

APPENDIX C

PROCESS SUMMARY SPREADSHEETS

SHAFT FURNACE DRI - VARIATION IN CARBON AND SCRAP CHARGE

- C-1: BASE CASE: 100% SHAFT FURNACE DRI CHARGE TO EAF, 1.0 WT. % DRI CARBON
- C-2: 100% SHAFT FURNACE DRI CHARGE TO EAF, 2.5 WT.% DRI CARBON
- C-3: 100% STEEL SCRAP CHARGE TO EAF
- C-4: 30% SHAFT FURNACE DRI/70% SCRAP CHARGE TO EAF, 1.0 WT.% DRI CARBON
- C-5: 30% SHAFT FURNACE DRI/70% SCRAP CHARGE TO EAF, 2.5 WT.% DRI CARBON
- C-6: HYLSA SHAFT FURNACE WITHOUT REFORMER (HYL IV), HOT DRI CHARGE TO EAF

HOT METAL VARIATIONS

- C-7: 30% BLAST FURNACE HOT METAL/70% SCRAP CHARGE TO EAF, CO-PRODUCT COKE
- C-8: 30% BLAST FURNACE HOT METAL/70% SCRAP CHARGE TO EAF, N. R. COKE WITH POWER GENERATION
- C-9: 30% COLD PIG IRON/70% SCRAP CHARGE TO EAF, 4.5% CARBON PIG

- C-10: 30% TECHNORED HOT METAL/70% SCRAP CHARGE TO EAF, 4.5% CARBON H. M. WITH CO-GENERATION OF ELECTRICAL POWER**
- C-11: 30% TECHNORED HOT METAL/70% SCRAP CHARGE TO EAF, 4.5% CARBON H. M. WITHOUT CO-GENERATION OF ELECTRICAL POWER**
- C-12: COREX/MIDREX WITH 60% HOT METAL AND 40% DRI CHARGE TO EAF**
- C-13: HISMELT WITH 34.5% HOT METAL CHARGE TO EAF**

ROTARY HEARTH FURNACES

- C-14: REDSMELT HOT METAL WITH ONLY RECYCLE SCRAP CHARGE TO EAF**
- C-15: MAUMEE BRIQUETTE DRI/EAF WITH ONLY RECYCLE SCRAP CHARGE TO EAF**
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FLUID-BED DRI/HBI

- C-17: CIRCORED/HBI/EAF WITH ONLY RECYCLE SCRAP CHARGE TO EAF**
- C-18: CIRCOFER/HBI/SAF/EAF WITH ONLY RECYCLE SCRAP CHARGE TO EAF**
- C-19: FINMET/HBI/EAF WITH ONLY RECYCLE SCRAP CHARGE TO EAF**
- C-20: GENERIC IRON CARBIDE/EAF RECYCLE SCRAP TO EAF (REPRESENTS NUCOR/ICH, QUALITECH/KAWASAKI, PROCEDYNE PROCESSES)**

OTHER PROCESSES

**C-21 SL/RN ROTARY KILN WITH ONLY RECYCLE SCRAP
CHARGE TO EAF**

SHAFT FURNACE DRI PROCESSES

APPENDIX C-1

**BASE CASE: 100% SHAFT FURNACE DRI CHARGE
TO EAF, 1.0 WT. % DRI CARBON**

OVERALL SUMMARY MASS BALANCES - BASE PROCESS DRI/EAF

DOEBASE
07-June-2000

100% DRI CHARGE - 1.0 wt.% CARBON

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

6.294 MM MT/YEAR AS-MINED ROCK
3.806 MM MT/YEAR WASTE ROCK
2.488 MM MT/YEAR ORE ROCK TO CONCENTRATOR
1.465 MM MT/YEAR CONCENTRATE
1.940 MM MT/YEAR NET GREENBALL PELLETS
1.836 MM MT/YEAR NET INDURATED PELLETS
1.781 MM MT/YEAR PELLET FEED TO DRI
1.089 MM MT/YEAR NET DRI TO EAF

ASSUMPTIONS:

85.00% DIESEL FUEL (ORE MINING) %C
0.003192 SHOVEL OPERATION (hrs/mt ORE)
0.006384 LOADER OPERATION (hrs/mt ORE)
0.007721 HAUL TRUCK WASTE (hrs/mt ORE)
0.005046 HAUL TRUCK ORE (hrs/mt ORE)
128.581 TOTAL SHOVEL FUEL CONSUMPTION (kg/hr)
235.022 TOTAL LOADER FUEL CONSUMPTION (kg/hr)
878.780 TOTAL HAUL TRUCK FUEL CONSUMPTION (kg/hr)
1242.383 TOTAL FUEL FOR ALL ROCK (kg/hr)
0.410 TOTAL FUEL (kg/mt ORE) - SHOVEL (1)
1.500 TOTAL FUEL (kg/mt ORE) - LOADERS (2)
11.220 TOTAL FUEL (kg/mt ORE) - TRUCKS (4)
13.131 TOTAL FUEL (kg/mt ORE)
755 SHOVEL HORSEPOWER (CAT 13.75 CU YD)
690 LOADER HORSEPOWER (CAT 992D, 14 CU YD)
1290 HAUL TRUCK HORSEPOWER (CAT 785B, 130 TON)
85.00% DIESEL FUEL % CARBON
5.00 IRON ORE MINE ELECTRICAL POWER REQ'D (kWhr/mt ROCK)
28.12 CONCENTRATOR ELECTRICAL POWER REQ'D (kWhr/mt ORE)
0.333 PIPELINE ELECTRICAL POWER REQ'D (kWhr/mt ORE/km)
250 ASSUMED CONC. SLURRY PIPELINE LENGTH (km)
1.30 FUEL REQUIREMENT - PELLET PLANT (GJ/mt PEL)
26.08 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
65.0 PELLET PLANT ELEC. POWER REQ'D (kWhr/mt FEED)

11.70 FUEL TO DRI - (GJ/mt DRI)
7.15 FUEL TO DRI - (GJ/mt FEED OXIDE)
234.75 FUEL TO DRI - (kg/mt DRI)
143.51 FUEL TO DRI - (kg/mt FEED OXIDE)
130.00 DRI ELEC. POWER REQ'D - (kWhr/mt DRI)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
698.1 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING

20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE

91.19 ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)

ELECTRODES

9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)

PETROLEUM COKE (CARBON)

16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)

OXYGEN

2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)

ELECTRICAL POWER GENERATION (NET)

0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEBASE

07-June-2000

OVERALL SUMMARY MASS BALANCES - BASE PROCESS DRI/EAF

100% DRI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
1001	AS-MINED ROCK	6.294	0.195	6.488	30.00%	1.888	0.00%	0.000	
1002	WASTE ROCK	3.806	0.118	3.924	16.93%	0.644	0.00%	0.000	
1	IRON ORE TO CONCENTRATOR	2.488	0.077	2.564	50.00%	1.244	0.00%	0.000	
	DIESEL FUEL (MINING ETC.)		0.0327				85.00%	0.028	
	EXHAUST GASES								0.1018
	MINE ELECTRICAL POWER REQ'D	(MM kWh/yr) 31.479							
47	CONCENTRATE TO PIPELINE FEED	1.465	0.789	2.254	68.56%	1.005	0.00%	0.000	
50	DEWATERED TAILINGS TO DISPOSAL	1.022	1.899	2.921	23.40%	0.239	0.00%	0.000	
	CONC. ELECTRICAL POWER REQ'D	(MM kWh/yr) 69.941							
	CONC. SLURRY PIPELINE POWER	(MM kWh/yr) 122.098							
218	NET OXIDE FEED TO PELLETIZING	1.969	0.173	2.142	70.47%	1.388	0.00%	0.000	
221	BINDER TO PELLETIZING	0.012	0.000	0.012					
222	DOLOMITE TO PELLETIZING	0.040	0.000	0.040					
	TOTAL OTHER FEED TO PELLETIZING	0.504	AS N.G. 0.0514		76.03%	0.383			
	FUEL (DRYING, INDURATION, ETC.)						72.00%	0.037	
	PELLET PLANT FLUE GASES	0.123			67.81%	0.115			0.1356
	PELLET ELECTRICAL POWER REQ'D	(MM kWh/yr) 128.005							
300	NET PELLETS, ETC. TO SHAFT FCE.	1.781	0.000	1.781	67.81%	1.207			
317	DRI TO SCREENS (1.0 %C)	1.089	0.000	1.089	92.80%	1.010	1.00%	0.011	
319	DRI TO EAF (1.0% C)	1.045	0.000	1.045	92.80%	0.970	1.00%	0.010	

100% DRI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	FUEL TO DRI		AS N.G. 0.2555				72.00%	0.184	
	DRI OFF GASES	0.1661 (MM kWhr/yr)			87.80%	0.146			0.6746
	DRI ELECTRICAL POWER REQ'D	141.514							
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.00010	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0120	0.0000	0.0120			94.00%	0.01129	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00359	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 11.00						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0182	
	TOT. C IN OFF GASES (INCL. LRF)							0.0166	
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)							0.0610
	EAF ELECTRICAL POWER REQ'D	736.027							
417	LIME TO LADLE REF. FCE.	0.005	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.897 (MM kWhr/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1561	0.0000	0.1561	26.97%	0.0421			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.974	0.15%	0.00147	

100% DRI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 1,263.96							
	BINDER TO PELLET	0.0118	(MM kWh/yr) 0.2386					0.0001	0.0004
	BURNT LIME/DOLOMITE TO PELLET	0.0402	3.6649					0.0153	0.0563
	LIME TO EAF	0.0124	1.1267					0.0047	0.0173
	OXYGEN TO EAF	(MM Nm ³ /YR) 11.0000	23.3200						
	EAF ELECTRODES	0.0038	34.3878					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0120	0.2033					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D								
	TOTAL ELECTRICAL POWER	(MM kWh/yr) 1,326.90	DRI 496.94					0.2867	1.0514
	TOTAL CO2 PRODUCED (PROCESS)								1.2103
	EQUIVALENT CO2 FROM POWER GEN.								2.2617
	TOTAL CO2 FROM ALL SOURCES								

APPENDIX C-2

**100% SHAFT FURNACE DRI CHARGE TO EAF, 2.5
WT.% DRI CARBON**

DOE10025 OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF

08-June-2000 100% DRI CHARGE - 2.5% C

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

6.301 MM MT/YEAR AS-MINED ROCK
3.811 MM MT/YEAR WASTE ROCK
2.491 MM MT/YEAR ORE ROCK TO CONCENTRATOR
1.467 MM MT/YEAR CONCENTRATE
1.943 MM MT/YEAR NET GREENBALL PELLETS
1.838 MM MT/YEAR NET INDURATED PELLETS
1.783 MM MT/YEAR PELLET FEED TO DRI
1.107 MM MT/YEAR NET DRI TO EAF

ASSUMPTIONS:

85.00% DIESEL FUEL (ORE MINING) %C
0.003188 SHOVEL OPERATION (hrs/mt ORE)
0.006376 LOADER OPERATION (hrs/mt ORE)
0.007711 HAUL TRUCK WASTE (hrs/mt ORE)
0.005040 HAUL TRUCK ORE (hrs/mt ORE)
128.581 TOTAL SHOVEL FUEL CONSUMPTION (kg/hr)
235.022 TOTAL LOADER FUEL CONSUMPTION (kg/hr)
878.780 TOTAL HAUL TRUCK FUEL CONSUMPTION (kg/hr)
1242.383 TOTAL FUEL FOR ALL ROCK (kg/hr)
0.410 TOTAL FUEL (kg/mt ORE) - SHOVEL (1)
1.498 TOTAL FUEL (kg/mt ORE) - LOADERS (2)
11.206 TOTAL FUEL (kg/mt ORE) - TRUCKS (4)
13.114 TOTAL FUEL (kg/mt ORE)
755 SHOVEL HORSEPOWER (CAT 13.75 CU YD)
690 LOADER HORSEPOWER (CAT 992D, 14 CU YD)
1290 HAUL TRUCK HORSEPOWER (CAT 785B, 130 TON)
85.00% DIESEL FUEL % CARBON
5.00 IRON ORE MINE ELECTRICAL POWER REQ'D (kW/mt ROCK)
28.10 CONCENTRATOR ELECTRICAL POWER REQ'D (kW/mt ORE)
0.333 PIPELINE ELECTRICAL POWER REQ'D (kW/mt ORE/km)
250 ASSUMED CONC. SLURRY PIPELINE LENGTH (km)
1.30 FUEL REQUIREMENT - PELLET PLANT (GJ/mt PEL)
26.08 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
65.0 PELLET PLANT ELEC. POWER REQ'D (kW/mt FEED)

11.70 FUEL TO DRI - (GJ/mt DRI)
7.26 FUEL TO DRI - (GJ/mt FEED OXIDE)
234.75 FUEL TO DRI - (kg/mt DRI)
145.74 FUEL TO DRI - (kg/mt FEED OXIDE)
130.00 DRI ELEC. POWER REQ'D - (kW/mt DRI)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
698.1 EAF ELEC. POWER (TOTAL) - (kW/mt LIQ. STEEL)
33.1 LRF ELEC. POWER - (kW/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
20.19 ELECTRIC POWER REQ'D - (kW/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE
91.84 ELECTRIC POWER REQ'D - (kW/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES
9,000.00 ELECTRIC POWER REQ'D - (kW/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)
16.936 ELECTRIC POWER REQ'D - (kW/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN
2.12 ELECTRIC POWER REQ'D - (kW/mt)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)
0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOE10025

08-June-2000

Rev. 2

OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF

100% DRI CHARGE - 2.5% C

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
1001	AS-MINED ROCK	6.301	0.195	6.496	30.00%	1.890	0.00%	0.000	
1002	WASTE ROCK	3.811	0.118	3.929	16.93%	0.645	0.00%	0.000	
1	IRON ORE TO CONCENTRATOR	2.491	0.077	2.568	50.00%	1.245	0.00%	0.000	
	DIESEL FUEL (MINING ETC.)		0.0327				85.00%	0.028	
	EXHAUST GASES								0.1018
	MINE ELECTRICAL POWER REQ'D	(MM kWh/yr) 31.502							
47	CONCENTRATE TO PIPELINE FEED	1.467	0.790	2.257	68.56%	1.006	0.00%	0.000	
50	DEWATERED TAILINGS TO DISPOSAL	1.024	1.901	2.925	23.40%	0.240	0.00%	0.000	
	CONC. ELECTRICAL POWER REQ'D	(MM kWh/yr) 69.994							
	CONC. SLURRY PIPELINE POWER	(MM kWh/yr) 122.250							
218	NET OXIDE FEED TO PELLETIZING	1.971	0.173	2.144	70.29%	1.386	0.00%	0.000	
221	BINDER TO PELLETIZING	0.012	0.000	0.012					
222	DOLOMITE TO PELLETIZING	0.040	0.000	0.040					
	TOTAL OTHER FEED TO PELLETIZING	0.504							
	FUEL (DRYING, INDURATION, ETC.)		AS N.G. 0.0514				72.00%	0.037	
	PELLET PLANT FLUE GASES	0.123							0.1358
	PELLET ELECTRICAL POWER REQ'D	(MM kWh/yr) 128.142							
300	NET PELLETS, ETC. TO SHAFT FCE.	1.783	0.000	1.783	67.64%	1.206			
317	DRI TO SCREENS (2.5 %C)	1.107	0.000	1.107	91.39%	1.011	2.50%	0.028	
319	DRI TO EAF (2.5% C)	1.062	0.000	1.062	91.39%	0.971	2.50%	0.027	

DOE10025 100% DRI CHARGE - 2.5% C

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	FUEL TO DRI		AS N.G. 0.2598				72.00%	0.187	
	DRI OFF GASES	0.1661 (MM kWhr/yr) 143.870			86.39%	0.144			0.6859
	DRI ELECTRICAL POWER REQ'D								
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.00010	
403	MISC. ADDITIVES	0.0072	0.0000	0.0072	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0099	0.0000	0.0099			94.00%	0.00932	
405	EAF ELECTRODES	0.0045	0.0000	0.0045			94.00%	0.00420	
401	LIME CHARGED	0.0126	0.0000	0.0126					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 19.25						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0549	1.0549	99.70%	1.0518	0.15%	0.00158	
	TOTAL CARBON INTO EAF								
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G. 0.0023					0.0434	
	AUX. FUEL TO EAF						72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr) 736.472							
	EAF ELECTRICAL POWER REQ'D								
417	LIME TO LADLE REF. FCE.	0.005	0.000	0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						0.1534
	LRF ELECTRICAL POWER REQ'D								
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1587	0.0000	0.1587	26.95%	0.0428			
421	REFINED STEEL TO CASTING	0.0000	1.0528	1.0528	99.70%	1.050	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9774	0.0000	0.9774	99.70%	0.975	0.15%	0.00147	

100% DRI CHARGE - 2.5% C

DOE10025

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 1,267.15	(MM kWh/yr) 0.2388					0.0001	0.0004
	BINDER TO PELLET	0.0118	3.6950					0.0154	0.0563
	BURNT LIME/DOLOMITE TO PELLET	0.0402	1.1536					0.0048	0.0176
	LIME TO EAF	0.0126	40.8100						
	OXYGEN TO EAF	(MM Nm3/YR) 19.2500	40.2046					0.0013	0.0048
	EAF ELECTRODES	0.0045	0.1678					0.0000	0.0002
	PETROLEUM COKE TO EAF	0.0099							
	COMPONENTS ELEC. POWER REQ'D	(MM kWh/yr) 1,353.42	DRI 499.69					0.3153	1.1562
	TOTAL ELECTRICAL POWER								
	TOTAL CO2 PRODUCED (PROCESS)								1.2345
	EQUIVALENT CO2 FROM POWER GEN.								2.3906
	TOTAL CO2 FROM ALL SOURCES								

APPENDIX C-3

100% STEEL SCRAP CHARGE TO EAF

DOESC100 OVERALL SUMMARY MASS BALANCES - EAF

08-June-2000 100% SCRAP CHARGED TO EAF

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
 0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

0.000 MM MT/YEAR AS-MINED ROCK
 0.000 MM MT/YEAR WASTE ROCK
 0.000 MM MT/YEAR ORE ROCK TO CONCENTRATOR
 0.000 MM MT/YEAR CONCENTRATE
 0.000 MM MT/YEAR NET GREENBALL PELLETS
 0.000 MM MT/YEAR NET INDURATED PELLETS
 0.000 MM MT/YEAR PELLET FEED TO DRI
 0.000 MM MT/YEAR NET DRI TO EAF

ASSUMPTIONS:

0.00% DIESEL FUEL (ORE MINING) %C
 0.000000 SHOVEL OPERATION (hrs/mt ORE)
 0.000000 LOADER OPERATION (hrs/mt ORE)
 0.000000 HAUL TRUCK WASTE (hrs/mt ORE)
 0.000000 HAUL TRUCK ORE (hrs/mt ORE)
 0.000 TOTAL SHOVEL FUEL CONSUMPTION (kg/hr)
 0.000 TOTAL LOADER FUEL CONSUMPTION (kg/hr)
 0.000 TOTAL HAUL TRUCK FUEL CONSUMPTION (kg/hr)
 0.000 TOTAL FUEL FOR ALL ROCK (kg/hr)
 0.000 TOTAL FUEL (kg/mt ORE) - SHOVEL (1)
 0.000 TOTAL FUEL (kg/mt ORE) - LOADERS (2)
 0.000 TOTAL FUEL (kg/mt ORE) - TRUCKS (4)
 0.000 TOTAL FUEL (kg/mt ORE)
 0 SHOVEL HORSEPOWER (CAT 13.75 CU YD)
 0 LOADER HORSEPOWER (CAT 992D, 14 CU YD)
 0 HAUL TRUCK HORSEPOWER (CAT 785B, 130 TON)
 0.00% DIESEL FUEL % CARBON
 0.00 IRON ORE MINE ELECTRICAL POWER REQ'D (kWhr/mt ROCK)
 0.00 CONCENTRATOR ELECTRICAL POWER REQ'D (kWhr/mt ORE)
 0.000 PIPELINE ELECTRICAL POWER REQ'D (kWhr/mt ORE/km)
 0 ASSUMED CONC. SLURRY PIPELINE LENGTH (km)
 0.00 FUEL REQUIREMENT - PELLET PLANT (GJ/mt PEL)
 0.00 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
 0.0 PELLET PLANT ELEC. POWER REQ'D (kWhr/mt FEED)

11.70 FUEL TO DRI - (GJ/mt DRI)
 5.65 FUEL TO DRI - (GJ/mt FEED OXIDE)
 234.75 FUEL TO DRI - (kg/mt DRI)
 113.31 FUEL TO DRI - (kg/mt FEED OXIDE)
 130.00 DRI ELEC. POWER REQ'D - (kWhr/mt DRI)
 0.150% STEEL PERCENT CARBON - (wt.% C)
 2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
 689.5 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
 33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
 20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (kg/mt)
 BURNT LIME/DOLOMITE
 91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.4002 CUMULATIVE CO2 EMISSIONS - (kg/mt)
 ELECTRODES
 9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.0763 CUMULATIVE CO2 EMISSIONS - (kg/mt)
 PETROLEUM COKE (CARBON)
 16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0156 CUMULATIVE CO2 EMISSIONS - (kg/mt)
 OXYGEN
 2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
 NONE CUMULATIVE CO2 EMISSIONS - (kg/mt)
 ELECTRICAL POWER GENERATION (NET)
 0.000599 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
 0.001355 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
 0.000977 CUM. CO2 EMISSIONS - 50% N.G./50% COAL - (MT/kWhr NET)

DOESC100

08-June-2000

OVERALL SUMMARY MASS BALANCES - EAF

100% SCRAP CHARGED TO EAF

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
1001	AS-MINED ROCK	2.087	0.065	2.152	30.00%	0.626	0.00%	0.000	
1002	WASTE ROCK	1.262	0.039	1.301	16.93%	0.214	0.00%	0.000	
1	IRON ORE TO CONCENTRATOR	0.825	0.026	0.851	50.00%	0.413	0.00%	0.000	
	DIESEL FUEL (MINING ETC.)		0.0000				0.00%	0.000	
	EXHAUST GASES								0.0000
	MINE ELECTRICAL POWER REQ'D	(MM kWhr/yr) 0.000							
47	CONCENTRATE TO PIPELINE FEED	0.486	0.262	0.748	68.56%	0.333	0.00%	0.000	
50	DEWATERED TAILINGS TO DISPOSAL	0.339	0.630	0.969	23.41%	0.079	0.00%	0.000	
	CONC. ELECTRICAL POWER REQ'D	(MM kWhr/yr) 0.000							
	CONC. SLURRY PIPELINE POWER	(MM kWhr/yr) 0.000							
218	NET OXIDE FEED TO PELLETTIZING	0.842	0.074	0.916	73.53%	0.619	0.00%	0.000	
221	BINDER TO PELLETTIZING	0.005	0.000	0.005					
222	DOLOMITE TO PELLETTIZING	0.017	0.000	0.017					
	TOTAL OTHER FEED TO PELLETTIZING	0.356				0.286		0.000	
	FUEL (DRYING, INDURATION, ETC.)		AS N.G. 0.0000				72.00%		
	PELLET PLANT FLUE GASES	0.053			70.74%	0.071			0.0000
	PELLET ELECTRICAL POWER REQ'D	(MM kWhr/yr) 0.000							
300	NET PELLETS, ETC. TO SHAFT FCE.	0.761	0.000	0.761	70.74%	0.539			
317	DRI TO SCREENS (1.0 %C)	0.367	0.000	0.367	92.80%	0.341	1.00%	0.004	
319	DRI TO EAF (1.0% C)	0.353	0.000	0.353	92.80%	0.327	1.00%	0.004	

100% SCRAP CHARGED TO EAF

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	FUEL TO DRI		AS N.G. 0.0000				72.00%	0.000	
	DRI/OFF GASES	0.0000 (MM kWhr/yr)			87.80%	0.000			0.0000
	DRI ELECTRICAL POWER REQ'D	0.000							
409	TOTAL STEEL SCRAP (100%)	1.0776	0.0000	1.0776	99.70%	1.0743	0.15%	0.00162	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0119	0.0000	0.0119			94.00%	0.01117	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00356	
401	LIME CHARGED	0.0122	0.0000	0.0122					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 11.91						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0196	
	TOT. C IN OFF GASES (INCL. LRF)							0.0180	
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)							
	EAF ELECTRICAL POWER REQ'D	726.931							
417	LIME TO LADLE REF. FCE.	0.005	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.896 (MM kWhr/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1545	0.0000	0.1545	26.99%	0.0417			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.974	0.15%	0.00147	

100% SCRAP CHARGED TO EAF

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 761.83							
	BINDER TO PELLET	0.0000	(MM kWhr/yr) 0.0000					0.0000	0.0000
	BURNT LIME/DOLOMITE TO PELLET	0.0000	0.0000					0.0000	0.0000
	LIME TO EAF	0.0122	1.1232					0.0047	0.0171
	OXYGEN TO EAF	(MM Nm ³ /YR) 11.9131	25.2558						
	EAF ELECTRODES	0.0038	34.0404					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0119	0.2013					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D								
	TOTAL ELECTRICAL POWER	(MM kWhr/yr) 822.45							
	TOTAL CO2 PRODUCED (PROCESS)							0.0238	0.0874
	EQUIVALENT CO2 FROM POWER GEN.								0.8035
	TOTAL CO2 FROM ALL SOURCES								0.8909

APPENDIX C-4

**30% SHAFT FURNACE DRI/70% SCRAP CHARGE
TO EAF, 1.0 WT.% DRI CARBON**

OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF

DOE3010

08-June-2000 30% DRI CHARGE - 1.0 WT.% CARBON

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

2.087 MM MT/YEAR AS-MINED ROCK
1.262 MM MT/YEAR WASTE ROCK
0.825 MM MT/YEAR ORE ROCK TO CONCENTRATOR
0.486 MM MT/YEAR CONCENTRATE
0.830 MM MT/YEAR NET GREENBALL PELLETS
0.785 MM MT/YEAR NET INDURATED PELLETS
0.761 MM MT/YEAR PELLET FEED TO DRI
0.367 MM MT/YEAR NET DRI TO EAF

11.70 FUEL TO DRI - (GJ/mt DRI)
5.65 FUEL TO DRI - (GJ/mt FEED OXIDE)
234.75 FUEL TO DRI - (kg/mt DRI)
113.31 FUEL TO DRI - (kg/mt FEED OXIDE)
130.00 DRI ELEC. POWER REQ'D - (kWhr/mt DRI)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
699.4 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

ASSUMPTIONS:

85.00% DIESEL FUEL (ORE MINING) %C
0.009624 SHOVEL OPERATION (hrs/mt ORE)
0.019247 LOADER OPERATION (hrs/mt ORE)
0.023279 HAUL TRUCK WASTE (hrs/mt ORE)
0.015215 HAUL TRUCK ORE (hrs/mt ORE)
128.581 TOTAL SHOVEL FUEL CONSUMPTION (kg/hr)
235.022 TOTAL LOADER FUEL CONSUMPTION (kg/hr)
878.780 TOTAL HAUL TRUCK FUEL CONSUMPTION (kg/hr)
1242.383 TOTAL FUEL FOR ALL ROCK (kg/hr)
0.376 TOTAL FUEL (kg/mt ORE) - SHOVEL (1)
1.373 TOTAL FUEL (kg/mt ORE) - LOADERS (2)
10.273 TOTAL FUEL (kg/mt ORE) - TRUCKS (4)
12.023 TOTAL FUEL (kg/mt ORE)
755 SHOVEL HORSEPOWER (CAT 13.75 CU YD)
690 LOADER HORSEPOWER (CAT 992D, 14 CU YD)
1290 HAUL TRUCK HORSEPOWER (CAT 785B, 130 TON)
85.00% DIESEL FUEL % CARBON
7.76 IRON ORE MINE ELECTRICAL POWER REQ'D (kWhr/mt ROCK)
43.72 CONCENTRATOR ELECTRICAL POWER REQ'D (kWhr/mt ORE)
0.333 PIPELINE ELECTRICAL POWER REQ'D (kWhr/mt ORE/km)
250 ASSUMED CONC. SLURRY PIPELINE LENGTH (km)
1.30 FUEL REQUIREMENT - PELLET PLANT (GJ/mt PEL)
26.08 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
65.0 PELLET PLANT ELEC. POWER REQ'D (kWhr/mt FEED)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE
91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES
9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)
16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0456 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN
2.12 ELECTRIC POWER REQ'D - (kWhr/Nm³)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)
0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOE3010

08-June-2000

Rev. 2

OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF

30% DRI CHARGE - 1.0 WT.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
1001	AS-MINED ROCK	2.087	0.065	2.152	30.00%	0.626	0.00%	0.000	
1002	WASTE ROCK	1.262	0.039	1.301	16.93%	0.214	0.00%	0.000	
1	IRON ORE TO CONCENTRATOR	0.825	0.026	0.851	50.00%	0.413	0.00%	0.000	
	DIESEL FUEL (MINING ETC.)		0.0099				85.00%	0.008	
	EXHAUST GASES								0.0309
	MINE ELECTRICAL POWER REQ'D	(MM kWh/yr) 16.188							
47	CONCENTRATE TO PIPELINE FEED	0.486	0.262	0.748	68.56%	0.333	0.00%	0.000	
50	DEWATERED TAILINGS TO DISPOSAL	0.339	0.630	0.969	23.41%	0.079	0.00%	0.000	
	CONC. ELECTRICAL POWER REQ'D	(MM kWh/yr) 36.071							
	CONC. SLURRY PIPELINE POWER	(MM kWh/yr) 40.497							
218	NET OXIDE FEED TO PELLETTIZING	0.842	0.074	0.916	73.53%	0.619	0.00%	0.000	
221	BINDER TO PELLETTIZING	0.005	0.000	0.005					
222	DOLOMITE TO PELLETTIZING	0.017	0.000	0.017					
	TOTAL OTHER FEED TO PELLETTIZING	0.356	AS N.G. 0.0220		80.31%	0.286	72.00%	0.016	
	FUEL (DRYING, INDURATION, ETC.)								0.0580
	PELLET PLANT FLUE GASES	0.053			70.74%	0.071			
	PELLET ELECTRICAL POWER REQ'D	(MM kWh/yr) 54.721							
300	NET PELLETS, ETC. TO SHAFT FCE.	0.761	0.000	0.761	70.74%	0.539			
317	DRI TO SCREENS (1.0 %C)	0.367	0.000	0.367	92.80%	0.341	1.00%	0.004	
319	DRI TO EAF (1.0% C)	0.353	0.000	0.353	92.80%	0.327	1.00%	0.004	

OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF

DOE3010
08-June-2000

30% DRI CHARGE - 1.0 WT.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM TYR)	LIQUID (MM TYR)	TOTAL (MM TYR)	%Fe (DRY)	Fe UNITS (MM TYR)	%C (DRY)	C UNITS (MM TYR)	CO2 (MM TYR)
	FUEL TO DRI		AS N.G. 0.0863				72.00%	0.062	
	DRI/OFF GASES	0.1661 (MM kWh/yr)			87.80%	0.146			0.2277
	DRI ELECTRICAL POWER REQ'D	47.767							
409	TOTAL STEEL SCRAP (100% DRI)	0.7364	0.0000	0.7364	99.70%	0.7342	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0122	0.0000	0.0122			94.00%	0.01144	
405	EAF ELECTRODES	0.0039	0.0000	0.0039			94.00%	0.00364	
401	LIME CHARGED	0.0125	0.0000	0.0125					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 11.81						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0541	1.0541	99.70%	1.0510	0.15%	0.00158	
	TOTAL CARBON INTO EAF								
	TOT. C IN OFF GASES (INCL. LRF)								
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWh/yr)			48.50%	0.010		0.0179	0.0655
	EAF ELECTRICAL POWER REQ'D	737.292							
417	LIME TO LADLE REF. FCE.	0.005	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.891							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1583	0.0000	0.1583	26.96%	0.0427			
421	REFINED STEEL TO CASTING	0.0000	1.0520	1.0520	99.70%	1.049	0.15%	0.00158	
	NET STEEL SLAB PRODUCE	0.9767	0.0000	0.9767	99.70%	0.974	0.15%	0.00147	

DOE3010
08-June-2000
OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF
30% DRI CHARGE - 1.0 WT.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 967.43							
	BINDER TO PELLET	0.0051	(MM kWh/yr) 0.1020					0.0001	0.0002
	BURNT LIME/DOLOMITE TO PELLET	0.0172	1.5779					0.0066	0.0241
	LIME TO EAF	0.0125	1.1506					0.0048	0.0175
	OXYGEN TO EAF	(MM Nm ³ /YR) 11.8117	25.0409						
	EAF ELECTRODES	0.0039	34.8696					0.0011	0.0042
	PETROLEUM COKE TO EAF	0.0122	0.2062					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D								
	TOTAL ELECTRICAL POWER	(MM kWh/yr) 1,030.37							
	TOTAL CO2 PRODUCED (PROCESS)							0.1168	0.4283
	EQUIVALENT CO2 FROM POWER GEN								0.9398
	TOTAL CO2 FROM ALL SOURCES								1.3681

APPENDIX C-5

**30% SHAFT FURNACE DRI/70% SCRAP CHARGE
TO EAF, 2.5 WT.% DRI CARBON**

DOE3025

OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF

08-June-2000

(30% DRI CHARGE - 2.5% C)

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
 0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

2.089 MM MT/YEAR AS-MINED ROCK
 1.263 MM MT/YEAR WASTE ROCK
 0.826 MM MT/YEAR ORE ROCK TO CONCENTRATOR
 0.486 MM MT/YEAR CONCENTRATE
 0.830 MM MT/YEAR NET GREENBALL PELLETS
 0.785 MM MT/YEAR NET INDURATED PELLETS
 0.762 MM MT/YEAR PELLET FEED TO DRI
 0.373 MM MT/YEAR NET DRI TO EAF

ASSUMPTIONS:

85.00% DIESEL FUEL (ORE MINING) %C
 0.009617 SHOVEL OPERATION (hrs/mt ORE)
 0.019234 LOADER OPERATION (hrs/mt ORE)
 0.023264 HAUL TRUCK WASTE (hrs/mt ORE)
 0.015205 HAUL TRUCK ORE (hrs/mt ORE)
 128.581 TOTAL SHOVEL FUEL CONSUMPTION (kg/hr)
 235.022 TOTAL LOADER FUEL CONSUMPTION (kg/hr)
 878.780 TOTAL HAUL TRUCK FUEL CONSUMPTION (kg/hr)
 1242.383 TOTAL FUEL FOR ALL ROCK (kg/hr)
 0.375 TOTAL FUEL (kg/mt ORE) - SHOVEL (1)
 1.373 TOTAL FUEL (kg/mt ORE) - LOADERS (2)
 10.267 TOTAL FUEL (kg/mt ORE) - TRUCKS (4)
 12.015 TOTAL FUEL (kg/mt ORE)
 755 SHOVEL HORSEPOWER (CAT 13.75 CU YD)
 690 LOADER HORSEPOWER (CAT 992D, 14 CU YD)
 1290 HAUL TRUCK HORSEPOWER (CAT 785B, 130 TON)
 85.00% DIESEL FUEL % CARBON
 7.75 IRON ORE MINE ELECTRICAL POWER REQ'D (kWhr/mt ROCK)
 43.71 CONCENTRATOR ELECTRICAL POWER REQ'D (kWhr/mt ORE)
 0.333 PIPELINE ELECTRICAL POWER REQ'D (kWhr/mt ORE/km)
 250 ASSUMED CONC. SLURRY PIPELINE LENGTH (km)
 1.30 FUEL REQUIREMENT - PELLET PLANT (GJ/mt PEL)
 26.08 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
 65.0 PELLET PLANT ELEC. POWER REQ'D (kWhr/mt FEED)

11.70 FUEL TO DRI - (GJ/mt DRI)
 5.74 FUEL TO DRI - (GJ/mt FEED OXIDE)
 234.75 FUEL TO DRI - (kg/mt DRI)
 115.08 FUEL TO DRI - (kg/mt FEED OXIDE)
 130.00 DRI ELEC. POWER REQ'D - (kWhr/mt DRI)
 0.150% STEEL PERCENT CARBON - (wt.% C)
 2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
 699.4 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
 33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
 20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 BURNT LIME/DOLomite
 91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRODES
 9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 PETROLEUM COKE (CARBON)
 16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 OXYGEN
 2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
 NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRICAL POWER GENERATION (NET)
 0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
 0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
 0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
 0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOE3025

08-June-2000

Rev. 2

**OVERALL SUMMARY MASS BALANCES - BASE PROCESS SHAFT FURNACE DRI/EAF
(30% DRI CHARGE - 2.5% C)**

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
1001	AS-MINED ROCK	2.089	0.065	2.153	30.00%	0.627	0.00%	0.000	
1002	WASTE ROCK	1.263	0.039	1.302	16.93%	0.214	0.00%	0.000	
1	IRON ORE TO CONCENTRATOR	0.826	0.026	0.851	50.00%	0.413	0.00%	0.000	
	DIESEL FUEL (MINING ETC.)		0.0099				85.00%	0.008	
	EXHAUST GASES								0.0309
	MINE ELECTRICAL POWER REQ'D	(MM kWh/yr) 16.195							
47	CONCENTRATE TO PIPELINE FEED	0.486	0.262	0.748	68.56%	0.333	0.00%	0.000	
50	DEWATERED TAILINGS TO DISPOSAL	0.339	0.630	0.970	23.41%	0.079	0.00%	0.000	
	CONC. ELECTRICAL POWER REQ'D	(MM kWh/yr) 36.086							
	CONC. SLURRY PIPELINE POWER	(MM kWh/yr) 40.524							
218	NET OXIDE FEED TO PELLETIZING	0.842	0.074	0.916	73.10%	0.616	0.00%	0.000	
221	BINDER TO PELLETIZING	0.005	0.000	0.005					
222	DOLOMITE TO PELLETIZING	0.017	0.000	0.017					
	TOTAL OTHER FEED TO PELLETIZING	0.356							
	FUEL (DRYING, INDURATION, ETC.)		AS N.G. 0.0220			0.282	72.00%	0.016	
	PELLET PLANT FLUE GASES	0.053							0.0580
	PELLET ELECTRICAL POWER REQ'D	(MM kWh/yr) 54.745							
300	NET PELLETS, ETC. TO SHAFT FCE.	0.762	0.000	0.762	70.34%	0.536			
317	DRI TO SCREENS (2.5 %C)	0.373	0.000	0.373	91.39%	0.341	2.50%	0.009	
319	DRI TO EAF (2.5% C)	0.358	0.000	0.358	91.39%	0.328	2.50%	0.009	

DOE3025 (30% DRI CHARGE - 2.5% C)

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	FUEL TO DRI		AS N.G. 0.0876				72.00%	0.063	
	DRI OFF GASES	0.1661 (MM kWhr/yr)			86.39%	0.144			0.2314
	DRI ELECTRICAL POWER REQ'D	48.536							
409	TOTAL STEEL SCRAP (100% DRI)	0.7364	0.0000	0.7364	99.70%	0.7342	0.15%	0.00110	
403	MISC. ADDITIVES	0.0072	0.0000	0.0072	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0099	0.0000	0.0099			94.00%	0.00934	
405	EAF ELECTRODES	0.0045	0.0000	0.0045			94.00%	0.00421	
401	LIME CHARGED	0.0126	0.0000 AS GAS 25.08	0.0126					
415	O2 GAS TO EAF (MM Nm3/YR)								
416	LIQ. EAF STEEL TO LRF	0.0000	1.0542	1.0542	99.70%	1.0510	0.15%	0.00158	
	TOTAL CARBON INTO EAF								
	TOT. C IN OFF GASES (INCL. LRF)								
	AUX. FUEL TO EAF		AS N.G. 0.0023						
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)					72.00%	0.002	
	EAF ELECTRICAL POWER REQ'D	737.332							
417	LIME TO LADLE REF. FCE.	0.005	0.000	0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.893							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1591	0.0000	0.1591	26.95%	0.0429			
421	REFINED STEEL TO CASTING	0.0000	1.0520	1.0520	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9767	0.0000	0.9767	99.70%	0.974	0.15%	0.00147	

DOE3025 (30% DRI CHARGE - 2.5% C)

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 968.31							
	BINDER TO PELLET	0.0051	(MM kWh/yr) 0.1020					0.0001	0.0002
	BURNT LIME/DOLOMITE TO PELLET	0.0172	1.5786					0.0066	0.0241
	LIME TO EAF	0.0126	1.1568					0.0048	0.0176
	OXYGEN TO EAF	(MM Nm ³ /YR) 25.0833	53.1766						
	EAF ELECTRODES	0.0045	40.3162					0.0013	0.0048
	PETROLEUM COKE TO EAF	0.0099	0.1683					0.0000	0.0002
	COMPONENTS ELEC. POWER REQ'D								
	TOTAL ELECTRICAL POWER	(MM kWh/yr) 1,064.81							
	TOTAL CO2 PRODUCED (PROCESS)							0.1254	0.4599
	EQUIVALENT CO2 FROM POWER GEN.								0.9712
	TOTAL CO2 FROM ALL SOURCES								1.4311

APPENDIX C-6

**HYLSA SHAFT FURNACE WITHOUT REFORMER
(HYL IVM) HOT DRI CHARGE TO EAF**

DOEHLIV OVERALL SUMMARY MASS BALANCES - HYL IVM SHAFT FCE. PROCESS DRI/EAF

08-June-2000 100% DRI CHARGE - 4.0 wt.% CARBON

Rev. 2

IBASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

6.294 MM MT/YEAR AS-MINED ROCK
3.806 MM MT/YEAR WASTE ROCK
2.488 MM MT/YEAR ORE ROCK TO CONCENTRATOR
1.465 MM MT/YEAR CONCENTRATE
1.940 MM MT/YEAR NET GREENBALL PELLETS
1.836 MM MT/YEAR NET INDURATED PELLETS
1.781 MM MT/YEAR PELLET FEED TO DRI
1.089 MM MT/YEAR NET DRI TO EAF

ASSUMPTIONS:

85.00% DIESEL FUEL (ORE MINING) %C
0.003192 SHOVEL OPERATION (hrs/mt ORE)
0.006384 LOADER OPERATION (hrs/mt ORE)
0.007721 HAUL TRUCK WASTE (hrs/mt ORE)
0.005046 HAUL TRUCK ORE (hrs/mt ORE)
128.581 TOTAL SHOVEL FUEL CONSUMPTION (kg/hr)
235.022 TOTAL LOADER FUEL CONSUMPTION (kg/hr)
878.780 TOTAL HAUL TRUCK FUEL CONSUMPTION (kg/hr)
1242.383 TOTAL FUEL FOR ALL ROCK (kg/hr)
0.410 TOTAL FUEL (kg/mt ORE) - SHOVEL (1)
1.500 TOTAL FUEL (kg/mt ORE) - LOADERS (2)
11.220 TOTAL FUEL (kg/mt ORE) - TRUCKS (4)
13.131 TOTAL FUEL (kg/mt ORE)
755 SHOVEL HORSEPOWER (CAT 13.75 CU YD)
690 LOADER HORSEPOWER (CAT 992D, 14 CU YD)
1290 HAUL TRUCK HORSEPOWER (CAT 785B, 130 TON)
85.00% DIESEL FUEL % CARBON
5.00 IRON ORE MINE ELECTRICAL POWER REQ'D (kWhr/mt ROCK)
28.12 CONCENTRATOR ELECTRICAL POWER REQ'D (kWhr/mt ORE)
0.333 PIPELINE ELECTRICAL POWER REQ'D (kWhr/mt ORE/km)
250 ASSUMED CONC. SLURRY PIPELINE LENGTH (km)
1.30 FUEL REQUIREMENT - PELLET PLANT (GJ/mt PEL)
26.08 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
65.0 PELLET PLANT ELEC. POWER REQ'D (kWhr/mt FEED)

9.45 FUEL TO DRI - (GJ/mt DRI)
5.77 FUEL TO DRI - (GJ/mt FEED OXIDE)
189.61 FUEL TO DRI - (kg/mt DRI)
115.77 FUEL TO DRI - (kg/mt FEED OXIDE)
100.00 DRI ELEC. POWER REQ'D - (kWhr/mt DRI)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
606.3 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLomite
91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES
9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)
16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN
2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)
0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEHLIV

08-June-2000

OVERALL SUMMARY MASS BALANCES - HYL IVM SHAFT FCE. PROCESS DRI/EAF

100% DRI CHARGE - 4.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
1001	AS-MINED ROCK	6.294	0.195	6.488	30.00%	1.888	0.00%	0.000	
1002	WASTE ROCK	3.806	0.118	3.924	16.93%	0.644	0.00%	0.000	
1	IRON ORE TO CONCENTRATOR	2.488	0.077	2.564	50.00%	1.244	0.00%	0.000	
	DIESEL FUEL (MINING ETC.)		0.0327				85.00%	0.028	
	EXHAUST GASES								0.1018
	MINE ELECTRICAL POWER REQ'D	(MM KWhr/yr) 31.479							
47	CONCENTRATE TO PIPELINE FEED	1.465	0.789	2.254	68.56%	1.005	0.00%	0.000	
50	DEWATERED TAILINGS TO DISPOSAL	1.022	1.899	2.921	23.40%	0.239	0.00%	0.000	
	CONC. ELECTRICAL POWER REQ'D	(MM KWhr/yr) 69.941							
	CONC. SLURRY PIPELINE POWER	(MM KWhr/yr) 122.098							
218	NET OXIDE FEED TO PELLETIZING	1.969	0.173	2.142	70.47%	1.388	0.00%	0.000	
221	BINDER TO PELLETIZING	0.012	0.000	0.012					
222	DOLOMITE TO PELLETIZING	0.040	0.000	0.040					
	TOTAL OTHER FEED TO PELLETIZING	0.504			76.03%	0.383			
	FUEL (DRYING, INDURATION, ETC.)		AS N.G. 0.0514				72.00%	0.037	
	PELLET PLANT FLUE GASES	0.123			67.81%	0.115			0.1356
	PELLET ELECTRICAL POWER REQ'D	(MM KWhr/yr) 128.005							
300	NET PELLETS, ETC. TO SHAFT FCE.	1.781	0.000	1.781	67.81%	1.207			
317	DRI TO SCREENS (1.0 %C)	1.089	0.000	1.089	92.80%	1.010	4.00%	0.044	
319	DRI TO EAF (1.0% C)	1.045	0.000	1.045	92.80%	0.970	4.00%	0.042	

100% DRI CHARGE - 4.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	FUEL TO DRI		AS N.G. 0.2062				72.00%	0.148	
	DRI/OFF GASES	0.1661 (MM kWh/yr)			87.80%	0.146			0.5443
	DRI ELECTRICAL POWER REQ'D	108.857							
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.00010	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0084	0.0000	0.0084			94.00%	0.00791	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00359	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 44.00						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0149	
	TOT. C IN OFF GASES (INCL. LRF)							0.0133	
	AUX. FUEL TO EAF		AS N.G. 0.0023					0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWh/yr)							0.0487
	EAF ELECTRICAL POWER REQ'D	639.221							
417	LIME TO LADLE REF. FCE.	0.005	0.000	0.0053	48.50%	0.010	72.00%		
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.897 (MM kWh/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1561	0.0000	0.1561	26.97%	0.0421			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.974	0.15%	0.00147	

100% DRI CHARGE - 4.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 1,134.50							
	BINDER TO PELLET	0.0118	(MM kWh/yr) 0.2386					0.0001	0.0004
	BURNT LIME/DOLOMITE TO PELLET	0.0402	3.6910					0.0153	0.0563
	LIME TO EAF	0.0124	1.1347					0.0047	0.0173
	OXYGEN TO EAF	(MM Nm ³ /YR) 44.0000	93.2800						
	EAF ELECTRODES	0.0038	34.3878					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0084	0.1425					0.0000	0.0001
	COMPONENTS ELEC. POWER REQ'D								
	TOTAL ELECTRICAL POWER	(MM kWh/yr) 1,267.37							
	TOTAL CO2 PRODUCED (PROCESS)							0.2478	0.9086
	EQUIVALENT CO2 FROM POWER GEN.								1.1560
	TOTAL CO2 FROM ALL SOURCES								2.0646

HOT METAL VARIATIONS

APPENDIX C-7

**30% BLAST FURNACE HOT METAL/70% SCRAP
CHARGE TO EAF, CO-PRODUCT COKE**

OVERALL SUMMARY MASS BALANCES - BLAST FURNACE HOT METAL/EAF

08-June-2000 30% BLAST FURNACE HOT METAL CHARGE - CO-PRODUCT COKE

Rev. 2

BASIS: 28" DIA BLAST FURNACE (REF. MST OF STEEL, 9th EDITION)

0.688 MM MT/YEAR PURCHASED SCRAP CHARGED TO EAF
 0.358 MM MT/YEAR LIQUID HOT METAL (TARGET)
 0.358 MM MT/YEAR LIQUID HOT METAL (CALC.)
 1.000 MM MT/YEAR LIQUID STEEL (TARGET)
 0.977 MM MT/YEAR HOT BAND EQUIVALENT (CALC.)

SUMMARY:

0.105 MMM MT/YEAR LUMP IRON ORE
 0.210 MMM MT/YEAR IRON ORE PELLETS FEED
 0.210 MMM MT/YEAR FLUXED IRON SINTER
 0.034 MMM MT/YEAR IRON SCRAP
 0.003 MMM MT/YEAR LIMESTONE
 0.003 MMM MT/YEAR SiO2/GRAVEL
 0.175 MMM MT/YEAR COKE
 0.739 MMT MT/YEAR TOTAL SOLID BF FEED (ASSUMPTION)

ASSUMPTIONS:

4320
 14.26% PERCENT LUMP IRON ORE OF FEED
 28.38% PERCENT IRON ORE PELLETS OF FEED
 28.38% PERCENT SINTER OF FEED
 4.56% PERCENT SCRAP IN FEED
 0.35% PERCENT LIMESTONE IN FEED
 0.35% PERCENT GRAVEL IN FEED
 23.73% PERCENT COKE IN FEED
 64.00% PERCENT IRON IN LUMP ORE
 64.50% PERCENT IRON IN PELLETS
 50.00% PERCENT IRON IN SINTER
 85.70% PERCENT C IN COKE
 2.00% PERCENT C IN SCRAP CHARGED
 1.639 Moisture to Furnace - (mt/mt HM)
 20.500 Air to Furnace - (mt/mt HM)
 41.7 Fuel Requirement - Pellet Plant (kg N.G./mt Pel)
 42.70% Blast Furnace Elec. Power Req'd (kW/mt Feed)
 0.249 Percent C in Limestone
 0.006 Slag from Furnace (mt/mt HM)
 2.539 Scrap from BF (mt/mt HM)
 0.042 BF Top Gas from Furnace (mt/mt HM)
 2.00% Dust from Furnace (mt/mt HM)
 0.000977 Percent C in BF Slag

40.00% PERCENT IRON IN BF DUST
 20.00% PERCENT CARBON IN BF DUST
 4.50% PERCENT CARBON IN HOT METAL
 0.00 ELEC. POWER GENERATED - (kW/mt HM)
 3.61% PERCENT Fe IN BLAST FCE SLAG
 24.90% WEIGHT BF FCE SLAG PRODUCED - (mt/mt HM)
 95.13% PERCENT IRON IN HM
 0.150% STEEL SCRAP PERCENT CARBON - (wt. % C)
 2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
 514.1 EAF ELEC. POWER (TOTAL) - (kW/mt LIQ. STEEL)
 33.1 LRF ELEC. POWER - (kW/mt LIQ. STEEL)
 POWER & CO2 EMISSIONS FOR COMPONENTS:
 BINDER FOR PELLETIZING
 20.19 ELECTRIC POWER REQ'D - (kW/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 BURNT LIME/DOLomite
 91.84 ELECTRIC POWER REQ'D - (kW/mt)
 1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRODES
 9,000.00 ELECTRIC POWER REQ'D - (kW/mt)
 1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 PETROLEUM COKE (CARBON)
 16.936 ELECTRIC POWER REQ'D - (kW/mt)
 0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 OXYGEN
 2.12 ELECTRIC POWER REQ'D - (kW/mt)
 NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
 CO-PRODUCT COKE
 30.6157 ELECTRIC POWER REQ'D - (kW/mt)
 0.9975 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRICAL POWER GENERATION (NET)
 0.000599 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kW/mt NET)
 0.001355 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kW/mt NET)
 LUMP IRON ORE DELIVERED
 32.24 ELECTRIC POWER REQ'D - (kW/mt)
 0.1437 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 IRON ORE PELLETS DELIVERED
 197.3739 ELECTRIC POWER REQ'D - (kW/mt)
 0.2374 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 IRON SINTER DELIVERED
 89.5474 ELECTRIC POWER REQ'D - (kW/mt)
 0.1356 CUMULATIVE CO2 EMISSIONS - (MT/mt)

DOEBF

08-June-2000

OVERALL SUMMARY MASS BALANCES - BLAST FURNACE HOT METAL/EA

30% BLAST FURNACE HOT METAL CHARGE - CO-PRODUCT COKE

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	LUMP IRON ORE FEED	0.1054	0.000	0.105	64.00%	0.067	0.00%	0.000	
	IRON PELLETT FEED	0.2097	0.000	0.210	64.50%	0.135	0.00%	0.000	
	IRON SINTER FEED	0.2097	0.000	0.210	50.00%	0.105	0.00%	0.000	
	IRON SCRAP FEED	0.0337	0.000	0.034	97.70%	0.033	2.00%	0.001	
	LIMESTONE FEED	0.0026	0.000	0.003	0.00%	0.000	43.20%	0.001	
	GRAVEL FEED	0.0026	0.000	0.003	0.00%	0.000	0.00%	0.000	
	COKE FEED	0.1753	0.000	0.175	0.00%	0.000	85.70%	0.150	
	AIR TO FURNACE	0.0000	AS GAS 0.587	0.587	0.00%	0.000	0.00%	0.000	
	MOISTURE TO FURNACE	0.0000	AS GAS 0.006	0.006	0.00%	0.000	0.00%	0.000	
	NET SOLID FEED TO FURNACE	0.7390	0.000	0.739	46.08%	0.3405	21.11%	0.1560	
	N.G. FUEL TO FURNACE	0.0000	AS GAS 0.007	0.005			72.00%	0.004	0.0144
	BF ELECTRICAL POWER REQ'D	30.8536							
	BLAST GAS FROM FURNACE	0.0000	(MM mt/YR) 0.9100	0.910	0.00%	0.000	14.83%	0.135	0.4948
	SLAG FROM FURNACE	0.0892	0.000	0.089	46.08%	0.041	2.00%	0.002	
	BF HOT METAL FROM FURNACE	0.3584	0.000	0.358	95.13%	0.341	4.50%	0.016	
	BF SCRAP FROM FCE	0.0022	0.000	0.0022	95.13%	0.002	4.50%	0.000	
	BF DUST FROM FCE	0.0151	0.000	0.0151	40.00%	0.006	20.00%	0.003	

30% BLAST FURNACE HOT METAL CHARGE - CO-PRODUCT COKE

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR) AS N.G.	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
409	TOTAL STEEL SCRAP (100% DRI)	0.7366	0.0000	0.7366	99.70%	0.6862	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	0.0029			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00361	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 38.99						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0545	1.0545	99.70%	0.0000	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0265	
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G.				72.00%	0.0249	
	AUX. FUEL TO EAF		0.0023					0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr) 542.1070			48.50%	0.010		0.0266	0.0976
	EAF ELECTRICAL POWER REQ'D								
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	(MM kWhr/yr) 34.9032							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.042			
421	REFINED STEEL TO CASTING	1.000	0.0000	1.000	99.70%	0.997	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

30% BLAST FURNACE HOT METAL CHARGE, CO-PRODUCT COKE - SUMMARY

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 607.8438							
	COKE TO BLAST FURNACE	0.1753	(MM kWhr/yr) 5.3682					0.0477	0.1749
	LUMP IRON ORE TO BLAST FURNACE	0.1054	3.3973					0.0041	0.0151
	IRON ORE PELL. TO BLAST FURNACE	0.2097	41.3943					0.0136	0.0498
	IRON SINTER TO BLAST FURNACE	0.2097	18.7804					0.0078	0.0284
	LIMESTONE TO BLAST FURNACE	0.0026	0.0827					0.0001	0.0004
	SiO2/GRAVEL TO BLAST FURNACE	0.0026	0.0827					0.0001	0.0004
	LIME TO EAF	0.0124	1.1412					0.0047	0.0174
	OXYGEN TO EAF	(MM Nm3/YR) 38.9907	82.6602						
	EAF ELECTRODES	0.0038	34.5856					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0060	0.1023					0.00003	0.00009
	COMPONENTS ELEC. POWER REQ'D		187.5950						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWhr/yr) 795.4388							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	795.4388						0.2448	0.8974
	TOTAL CO2 PRODUCED (PROCESS)								0.7771
	EQUIVALENT CO2 FROM POWER GEN.								1.6746
	TOTAL CO2 FROM ALL SOURCES								

IRON/STEELMAKING WATER & SOLIDS BALANCE

DOEBF

19-Sept-1999 30% BLAST FURNACE HOT METAL CHARGE - CO-PRODUCT COKE

Revision A: OREBODY ASSUMPTIONS

EAF STEELMAKING/LMF (PFD-009)

1.00 (MM T/YR LIQUID STEEL)

STREAM NUMBER	STREAM LABEL	BASIS:			1.00 (MM T/YR LIQUID STEEL)			
		% SOLIDS	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	% OF SLAB OF DRI FD	%Fe (DRY)	Fe UNITS (MM T/YR)
400	TOTAL HOT METAL FEED TO EAF	0.0%	0.000	0.358	0.358	47.1%	95.13%	0.341
401	LUMP LIME FLUX TO EAF	100.0%	0.012	0.000	0.012	1.6%		
402	SILICA FLUX	100.0%	0.000	0.000	0.000	0.0%		
403	MISC. ADDITIVES (Al, FeMn, FeSi, etc.)	100.0%	0.007	0.000	0.007	4.2%	40.72%	0.013
404	STEEL CARBON (CHARGED+SLAG INJ.)	100.0%	0.006	0.000	0.006	7.1%		
405	EAF ELECTRODES	100.0%	0.004	0.000	0.004	1.1%		
406	TOTAL EAF COOLING WATER CIRC. (MM T/YR)	0.0%	0.000	70.627	70.627	0.0%		
407	REVERT SCRAP	100.0%	0.048	0.000	0.048	6.4%	99.70%	0.048
408	PURCHASED SCRAP	100.0%	0.688	0.000	0.688	90.4%	99.70%	0.686
409	NET SCRAP CHARGED	100.0%	0.737	0.000	0.737	96.8%	99.70%	0.734
410	TOTAL FLUX & ADDITIVES CHARGED	100.0%	0.026	0.000	0.026	3.4%	50.80%	0.013
411	REFRACTORIES CONSUMMED	100.0%	0.015	0.000	0.015	1.9%		
412	PROCESS/COOLING WATER OUT OF EAF	0.0%	0.000	70.627	70.627	0.0%		
413	EAF SLAG (LIQUID)	0.0%	0.000	0.157	0.157	0.0%	25.60%	0.040
414	EAF DUST TO EAF DUST COLLECTION	100.0%	0.020	0.000	0.020	2.6%	48.50%	0.010
415	OXYGEN GAS TO FURNACE (MM Nm ³ /YR)	0.0%	0.000	38.991	38.991	0.0%		
416	LIQUID EAF STEEL TO LADLE REFINING	0.0%	0.000	1.054	1.054	0.0%	99.70%	1.051
417	PULVERIZED LIME TO LADLE REF. FCE.	100.0%	0.005	0.000	0.005	0.7%		
418	SLAGWIRE DESULFURIZER TO LRF	100.0%	0.0004	0.0000	0.00034	0.4%		
419	ARGON GAS TO LRF (MM Nm ³ /YR)	0.0%	0.000	0.063	0.063	0.0%		

IRON/STEELMAKING WATER & SOLIDS BALANCE

DOEBF

19-Sept.-1999

30% BLAST FURNACE HOT METAL CHARGE - CO-PRODUCT COKE

Revision A: OREBEAF STLMAKING/LMF (PFD-009)

BASIS: 1.00 (MM T/YR LIQUID STEEL)

STREAM NUMBER	STREAM LABEL	% SOLIDS	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	% OF SLAB OF DRI FD	%Fe (DRY)	Fe UNITS (MM T/YR)
420	SLAG & LOSSES FROM LRF	0.0%	0.000	0.007	0.007	0.0%	31.80%	0.002
421	REFINED STEEL TO CASTING	0.0%	0.000	1.052	1.052	0.0%	99.70%	1.049
422	PULVERIZED LIME FLUX TO EAF	100.0%	0.014	0.000	0.012	1.5%		
423	WATER FOR EAF DUST TRANSPORT	0.0%	0.000	0.112	0.112	0.0%		
424	PROC. COOLING WATER LMF	0.0%	0.000	14.125	14.125	0.0%		
425	TOTAL SLAG OUTPUT (AS SOLID)	100.0%	0.157	0.000	0.157	20.6%	26.97%	0.042
501	SLAB SCALE	0.0%	0.005	0.000	0.005	0.7%	80.00%	0.004
502	LADLE SCRAP	0.0%	0.024	0.000	0.024	3.1%	99.70%	0.024
503	TUNDISH SCRAP	100.0%	0.006	0.000	0.006	0.8%	99.70%	0.006
504	CROP END SCRAP	0.0%	0.018	0.000	0.018	2.4%	99.70%	0.018
505	MOLD POWDER TO CASTING	100.0%	0.0006	0.000	0.001	11.3%		
506	TUNDISH POWDER TO CASTING	100.0%	0.0003	0.000	0.000	3.5%		
507	MOLD COOLING WATER (MM NM3/YR)	0.0%	0.000	29.206	29.206	0.0%		
508	CONTACT COOLING WATER (MM NMS/YR)	0.0%	0.162	9.600	9.762	21.3%		
509	NET STEEL TO CASTING	0.0%	0.000	1.000	1.000	0.0%	99.70%	0.997
510	TOTAL CAST SLAB PRODUCT	100.0%	0.977	0.000	0.977	128.3%	99.70%	0.974
511	THIN SLAB TO HOT BAND	0.0%	0.000	0.000	0.000	0.0%	99.70%	0.000
512	SLABS TO SALES	100.0%	0.977	0.000	0.977	128.3%	99.70%	0.974
513	HOT BAND TO SALES	100.0%	0.000	0.000	0.000	0.0%	99.70%	0.000

APPENDIX C-8

**30% BLAST FURNACE HOT METAL/70% SCRAP
CHARGE TO EAF, N. R. COKE WITH POWER
GENERATION**

DOEBFNRC OVERALL SUMMARY MASS BALANCES - BLAST FURNACE HOT METAL/EAF

08-June-2000 30% BLAST FURNACE HOT METAL CHARGE - WITH N.R. COKE & PWR. GEN.

Rev. 2

28' DIA BLAST FURNACE (REF. MST OF STEEL, 9th EDITION)

0.688	MM MT/YEAR PURCHASED SCRAP CHARGED TO EAF
0.358	MM MT/YEAR LIQUID HOT METAL (TARGET)
0.358	MM MT/YEAR LIQUID HOT METAL (CALC.)
1.000	MM MT/YEAR LIQUID STEEL (TARGET)
0.977	MM MT/YEAR HOT BAND EQUIVALENT (CALC.)
SUMMARY:	
0.108	MMMT MT/YEAR LUMP IRON ORE
0.214	MMMT MT/YEAR IRON ORE PELLETS FEED
0.214	MMMT MT/YEAR FLUXED IRON SINTER
0.034	MMMT MT/YEAR IRON SCRAP
0.003	MMMT MT/YEAR LIMESTONE
0.003	MMMT MT/YEAR SiO2/GRAVEL
0.163	MMMT MT/YEAR COKE
0.739	MMMT MT/YEAR TOTAL SOLID BF FEED (ASSUMPTION)

40.00%	PERCENT IRON IN BF DUST
20.00%	PERCENT CARBON IN BF DUST
4.50%	PERCENT CARBON IN HOT METAL
0.00	ELEC. POWER GENERATED - (kWhr/mt HM)
3.61%	PERCENT Fe IN BLAST FCE SLAG
24.90%	WEIGHT BF FCE SLAG PRODUCED - (mt/mt HM)
95.13%	PERCENT IRON IN HM
0.150%	STEEL SCRAP PERCENT CARBON - (wt.% C)
2.20	AUX. FUEL TO EAF - kg/T LIQ. ST.
514.1	EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
33.1	LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
POWER & CO2 EMISSIONS FOR COMPONENTS: BINDER FOR PELLETIZING	
20.19	ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364	CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE	
91.84	ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002	CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES	
9,000.00	ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763	CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)	
16.936	ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156	CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN	
2.12	ELECTRIC POWER REQ'D - (kWhr/Nm3)
NONE	CUMULATIVE CO2 EMISSIONS - (MT/mt)
NON-RECOVERY COKE	
59.358	ELECTRIC POWER REQ'D - (kWhr/mt)
1.1721	CUMULATIVE CO2 EMISSIONS - (MT/mt)
0.000912	ELECTRICAL POWER GENERATION (NET)
0.000604	CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448	CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
LUMP IRON ORE DELIVERED	
32.24	ELECTRIC POWER REQ'D - (kWhr/mt)
0.1437	CUMULATIVE CO2 EMISSIONS - (MT/mt)
IRON ORE PELLETS DELIVERED	
197.3739	ELECTRIC POWER REQ'D - (kWhr/mt)
0.2374	CUMULATIVE CO2 EMISSIONS - (MT/mt)
IRON SINTER DELIVERED	
89.5474	ELECTRIC POWER REQ'D - (kWhr/mt)
0.1356	CUMULATIVE CO2 EMISSIONS - (kg/mt)

ASSUMPTIONS:

4224	PERCENT LUMP IRON ORE OF FEED	E.P. Gen.
14.56%	PERCENT IRON ORE PELLETS OF FEED	866.937
29.02%	PERCENT SINTER OF FEED	FUEL OIL
29.02%	PERCENT SCRAP IN FEED	0.000871
4.66%	PERCENT LIMESTONE IN FEED	
0.36%	PERCENT SILICA GRAVEL IN FEED	
0.36%	PERCENT COKE IN FEED	
22.02%	PERCENT IRON IN LUMP ORE	
64.00%	PERCENT IRON IN PELLETS	
64.50%	PERCENT IRON IN SINTER	
50.00%	PERCENT C IN COKE	
94.53%	PERCENT C IN SCRAP CHARGED	
2.00%	MOISTURE TO FURNACE - (mt/mt HM)	
0.016	AIR TO FURNACE - (mt/mt HM)	
1.639	FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)	
20.500	BLAST FURNACE ELEC. POWER REQ'D (kWhr/mt FEED)	
41.7	PERCENT C IN LIMESTONE	
42.70%	SLAG FROM FURNACE (mt/mt HM)	
0.249	SCRAP FROM BF (mt/mt HM)	
0.006	BF TOP GAS FROM FURNACE (mt/mt HM)	
2.539	DUST FROM FURNACE (mt/mt HM)	
0.042	PERCENT C IN BF SLAG	
2.00%		

OVERALL SUMMARY MASS BALANCES - BLAST FURNACE HOT METAL/EAFF

30% BLAST FURNACE HOT METAL CHARGE - WITH N.R. COKE & PWR. GEN.

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	LUMP IRON ORE FEED	0.1076	0.000	0.108	64.00%	0.069	0.00%	0.000	
	IRON PELLETT FEED	0.2145	0.000	0.214	64.50%	0.138	0.00%	0.000	
	IRON SINTER FEED	0.2145	0.000	0.214	50.00%	0.107	0.00%	0.000	
	IRON SCRAP FEED	0.0345	0.000	0.034	97.70%	0.034	2.00%	0.001	
	LIMESTONE FEED	0.0026	0.000	0.003	0.00%	0.000	43.20%	0.001	
	GRAVEL FEED	0.0026	0.000	0.003	0.00%	0.000	0.00%	0.000	
	N.R. COKE FEED	0.1627	0.000	0.163	0.00%	0.000	94.53%	0.154	
	AIR TO FURNACE	0.0000	AS GAS 0.587	0.587	0.00%	0.000	0.00%	0.000	
	MOISTURE TO FURNACE	0.0000	AS GAS 0.006	0.006	0.00%	0.000	0.00%	0.000	
	NET SOLID FEED TO FURNACE	0.7390	0.000	0.739	47.11%	0.3481	21.59%	0.1596	
	N.G. FUEL TO FURNACE	0.0000	AS GAS 0.007	0.005			72.00%	0.004	0.0144
	BF ELECTRICAL POWER REQ'D	(MM kWh/yr) 30.8336							
	BLAST GAS FROM FURNACE	0.0000	(MM mt/YR) 0.9100	0.910	0.00%	0.000	15.23%	0.139	0.5080
	SLAG FROM FURNACE	0.0892	0.000	0.089	47.11%	0.042	2.00%	0.002	
	BF HOT METAL FROM FURNACE	0.3584	0.000	0.358	95.13%	0.341	4.50%	0.016	
	BF SCRAP FROM FCE	0.0022	0.000	0.0022	95.13%	0.002	4.50%	0.000	
	BF DUST FROM FCE	0.0151	0.000	0.0151	40.00%	0.006	20.00%	0.003	

30% BLAST FURNACE HOT METAL CHARGE - WITH N.R. COKE & PWR. GEN.

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR) AS N.G.	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
409	TOTAL STEEL SCRAP (100% DRI)	0.7366	0.0000	0.7366	99.70%	0.6862	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	0.0029			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00361	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 38.99						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0545	1.0545	99.70%	0.0000	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0265	
	TOT. C IN OFF GASES (INCL. LRF)							0.0249	
	AUX. FUEL TO EAF						72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)				0.010		0.0266	0.0976
	EAF ELECTRICAL POWER REQ'D	542.1070							
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.9032 (MM kWhr/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.042			
421	REFINED STEEL TO CASTING	1.000	0.0000	1.000	99.70%	0.997	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

30% BLAST FURNACE HOT METAL CHARGE (N.R. COKE) - SUMMARY

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 607.8438							
	N.R. COKE TO BLAST FURNACE	0.1627	(MM kWhr/yr) 9.6592					0.0520	0.1907
	LUMP IRON ORE TO BLAST FURNACE	0.1076	3.4688					0.0042	0.0155
	IRON ORE PELL. TO BLAST FURNACE	0.2145	42.3335					0.0139	0.0509
	IRON SINTER TO BLAST FURNACE	0.2145	19.2065					0.0079	0.0291
	LIMESTONE TO BLAST FURNACE	0.0026	0.0846					0.0001	0.0004
	SiO2/GRAVEL TO BLAST FURNACE	0.0026	0.0846					0.0001	0.0004
	BURNT LIME TO EAF	0.0124	1.1412					0.0132	0.0483
	OXYGEN TO EAF	(MM Nm3/YR) 38.9907	82.6602						
	EAF ELECTRODES	0.0038	34.5856					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0060	0.1023					0.00003	0.00009
	COMPONENTS ELEC. POWER REQ'D		193.3265						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWhr/yr) 801.1703							
	TOTAL ELEC. POWER GEN. N.R. COKE	141.0750							
	TOTAL NET ELEC. ADDITIONAL	660.0953						0.2617	0.9594
	TOTAL CO2 PRODUCED (PROCESS)								0.6021
	EQUIVALENT CO2 FROM POWER GEN.								1.5615
	TOTAL CO2 FROM ALL SOURCES								

APPENDIX C-9

**30% COLD PIG IRON/70% SCRAP CHARGE TO EAF,
4.5% CARBON PIG**

DOEPIG OVERALL SUMMARY MASS BALANCES - BLAST FURNACE HOT METAL/EAF

08-June-2000 30% COLD BLAST FURNACE PIG IRON CHARGE

Rev. 2

BASIS: 28' DIA BLAST FURNACE (REF. MST OF STEEL, 9th EDITION)

0.688	MM MT/YEAR PURCHASED SCRAP CHARGED TO EAF
0.358	MM MT/YEAR LIQUID HOT METAL (TARGET)
0.358	MM MT/YEAR LIQUID HOT METAL (CALC.)
1.000	MM MT/YEAR LIQUID STEEL (TARGET)
0.977	MM MT/YEAR HOT BAND EQUIVALENT (CALC.)
SUMMARY:	
0.105	MMM MT/YEAR LUMP IRON ORE
0.210	MMM MT/YEAR IRON ORE PELLETS FEED
0.210	MMM MT/YEAR FLUXED IRON SINTER
0.034	MMM MT/YEAR IRON SCRAP
0.003	MMM MT/YEAR LIMESTONE
0.003	MMM MT/YEAR SiO2/GRAVEL
0.175	MMM MT/YEAR COKE
0.739	MMT MT/YEAR TOTAL SOLID BF FEED (ASSUMPTION)

ASSUMPTIONS:

4320	PERCENT LUMP IRON ORE OF FEED
14.26%	PERCENT IRON ORE PELLETS OF FEED
28.38%	PERCENT SINTER OF FEED
28.38%	PERCENT SCRAP IN FEED
4.56%	PERCENT LIMESTONE IN FEED
0.35%	PERCENT GRAVEL IN FEED
0.35%	PERCENT COKE IN FEED
23.73%	PERCENT IRON IN LUMP ORE
64.00%	PERCENT IRON IN PELLETS
64.50%	PERCENT IRON IN SINTER
50.00%	PERCENT C IN COKE
85.70%	PERCENT C IN SCRAP CHARGED
2.00%	MOISTURE TO FURNACE - (mt/mt HM)
0.016	AIR TO FURNACE - (mt/mt HM)
1.639	FUEL OIL 0.000871
20.500	FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
48.7	BF ELEC. POWER REQ'D - INCL. PIG IRON (kWhr/mt FEED)
42.70%	PERCENT C IN LIMESTONE
0.249	SLAG FROM FURNACE (mt/mt HM)
0.006	SCRAP FROM BF (mt/mt HM)
2.539	BF TOP GAS FROM FURNACE (mt/mt HM)
0.042	DUST FROM FURNACE (mt/mt HM)
2.00%	PERCENT C IN BF SLAG

40.00%	PERCENT IRON IN BF DUST
20.00%	PERCENT CARBON IN BF DUST
4.50%	PERCENT CARBON IN HOT METAL/PIG IRON
0.00	ELEC. POWER GENERATED - (kWhr/mt HM)
3.61%	PERCENT Fe IN BLAST FCE SLAG
24.90%	WEIGHT BF FCE SLAG PRODUCED - (mt/mt HM)
95.13%	PERCENT IRON IN HIM/PIG IRON
0.150%	STEEL SCRAP PERCENT CARBON - (wt.% C)
2.20	AUX. FUEL TO EAF - kg/T LIQ. ST.
698.1	EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
33.1	LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
	POWER & CO2 EMISSIONS FOR COMPONENTS:
	BINDER FOR PELLETIZING
20.19	ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	BURNT LIME/DOLOMITE
91.84	ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	ELECTRODES
9,000.00	ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	PETROLEUM COKE (CARBON)
16.936	ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	OXYGEN
2.12	ELECTRIC POWER REQ'D - (kWhr/Nm3)
NONE	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	CO-PRODUCT COKE
15.5435	ELECTRIC POWER REQ'D - (kWhr/mt)
0.9975	CUMULATIVE CO2 EMISSIONS - (MT/mt)
0.000912	ELECTRICAL POWER GENERATION (NET)
0.000604	CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448	CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
	LUMP IRON ORE DELIVERED
32.24	ELECTRIC POWER REQ'D - (kWhr/mt)
0.1437	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	IRON ORE PELLETS DELIVERED
197.3739	ELECTRIC POWER REQ'D - (kWhr/mt)
0.2374	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	IRON SINTER DELIVERED
89.5474	ELECTRIC POWER REQ'D - (kWhr/mt)
0.1356	CUMULATIVE CO2 EMISSIONS - (MT/mt)

OVERALL SUMMARY MASS BALANCES - BLAST FURNACE HOT METAL/EAF
30% COLD BLAST FURNACE PIG IRON CHARGE

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	LUMP IRON ORE FEED	0.1054	0.000	0.105	64.00%	0.067	0.00%	0.000	
	IRON PELLETT FEED	0.2097	0.000	0.210	64.50%	0.135	0.00%	0.000	
	IRON SINTER FEED	0.2097	0.000	0.210	50.00%	0.105	0.00%	0.000	
	IRON SCRAP FEED	0.0337	0.000	0.034	97.70%	0.033	2.00%	0.001	
	LIMESTONE FEED	0.0026	0.000	0.003	0.00%	0.000	43.20%	0.001	
	GRAVEL FEED	0.0026	0.000	0.003	0.00%	0.000	0.00%	0.000	
	COKE FEED	0.1753	0.000	0.175	0.00%	0.000	85.70%	0.150	
	AIR TO FURNACE	0.0000	AS GAS 0.587	0.587	0.00%	0.000	0.00%	0.000	
	MOISTURE TO FURNACE	0.0000	AS GAS 0.006	0.006	0.00%	0.000	0.00%	0.000	
	NET SOLID FEED TO FURNACE	0.7390	0.000	0.739	46.08%	0.3405	21.11%	0.1560	
	N.G. FUEL TO FURNACE	0.0000	AS GAS 0.007	(MM mt/YR) 0.005			72.00%	0.004	0.0144
	BF ELECTRICAL POWER REQ'D	36.0066							
	BLAST GAS FROM FURNACE	0.0000	(MM mt/YR) 0.9100	0.910	0.00%	0.000	14.83%	0.135	0.4948
	SLAG FROM FURNACE	0.0892	0.000	0.089	46.08%	0.041	2.00%	0.002	
	BF HOT METAL FROM FURNACE	0.3584	0.000	0.358	95.13%	0.341	4.50%	0.016	
	BF COLD PIG IRON	0.3584	0.000	0.358	95.13%	0.341	4.50%	0.016	
	BF SCRAP FROM FCE	0.0022	0.000	0.0022	95.13%	0.002	4.50%	0.000	
	BF DUST FROM FCE	0.0151	0.000	0.0151	40.00%	0.006	20.00%	0.003	

30% COLD BLAST FURNACE PIG IRON CHARGE

DOEPIG STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR) AS N.G.	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
409	TOTAL STEEL SCRAP (100% DRI)	0.7366	0.0000	0.7366	99.70%	0.6862	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	0.0029			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0050	0.0000	0.0050			94.00%	0.00470	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 38.99						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0545	1.0545	99.70%	0.0000	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0276	
	TOT. C IN OFF GASES (INCL. LRF)							0.0260	
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr) 736.1518			48.50%	0.010		0.0277	0.1015
	EAF ELECTRICAL POWER REQD								
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.000 AS GAS 0.063	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)								
	LRF ELECTRICAL POWER REQD	(MM kWhr/yr) 34.9032							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.042			
421	REFINED STEEL TO CASTING	1.000	0.0000	1.000	99.70%	0.997	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

30% BLAST FURNACE HOT METAL CHARGE - SUMMARY

DOEPIG STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 807.0616							
	COKE TO BLAST FURNACE	0.1753	(MM kWhr/yr) 2.7254					0.0477	0.1749
	LUMP IRON ORE TO BLAST FURNACE	0.1054	3.3973					0.0041	0.0151
	IRON ORE PELL. TO BLAST FURNACE	0.2097	41.3943					0.0136	0.0498
	IRON SINTER TO BLAST FURNACE	0.2097	18.7804					0.0078	0.0284
	LIMESTONE TO BLAST FURNACE	0.0026	0.0827					0.0001	0.0004
	SiO2/GRAVEL TO BLAST FURNACE	0.0026	0.0827					0.0001	0.0004
	LIME TO EAF	0.0124	1.1412					0.0047	0.0174
	OXYGEN TO EAF	(MM Nm3/YR) 38.9907	82.6602						
	EAF ELECTRODES	0.0050	44.9613					0.0015	0.0054
	PETROLEUM COKE TO EAF	0.0060	0.1023					0.00003	0.00009
	COMPONENTS ELEC. POWER REQ'D		195.3279						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWhr/yr) 1,002.3895							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	1,002.3895							
	TOTAL CO2 PRODUCED (PROCESS)							0.2462	0.9027
	EQUIVALENT CO2 FROM POWER GEN.								0.9143
	TOTAL CO2 FROM ALL SOURCES								1.8170

APPENDIX C-10

**30% TECHNORED HOT METAL/70% SCRAP
CHARGE TO EAF, 4.5% C H. M. WITH CO-
GENERATION OF ELECTRICAL POWER**

OVERALL SUMMARY MASS BALANCES - TECNORED PROCESS THROUGH HOT METAL (COKE BASED)

08-June-2000 30% HOT METAL CHARGE - WITH CO-GENERATION OF ELECTRICAL POWER

Rev. 2

BASIS:

0.688 MM MT/YEAR PURCHASED SCRAP CHARGED
 0.358 MM MT/YEAR LIQUID HOT METAL (TARGET)
 0.358 MM MT/YEAR LIQUID HOT METAL (CALC.)
 1.000 MM MT/YEAR LIQUID STEEL (TARGET)
 0.977 MM MT/YEAR HOT BAND EQUIVALENT (CALC.)

SUMMARY:

0.508 MMM MT/YEAR FINE ORE FEED
 0.098 MMM MT/YEAR EAF SLAG
 0.076 MMM MT/YEAR CHARCOAL
 0.005 MMM MT/YEAR BINDER C
 0.149 MMM MT/YEAR COKE
 0.722 MMM MT/YEAR NET GREENBALL PELLETS
 0.656 MMM MT/YEAR NET CURED/DRIED PELLETS
 0.638 MMM MT/YEAR PELLET FEED TO FCE

ASSUMPTIONS:

0.508 FINE ORE FEED TO PELLETIZING - (MM MT/YEAR)
 72.00% PERCENT FINE ORE TO PELLET
 64.50% PERCENT IRON IN FINE ORE - (wt.% Fe)
 1.00% PERCENT BINDER C IN PELLET
 12.00% PERCENT EAF SLAG TO PELLET
 15.00% PERCENT CHARCOAL TO PELLET
 1.22% PERCENT RETURN FINES TO PELLET MIX
 0.00% PERCENT CEMENT TO PELLET
 25.26% PERCENT IRON IN EAF SLAG
 80.00% PERCENT C IN BINDER C
 80.00% PERCENT C IN CHARCOAL
 10.00% PERCENT C IN RETURN FINES
 85.70% PERCENT C IN CHINA COKE
 48.83% PERCENT Fe IN RETURN FINES
 52.72% PERCENT Fe IN GREEN PELLETS (DRY BASIS)
 9.91% PERCENT C IN GREEN PELLETS (DRY BASIS)
 9.09% PERCENT MOISTURE IN GREEN PELLETS
 0.00% PERCENT MOISTURE DRIED PELLETS
 97.14% NET PERCENT OF DRIED PELLETS TO FURNACE
 52.72% PERCENT Fe IN DRIED PELLETS
 0.002 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
 30.0 PELLET PLANT ELEC. POWER REQ'D (kW/hr/mt FEED)

4.50% EAF SLAG TO FURNACE - (% OF FEED)
 18.09% CHINA COKE TO FURNACE - (% OF FEED)
 77.41% DRIED PELLET TO FURNACE - (% OF FEED)
 4,809.2 TOTAL OFF-GASES FROM FURNACE -(Nm³/mt HM)
 1.500 DENSITY OF OFF-GASES - (kg/Nm³)
 0.27% BURNT LIME TO SCRUBBER - (mt/mt FEED)
 0.10 AUX FUEL TO FCE - (kg/mt FEED OXIDE)
 4.50% PERCENT CARBON IN HOT METAL
 459.00 TECHN. ELEC. POWER GENERATED - (kW/hr/mt HM)
 3.61% PERCENT Fe IN TECNORED FCE SLAG
 37.17% WEIGHT TECNORED FCE SLAG PRODUCED - (mt/mt HM)
 95.13% PERCENT IRON IN HM
 70.00 ELECTRIC POWER CONSUMPTION TECNO. FCE. - (kW/hr/mt HM)
 0.150% STEEL SCRAP PERCENT CARBON - (wt.% C)
 2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
 461.3 EAF ELEC. POWER (TOTAL) - (kW/hr/mt LIQ. STEEL)
 33.1 LRF ELEC. POWER - (kW/hr/mt LIQ. STEEL)
 2.00% PERCENT C IN TECNORED SLAG
 POWER & CO2 EMISSIONS FOR COMPONENTS:
 BINDER FOR PELLETIZING
 20.19 ELECTRIC POWER REQ'D - (kW/hr/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 BURNT LIME/DOLomite
 91.84 ELECTRIC POWER REQ'D - (kW/hr/mt)
 1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRODES
 9,000.00 ELECTRIC POWER REQ'D - (kW/hr/mt)
 1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 PETROLEUM COKE (CARBON)
 16.936 ELECTRIC POWER REQ'D - (kW/hr/mt)
 0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 OXYGEN
 2.12 ELECTRIC POWER REQ'D - (kW/hr/Nm³)
 NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
 CO-PRODUCT COKE
 15.5435 ELECTRIC POWER REQ'D - (kW/hr/Nm³)
 0.9975 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRICAL POWER GENERATION (NET)
 0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kW/hr NET)
 0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kW/hr NET)
 0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kW/hr NET)
 0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kW/hr NET)

OVERALL SUMMARY MASS BALANCES - TECNORED PROCESS THROUGH HOT METAL (COKE BASED)
30% HOT METAL CHARGE - WITH CO-GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES TO PELLETT	0.5080	0.000	0.508	64.50%	0.328	0.00%	0.000	
	EAF SLAG TO PELLETT	0.0610	0.000	0.061	25.26%	0.015	0.00%	0.000	
	CHARCOAL TO PELLETT	0.0762	0.000	0.076	0.00%	0.000	80.00%	0.061	
	BINDER C TO PELLETT	0.0051	0.000	0.005	0.00%	0.000	80.00%	0.004	
	CEMENT TO PELLETT	0.0000	0.000	0.000	10.00%	0.000	0.00%	0.000	
	FINES RECYCLE TO PELLETT	0.0062	0.000	0.006	48.83%	0.003	0.00%	0.000	
	WATER TO PELLETT	0.0000	0.066	0.066	0.00%	0.000	0.00%	0.000	
	GREEN PELLETT MIXTURE	0.6565	0.066	0.722	52.72%	0.346	9.91%	0.065	
	DRY PELLETT PRODUCT	0.6565	0.000	0.656	52.72%	0.346	9.91%	0.065	
	NET PELLETT PRODUCT TO FURNACE	0.6377	0.000	0.638	52.72%	0.336	9.91%	0.063	
	HEAT FOR DRYING (N.G. EQUIV.)	0.4545	0.002	0.001			72.00%	0.001	0.0034
	PELETT ELECTRICAL POWER REQ'D	21.6632							
	EAF SLAG TO FURNACE	0.0371	0.000	0.037	25.26%	0.009	0.00%	0.000	
	CHINA COKE TO FURNACE	0.1490	0.000	0.149	0.00%	0.000	85.70%	0.128	
	PELETTTS TO FURNACE	0.6377	0.000	0.638	52.72%	0.336	9.91%	0.063	
	TOTAL SOLID FEED TO FURNACE	0.8238	0.000	0.824	41.95%	0.346	23.17%	0.191	
	BURNT LIME TO SCRUBBER	0.0022	0.000	0.0022					
	AUXILLARY FUEL REQUIREMENT	0.0638							
	ELECTRICAL POWER - CONSUMED FOR	25.074	GENERATED	378.1112					
	NET GASES PRODUCED	1722.6565	1.1484						0.175
	SLAG PRODUCED		0.1331		3.61%	0.005	2.00%	0.003	
D.O.E. IRONMAKING - TECNORED IRON FURNACE WITH HOT METAL PRODUCED	TARGET CO-GENERATION, Rev. 2.0	0.3585	0.3582		95.13%	0.341	4.50%	0.016	0.641

30% HOT METAL CHARGE - WITH CO-GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
409	TOTAL STEEL SCRAP (100% DRI)	0.7366	AS N.G. 0.0000	0.7366	99.70%	0.7344	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00361	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 36.84						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0545	1.0545	99.70%	1.0513	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0265	
	TOT. C IN OFF GASES (INCL. LRF)							0.0249	
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWh/yr)			48.50%	0.010		0.0266	0.0975
	EAF ELECTRICAL POWER REQ'D	486.4149							
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.9032 (MM kWh/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.0423			
421	REFINED STEEL TO CASTING	0.0000	1.0523	1.0523	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

DOETECN 08-June-2000 OVERALL SUMMARY MASS BALANCES - TECNORED PROCESS THROUGH HOT METAL (COKE BASED)
 30% HOT METAL CHARGE - WITH CO-GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 568.0553							
	CHINA COKE TO TECNORED FCE	0.1490	(MM kWh/yr) 2.3162					0.1277	0.1486
	CHARCOAL TO PELLETT	0.0762	1.1844					0.0207	0.0760
	BURNT LIME TO FCE SCRUB	0.0022	0.2053					0.0009	0.0031
	LIME TO EAF	0.0124	1.1412					0.0034	0.0124
	OXYGEN TO EAF	(MM Nm ³ /YR) 36.8404	78.1017						
	EAF ELECTRODES	0.0038	34.5856					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0060	0.1023					0.0000	0.0001
	EAF/LLRF OFF-GASES	0.0831						0.0266	0.0975
	COMPONENTS ELEC. POWER REQ'D		117.6368						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWh/yr) 685.6921							
	TOTAL ELECTRIC POWER PROD.	378.1112							
	TOTAL NET ELEC. ADDITIONAL	307.5809							
	TOTAL CO2 PRODUCED (PROCESS)							0.3149	1.1545
	EQUIV. CO2 FROM EXTR. POWER GEN								0.2805
	TOTAL CO2 FROM ALL SOURCES								1.4350

APPENDIX C-11

**30% TECHNORED HOT METAL/70% SCRAP
CHARGE TO EAF, 4.5% C H. M. WITHOUT
CO-GENERATION OF ELECTRICAL POWER**

DOETECN2 OVERALL SUMMARY MASS BALANCES - TECNORED PROCESS THROUGH HOT METAL

08-June-2000 30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

Rev. 2

BASIS:

0.688 MM MT/YEAR PURCHASED SCRAP CHARGED
 0.358 MM MT/YEAR LIQUID HOT METAL (TARGET)
 0.358 MM MT/YEAR LIQUID HOT METAL (CALC.)
 1.000 MM MT/YEAR LIQUID STEEL (TARGET)
 0.977 MM MT/YEAR HOT BAND EQUIVALENT (CALC.)

SUMMARY:

0.508 MMM MT/YEAR FINE ORE FEED
 0.098 MMM MT/YEAR EAF SLAG
 0.076 MMM MT/YEAR CHARCOAL
 0.005 MMM MT/YEAR BINDER C
 0.149 MMM MT/YEAR COKE
 0.722 MMM MT/YEAR NET GREENBALL PELLETS
 0.656 MMM MT/YEAR NET CURED/DRIED PELLETS
 0.638 MMM MT/YEAR PELLET FEED TO FCE

ASSUMPTIONS:

0.508 FINE ORE FEED TO PELLETIZING - (MM MT/YEAR)
 72.00% PERCENT FINE ORE TO PELLET
 64.50% PERCENT IRON IN FINE ORE - (wt.% Fe)
 1.00% PERCENT BINDER C IN PELLET
 12.00% PERCENT EAF SLAG TO PELLET
 15.00% PERCENT CHARCOAL TO PELLET
 1.22% PERCENT RETURN FINES TO PELLET MIX
 0.00% PERCENT CEMENT TO PELLET
 25.26% PERCENT IRON IN EAF SLAG
 80.00% PERCENT C IN BINDER C
 80.00% PERCENT C IN CHARCOAL
 10.00% PERCENT C IN RETURN FINES
 85.70% PERCENT C IN CHINA COKE
 48.83% PERCENT Fe IN RETURN FINES
 52.72% PERCENT Fe IN GREEN PELLET (DRY BASIS)
 9.94% PERCENT C IN GREEN PELLET (DRY BASIS)
 9.09% PERCENT MOISTURE IN GREEN PELLET
 0.00% PERCENT MOISTURE DRIED PELLET
 97.14% NET PERCENT OF DRIED PELLET TO FURNACE
 52.72% PERCENT Fe IN DRIED PELLET
 0.002 FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
 30.0 PELLET PLANT ELEC. POWER REQ'D (kWhr/mt FEED)

4.50% EAF SLAG TO FURNACE - (% OF FEED)
 18.09% CHINA COKE TO FURNACE - (% OF FEED)
 77.41% DRIED PELLET TO FURNACE - (% OF FEED)
 4,809.2 TOTAL OFF-GASES FROM FURNACE -(Nm3/mt HM)
 1.500 DENSITY OF OFF-GASES - (kg/Nm3)
 0.27% BURNT LIME TO SCRUBBER - (mt/mt FEED)
 0.10 AUX FUEL TO FCE - (kg/mt FEED OXIDE)
 4.50% PERCENT CARBON IN HOT METAL
 0.00 TECHN. ELEC. POWER GENERATED - (kWhr/mt HM)
 3.61% PERCENT Fe IN TECNORED FCE SLAG
 37.17% WEIGHT TECNORED FCE SLAG PRODUCED - (mt/mt HM)
 95.13% PERCENT IRON IN HM
 70.00 ELECTRIC POWER CONSUMPTION TECNO. FCE. - (kWhr/mt HM)
 0.150% STEEL SCRAP PERCENT CARBON - (wt.% C)
 2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
 461.3 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
 33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
 2.00% PERCENT C IN TECNORED SLAG
 POWER & CO2 EMISSIONS FOR COMPONENTS:
 BINDER FOR PELLETIZING
 20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 BURNT LIME/DOLOMITE
 91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRODES
 9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 PETROLEUM COKE (CARBON)
 16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 OXYGEN
 2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
 NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
 CO-PRODUCT COKE
 15.5435 ELECTRIC POWER REQ'D - (kWhr/Nm3)
 0.9975 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRICAL POWER GENERATION (NET)
 0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
 0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
 0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
 0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

OVERALL SUMMARY MASS BALANCES - TECNORED PROCESS THROUGH HOT METAL
30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES TO PELLETT	0.5080	0.000	0.508	64.50%	0.328	0.00%	0.000	
	EAF SLAG TO PELLETT	0.0610	0.000	0.061	25.26%	0.015	0.00%	0.000	
	CHARCOAL TO PELLETT	0.0762	0.000	0.076	0.00%	0.000	80.00%	0.061	
	BINDER C TO PELLETT	0.0051	0.000	0.005	0.00%	0.000	80.00%	0.004	
	CEMENT TO PELLETT	0.0000	0.000	0.000	10.00%	0.000	0.00%	0.000	
	FINES RECYCLE TO PELLETT	0.0062	0.000	0.006	48.83%	0.003	0.00%	0.000	
	WATER TO PELLETT	0.0000	0.066	0.066	0.00%	0.000	0.00%	0.000	
	GREEN PELLETT MIXTURE	0.6565	0.066	0.722	52.72%	0.346	9.91%	0.065	
	DRY PELLETT PRODUCT	0.6565	0.000	0.656	52.72%	0.346	9.91%	0.065	
	NET PELLETT PRODUCT TO FURNACE	0.6377 (MM BTU/yr)	0.000 (MM Nm3 NG)	0.638	52.72%	0.336	9.91%	0.063	0.0034
	HEAT FOR DRYING (N.G. EQUIV.)	0.4545 (MM kWh/yr)	0.002	0.001			72.00%	0.001	
	PELETT ELECTRICAL POWER REQ'D	21.6632							
	EAF SLAG TO FURNACE	0.0371	0.000	0.037	25.26%	0.009	0.00%	0.000	
	CHINA COKE TO FURNACE	0.1490	0.000	0.149	0.00%	0.000	85.70%	0.128	
	PELETTTS TO FURNACE	0.6377	0.000	0.638	52.72%	0.336	9.91%	0.063	
	TOTAL SOLID FEED TO FURNACE	0.8238	0.000	0.824	41.95%	0.346	23.17%	0.191	
	BURNT LIME TO SCRUBBER	0.0022 (MM mt/yr)	0.000	0.0022					
	AUXILLARY FUEL REQUIREMENT	0.0638 (MM kWh/yr)							
	ELECTRICAL POWER - CONSUMED FOR	25.074 (MM Nm3/yr)	GENERATED (MM mt/yr)	0.0000					
	NET GASES PRODUCED	1722.6565	1.1484				72.00%	0.046	0.1684
	SLAG PRODUCED		0.1331		3.61%	0.005	2.00%	0.003	
D.O.E. IRONMAKING - TECNORED IRON FURNACE WITH NO COGEN	GENERATION CALC	0.3585	0.3582		95.13%	0.341	4.50%	0.016	

30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
409	TOTAL STEEL SCRAP (100% DRI)	0.7366	AS N.G. 0.0000	0.7366	99.70%	0.7344	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00361	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 36.84						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0545	1.0545	99.70%	1.0513	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0265	
	TOT. C IN OFF GASES (INCL. LRF)							0.0249	
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0631 (MM kWh/yr)							0.0266
	EAF ELECTRICAL POWER REQD	486.4149							
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.9032							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.0423			
421	REFINED STEEL TO CASTING	0.0000	1.0523	1.0523	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

**OVERALL SUMMARY MASS BALANCES - TECNORED PROCESS THROUGH HOT METAL
30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER**

DOETECN2
08-June-2000

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 568.0553							
	CHINA COKE TO TECNORED FCE	0.1490	(MM kWh/yr) 2.3162					0.1277	0.1486
	CHARCOAL TO PELLET	0.0762	1.1844					0.0207	0.0760
	BURNT LIME TO FCE SCRUB	0.0022	0.2053					0.0009	0.0031
	LIME TO EAF	0.0124	1.1412					0.0034	0.0124
	OXYGEN TO EAF	(MM Nm ³ /YR) 36.8404	78.1017						
	EAF ELECTRODES	0.0038	34.5856					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0060	0.1023					0.0000	0.0001
	EAF/LRF OFF-GASES	0.0831	0.0000					0.0266	0.0975
	COMPONENTS ELEC. POWER REQ'D		117.6368						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWh/yr) 685.6921							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	685.6921							
	TOTAL CO2 PRODUCED (PROCESS)							0.3149	1.1545
	EQUIV. CO2 FROM EXTR. POWER GEN								0.6254
	TOTAL CO2 FROM ALL SOURCES								1.7799

APPENDIX C-12

**COREX/MIDREX WITH 60% HOT METAL AND 40%
DRI CHARGE TO EAF**

OVERALL SUMMARY MASS BALANCES - COREX HOT METAL/EAF

DOECOREX
4-Aug-2000

60% COREX HOT METAL CHARGE - 40% MIDREX DRI

Rev. 3

COREX	
0.418	MM MT/YEAR MIDREX DRI CHARGED TO EAF
0.628	MM MT/YEAR LIQUID HOT METAL (TARGET)
0.624	MM MT/YEAR LIQUID HOT METAL (CALC.)
1.000	MM MT/YEAR LIQUID STEEL (TARGET)
0.977	MM MT/YEAR HOT BAND EQUIVALENT (CALC.)
SUMMARY:	
0.431	MMM MT/YEAR LUMP IRON ORE
0.431	MMMM MT/YEAR IRON ORE PELLETS FEED
0.118	MMMM MT/YEAR FLUXED IRON SINTER
0.000	MMMM MT/YEAR IRON SCRAP
0.138	MMMM MT/YEAR LIMESTONE
0.138	MMMM MT/YEAR SiO2/GRAVEL
0.741	MMMM MT/YEAR COAL
1.958	MMT MT/YEAR TOTAL SOLID COREX FEED (ASSUMPTION)
ASSUMPTIONS:	
20.00%	PERCENT SUPPLEMENTAL GAS IN MIDREX
4320	PERCENT LUMP IRON ORE OF FEED
22.03%	PERCENT IRON ORE PELLETS OF FEED
22.03%	PERCENT SINTER OF FEED
6.03%	PERCENT SCRAP IN FEED
0.00%	PERCENT LIMESTONE IN FEED
7.06%	PERCENT DOLOMITE IN FEED
7.06%	PERCENT COAL IN FEED
37.86%	PERCENT IRON IN LUMP ORE
68.00%	PERCENT IRON IN PELLETS
68.50%	PERCENT IRON IN SINTER
50.00%	PERCENT C IN COAL
80.00%	PERCENT C IN SCRAP CHARGED
2.00%	MOISTURE TO FURNACE - (mt/mt HM)
0.016	OXYGEN TO FURNACE - (mt/mt HM)
0.014	FUEL REQUIREMENT - PELLET PLANT (kg N.G./mt PEL)
20.500	COREX ELEC. POWER REQ'D (kW/hr/mt FEED)
42.70%	PERCENT C IN LIMESTONE
0.360	SLAG FROM FURNACE (mt/mt HM)
0.000	SCRAP FROM COREX (mt/mt HM)
1.8	TOP GAS FROM FURNACE (mt/mt HM)
0.042	DUST FROM FURNACE (mt/mt HM)
2.00%	PERCENT C IN SLAG
40.00%	PERCENT IRON IN COREX DUST
20.00%	PERCENT CARBON IN COREX DUST
4.50%	PERCENT CARBON IN HOT METAL
0.00	ELEC. POWER GENERATED - (kW/hr/mt HM)
3.61%	PERCENT Fe IN COREX FCE SLAG
36.00%	WEIGHT COREX FCE SLAG PRODUCED - (mt/mt HM)
93.00%	PERCENT IRON IN HM
0.150%	STEEL SCRAP PERCENT CARBON - (wt.% C)
2.20	AUX. FUEL TO EAF - kg/t LIQ. ST.
385.2	EAF ELEC. POWER (TOTAL) - (kW/hr/mt LIQ. STEEL)
33.1	LRF ELEC. POWER - (kW/hr/mt LIQ. STEEL)
	POWER & CO2 EMISSIONS FOR COMPONENTS:
	BINDER FOR PELLETIZING
20.19	ELECTRIC POWER REQ'D - (kW/hr/mt)
0.0364	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	BURNT LIME/DOLOMITE
91.84	ELECTRIC POWER REQ'D - (kW/hr/mt)
1.4002	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	ELECTRODES
9,000.00	ELECTRIC POWER REQ'D - (kW/hr/mt)
1.0763	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	PETROLEUM COKE (CARBON)
16.936	ELECTRIC POWER REQ'D - (kW/hr/mt)
0.0156	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	OXYGEN
2.12	ELECTRIC POWER REQ'D - (kW/hr/Nm3)
NONE	CUMULATIVE CO2 EMISSIONS - (MT/mt)
	CO-PRODUCT COKE
30.6157	ELECTRIC POWER REQ'D - (kW/hr/mt)
0.9975	CUMULATIVE CO2 EMISSIONS - (MT/mt)
0.000912	ELECTRICAL POWER GENERATION (NET)
0.000604	CUMULATIVE CO2 EMISSIONS - N.G. - (T/kWhr NET)
0.001448	CUMULATIVE CO2 EMISSIONS - COAL - (T/kWhr NET)
	LUMP IRON ORE DELIVERED
32.24	ELECTRIC POWER REQ'D - (kW/hr/mt)
0.1437	CUMULATIVE CO2 EMISSIONS - (kg/mt)
	IRON ORE PELLETS DELIVERED
197.3739	ELECTRIC POWER REQ'D - (kW/hr/mt)
0.2374	CUMULATIVE CO2 EMISSIONS - (kg/mt)
	IRON SINTER DELIVERED
89.5474	ELECTRIC POWER REQ'D - (kW/hr/mt)
0.1356	CUMULATIVE CO2 EMISSIONS - (kg/mt)

DOECOREX
4-Aug-2000

OVERALL SUMMARY MASS BALANCES - COREX HOT METAL/EAF

60% COREX HOT METAL CHARGE - 40% MIDREX DRI

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	LUMP IRON ORE FEED	0.4313	0.000	0.431	68.00%	0.293	0.00%	0.000	
	IRON PELLET FEED	0.4313	0.000	0.431	68.50%	0.295	0.00%	0.000	
	IRON SINTER FEED	0.1181	0.000	0.118	50.00%	0.059	0.00%	0.000	
	IRON SCRAP FEED	0.0000	0.000	0.000	97.70%	0.000	2.00%	0.000	
	LIMESTONE FEED	0.1382	0.000	0.138	0.00%	0.000	43.20%	0.060	
	GRAVEL FEED	0.1382	0.000	0.138	0.00%	0.000	0.00%	0.000	
	COAL FEED	0.7413	0.000	0.741	0.00%	0.000	80.00%	0.593	
	OXYGEN TO FURNACE	0.0000	AS GAS 0.009	0.009	0.00%	0.000	0.00%	0.000	
	MOISTURE TO FURNACE	0.0000	AS GAS 0.010	0.010	0.00%	0.000	0.00%	0.000	
	NET SOLID FEED TO FURNACE	1.9985	0.000	1.999	32.41%	0.6478	32.66%	0.6528	2.3934
	N.G. FUEL TO FURNACE	0.0000	AS GAS 0.013	0.009			72.00%	0.007	0.0251
	COREX ELECTRICAL POWER REQ'D	40.1390	(MM kWh/yr)						
	BLAST GAS FROM FURNACE	0.0000	(MM mt/YR) 1.1226	1.123	0.00%	0.000	54.78%	0.615	2.2549
	SLAG FROM FURNACE	0.2245	0.000	0.225	32.41%	0.073	2.00%	0.004	
	HOT METAL FROM FURNACE	0.6237	0.000	0.624	93.00%	0.580	4.50%	0.028	
	SCRAP FROM FCE	0.0000	0.000	0.0000	93.00%	0.000	4.50%	0.000	
	DUST FROM FCE	0.0262	0.000	0.0262	40.00%	0.010	20.00%	0.005	
	NET OXIDE FEED TO PELLET - MIDREX	0.7876	0.069	0.8568	70.47%		0.00%	0.000	
	BINDER TO PELLET - MIDREX	0.0050	0.000	0.0050					
	DOLOMITE TO PELLET - MIDREX	0.0160	0.000	0.0160					
	TOTAL OTHER FEED - MIDREX	0.2000			76.03%	0.153			

60% COREX HOT METAL CHARGE - 40% MIDREX DRI

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	NET PELLETS TO SHAFT FCE - MIDREX	0.7124	0.000	0.7124	67.81%	0.046			
	FUEL TO DRI	AS N.G.	0.020				72.00%	0.015	
	MIDREX ELECTRIC POWER REQ'D	82.4296 (MM kWhr/yr)							
409	MIDREX DRI (100% DRI)	0.4180	0.0000	0.4180	95.00%	0.3971	0.15%	0.00063	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	0.0029			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00361	
401	LIME CHARGED	0.0124	0.0000	0.0124					
	AS GAS	38.99							
415	O2 GAS TO EAF (MM Nm3/YR)		1.0545	1.0545	99.70%	0.0000	0.15%	0.00158	
416	LIQ. EAF STEEL TO LRF	0.0000							
	TOTAL CARBON INTO EAF								
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G.						
	AUX. FUEL TO EAF		0.0023						
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)							0.1396
	EAF ELECTRICAL POWER REQ'D	406.2297							
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.000	0.0004					
	AS GAS		0.063						
419	ARGON GAS TO LRF (MM Nm3/YR)				48.50%	0.010			
	LRF ELECTRICAL POWER REQ'D	34.9032 (MM kWhr/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.042			
421	REFINED STEEL TO CASTING	1.000	0.0000	1.000	99.70%	0.997	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

60% COREX HOT METAL CHARGE, 40% MIDREX DRI - SUMMARY

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 563.7015							
	COAL TO COREX FURNACE	0.7413	(MM kWh/yr) 1.5848					0.0108	0.0395
	LUMP IRON ORE TO COREX FURNACE	0.4313	13.9066					0.0169	0.0620
	IRON ORE PELL. TO COREX FURNACE	0.4313	85.1367					0.0279	0.1024
	IRON SINTER TO COREX FURNACE	0.1181	10.5726					0.0044	0.0160
	LIMESTONE TO COREX FURNACE	0.1382	4.4567					0.0054	0.0199
	SiO2/GRAVEL TO COREX FURNACE	0.1382	4.4567					0.0054	0.0199
	NET PELLETS TO MIDREX FURNACE	0.7124	140.609					0.0461	0.1691
	FUEL TO DRI - MIDREX	AS N.G.						0.0147	0.0540
	LIME TO EAF	0.020						0.0047	0.0174
	OXYGEN TO EAF	(MM kWh/yr) 0.0124	1.1412					0.0011	0.0041
	EAF ELECTRODES	(MM Nm ³ /YR) 38.9907	82.6602					0.00003	0.00009
	PETROLEUM COKE TO EAF	0.0038	34.5856						
		0.0060	0.1023						
	COMPONENTS ELEC. POWER REQ'D		379.2127						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWh/yr) 942.9142							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	942.9142						0.7974	2.9239
	TOTAL CO2 PRODUCED (PROCESS)								0.8600
	EQUIVALENT CO2 FROM POWER GEN.								3.7839
	TOTAL CO2 FROM ALL SOURCES								

IRON/STEELMAKING WATER & SOLIDS BALANCE

DOECOREX 19-Sept.-1999 Revision A: OREBODY ASSUMPTIONS		60% COREX HOT METAL CHARGE - 40% MIDREX DRI EAF STEELMAKING/LMF (PFD-009)		BASIS: 1.00 (MM T/YR LIQUID STEEL)				
STREAM NUMBER	STREAM LABEL	% SOLIDS	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	% OF SLAB OF DRI FD	%Fe (DRY)	Fe UNITS (MM T/YR)
400	TOTAL HOT METAL FEED TO EAF	0.0%	0.000	0.628	0.628	47.1%	93.00%	0.584
401	LUMP LIME FLUX TO EAF	100.0%	0.012	0.000	0.012	1.6%		
402	SILICA FLUX	100.0%	0.000	0.000	0.000	0.0%		
403	MISC. ADDITIVES (Al, FeMn, FeSi, etc.)	100.0%	0.007	0.000	0.007	4.2%	40.72%	0.013
404	STEEL CARBON (CHARGED+SLAG INJ.)	100.0%	0.006	0.000	0.006	7.1%		
405	EAF ELECTRODES	100.0%	0.004	0.000	0.004	1.1%		
406	TOTAL EAF COOLING WATER CIRC. (MM T/YR)	0.0%	0.000	70.627	70.627	0.0%		
407	MIDREX DRI	100.0%	0.418	0.000	0.418	6.4%	95.00%	0.397
408	PURCHASED SCRAP	100.0%	0.000	0.000	0.000	90.4%	99.70%	0.000
409	NET DRI CHARGED	100.0%	0.418	0.000	0.418	96.8%	95.00%	0.397
410	TOTAL FLUX & ADDITIVES CHARGED	100.0%	0.026	0.000	0.026	3.4%	50.80%	0.013
411	REFRACTORIES CONSUMMED	100.0%	0.015	0.000	0.015	1.9%		
412	PROCESS/COOLING WATER OUT OF EAF	0.0%	0.000	70.627	70.627	0.0%		
413	EAF SLAG (LIQUID)	0.0%	0.000	0.157	0.157	0.0%	25.60%	0.040
414	EAF DUST TO EAF DUST COLLECTION	100.0%	0.020	0.000	0.020	2.6%	48.50%	0.010
415	OXYGEN GAS TO FURNACE (MM Nm ³ /YR)	0.0%	0.000	38.991	38.991	0.0%		
416	LIQUID EAF STEEL TO LADLE REFINING	0.0%	0.000	1.054	1.054	0.0%	99.70%	0.981
417	PULVERIZED LIME TO LADLE REF. FCE.	100.0%	0.005	0.000	0.005	0.7%		
418	SLAG/WIRE DESULFURIZER TO LRF	100.0%	0.0004	0.0000	0.0004	0.4%		
419	ARGON GAS TO LRF (MM Nm ³ /YR)	0.0%	0.000	0.063	0.063	0.0%		

IRON/STEELMAKING WATER & SOLIDS BALANCE

DOECOREX

19-Sept.-1999

60% COREX HOT METAL CHARGE - 40% MIDREX DRI

Revision A: OREBEAF STLMAKING/LMF (PFD-009)

1.00 (MM T/YR LIQUID STEEL)

BASIS:

STREAM NUMBER	STREAM LABEL	% SOLIDS	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	% OF SLAB OF DRI/FD	%Fe (DRY)	Fe UNITS (MM T/YR)
420	SLAG & LOSSES FROM LRF	0.0%	0.000	0.007	0.007	0.0%	31.80%	0.002
421	REFINED STEEL TO CASTING	0.0%	0.000	1.052	1.052	0.0%	99.70%	1.049
422	PULVERIZED LIME FLUX TO EAF	100.0%	0.014	0.000	0.012	1.5%		
423	WATER FOR EAF DUST TRANSPORT	0.0%	0.000	0.112	0.112	0.0%		
424	PROC. COOLING WATER LMF	0.0%	0.000	14.125	14.125	0.0%		
425	TOTAL SLAG OUTPUT (AS SOLID)	100.0%	0.157	0.000	0.157	20.6%	26.97%	0.042
501	SLAB SCALE	0.0%	0.005	0.000	0.005	0.7%	80.00%	0.004
502	LADLE SCRAP	0.0%	0.024	0.000	0.024	3.1%	99.70%	0.024
503	TUNDISH SCRAP	100.0%	0.006	0.000	0.006	0.8%	99.70%	0.006
504	CROP END SCRAP	0.0%	0.018	0.000	0.018	2.4%	99.70%	0.018
505	MOLD POWDER TO CASTING	100.0%	0.0006	0.000	0.001	11.3%		
506	TUNDISH POWDER TO CASTING	100.0%	0.0003	0.000	0.000	3.5%		
507	MOLD COOLING WATER (MM NIM3/YR)	0.0%	0.000	29.206	29.206	0.0%		
508	CONTACT COOLING WATER (MM NIM3/YR)	0.0%	0.162	9.600	9.762	21.3%		
509	NET STEEL TO CASTING	0.0%	0.000	1.000	1.000	0.0%	99.70%	0.997
510	TOTAL CAST SLAB PRODUCT	100.0%	0.977	0.000	0.977	128.3%	99.70%	0.974
511	THIN SLAB TO HOT BAND	0.0%	0.000	0.000	0.000	0.0%	99.70%	0.000
512	SLABS TO SALES	100.0%	0.977	0.000	0.977	128.3%	99.70%	0.974
513	HOT BAND TO SALES	100.0%	0.000	0.000	0.000	0.0%	99.70%	0.000

APPENDIX C-13

**HISMELT WITH 34.5% HOT METAL CHARGE TO
EAF**

DOEHISMT 08-June-2000 Rev. 2

OVERALL SUMMARY MASS BALANCES - HISMELT PROCESS TO PRODUCE HOT METAL
 30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

BASIS:

0.6882 MM MT/YEAR PURCHASED SCRAP CHARGED
 0.3585 MM MT/YEAR LIQUID HOT METAL (TARGET)
 0.3585 MM MT/YEAR LIQUID HOT METAL (CALC.)
 1.0000 MM MT/YEAR LIQUID STEEL (TARGET)
 0.9770 MM MT/YEAR HOT BAND EQUIVALENT (CALC.)

SUMMARY:

0.534 MMM MT/YEAR FINE ORE FEED
 454.376 MMM Nm³/YEAR AIR
 61.452 MMM Nm³/YEAR OXYGEN
 16.760 MMM Nm³/YEAR NATURAL GAS
 0.204 MMM MT/YEAR COAL
 0.061 MMM MT/YEAR FLUX ADDED
 0.125 MMM MT/YEAR NET SLAG PRODUCED
 316.573 MMM Nm³/YEAR WASTE FLUE GASES

ASSUMPTIONS:

0.534 FINE IRON ORE FEED - (MM MT/YR)
 72.00% PERCENT FINE ORE TO PELLET
 64.50% PERCENT IRON IN FINE ORE - (wt.% Fe)
 25.246 CUMULATIVE E. POWER IN FINE ORE - (kWhr/mt)
 1.621 ORE/HM RATIO - (MT/mt HM)
 0.620 COAL TO HM RATIO - (MT/mt HM)
 2.200 NATURAL GAS - (GJ/mt HM)
 50.847 TOTAL AIR TO SRV - (Nm³/mt HM)
 1,378.531 OXYGEN TO SRV - (Nm³/mt HM)
 186.441 PERCENT C IN COAL
 80.00% GAS VOLUME LEAVING SRV - (Nm³/mt HM)
 960.45 FLUX CHARGED (B. LIME) TO SRV - (MT/mt HM)
 0.1864 SLAG PRODUCED - (MT/mt HM)
 0.3785 PERCENT C IN HOT METAL
 4.50% SRV PLANT ELEC. POWER REQ'D, W/O O₂ PLANT - (kWhr/mt HM)
 174.81 TOTAL ORE/TOTAL MINED ROCK RATIO - (MT/mt)
 0.3953 FINE ORE FRACTION/TOTAL ORE FEED TO PREP. - (MT/mt)
 0.2000 FINE ORE TRUCK TRANSPORT FUEL - (kg/mt)
 10.69

960.5 TOTAL OFF-GASES FROM FURNACE - (Nm³/mt HM)
 1.692 DENSITY OF OFF-GASES - (kg/Nm³)
 4.50% PERCENT CARBON IN HOT METAL
 3.42% PERCENT Fe IN HISMELT FCE SLAG
 95.13% PERCENT IRON IN HM
 95.00 ELECTRIC POWER CONSUMPTION HISMELT - (kWhr/mt HM)
 0.150% STEEL SCRAP PERCENT CARBON - (wt.% C)
 461.3 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
 33.1 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
 0.00 ELEC. POWER GENERATED - (kWhr/mt HM)
 2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
 2.00% PERCENT C IN HISMELT SLAG

POWER & CO₂ EMISSIONS FOR COMPONENTS:

FINE ORE DELIVERED

25.246 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.00805 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 FINE COAL DELIVERED

5.533 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.01601 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 BINDER FOR PELLETIZING

20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0364 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 BURNT LIME/DOLomite

91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.4002 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 ELECTRODES

9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.0763 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 PETROLEUM COKE (CARBON)

16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0156 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 OXYGEN

2.12 ELECTRIC POWER REQ'D - (kWhr/Nm³)
 NONE CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 CO-PRODUCT COKE

15.5435 ELECTRIC POWER REQ'D - (kWhr/Nm³)
 0.9975 CUMULATIVE CO₂ EMISSIONS - (MT/mt)
 ELECTRICAL POWER GENERATION (NET)

0.000604 CUMULATIVE CO₂ EMISSIONS - N.G. - (MT/kWhr NET)
 0.001448 CUMULATIVE CO₂ EMISSIONS - COAL - (MT/kWhr NET)
 0.000871 CUMULATIVE CO₂ EMISSIONS - FUEL OIL - (MT/kWhr NET)
 0.000912 CUM. CO₂ EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEHISMT
08-June-2000

OVERALL SUMMARY MASS BALANCES - HISMELT PROCESS TO PRODUCE HOT METAL
30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES FEED	0.5345	0.000	0.534	64.50%	0.345	0.00%	0.000	
	COAL FINES TO FEED	0.2045	0.000	0.204	0.00%	0.000	80.00%	0.164	
	AIR TO SRV	MM Nm3/YR 454.38	0.000	454.38	0.00%	0.000	0.00%	0.000	
	OXYGEN GAS TO SRV	MM Nm3/YR 61.45	0.000	61.45	0.00%	0.000	0.00%	0.000	
	FLUX CHARGED TO SRV (LIME)	0.0615	0.000	0.061	1.00%	0.001	0.00%	0.000	
	NATURAL GAS TO SRV	MM Nm3/YR 16.7598	0.000	16.76	0.00%	0.000	72.00%	0.009	
	SLAG LEAVING SRV	0.1248	0.000	0.125	3.42%	0.004	2.00%	0.002	
	TOTAL WASTE GAS LEAVING SRV	MM Nm3/YR 316.5732	0.000	316.573	0.00%	0.000	16.57%	0.154	0.563
	HOT METAL LEAVING SRV TO EAF	0.3585	0.000	0.359	95.13%	0.341	4.50%	0.016	
	ELECT. POWER CONSUMMED IN SRV	62.673							

DOEHISMT 08-June-2000 OVERALL SUMMARY MASS BALANCES - HISMELT PROCESS TO PRODUCE HOT METAL

30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
409	TOTAL STEEL SCRAP (100% DRI)	0.7366	AS N.G. 0.0000	0.7366	99.70%	0.7344	0.15%	0.00110	
403	MISC. ADDITIVES	0.0071	0.0000	0.0071	40.72%	1.30%			
404	STEEL C (CHARGE+SLAG INJ)	0.0060	0.0000	0.0060			94.00%	0.00568	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.00361	
401	LIME CHARGED	0.0124	0.0000 AS GAS 36.84	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)								
416	LIQ. EAF STEEL TO LRF	0.0000	1.0545	1.0545	99.70%	1.0513	0.15%	0.00158	
	TOTAL CARBON INTO EAF							0.0265	
	TOT. C IN OFF GASES (INCL. LRF)							0.0249	
	AUX. FUEL TO EAF		AS N.G. 0.0023				72.00%	0.002	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)							0.0975
	EAF ELECTRICAL POWER REQ'D	486.4149							
417	LIME TO LADLE REF. FCE.	0.0053	0.000	0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.000 AS GAS 0.063	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)								
	LRF ELECTRICAL POWER REQ'D	34.9032 (MM kWhr/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1570	0.0000	0.1570	26.97%	0.0423			
421	REFINED STEEL TO CASTING	0.0000	1.0523	1.0523	99.70%	1.049	0.15%	0.00158	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

DOEHISMT 08-June-2000 OVERALL SUMMARY MASS BALANCES - HISMELT PROCESS TO PRODUCE HOT METAL
 30% HOT METAL CHARGE - WITH NO GENERATION OF ELECTRICAL POWER

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	ELEC. POW. (MM kWhr/yr)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 583.9908							
	IRON ORE FINES TO FEED	0.5345	13.4925					0.0012	0.0043
	COAL FINES TO FEED	0.2045	1.1313					0.0044	0.0160
	OXYGEN GAS TO SRV	(MM Nm ³ /YR) 61.4524	130.2792						
	FLUX CHARGED TO SRV (LIME)	0.0615	5.6438					0.0235	0.0860
	NATURAL GAS TO SRV	16.7598	0.0378						
	OXYGEN TO EAF	(MM Nm ³ /YR) 36.8404	78.1017						
	EAF ELECTRODES	0.0038	34.5856					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0060	0.1023					0.0000	0.0001
	EAF/LRF OFF-GASES	0.0831						0.0266	0.0975
	COMPONENTS ELEC. POWER REQ'D		263.3742						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWhr/yr) 847.3650							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	847.3650						0.2370	0.8689
	TOTAL CO2 PRODUCED (PROCESS)								0.7729
	EQUIV. CO2 FROM EXTR. POWER GEN								1.6417
	TOTAL CO2 FROM ALL SOURCES								

ROTARY HEARTH DRI FURNACES

APPENDIX C-14

**REDSMELT HOT METAL WITH ONLY RECYCLE
SCRAP CHARGE TO EAF**

OVERALL SUMMARY MASS BALANCES - REDSMELT PROCESS TO PRODUCE HOT METAL

DOEREDSM
08-June-2000
Rev. 2

MAXIMUM HOT METAL CHARGED -

BASIS:

0.1181 MM MT/YEAR PURCHASED SCRAP CHARGED
0.0363 MM MT/YEAR RECYCLED SCRAP CHARGED
1.0261 MM MT/YEAR DRI CHARGED
0.9078 MM MT/YEAR LIQUID HOT METAL (TARGET)
0.9112 MM MT/YEAR LIQUID HOT METAL (CALC.)
1.0000 MM MT/YEAR LIQUID STEEL (TARGET)
0.9770 MM MT/YEAR CAST SLAB EQUIVALENT (CALC.)

SUMMARY:

1.454 MMM MT/YEAR FINE ORE FEED
3,344.5 MMM Nm³/YEAR AIR
13.9 MMM Nm³/YEAR OXYGEN
2.1 MMM Nm³/YEAR NATURAL GAS
0.350 MMM MT/YEAR COAL
0.052 MMM MT/YEAR FLUX ADDED
2.014 MMM MT/YEAR NET G.B. PELLETS PRODUCED
3,442.3 MMM Nm³/YEAR WASTE FLUE GASES SAF
0.159 MM MT/YEAR NET SLAG PRODUCED

ASSUMPTIONS:

48.48 ELECTRIC POWER CONSUMPTION IN RHF - (kWhr/mt DRI)
1.454 FINE IRON ORE FEED - (MM MT/YR)
72.00% PERCENT FINE ORE TO PELLETT
64.50% PERCENT IRON IN FINE ORE - (wt.% Fe)
25.246 CUMULATIVE E. POWER IN FINE ORE - (kWhr/mt)
1.621 ORE/HM RATIO - (MT/mt HM)
0.384 COAL TO HM RATIO - (MT/mt HM)
2.375 NATURAL GAS - (GJ/mt HM)
54.890 NATURAL GAS TO RHF - (Nm³/mt HM)
3,344.546 TOTAL AIR TO RHF - (Nm³/mt HM)
13.500 OXYGEN TO RHF - (Nm³/mt HM)
80.00% PERCENT C IN COAL
3,442.33 GAS VOLUME LEAVING RHF - (Nm³/mt HM)
0.0596 FLUX CHARGED (B. LIME) TO SAF+LRF - (MT/mt HM)
0.1742 TOTAL SLAG PRODUCED IN SAF+LRF - (MT/mt HM)
0.0000 SILICA FLUX TO SAF - (MT/mt HM)
0.0050 DESULFURIZING ADDITIVES TO LRF - (MT/mt HM)
0.0239 CARBON (AS COAL) CHARGE TO SAF - (MT/mt HM)
0.00194 ELECTRODES TO SAF - (MT/mt HM)
0.05613 TOTAL DUST LOSSES (SAF + LT) - (MT/mt HM)
69.71% PERCENT IRON IN DUST
18.6200 ELECTRIC POWER CONSUMMED IN G-B PELLETT. - (kWhr/mt GB)
0.9301 NET IRON RECOVERY IN SAF + LTF

4.00% PERCENT CARBON IN DRI

3,442.3 TOTAL OFF-GASES FROM SAF FURNACE - (Nm³/mt HM)
1.977 DENSITY OF OFF-GASES - (kg/Nm³)
3.60% PERCENT CARBON IN HOT METAL
3.42% PERCENT Fe IN SAF SLAG
96.11% PERCENT IRON IN HM
291.00 ELECTRIC POWER CONSUMPTION SAF - (kWhr/mt HM)
0.150% STEEL SCRAP PERCENT CARBON - (wt.% C)
130.0 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
30 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
0.00 ELEC. POWER GENERATED - (kWhr/mt HM)
2.20 AUX. FUEL TO EAF - kg/T LIQ. ST.
2.00% PERCENT C IN SAF SLAG
90.51% PERCENT IRON IN DRI
POWER & CO2 EMISSIONS FOR COMPONENTS:

25.246 ELECTRIC POWER REQ'D - (kWhr/mt)
0.00805 CUMULATIVE CO2 EMISSIONS - (MT/mt)
FINE COAL DELIVERED
5.533 ELECTRIC POWER REQ'D - (kWhr/mt)
0.01601 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BINDER FOR PELLETIZING
20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE
91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES
9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)
16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN
2.12 ELECTRIC POWER REQ'D - (kWhr/Nm³)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
CO-PRODUCT COKE
15.5435 ELECTRIC POWER REQ'D - (kWhr/Nm³)
0.9975 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)
0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEREDSM
08-June-2000

OVERALL SUMMARY MASS BALANCES - REDSMELT PROCESS TO PRODUCE HOT METAL
MAXIMUM HOT METAL CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES TO PELLETIZING	1.4535	0.000	1.4535	64.50%	0.938	0.00%	0.000	
	COAL FINES TO PELLETIZING	0.3496	0.0018	0.3514	0.00%	0.000	80.00%	0.280	
	BINDER TO PELLETIZING	0.0203	0.0015	0.0218	9.93%	0.002	0.00%	0.000	
	RECYCLE DUST TO PELLETIZING	0.2046	0.2046	0.4092	69.71%	0.143	2.00%	0.004	
	RECYCLE PELLETS TO PELLETIZING	0.0516	0.0070	0.0587	1.00%	0.001	14.09%	0.007	
	GROSS GREEN-BALL PELLETS	2.0653	0.2816	2.3469	0.00%	0.000	14.09%	0.291	
	GREEN-BALL PELLETS FEED TO RHF	2.0137 (MM kWhr/yr)	0.2746	2.2883	3.42%	0.069	14.09%	0.284	
	ELEC. POWER IN G-B PELLETIZING	38.4559869 (MM Nm3/yr)							
	NATURAL GAS FUEL TO RHF	54.8896 (MM Nm3/yr)	0.04074 (MM MT/yr)				72.00%	0.029	
	COMBUSTION AIR TO RHF	3,344.5459 (MM Nm3/yr)	4.32383 (MM MT/yr)				0.00%	0.000	
	TOTAL WASTE GAS LEAVING RHF	3,442.3299 (MM Nm3/yr)	4.45664 (MM MT/yr)				22.38%	0.272	0.998
	DRI LEAVING RHF TO SAF	1.0261 (MM kWhr/yr)	0.000	1.0261	90.51%	0.9287	4.00%	0.041	
	ELECT. POWER CONSUMMED IN RHF	49.7464 (MM kWhr/yr)							

DOEREDSM 08-June-2000 OVERALL SUMMARY MASS BALANCES - REDSMELT PROCESS TO PRODUCE HOT METAL

MAXIMUM HOT METAL CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	NET DRI CHARGE TO SAF (>450 °C)	1.0261	0.0000	1.0261	90.51%	0.9287	4.00%	0.0410	
	LIME FLUX TO SAF	0.0635							
	SILICA FLUX TO SAF	0.0000							
	ELECTRODES TO SAF	0.0018					96.00%	0.0017	
	SAF CHARGE CARBON	0.0217					80.00%	0.0174	
	SLAGWIRE DESULFURIZER TO LTF	0.0046							
	SAF FCE. SCRAP, SKULLS	0.0364			95.91%	0.0350	3.60%	0.0013	
	SAF + LADLE TREATMENT DUST	0.0511			69.71%	0.0357			
	MOLTEN SLAG SAF + LTF	0.1587			12.34%	0.0196	2.00%	0.0032	
	NET HOT METAL CHARGE TO EAF	0.9112			96.11%	0.8638	3.60%	0.0328	
	ELECTRIC POWER CONSUMP. SAF	265.1621							
	SAF OFF GASES								0.0838
409	TOTAL STEEL SCRAP TO EAF	0.1544		0.1544	99.59%	0.1537	0.15%	0.00110	
403	MISC. ADDITIVES	0.0155		0.0155	40.72%	0.0063			
404	STEEL C (CHARGE+SLAG INJ)	0.0130		0.0130			94.00%	0.01218	
405	EAF ELECTRODES	0.0005		0.0005			94.00%	0.00043	
401	LIME CHARGED	0.0243	AS GAS 52.60	0.0243					
415	O2 GAS TO EAF (MM Nm3/YR)								
416	LIQ. EAF STEEL TO LRF	0.0000	1.0032	1.0032	99.70%	1.0002	0.15%	0.00150	

DOEREDSM OVERALL SUMMARY MASS BALANCES - REDSMELT PROCESS TO PRODUCE HOT METAL

08-June-2000 MAXIMUM HOT METAL CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	TOTAL CARBON INTO EAF							0.0465	
	TOT. C IN OFF GASES (INCL. LRF)		ASN.G. 0.0023					0.0450	
	AUX. FUEL TO EAF						72.00%	0.0017	
	EAF/LRF OFF GASES	0.0185 (MM kWh/yr)			48.50%	0.009		0.0467	0.1712
	EAF ELECTRICAL POWER REQ'D	130.0000							
417	LIME TO LADLE REF. FCE.	0.0053		0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004		0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)	(MM kWh/yr) 30.0950	AS GAS 0.063						
425	LRF ELECTRICAL POWER REQ'D								
	TOTAL SLAG OUTPUT (EAF+LRF)	0.0410		0.0410	26.97%	0.0111			
421	REFINED STEEL TO CASTING	0.0000	1.0032	1.0032	99.70%	1.000	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

DOEREDSM 08-June-2000 OVERALL SUMMARY MASS BALANCES - REDSMELT PROCESS TO PRODUCE HOT METAL
 MAXIMUM HOT METAL CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM TYR)	ELEC. POW. (MM kWhr/yr)	TOTAL (MM TYR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM TYR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 513.4595							
	IRON ORE FINES TO G.B. PEL. FEED	1.4535	36.6963					0.0032	0.0117
	COAL FINES TO G.B. PEL. FEED	0.3496	1.9343					0.0015	0.0056
	BINDER TO G.B. PELLET.	0.0218	0.4397					0.0002	0.0008
	FLUX TO SAF	0.0635	5.8283					0.0242	0.0889
	CARBON TO SAF	0.0217	0.1203					0.0001	0.0003
	ELECTRODES TO SAF	0.0018	15.9462					0.0005	0.0019
	OXYGEN GAS TO EAF	(MM Nm ³ /YR) 52.5985	111.5088						
	EAF ELECTRODES	0.0005	4.1273					0.0001	0.0005
	PETROLEUM COKE TO EAF	0.0130	0.2195					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D		176.8207						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWhr/yr) 690.2802							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	690.2802							
	TOTAL CO2 PRODUCED (PROCESS)							0.3716	1.3624
	EQUIV. CO2 FROM EXTR. POWER GEN								0.6296
	TOTAL CO2 FROM ALL SOURCES								1.9921

APPENDIX C-15

**MAUMEE BRIQUETTE DRI/EAF WITH ONLY
RECYCLE SCRAP CHARGE TO EAF**

OVERALL SUMMARY MASS BALANCES - MAUMEE ROTARY HEARTH/EAF

DOEMAUME
08-June-2000
Rev. 2

100% DRI CHARGE - 4.0 wt.% CARBON

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

0.787 MM MT/YEAR FINE ORE FEED (BY-PRODUCT OF LUMP)
1.898 MM MT/YEAR NET GREEN BRIQUETTE FEED TO RHF
1.122 MM MT/YEAR NET DRI TO EAF
1.011 MM MT/YEAR NET DRI IRON UNITS TO EAF

ASSUMPTIONS:

500 ASSUMED FINE ORE SHIPMENT DISTANCE (km)
0.3333 FUEL REQUIREMENT SHIPPING (kg/km)
65,000 SHIPPING TONNAGE (MT FINE ORE/SHIP NET)
0.0026 TOTAL FUEL FOR ORE SHIPPING (MT/mt FINE ORE)

20.0 BRIQUETTING PLANT ELEC. POWER REQ'D (kW/hr/mt FEED)
4.00% DRI/HBI PERCENT CARBON - (WT.% C)
67.20% ORE FINES PERCENT IRON - (WT.% Fe DRY)
75.00% MILL SCALE PERCENT IRON - (WT.% Fe DRY)
47.50% RESIDUAL IRON UNIT PERCENT IRON - (WT.% Fe DRY)
39.47% PERCENT IRON ORE FINES IN FEED - (IRON ORE/BRIQUETTE)
19.74% PERCENT MILL SCALE IN FEED - (SCALE/BRIQUETTE)
19.74% PERCENT RESIDUAL IRON UNITS IN FEED - (RIU/BRIQUETTE)
16.29% PERCENT COAL IN FEED - (COAL/BRIQUETTE)
4.76% PERCENT RECYCLE BRIQUETTE MATERIAL IN FEED - (% RECYCLE)
80.00% PERCENT CARBON IN COAL - (% C)

55.00 OXYGEN REQUIREMENT FOR EAF - (Nm²/mt HM)

2.52 SUPPLEMENTAL FUEL TO DRI - (GJ/mt DRI)
50.56 SUPPLEMENTAL FUEL TO DRI - (kg/mt DRI)

147.18 HBI ELEC. POWER REQ'D - (kW/hr/mt HBI)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF/LRF - (kg/mt LIQ. ST.)
566.7 EAF ELEC. POWER (TOTAL) - (kW/hr/mt LIQ. STEEL)
33.075 LRF ELEC. POWER - (kW/hr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:
BINDER FOR PELLETIZING
20.19 ELECTRIC POWER REQ'D - (kW/hr/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE
91.84 ELECTRIC POWER REQ'D - (kW/hr/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES
9,000.00 ELECTRIC POWER REQ'D - (kW/hr/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)
16.936 ELECTRIC POWER REQ'D - (kW/hr/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN
2.12 ELECTRIC POWER REQ'D - (kW/hr/Nm³)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)
0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

OVERALL SUMMARY MASS BALANCES - MAUMEE ROTARY HEARTH/EAF

100% DRI CHARGE - 4.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	ORE FINES DELIVERED TO PLANT SITE	0.7868		0.7868	67.20%	0.5287	0.00%	0.0000	
	FUEL OIL FOR ORE FINES DELIVERY		AS LIQUID 0.0020				85.00%	0.0017	0.0063
	NET ORE FINES FEED TO BRIQUETTING	0.7868		0.7868	67.20%	0.5287	0.00%	0.0000	
	COAL TO BRIQUETTING	0.3248		0.3248			80.00%	0.2598	
	MILL SCALE TO BRIQUETTING	0.3934		0.3934	75.00%	0.2950	0.00%	0.0000	
	RESIDUAL IRON UNITS TO BRIQUETTING	0.3934		0.3934	47.50%	0.1869	0.00%	0.0000	
	RECYCLE BRIQUETTES TO FEED	0.0949		0.0949	75.00%	0.0712	13.69%	0.0130	
	TOTAL FEED TO BRIQUETTING	1.9932		1.9932		1.0818	13.69%	0.2728	
	TOTAL BRIQUETTES TO RHF	1.8983		1.8983	75.00%	1.0106	13.69%	0.2598	
	BRIQUETTE ELECTRICAL POWER REQ'D	39.8645							
	NET HBI TO EAF (4.0% C)	1.1217	AS N.G.	1.1217	90.10%	1.0106	4.00%	0.0449	
	AUXILIARY FUEL TO DRI		0.0567				72.00%	0.0408	
	DRI OFF GASES							0.2558	0.9379
	RHF DRI ELECTRICAL POWER REQ'D								

165.0916

DOEMAUME OVERALL SUMMARY MASS BALANCES - MAUMEE ROTARY HEARTH/EAF

08-June-2000 100% DRI CHARGE - 4.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	HBI FEED TO EAF	1.1217		1.1217	90.10%	1.0106	4.00%	0.0449	
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.0001	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	0.0130			
404	STEEL C (CHARGE+SLAG INJ)	0.0000	0.0000	0.0000			94.00%	0.0000	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.0036	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 44.0000						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.0016	
	TOTAL CARBON INTO EAF								
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G. 0.0023						
	AUX. FUEL TO EAF						72.00%	0.0017	
	EAF/LRF OFF GASES	0.0831 (MM kWh/yr)							0.1842
	EAF ELECTRICAL POWER REQD	597.4453							
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.0000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.0633						
	LRF ELECTRICAL POWER REQD	(MM kWh/yr) 34.8703							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1562	0.0000	0.1562	26.97%	0.0421			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.0490	0.15%	0.0016	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.9739	0.15%	0.0015	

DOEMAUME OVERALL SUMMARY MASS BALANCES - MAUMEE ROTARY HEARTH/EAF

08-June-2000 100% DR(CHARGE - 4.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 837.2718							
	LIME TO EAF	0.0124	(MM kWhr/yr) 1.1352					0.0047	0.0173
	OXYGEN TO EAF	(MM Nms3/YR) 44.0000	93.2800						
	EAF ELECTRODES	0.0038	34.4015					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0000						0.0000	0.0000
	COMPONENTS ELEC. POWER REQ'D		(MM kWhr/yr) 128.8167						
	TOTAL ELECTRICAL POWER	(MM kWhr/yr) 966.0884							
	TOTAL CO2 PRODUCED (PROCESS)							0.3136	1.1498
	EQUIVALENT CO2 FROM POWER GEN.								0.8812
	TOTAL CO2 FROM ALL SOURCES								2.0310

APPENDIX C-16

**ITMK3 TO EAF WITH ONLY RECYCLE SCRAP TO
EAF**

DOEITMK3 OVERALL SUMMARY MASS BALANCES - ITmk3 PROCESS TO PRODUCE SHOT IRON

22-June-2000 MAXIMUM SHOT IRON CHARGED -

Rev. 3

BASIS:	
0.1181	MM MT/YEAR PURCHASED SCRAP CHARGED
0.0363	MM MT/YEAR RECYCLED SCRAP CHARGED
1.0261	MM MT/YEAR DRI CHARGED
0.9112	MM MT/YEAR LIQUID HOT METAL (TARGET)
0.9112	MM MT/YEAR LIQUID HOT METAL (CALC.)
1.0000	MM MT/YEAR LIQUID STEEL (TARGET)
0.9770	MM MT/YEAR CAST SLAB EQUIVALENT (CALC.)
SUMMARY:	
1.454	MM/M MT/YEAR FINE ORE FEED
2,725.4	MM/M Nm ³ /YEAR AIR
0.0	MM/M Nm ³ /YEAR OXYGEN
121.7	MM/M Nm ³ /YEAR NATURAL GAS (PELLET+ITF)
0.404	MM/M MT/YEAR COAL
0.000	MM/M MT/YEAR FLUX ADDED
1.878	MM/M MT/YEAR NET G.B. PELLETS PRODUCED
3,189.7	MM/M Nm ³ /YEAR WASTE FLUE GASES SAF
ASSUMPTIONS:	
130	ELECTRIC POWER CONSUMPTION IN ITF - (kWhr/mt DRI)
1.454	FINE IRON ORE FEED - (MM MT/YR)
77.00%	PERCENT FINE ORE TO PELLET
64.50%	PERCENT IRON IN FINE ORE - (wt.% Fe)
25.246	CUMULATIVE E. POWER IN FINE ORE - (kWhr/mt)
1.621	ORE/HM RATIO - (MT/mt HM)
0.384	COAL TO HM RATIO - (MT/mt HM)
4.850	NATURAL GAS - (GJ/mt HM)
121.692	NATURAL GAS TO ITF & PELLET - (Nm ³ /mt HM)
2,725.405	TOTAL AIR TO ITF - (Nm ³ /mt HM)
0.000	OXYGEN TO ITF - (Nm ³ /mt HM)
80.00%	PERCENT C IN COAL
3,189.73	GAS VOLUME LEAVING ITF - (Nm ³ /mt HM)
18.6200	ELECTRIC POWER CONSUMED IN G-B PELLET - (kWhr/mt GB)
0.8999	NET IRON RECOVERY IN SCREENS
2.50%	PERCENT CARBON IN DRI
3,189.7	TOTAL OFF-GASES FROM SAF FURNACE - (Nm ³ /mt HM)
1.977	DENSITY OF OFF-GASES - (kg/Nm ³)
3.60%	PERCENT CARBON IN HOT METAL
3.42%	PERCENT Fe IN SAF SLAG
97.00%	PERCENT IRON IN SI
0.00	ELECTRIC POWER CONSUMPTION SAF - (kWhr/mt HM)
0.150%	STEEL SCRAP PERCENT CARBON - (wt.% C)
467.0	EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
34.703	LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
0.00	ELEC. POWER GENERATED - (kWhr/mt HM)
2.20	AUX. FUEL TO EAF - kg/T LIQ. ST.
2.00%	PERCENT C IN SAF SLAG
97.00%	PERCENT IRON IN SHOT IRON
POWER & CO2 EMISSIONS FOR COMPONENTS:	
FINE ORE DELIVERED	
25.246	ELECTRIC POWER REQ'D - (kWhr/mt)
0.00805	CUMULATIVE CO2 EMISSIONS - (MT/mt)
FINE COAL DELIVERED	
5.533	ELECTRIC POWER REQ'D - (kWhr/mt)
0.01601	CUMULATIVE CO2 EMISSIONS - (MT/mt)
BINDER FOR PELLETIZING	
20.19	ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364	CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE	
91.84	ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002	CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES	
9,000.00	ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763	CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)	
16.936	ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156	CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN	
2.12	ELECTRIC POWER REQ'D - (kWhr/Nm ³)
NONE	CUMULATIVE CO2 EMISSIONS - (MT/mt)
CO-PRODUCT COKE	
15.5435	ELECTRIC POWER REQ'D - (kWhr/Nm ³)
0.9975	CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)	
0.000604	CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448	CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871	CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912	CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEITMK3
22-June-2000

OVERALL SUMMARY MASS BALANCES - ITmk3 PROCESS TO PRODUCE SHOT IRON
MAXIMUM SHOT IRON CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES TO PELLETIZING	1.4535	0.000	1.4535	64.50%	0.938	0.00%	0.000	
	COAL FINES TO PELLETIZING	0.4038	0.0018	0.4056	0.00%	0.000	80.00%	0.323	
	BINDER TO PELLETIZING	0.0203	0.0015	0.0218	9.93%	0.002	0.00%	0.000	
	RECYCLE DUST TO PELLETIZING	0.0000	0.0000	0.0000	0.00%	0.000	2.00%	0.000	
	RECYCLE PELLETS TO PELLETIZING	0.0000	0.0000	0.0000	1.00%	0.000	17.20%	0.000	
	GROSS PELLETS	1.8776	0.0033	1.8809	50.04%	0.940	17.20%	0.323	
	PELLETS FEED TO RHF	1.8776 (MM kWh/yr)	0.0033	1.8809	50.04%	0.940	17.20%	0.323	
	ELEC. POWER IN PELLETIZING	34.9614795 (MM Nm3/yr)							
	NATURAL GAS FUEL TO ITF	121.6915 (MM Nm3/yr)					72.00%	0.065	
	COMBUSTION AIR TO ITF	2,725.4053 (MM Nm3/yr)					0.00%	0.000	
	TOTAL WASTE GAS LEAVING ITF	3,189.7336 (MM Nm3/yr)					32.04%	0.362	1.329
	SI LEAVING ITF TO SCREENS	1.0261 (MM kWh/yr)	0.000	1.0261	90.00%	0.9235	2.50%	0.026	
	ELECT. POWER CONSUMMED IN ITF	133.3960 (MM kWh/yr)							

DOEITMK3 22-June-2000 OVERALL SUMMARY MASS BALANCES - ITmk3 PROCESS TO PRODUCE SHOT IRON
 MAXIMUM SHOT IRON CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	SHOT IRON + SLAG	1.0261	0.0000	1.0261	90.00%	0.9235	2.50%	0.0257	
	LIME FLUX TO SAF	#VALUE!							
	SILICA FLUX TO SAF	0.0000					96.00%	0.0000	
	ELECTRODES TO SAF	0.0000					80.00%	0.0000	
	SAF CHARGE CARBON	0.0000							
	SLAG/WIRE DESULFURIZER TO LTF	0.0000							
	SAF FCE. SCRAP, SKULLS	0.0231			95.91%	0.0221	3.60%	0.0008	
	SAF + LADLE TREATMENT DUST	0.0000			0.00%	0.0000			
	MOLTEN SLAG SAF + LTF				12.34%	0.0000	2.00%	0.0000	
	NET SHOT IRON CHARGE TO EAF	0.9235			97.00%	0.8311	3.60%	0.0332	
	ELECTRIC POWER CONSUMP. SAF	0.0000							
	SAF OFF GASES								0.0000
409	TOTAL STEEL SCRAP TO EAF	0.1544		0.1544	99.59%	0.1537	0.15%	0.00110	
403	MISC. ADDITIVES	0.0155		0.0155	40.72%	0.0063			
404	STEEL C (CHARGE+SLAG INJ)	0.0130		0.0130			94.00%	0.01218	
405	EAF ELECTRODES	0.0005		0.0005			94.00%	0.00043	
401	LIME CHARGED	0.0243	AS GAS	0.0243					
415	O2 GAS TO EAF (MM Nm3/YR)		52.60						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0032	1.0032	99.70%	1.0002	0.15%	0.00150	

OVERALL SUMMARY MASS BALANCES - ITmk3 PROCESS TO PRODUCE SHOT IRON
MAXIMUM SHOT IRON CHARGED -

DOEITMK3
 22-June-2000

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	TOTAL CARBON INTO EAF							0.0470	
	TOT. C IN OFF GASES (INCL. LRF)							0.0455	
	AUX. FUEL TO EAF		AS N.G 0.0023				72.00%	0.0017	
	EAF/LRF OFF GASES	0.0185 (MM kWh/yr)			48.50%	0.009		0.0471	0.1728
	EAF ELECTRICAL POWER REQ'D	467.0000							
417	LIME TO LADLE REF. FOE.	0.0053		0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004		0.0004					
419	ARGON GAS TO LRF (MM Nm ³ /YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	34.8129							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.0410		0.0410	26.97%	0.0111			
421	REFINED STEEL TO CASTING	0.0000	1.0032	1.0032	99.70%	1.000	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

**OVERALL SUMMARY MASS BALANCES - ITmk3 PROCESS TO PRODUCE SHOT IRON
MAXIMUM SHOT IRON CHARGED -**

DOEITMK3
22-June-2000

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	ELEC. POW. (MM kWhr/yr)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 670.1703							
	IRON ORE FINES TO G.B. PEL. FEED	1.4535	36.6963					0.0032	0.0117
	COAL FINES TO G.B. PEL. FEED	0.4038	2.2339					0.0018	0.0065
	BINDER TO G.B. PELLET.	0.0218	0.4397					0.0002	0.0008
	FLUX TO SAF							0.0000	0.0000
	CARBON TO SAF	0.0000	0.0000					0.0000	0.0000
	ELECTRODES TO SAF	0.0000	0.0000					0.0000	0.0000
	OXYGEN GAS TO EAF	(MM Nm3/YR) 52.5985	111.5088						
	EAF ELECTRODES	0.0005	4.1273					0.0001	0.0005
	PETROLEUM COKE TO EAF	0.0130	0.2195					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D		155.2255						
	TOTAL ELECTRICAL POWER REQ'D	(MM kWhr/yr) 825.3959							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	825.3959							
	TOTAL CO2 PRODUCED (PROCESS)							0.4149	1.5213
	EQUIV. CO2 FROM EXTR. POWER GEN								0.7529
	TOTAL CO2 FROM ALL SOURCES								2.2741

FLUID-BED DRI PROCESSES

APPENDIX C-17

**CIRCORED/HBI/EAF WITH ONLY RECYCLE
CHARGE TO EAF**

OVERALL SUMMARY MASS BALANCES - CIRCORED/HBI/EAF

DOECIRCS

08-June-2000 100% DRI/HBI CHARGE - 1.0 wt.% CARBON

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
 0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

1.791 MM MT/YEAR FINE ORE FEED (BY-PRODUCT OF LUMP)
 1.544 MM MT/YEAR NET INDURATED MICRO PELLETS
 1.089 MM MT/YEAR NET DRI TO EAF

ASSUMPTIONS:

3.000 ASSUMED FINE ORE SHIPPING DISTANCE (km)
 0.3333 FUEL REQUIREMENT SHIPPING (kg/km)
 65,000 SHIPPING TONNAGE (MT FINE ORE/SHIP NET)
 0.0154 TOTAL FUEL FOR ORE SHIPPING (MT/mt FINE ORE)
 1.30 FUEL REQUIREMENT - MICRO PELLETT PLANT (GJ/mt PEL)
 26.08 FUEL REQUIREMENT - MICRO-PELLET PLANT (kg N.G./mt PEL)
 27.6 MICRO PELLETT PLANT ELEC. POWER REQ'D (kWhr/mt FEED)
 1.00% DRI/HBI PERCENT CARBON - (WT.% C)
 67.20% ORE FINES PERCENT IRON - (WT.% Fe DRY)

15.05 FUEL TO DRI - (GJ/mt DRI)
 301.95 FUEL TO DRI - (kg/mt DRI)

 147.18 HBI ELEC. POWER REQ'D - (kWhr/mt HBI)
 0.150% STEEL PERCENT CARBON - (wt.% C)
 2.20 AUX. FUEL TO EAF/LRF - kg/mt LIQ. ST.
 566.7 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
 33.075 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
 20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 BURNT LIME/DOLOMITE
 91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRODES
 9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
 1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 PETROLEUM COKE (CARBON)
 16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 OXYGEN
 2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
 NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRICAL POWER GENERATION (NET)
 0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
 0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
 0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
 0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOECIRCS

08-June-2000

OVERALL SUMMARY MASS BALANCES - CIRCORED/HBI/EAF

100% DRI/HBI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	ORE FINES DELIVERED TO PLANT SITE	1.7908		1.7908	67.20%	1.2034	0.00%	0.0000	
	FUEL OIL FOR ORE FINES DELIVERY		AS LIQUID 0.0276				85.00%	0.0234	0.0859
	NET ORE FINES FEED TO MICRO-PELL.	1.7908		1.7908	67.20%	1.2034	0.00%	0.0000	
	BINDER TO MICRO-PELLET	0.0015		0.0015					
	FUEL (DRYING, INDURATION, ETC.)		AS N.G. 0.0467				72.00%	0.0336	
	MICRO-PELLET PLANT FLUE GASES								0.1233
	MICRO-PELLET ELECTRICAL POWER REQ'D	(MM kWh/yr) 49.3584							
	NET IND. MICRO-PELLETS, ETC. TO CFB	1.5436		1.5436	67.81%	0.0000			
	NET HBI TO EAF (1.0% C)	1.0890		1.0890	92.80%	1.0106	1.00%	0.0109	
	FUEL TO DRI		AS N.G. 0.3288				72.00%	0.2368	
	DRI OFF GASES	0.1661 (MM kWh/yr)			87.80%	0.1459			0.8681
	DRI/HBI ELECTRICAL POWER REQ'D	160.2832							

DOECIRCS OVERALL SUMMARY MASS BALANCES - CIRCORED/HBI/EAF

08-June-2000 100% DRI/HBI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	HBI FEED TO EAF	1.0890		1.0890	92.80%	1.0106	1.00%	0.0109	
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.0001	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	0.0130			
404	STEEL C (CHARGE+SLAG INJ)	0.0120	0.0000	0.0120			94.00%	0.0113	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.0036	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)		AS GAS 11.0000						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.0016	
	TOTAL CARBON INTO EAF							0.0291	
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G. 0.0023					0.0275	
	AUX. FUEL TO EAF							0.0017	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)						0.0275	0.1010
	EAF ELECTRICAL POWER REQ'D	597.4453							
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	0.0000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS 0.0633						
	LRF ELECTRICAL POWER REQ'D	(MM kWhr/yr) 34.8703							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1562	0.0000	0.1562	26.97%	0.0421			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.0490	0.15%	0.0016	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.9739	0.15%	0.0015	

OVERALL SUMMARY MASS BALANCES - CIRCORED/HBI/EAF

DOECIRCS
08-June-2000

100% DRU/HBI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 841.9572							
	BINDER TO PELLET	0.0015	(MM kWhr/yr) 0.0302					0.0000	0.0001
	BURNT LIME/DOLOMITE TO PELLET	0.0000	0.0000					0.0000	0.0000
	LIME TO EAF	0.0124	1.1352					0.0047	0.0173
	OXYGEN TO EAF	(MM Nm ³ /YR) 11.0000	23.3200						
	EAF ELECTRODES	0.0038	34.4015					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0120	0.2034					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D		(MM kWhr/yr) 59.0903						
	TOTAL ELECTRICAL POWER	900.8441							
	TOTAL CO2 PRODUCED (PROCESS)							0.3273	1.1999
	EQUIVALENT CO2 FROM POWER GEN.								0.8217
	TOTAL CO2 FROM ALL SOURCES								2.0216

APPENDIX C-18

**CIRCOFER/HAPSAF/EAF WITH ONLY RECYCLE
SCRAP CHARGE TO EAF**

DOECIRFR 08-June-2000 Rev. 2

MAXIMUM HOT METAL CHARGED - CFB/SAF/EAF

OVERALL SUMMARY MASS BALANCES - CIRCOFER PROCESS TO PRODUCE HOT METAL

DOECIRFR	08-June-2000	Rev. 2	MAXIMUM HOT METAL CHARGED - CFB/SAF/EAF
BASIS:			
0.1181	MM	MT/YEAR	PURCHASED SCRAP CHARGED
0.0363	MM	MT/YEAR	RECYCLED SCRAP CHARGED
1.0261	MM	MT/YEAR	DRI CHARGED
0.9112	MM	MT/YEAR	LIQUID HOT METAL (TARGET)
0.9112	MM	MT/YEAR	LIQUID HOT METAL (CALC.)
1.0000	MM	MT/YEAR	LIQUID STEEL (TARGET)
0.9770	MM	MT/YEAR	CAST SLAB EQUIVALENT (CALC.)
SUMMARY:			
1.737	MMM	MT/YEAR	FINE ORE FEED
201.1	MM	Nm3/YEAR	OXYGEN TO CFB
0.482	MMM	MT/YEAR	COAL IN CFB
ASSUMPTIONS:			
112.24			ELECTRIC POWER CONSUMPTION IN CFB - (kWhr/mt DRI)
1.737			FINE IRON ORE FEED - (MM MT/YR)
72.00%			PERCENT FINE ORE TO PELLET
64.50%			PERCENT IRON IN FINE ORE - (wt.% Fe)
25.246			CUMULATIVE E. POWER IN FINE ORE - (kWhr/mt)
1.857			ORE/HM RATIO - (MT/mt HM)
0.470			COAL TO DRI RATIO - (MT/mt DRI)
0.482			COAL CHARGED - (MT/YR COAL)
0.278			COAL TO ORE RATIO - (MT/mt FEED ORE)
196.000			OXYGEN TO CFB - (Nm3/mt DRI)
80.00%			PERCENT C IN COAL
0.001			BINDER TO MICROPELLETIZING - (MT/mt FEED ORE)
0.0696			FLUX CHARGED (B. LIME) TO SAF+LRF - (MT/mt HM)
0.1742			TOTAL SLAG PRODUCED IN SAF+LRF - (MT/mt HM)
0.0367			SILICA FLUX TO SAF - (MT/mt HM)
0.0050			DESULFURIZING ADDITIVES TO LRF - (MT/mt HM)
0.0239			CARBON (AS COAL) CHARGE TO SAF - (MT/mt HM)
0.00225			ELECTRODES TO SAF - (MT/mt HM)
0.05613			TOTAL DUST LOSSES (SAF + LT) - (MT/mt HM)
59.71%			PERCENT IRON IN DUST
18.6200			ELECTRIC POWER CONSUMMED IN SAF - (kWhr/mt GB)
0.9301			NET IRON RECOVERY IN SAF + LTF
4.00% PERCENT CARBON IN DRI			
TOTAL OFF-GASES FROM SAF FURNACE - (Nm3/mt HM)			
1.977			DENSITY OF OFF-GASES - (kg/Nm3)
3.60%			PERCENT CARBON IN HOT METAL
3.42%			PERCENT Fe IN SAF SLAG
96.11%			PERCENT IRON IN HM
350.00			ELECTRIC POWER CONSUMPTION SAF - (kWhr/mt HM)
0.150%			STEEL SCRAP PERCENT CARBON - (wt.% C)
130.0			EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
30			LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
0.00			ELEC. POWER GENERATED - (kWhr/mt HM)
2.20			AUX. FUEL TO EAF - kg/T LIQ. ST.
2.00%			PERCENT C IN SAF SLAG
90.51%			PERCENT IRON IN DRI
POWER & CO2 EMISSIONS FOR COMPONENTS:			
FINE ORE DELIVERED			
25.246			ELECTRIC POWER REQ'D - (kWhr/mt)
0.00805			CUMULATIVE CO2 EMISSIONS - (MT/mt)
FINE COAL DELIVERED			
5.533			ELECTRIC POWER REQ'D - (kWhr/mt)
0.01601			CUMULATIVE CO2 EMISSIONS - (MT/mt)
BINDER FOR PELLETIZING			
20.19			ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364			CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE			
91.84			ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002			CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES			
9,000.00			ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763			CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)			
16.936			ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156			CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN			
2.12			ELECTRIC POWER REQ'D - (kWhr/Nm3)
NONE			CUMULATIVE CO2 EMISSIONS - (MT/mt)
CO-PRODUCT COKE			
15.5435			ELECTRIC POWER REQ'D - (kWhr/Nm3)
0.9575			CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)			
0.000604			CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448			CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871			CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912			CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOECIRFR
08-June-2000

OVERALL SUMMARY MASS BALANCES - CIRCOFER PROCESS TO PRODUCE HOT METAL
MAXIMUM HOT METAL CHARGED - CFB/SAF/EAF

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES TO CIRCOFER	1.7367		1.7367	64.50%	1.120	0.00%	0.000	
	COAL FINES TO CIRCOFER	0.4823		0.4823	0.00%	0.000	80.00%	0.386	
	BINDER TO MICROPELLETIZING	0.0017		0.0017	0.00%	0.000	0.00%	0.000	
	RECYCLE DUST TO MICROPELLETIZING	0.0868		0.0868	69.71%	0.061	2.00%	0.002	
	TOTAL WASTE GAS LEAVING CFB								1.271
	DRI LEAVING CFB TO SAF	1.0261	0.000	1.0261	90.51%	0.9287	4.00%	0.041	
	ELECT. POWER CONSUMMED IN CFB	115.1720 (MM kWh/yr)							

DOECIRFR
08-June-2000

OVERALL SUMMARY MASS BALANCES - CIRCOFER PROCESS TO PRODUCE HOT METAL

MAXIMUM HOT METAL CHARGED - CFB/SAF/EAF

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	NET DRI CHARGE TO SAF (>450 °C)	1.0261	0.0000	1.0261	90.51%	0.9287	4.00%	0.0410	
	LIME FLUX TO SAF	0.0635							
	SILICA FLUX TO SAF	0.0334							
	ELECTRODES TO SAF	0.0021					96.00%	0.0020	
	SAF CHARGE CARBON	0.0217					80.00%	0.0174	
	SLAG/WIRE DESULFURIZER TO LTF	0.0046							
	SAF FCE. SCRAP, SKULLS	0.0364			95.91%	0.0350	3.60%	0.0013	
	SAF + LADLE TREATMENT DUST	0.0511			69.71%	0.0357			
	MOLTEN SLAG SAF + LTF	0.1587			12.34%	0.0196	2.00%	0.0032	
	NET HOT METAL CHARGE TO EAF	0.9112			96.11%	0.8638	3.60%	0.0328	
	ELECTRIC POWER CONSUMP. SAF	318.9235							
	SAF OFF GASES								0.0848
409	TOTAL STEEL SCRAP TO EAF	0.1544		0.1544	99.59%	0.1537	0.15%	0.00110	
403	MISC. ADDITIVES	0.0155		0.0155	40.72%	0.0063			
404	STEEL C (CHARGE+SLAG INJ)	0.0130		0.0130			94.00%	0.01218	
405	EAF ELECTRODES	0.0005		0.0005			94.00%	0.00043	
401	LIME CHARGED	0.0243	AS GAS 52.60	0.0243					
415	O2 GAS TO EAF (MM Nm3/YR)		1.0032	1.0032					
416	LIQ. EAF STEEL TO LRF	0.0000		1.0032	99.70%	1.0002	0.15%	0.00150	

DOECIRFR 08-June-2000 OVERALL SUMMARY MASS BALANCES - CIRCOFER PROCESS TO PRODUCE HOT METAL

MAXIMUM HOT METAL CHARGED - CFB/SAF/EAFF

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	TOTAL CARBON INTO EAF							0.0465	
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G. 0.0023					0.0450	
	AUX. FUEL TO EAF						72.00%	0.0017	
	EAF/LRF OFF GASES	0.0185 (MM kWhr/yr)			48.50%	0.009		0.0467	0.1712
	EAF ELECTRICAL POWER REQ'D	130.0000							
417	LIME TO LADLE REF. FCE.	0.0053		0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004		0.0004					
419	ARGON GAS TO LRF (MM Nm ³ /YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	30.0950 (MM kWhr/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.0410		0.0410	26.97%	0.0111			
421	REFINED STEEL TO CASTING	0.0000	1.0032	1.0032	99.70%	1.000	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

**OVERALL SUMMARY MASS BALANCES - CIRCOFER PROCESS TO PRODUCE HOT METAL
MAXIMUM HOT METAL CHARGED - CFB/SAF/EAF**

DOECIRFR
08-June-2000

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR) (MM kWhr/yr)	ELEC. POW. (MM kWhr/yr)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	594.1905							
	IRON ORE FINES TO G.B. PEL. FEED	1.7367	43.8436					0.0038	0.0140
	COAL FINES TO G.B. PEL. FEED	0.4823	2.6683					0.0021	0.0077
	BINDER TO G.B. PELLET.	0.0017	0.0351					0.0000	0.0001
	FLUX TO SAF	0.0635	5.8283					0.0242	0.0889
	CARBON TO SAF	0.0217	0.1203					0.0001	0.0003
	ELECTRODES TO SAF	0.0021	18.4520					0.0006	0.0022
	OXYGEN GAS TO EAF	52.5985	111.5088						
	EAF ELECTRODES	0.0005	4.1273					0.0001	0.0005
	PETROLEUM COKE TO EAF	0.0130	0.2195					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D		186.8032						
	TOTAL ELECTRICAL POWER REQ'D	780.9938							
	TOTAL ELECTRIC POWER PROD.	0.0000							
	TOTAL NET ELEC. ADDITIONAL	780.9938							
	TOTAL CO2 PRODUCED (PROCESS)							0.4474	1.6404
	EQUIV. CO2 FROM EXTR. POWER GEN.								0.7124
	TOTAL CO2 FROM ALL SOURCES								2.3527

APPENDIX C-19

**FINMET/HBI/EAF WITH ONLY RECYCLE SCRAP
CHANGE TO EAF**

OVERALL SUMMARY MASS BALANCES - FINMET/HBI/EAF

DOEFINMT
08-June-2000
Rev. 2

100% DRI/HBI CHARGE - 1.0 wt.% CARBON

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

1.751 MM MT/YEAR FINE ORE FEED (BY-PRODUCT OF LUMP)
1.509 MM MT/YEAR NET INDURATED MICRO PELLETS TO FL. BEDS
1.089 MM MT/YEAR NET DRI/HBI TO EAF

ASSUMPTIONS:

3.000 ASSUMED FINE ORE SHIPMENT DISTANCE (km)
0.3333 FUEL REQUIREMENT SHIPPING (kg/km)
65,000 SHIPPING TONNAGE (MT FINE ORE/SHIP NET)
0.0154 TOTAL FUEL FOR ORE SHIPPING (MT/mt FINE ORE)
1.30 FUEL REQUIREMENT - MICRO PELLET PLANT (GJ/mt PEL)
26.08 FUEL REQUIREMENT - MICRO-PELLET PLANT (kg N.G./mt PEL)
16.5 MICRO PELLET PLANT ELEC. POWER REQ'D (kW/mt FEED)
1.00% DRI/HBI PERCENT CARBON - (WT.% C)
67.20% ORE FINES PERCENT IRON - (WT.% Fe DRY)

12.95 FUEL TO DRI - (GJ/mt DRI)
259.83 FUEL TO DRI - (kg/mt DRI)

172.27 HBI ELEC. POWER REQ'D - (kW/mt HBI)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF/LRF - kg/mt LIQ. ST.
566.7 EAF ELEC. POWER (TOTAL) - (kW/mt LIQ. STEEL)
33.075 LRF ELEC. POWER - (kW/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING
20.19 ELECTRIC POWER REQ'D - (kW/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE
91.84 ELECTRIC POWER REQ'D - (kW/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES
9,000.00 ELECTRIC POWER REQ'D - (kW/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)
16.936 ELECTRIC POWER REQ'D - (kW/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN
2.12 ELECTRIC POWER REQ'D - (kW/mt)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)
0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEFINMT
08-June-2000

OVERALL SUMMARY MASS BALANCES - FINMET/HBI/EAF
100% DRI/HBI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	ORE FINES DELIVERED TO PLANT SITE	1.7511	AS LIQUID 0.0269	1.7511	67.20%	1.1767	0.00%	0.0000	
	FUEL OIL FOR ORE FINES DELIVERY						85.00%	0.0229	0.0840
	NET ORE FINES FEED TO MICRO-PELL.	1.7511		1.7511	67.20%	1.1767	0.00%	0.0000	
	BINDER TO MICRO-PELLET	0.0015	AS N.G. 0.0457	0.0015					
	FUEL (DRYING, INDURATION, ETC.)						72.00%	0.0329	
	MICRO-PELLET PLANT FLUE GASES								0.1206
	MICRO-PELLET ELECTRICAL POWER REQ'D	(MM kWh/yr) 28.9590							
	NET IND. MICRO-PELLETS, ETC. TO FB	1.5091		1.5091	67.81%	0.0000			
	NET HBI TO EAF (1.0% C)	1.0890	AS N.G. 0.2830	1.0890	92.80%	1.0106	1.00%	0.0109	
	FUEL TO DRI						72.00%	0.2037	
	DRI OFF GASES	0.1661 (MM kWh/yr)							0.7470
	DRI/HBI ELECTRICAL POWER REQ'D	187.5973							

DOEFINMT OVERALL SUMMARY MASS BALANCES - FINMET/HBI/EAF

08-June-2000 100% DRI/HBI CHARGE - 1.0 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	HBI FEED TO EAF	1.0890		1.0890	92.80%	1.0106	1.00%	0.0109	
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.0001	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	0.0130			
404	STEEL C (CHARGE+SLAG INJ)	0.0120	0.0000	0.0120			94.00%	0.0113	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.0036	
401	LIME CHARGED	0.0124	0.0000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)	11.0000	AS GAS						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.0016	
	TOTAL CARBON INTO EAF							0.0291	
	TOT. C IN OFF GASES (INCL. LRF)							0.0275	
	AUX. FUEL TO EAF		AS N.G.				72.00%	0.0017	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr)	0.0023					0.0017	0.1010
	EAF ELECTRICAL POWER REQ'D	597.4453						0.0275	
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.0000	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		AS GAS						
	LRF ELECTRICAL POWER REQ'D		0.0633						
			(MM kWhr/yr)						
			34.8703						
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1562	0.0000	0.1562	26.97%	0.0421			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.0490	0.15%	0.0016	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.9739	0.15%	0.0015	

OVERALL SUMMARY MASS BALANCES - FINMET/HBI/EAF
 100% DRI/HBI CHARGE - 1.0 wt.% CARBON

DOEFINMT
 08-June-2000

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 848.8720							
	BINDER TO PELLET	0.0015	(MM kWhr/yr) 0.0302					0.0000	0.0001
	BURNT LIME/DOLOMITE TO PELLET	0.0000	0.0000					0.0000	0.0000
	LIME TO EAF	0.0124	1.1352					0.0047	0.0173
	OXYGEN TO EAF	(MM Nm ³ /YR) 11.0000	23.3200						
	EAF ELECTRODES	0.0038	34.4015					0.0011	0.0041
	PETROLEUM COKE TO EAF	0.0120	0.2034					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D		(MM kWhr/yr) 59.0903						
	TOTAL ELECTRICAL POWER	(MM kWhr/yr) 907.7589							
	TOTAL CO2 PRODUCED (PROCESS)							0.2930	1.0742
	EQUIVALENT CO2 FROM POWER GEN.								0.8280
	TOTAL CO2 FROM ALL SOURCES								1.9022

APPENDIX C-20

**GENERIC IRON CARBIDE/EAF RECYCLE SCRAP TO
EAF (REPRESENTS NUCOR/ICH,
QUALITEC/KAWASKI, PROCEDYNE)**

DOEIRCB OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF

08-June-2000 100% IRON CARBIDE CHARGE - 6.5 wt.% CARBON

Rev. 2

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
 0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

1.701 MM MT/YEAR FINE ORE FEED (BY-PRODUCT OF LUMP)
 1.229 MM MT/YEAR NET DRI/HBI TO EAF

ASSUMPTIONS:

3,000 ASSUMED FINE ORE SHIPMENT DISTANCE (km)
 0.3333 FUEL REQUIREMENT SHIPPING (kg/km)
 65,000 SHIPPING TONNAGE (MT FINE ORE/SHIP NET)
 0.0154 TOTAL FUEL FOR ORE SHIPPING (MT/mt FINE ORE)

6.50% EFFECTIVE IC PERCENT CARBON - (WT.% C)
 67.20% ORE FINES PERCENT IRON - (WT.% Fe DRY)

13.40 FUEL TO IRON CARBIDE - (GJ/mt IC)
 268.86 FUEL TO IC - (kg/mt IC)

 206.24 IC ELEC. POWER REQ'D - (kWhr/mt IC)
 0.150% STEEL PERCENT CARBON - (wt.% C)
 2.20 AUX. FUEL TO EAF/LRF - kg/mt LIQ. ST.
 483.0 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
 33.075 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING

20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
 0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 BURNT LIME/DOLOMITE

91.84 ELECTRIC POWER REQ'D - (kWhr/mt)

1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 ELECTRODES

9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)

1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)

PETROLEUM COKE (CARBON)

16.936 ELECTRIC POWER REQ'D - (kWhr/mt)

0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
 OXYGEN

2.12 ELECTRIC POWER REQ'D - (kWhr/Nm³)

NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)

ELECTRICAL POWER GENERATION (NET)

0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)

0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)

0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)

0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

DOEIRCB
08-June-2000

OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF

100% IRON CARBIDE CHARGE - 6.5 wt.% CARBON

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	ORE FINES DELIVERED TO PLANT SITE	1.7011		1.7011	67.20%	1.1431	0.00%	0.0000	
	FUEL OIL FOR ORE FINES DELIVERY		AS LIQUID 0.0262				85.00%	0.0222	0.0816
	NET IRON CARBIDE TO EAF (1.0% C)	1.2289	AS N.G. 0.3304	1.2289	90.00%	1.1060	6.50%	0.0799	
	FUEL TO IRON CARBIDE REACTOR						72.00%	0.2379	
	IRON CARBIDE OFF GASES	0.0424 (MM kWh/yr)							0.8723
	IRON CARBIDE ELEC. POWER REQ'D	253.4460							

OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF

08-June-2000 100% IRON CARBIDE CHARGE - 6.5 wt.% CARBON

DOEIRCB 08-June-2000 STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON CARBIDE FEED TO EAF	1.2289		1.2289	90.00%	1.1060	6.50%	0.0799	
409	TOTAL STEEL SCRAP (100% DRI)	0.0648	0.0000	0.0648	99.70%	0.0646	0.15%	0.0001	
403	MISC. ADDITIVES	0.0070	0.0000	0.0070	40.72%	0.0130			
404	STEEL C (CHARGE+SLAG INJ)	0.0000	0.0000	0.0000			94.00%	0.0000	
405	EAF ELECTRODES	0.0038	0.0000	0.0038			94.00%	0.0036	
401	LIME CHARGED	0.0124	0.0000 AS GAS 71.5000	0.0124					
415	O2 GAS TO EAF (MM Nm3/YR)								
416	LIQ. EAF STEEL TO LRF	0.0000	1.0543	1.0543	99.70%	1.0511	0.15%	0.0016	
	TOTAL CARBON INTO EAF								
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G. 0.0023						
	AUX. FUEL TO EAF						72.00%	0.0017	
	EAF/LRF OFF GASES	0.0831 (MM kWhr/yr) 509.2178			48.50%	0.0096		0.0852	0.3126
	EAF ELECTRICAL POWER REQ'D								
418	SLAGWIRE DESULFURIZER TO LRF	0.0004	0.0000 AS GAS	0.0004					
419	ARGON GAS TO LRF (MM Nm3/YR)		0.0633						
	LRF ELECTRICAL POWER REQ'D								
		(MM kWhr/yr) 34.8703							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.1562	0.0000	0.1562	26.97%	0.0421			
421	REFINED STEEL TO CASTING	0.0000	1.0521	1.0521	99.70%	1.0490	0.15%	0.0016	
510	NET STEEL SLAB PRODUCED	0.9768	0.0000	0.9768	99.70%	0.9739	0.15%	0.0015	

OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF

100% IRON CARBIDE CHARGE - 6.5 wt.% CARBON

DOEIRCB
08-June-2000

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWhr/yr) 797.5342	(MM kWhr/yr) 0.0000					0.0000	0.0000
	BINDER TO PELLET	0.0000	0.0000					0.0000	0.0000
	BURNT LIME/DOLOMITE TO PELLET	0.0000	0.0000					0.0047	0.0173
	LIME TO EAF	0.0124	1.1352						
	OXYGEN TO EAF	(MM Nm ³ /YR) 71.5000	151.5800						
	EAF ELECTRODES	0.0025	22.7050					0.0007	0.0027
	PETROLEUM COKE TO EAF	0.0000						0.0000	0.0000
	COMPONENTS ELEC. POWER REQ'D		(MM kWhr/yr) 175.4202						
	TOTAL ELECTRICAL POWER	(MM kWhr/yr) 972.9543						0.3508	1.2864
	TOTAL CO2 PRODUCED (PROCESS)								0.8874
	EQUIVALENT CO2 FROM POWER GEN.								2.1738
	TOTAL CO2 FROM ALL SOURCES								

**OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF
IRON CARBIDE/SAF MELTER/EAF
40% IRON CARBIDE CHARGE - 6.5 wt.% CARBON**

DOEIRCB2
20-June-2000
Rev. 1

BASIS:

1.000 MM MT/YEAR LIQUID STEEL PRODUCT
0.977 MM MT/YEAR NET SLAB PRODUCT

SUMMARY:

0.680 MM MT/YEAR FINE ORE FEED (BY-PRODUCT OF LUMP)
0.492 MM MT/YEAR NET IC TO SAF

13.40 FUEL TO IRON CARBIDE - (GJ/mt IC)
268.86 FUEL TO IC - (kg/mt IC)

206.24 IC ELEC. POWER REQ'D - (kWhr/mt IC)
0.150% STEEL PERCENT CARBON - (wt.% C)
2.20 AUX. FUEL TO EAF/LRF - kg/mt LIQ. ST.
267.5 EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
33.075 LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)

ASSUMPTIONS:

3.000 ASSUMED FINE ORE SHIPMENT DISTANCE (km)
0.3333 FUEL REQUIREMENT SHIPPING (kg/km)
65,000 SHIPPING TONNAGE (MT FINE ORE/SHIP NET)
0.0154 TOTAL FUEL FOR ORE SHIPPING (MT/mt FINE ORE)
6.50% EFFECTIVE IC PERCENT CARBON - (WT.% C)
67.20% ORE FINES PERCENT IRON - (WT.% Fe DRY)
0.0696 FLUX CHARGED (B. LIME) TO SAF+LRF - (MT/mt HM)
0.1742 TOTAL SLAG PRODUCED IN SAF+LRF - (MT/mt HM)
0.0367 SILICA FLUX TO SAF - (MT/mt HM)
0.0050 DESULFURIZING ADDITIVES TO LRF - (MT/mt HM)
0.0000 CARBON (AS COAL) CHARGE TO SAF - (MT/mt HM)
0.00225 ELECTRODES TO SAF - (MT/mt HM)
0.05613 TOTAL DUST LOSSES (SAF + LT) - (MT/mt HM)
69.71% PERCENT IRON IN DUST
18.6200 ELECTRIC POWER CONSUMMED IN SAF - (kWhr/mt GB)
0.9301 NET IRON RECOVERY IN SAF + LTF
6.50% PERCENT CARBON IN IC
1.977 DENSITY OF OFF-GASES FROM SAF FURNACE - (Nm3/mt HM)
3.60% PERCENT OF OFF-GASES - (kg/Nm3)
3.42% PERCENT CARBON IN HOT METAL
96.11% PERCENT Fe IN SAF SLAG
350.00 PERCENT IRON IN HM
0.9301 ELECTRIC POWER CONSUMPTION SAF - (kWhr/mt HM)
NET IRON RECOVERY IN SAF + LTF

POWER & CO2 EMISSIONS FOR COMPONENTS:

BINDER FOR PELLETIZING

20.19 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0364 CUMULATIVE CO2 EMISSIONS - (MT/mt)
BURNT LIME/DOLOMITE

91.84 ELECTRIC POWER REQ'D - (kWhr/mt)
1.4002 CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRODES

9,000.00 ELECTRIC POWER REQ'D - (kWhr/mt)
1.0763 CUMULATIVE CO2 EMISSIONS - (MT/mt)
PETROLEUM COKE (CARBON)

16.936 ELECTRIC POWER REQ'D - (kWhr/mt)
0.0156 CUMULATIVE CO2 EMISSIONS - (MT/mt)
OXYGEN

2.12 ELECTRIC POWER REQ'D - (kWhr/Nm3)
NONE CUMULATIVE CO2 EMISSIONS - (MT/mt)
ELECTRICAL POWER GENERATION (NET)

0.000604 CUMULATIVE CO2 EMISSIONS - N.G. - (MT/kWhr NET)
0.001448 CUMULATIVE CO2 EMISSIONS - COAL - (MT/kWhr NET)
0.000871 CUMULATIVE CO2 EMISSIONS - FUEL OIL - (MT/kWhr NET)
0.000912 CUM. CO2 EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

**OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF
40% IRON CARBIDE CHARGE - 6.5 wt.% CARBON**

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	ORE FINES DELIVERED TO PLANT SITE	0.6804	AS LIQUID 0.0105	0.6804	67.20%	0.4573	0.00%	0.0000	
	FUEL OIL FOR ORE FINES DELIVERY						85.00%	0.0089	0.0326
	NET IRON CARBIDE TO SAF (6.5% C)	0.4916	AS N.G. 0.1322	0.4916	90.00%	0.4424	6.50%	0.0320	
	FUEL TO IRON CARBIDE REACTOR						72.00%	0.0952	
	IRON CARBIDE OFF GASES	0.0170 (MM kWhr/yr)			87.50%	0.0149			0.3489
	IRON CARBIDE ELEC. POWER REQ'D	101.3784							
	NET IC CHARGE TO SAF	0.4916	0.0000	0.4916	90.00%	0.4424	6.50%	0.0320	
	LIME FLUX TO SAF	0.0298							
	SILICA FLUX TO SAF	0.0157							
	ELECTRODES TO SAF	0.0010					96.00%	0.0009	
	SAF CHARGE CARBON	0.0000					80.00%	0.0000	
	SLAGWIRE DESULFURIZER TO LTF	0.0021							
	SAF FCE. SCRAP, SKULLS	0.0128			95.91%	0.0123	3.60%	0.0005	
	SAF + LADLE TREATMENT DUST	0.0240			6.96%	0.0017			
	MOLTEN SLAG SAF + LTF	0.0746			12.34%	0.0092	0.00%	0.0000	
	NET HOT METAL CHARGE TO EAF	0.4281 (MM kWhr/yr)			96.11%	0.4115	3.60%	0.0154	
	ELECTRIC POWER CONSUMP. SAF	149.8423							

**OVERALL SUMMARY MASS BALANCES - GENERIC IRON CARBIDE PROCESS/EAF
40% IRON CARBIDE CHARGE - 6.5 wt.% CARBON**

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	SAF OFF GASES							0.0170	0.0623
409	TOTAL STEEL SCRAP TO EAF	0.6375		0.1544	99.59%	0.1537	0.15%	0.00110	
403	MISC. ADDITIVES	0.0155	AS GAS	0.0155	40.72%	0.0063			
404	STEEL C (CHARGE+SLAG INJ)	0.0000		0.0130			94.00%	0.01218	
405	EAF ELECTRODES	0.0005		0.0005	99.70%	0.0000	94.00%	0.00043	
401	LIME CHARGED	0.0243		0.0243					
415	O2 GAS TO EAF (MM Nm3/YR)		44.48						
416	LIQ. EAF STEEL TO LRF	0.0000	1.0032	1.0032	99.70%	1.0002	0.15%	0.00150	
	TOTAL CARBON INTO EAF	0.0000			48.50%	0.000		0.0465	
	TOT. C IN OFF GASES (INCL. LRF)	0.0000						0.0450	
417	AUX. FUEL TO EAF	0.0053	AS N.G. 0.0023	0.0053			72.00%	0.0017	0.1712
418	EAF/LRF OFF GASES	0.0185		0.0004	48.50%	0.009		0.0467	
	EAF ELECTRICAL POWER REQ'D	268.3688	0.063						
417	LIME TO LADLE REF. FCE.	0.0053		0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004	AS GAS	0.0004	26.97%	0.4175		0.00000	
419	ARGON GAS TO LRF (MM Nm3/YR)	0.0000	0.063	0.0000	99.70%	0.000	0.15%	0.00000	
510	LRF ELECTRICAL POWER REQ'D	30.0950	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.0410		0.0410	26.97%	0.0111		0.00150	
421	REFINED STEEL TO CASTING	0.0000	1.0032	1.0032	99.70%	1.000	0.15%	0.00147	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

OTHER PROCESSES

APPENDIX C-21

**SL/RN ROTARY KILN WITH ONLY RECYCLE
SCRAP CHARGE TO EAF**

OVERALL SUMMARY MASS BALANCES - SLIRN PROCESS TO PRODUCE DRI

DOESLRNVB
21-June-2000
Rev. 2

MAXIMUM DRI CHARGED -

BASIS:		4.00% PERCENT CARBON IN DRI	
0.1181	MM MT/YEAR PURCHASED SCRAP CHARGED	3,442.3	TOTAL OFF-GASES FROM SAF FURNACE - (Nm ³ /mt HM)
0.0363	MM MT/YEAR RECYCLED SCRAP CHARGED	1.977	DENSITY OF OFF-GASES - (kg/Nm ³)
0.9365	MM MT/YEAR DRI CHARGED	3.60%	PERCENT CARBON IN HOT METAL
0.0000	MM MT/YEAR LIQUID HOT METAL (TARGET)	3.42%	PERCENT Fe IN SAF SLAG
0.0000	MM MT/YEAR LIQUID HOT METAL (CALC.)	96.11%	PERCENT IRON IN HM
1.0000	MM MT/YEAR LIQUID STEEL (TARGET)	0.00	ELECTRIC POWER CONSUMPTION SAF - (kWhr/mt HM)
0.9770	MM MT/YEAR CAST SLAB EQUIVALENT (CALC.)	0.150%	STEEL SCRAP PERCENT CARBON - (wt.% C)
SUMMARY:		686.2	EAF ELEC. POWER (TOTAL) - (kWhr/mt LIQ. STEEL)
		30	LRF ELEC. POWER - (kWhr/mt LIQ. STEEL)
1.356	MMM MT/YEAR FINE ORE FEED	0.00	ELEC. POWER GENERATED - (kWhr/mt HM)
3,344.546	MMM Nm ³ /YEAR AIR	2.20	AUX. FUEL TO EAF - kg/T LIQ. ST.
12.643	MMM Nm ³ /YEAR OXYGEN	2.00%	PERCENT C IN SAF SLAG
55.455	MMM Nm ³ /YEAR NATURAL GAS	90.51%	PERCENT IRON IN DRI
0.702	MMM MT/YEAR COAL	POWER & CO ₂ EMISSIONS FOR COMPONENTS:	
0.052	MMM MT/YEAR FLUX ADDED	FINE ORE DELIVERED	
2.014	MMM MT/YEAR NET G.B. PELLETS PRODUCED	25.246	ELECTRIC POWER REQ'D - (kWhr/mt)
3,442.330	MMM Nm ³ /YEAR WASTE FLUE GASES SAF	0.00805	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
0.000	MM MT/YEAR NET SLAG PRODUCED	5.533	ELECTRIC POWER REQ'D - (kWhr/mt)
ASSUMPTIONS:		0.01601	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
51.38	ELECTRIC POWER CONSUMPTION IN RK - (kWhr/mt DRI)	BINDER FOR PELLETIZING	
1.356	FINE IRON ORE FEED - (MM MT/YR)	20.19	ELECTRIC POWER REQ'D - (kWhr/mt)
63.00%	PERCENT FINE ORE TO PELLET	0.0364	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
64.50%	PERCENT IRON IN FINE ORE - (wt.% Fe)	BURNT LIME/DOLOMITE	
25.246	CUMULATIVE E. POWER IN FINE ORE - (kWhr/mt)	91.84	ELECTRIC POWER REQ'D - (kWhr/mt)
1.448	ORE/DRI RATIO - (MT/mt DRI)	1.4002	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
0.750	COAL TO DRI RATIO - (MT/mt DRI)	ELECTRODES	
0.100	BINDER TO DRI RATIO - (MT/mt DRI)	9,000.00	ELECTRIC POWER REQ'D - (kWhr/mt)
59.215	NATURAL GAS TO RK - (Nm ³ /mt DRI)	1.0763	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
3,344.546	TOTAL AIR TO RK - (Nm ³ /mt DRI)	PETROLEUM COKE (CARBON)	
13.500	OXYGEN TO RK - (Nm ³ /mt DRI)	16.936	ELECTRIC POWER REQ'D - (kWhr/mt)
80.00%	PERCENT C IN COAL	0.0156	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
3,442.33	GAS VOLUME LEAVING RK - (Nm ³ /mt HM)	OXYGEN	
0.0000	FLUX CHARGED (B. LIME) TO SAF+LRF - (MT/mt HM)	2.12	ELECTRIC POWER REQ'D - (kWhr/Nm ³)
0.0000	TOTAL SLAG PRODUCED IN SAF+LRF - (MT/mt HM)	NONE	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
0.0000	SILICA FLUX TO SAF - (MT/mt HM)	CO-PRODUCT COKE	
0.0000	DESULFURIZING ADDITIVES TO LRF - (MT/mt HM)	15.5435	ELECTRIC POWER REQ'D - (kWhr/Nm ³)
0.0000	CARBON (AS COAL) CHARGE TO SAF - (MT/mt HM)	0.9975	CUMULATIVE CO ₂ EMISSIONS - (MT/mt)
0.00000	ELECTRODES TO SAF - (MT/mt HM)	ELECTRICAL POWER GENERATION (NET)	
0.00000	TOTAL DUST LOSSES (SAF + LT) - (MT/mt HM)	0.000604	CUMULATIVE CO ₂ EMISSIONS - N.G. - (MT/kWhr NET)
69.71%	PERCENT IRON IN DUST	0.001448	CUMULATIVE CO ₂ EMISSIONS - COAL - (MT/kWhr NET)
18.6200	ELECTRIC POWER CONSUMED IN G-B PELLET. - (kWhr/mt GB)	0.000871	CUMULATIVE CO ₂ EMISSIONS - FUEL OIL - (MT/kWhr NET)
1.0000	NET IRON RECOVERY IN SAF + LTF	0.000912	CUM. CO ₂ EMISSIONS - U.S.A. WTD. AVG. - (MT/kWhr NET)

OVERALL SUMMARY MASS BALANCES - SL/RN PROCESS TO PRODUCE DRI
MAXIMUM DRI CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	IRON ORE FINES TO PELLETTIZING	1.3560	0.000	1.3560	64.50%	0.875	0.00%	0.000	
	COAL FINES TO PELLETTIZING	0.7024	0.0000	0.7024	0.00%	0.000	80.00%	0.562	
	BINDER TO PELLETTIZING	0.0937	0.0015	0.0951	2.15%	0.002	0.00%	0.000	
	RECYCLE DUST TO PELLETTIZING	0.2046	0.2046	0.4092	69.71%	0.143	2.00%	0.004	
	RECYCLE PELLETS TO PELLETTIZING	0.0516	0.0070	0.0587	1.00%	0.001	28.11%	0.015	
	GROSS PELLETS	2.0653	0.2816	2.3469	0.00%	0.000	28.11%	0.581	
	PELLETS FEED TO RK	2.0137	0.2746	2.2883	3.42%	0.069	28.11%	0.566	
	ELEC. POWER IN G-B PELLETTIZING	(MM kWh/yr) 38.4559869							
	NATURAL GAS FUEL TO RK	(MM Nm3/yr) 59.2147	(MM MT/yr) 0.04396				72.00%	0.032	
	COMBUSTION AIR TO RK	(MM Nm3/yr) 3,344.5459	(MM MT/yr) 4.32383				0.00%	0.000	
	TOTAL WASTE GAS LEAVING RK	(MM Nm3/yr) 3,442.3299	(MM MT/yr) 5.49991				37.11%	0.557	2.041
	DRI LEAVING RK	1.0261	0.000	1.0261	90.51%	0.9287	4.00%	0.041	
	ELECT. POWER CONSUMMED IN RK	(MM kWh/yr) 52.7222							

OVERALL SUMMARY MASS BALANCES - SL/IRN PROCESS TO PRODUCE DRI

DOESLRNVB
21-June-2000

MAXIMUM DRI CHARGED -
STREAM LABEL

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	NET DRI CHARGE	1.0261	0.0000	1.0261	90.51%	0.9287	4.00%	0.0410	
	LIME FLUX TO SAF	0.0000							
	SILICA FLUX TO SAF	0.0000							
	ELECTRODES TO SAF	0.0000					96.00%	0.0000	
	SAF CHARGE CARBON	0.0000					80.00%	0.0000	
	SLAGWIRE DESULFURIZER TO LTF	0.0000							
	SAF FCE. SCRAP, SKULLS	0.0000			95.91%	0.0000	3.60%	0.0000	
	SAF + LADLE TREATMENT DUST	0.0000			69.71%	0.0000			
	MOLTEN SLAG SAF + LTF	0.0000			12.34%	0.0000	2.00%	0.0000	
	NET DRI CHARGE TO EAF	1.0261			96.11%	0.9287	3.60%	0.0369	
	ELECTRIC POWER CONSUMP. SAF	(MM kWh/yr) 0.0000							
	SAF OFF GASES								0.0150
409	TOTAL STEEL SCRAP TO EAF	0.1544		0.1544	99.59%	0.1537	0.15%	0.00110	
403	MISC. ADDITIVES	0.0155		0.0155	40.72%	0.0063			
404	STEEL C (CHARGE+SLAG INJ)	0.0130		0.0130			94.00%	0.01218	
405	EAF ELECTRODES	0.0045		0.0045			94.00%	0.00423	
401	LIME CHARGED	0.0243	AS GAS 52.60	0.0243					
415	O2 GAS TO EAF (MM Nm3/YR)								
416	LIQ. EAF STEEL TO LRF	0.0000	1.0032	1.0032	99.70%	1.0002	0.15%	0.00150	

DOESLRNVB 21-June-2000 OVERALL SUMMARY MASS BALANCES - SL/RN PROCESS TO PRODUCE DRI

STREAM NUMBER	MAXIMUM DRI CHARGED - STREAM LABEL	DRY SOLIDS (MM T/YR)	LIQUID (MM T/YR)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CO2 (MM T/YR)
	TOTAL CARBON INTO EAF							0.0545	
	TOT. C IN OFF GASES (INCL. LRF)		AS N.G. 0.0023					0.0530	
	AUX. FUEL TO EAF						72.00%	0.0017	
	EAF/LRF OFF GASES	0.0185 (MM kWh/yr)			48.50%	0.009		0.0546	0.2003
	EAF ELECTRICAL POWER REQ'D	686.2000							
417	LIME TO LADLE REF. FCE.	0.0053		0.0053					
418	SLAG/WIRE DESULFURIZER TO LRF	0.0004		0.0004					
419	ARGON GAS TO LRF (MM Nm ³ /YR)		AS GAS 0.063						
	LRF ELECTRICAL POWER REQ'D	30.0950 (MM kWh/yr)							
425	TOTAL SLAG OUTPUT (EAF+LRF)	0.0410		0.0410	26.97%	0.0111			
421	REFINED STEEL TO CASTING	0.0000	1.0032	1.0032	99.70%	1.000	0.15%	0.00150	
510	NET STEEL SLAB PRODUCED	0.9770	0.0000	0.9770	99.70%	0.974	0.15%	0.00147	

DOESLRNVB 21-June-2000 OVERALL SUMMARY MASS BALANCES - SL/ RN PROCESS TO PRODUCE DRI
 MAXIMUM DRI CHARGED -

STREAM NUMBER	STREAM LABEL	DRY SOLIDS (MM T/YR)	ELEC. POW. (MM kWh/yr)	TOTAL (MM T/YR)	%Fe (DRY)	Fe UNITS (MM T/YR)	%C (DRY)	C UNITS (MM T/YR)	CUM. CO2 (MM T/YR)
	PROCESS ELECTRIC POWER REQ'D	(MM kWh/yr) 807.4732							
	IRON ORE FINES TO G.B. PEL. FEED	1.3560	34.2336					0.0030	0.0109
	COAL FINES TO G.B. PEL. FEED	0.7024	3.8860					0.0031	0.0112
	BINDER TO G.B. PELLET.	0.0951	1.9203					0.0009	0.0035
	FLUX TO SAF	0.0000	0.0000					0.0000	0.0000
	CARBON TO SAF	0.0000	0.0000					0.0000	0.0000
	ELECTRODES TO SAF	0.0000	0.0000					0.0000	0.0000
	OXYGEN GAS TO EAF	(MM Nm ³ /YR) 52.5985	111.5088						
	EAF ELECTRODES	0.0045	40.5000					0.0013	0.0048
	PETROLEUM COKE TO EAF	0.0130	0.2195					0.0001	0.0002
	COMPONENTS ELEC. POWER REQ'D	(MM kWh/yr) 999.7413	192.2682						
	TOTAL ELECTRICAL POWER REQ'D	0.0000							
	TOTAL ELECTRIC POWER PROD.	999.7413						0.6237	2.2869
	TOTAL NET ELEC. ADDITIONAL								
	TOTAL CO2 PRODUCED (PROCESS)								
	EQUIV. CO2 FROM EXTR. POWER GEN								0.9119
	TOTAL CO2 FROM ALL SOURCES								3.1987