0.45	0.48	0.00	0.07	0.53	0.00
Methane	0.01	0.14	0.09	0.12	0.12	0.00	0.00	0.14	0.00
Water	0.07	0.00	0.01	0.29	0.11	10.42	0.21	0.00	0.19
Methanol	0.00	0.00	0.00	2.84	0.37	75.38	3.03	0.00	5.07
Other Oxygenates	0.00	0.00	0.00	0.02	0.00	0.64	0.00	0.00	0.00
Dimethyl Ether	0.00	2.11	1.14	6.61	6.32	11.18	47.32	2.11	47.91
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Flow (lb mole/hr)	55.02	64.53	119.41	94.91	91.95	3.07	0.07	18.77	8.66
MW	16.78	24.07	20.74	26.09	25.84	32.59	42.71	24.07	43.36
Flow (lb/hr)	923.25	1553.38	2476.63	2476.63	2376.22	100.00	2.82	451.84	375.31

Elemental Balances (Atoms In = Atoms Out)

Overall Balance:
Feed = Purge + MeOH Liq + Flash + DME Liq

	In	Out	(In-Out)*100 / In
Hydrogen	50.51	51.77	-2.5
Carbon	29.68	29.89	-0.7
Oxygen	32.06	32.27	-0.7
Nitrogen	0.21	0.20	4.7
Total	112.45	114.13	-1.5

Reactor Balance
Reactor In = Reactor Out

	In	Out	(In-Out)*100 / In
Hydrogen	94.03	95.32	-1.4
Carbon	77.62	77.60	0.0
Oxygen	89.83	89.80	0.0
Nitrogen	0.87	0.86	0.9
Total	262.36	263.58	-0.5

Mole Balance (moles = moles)

Production Balance
Rxn Out-Rxn In = Products + Purges - Feed

	Made	Out-In	(M-O)*100 / Made
DME	4.91	4.89	0.3
MeOH	2.70	2.80	-3.9
H2O	0.27	0.34	-28.0
CO2	4.65	4.63	0.4
Total	12.53	12.67	-1.1