

PARAMETER		UNIT	KEEWATIN TACONITE (KEETAC)	HIBBING TACONITE (HIBTAC)			Arcelor	MinnTAC					UNITED TACONITE (U-TAC)		Essar	Mesabi Nugget	TOTAL
LOCATION			Keewatin	Hibbing				Mountain Iron					Eveleth				
LINE NO.		(-)	1	1	2	3	1	3	4	5	6	7	1	2	1		
INDURATION TYPE		(-)	Grate Kiln	Straight Grate	Straight Grate	Straight Grate	Straight Grate	Grate Kiln	Grate Kiln	Grate Kiln	Grate Kiln	Grate Kiln	Grate Kiln	Grate Kiln	Straight Grate	Rotating Hearth	
FUEL			natural gas, coal	NG	NG	NG	NG	NG, biomass	NG, biomass	NG, biomass	NG, biomass	NG, biomass	NG, coal	NG, coal	NG		
Mercury Conc.		ug/dscm	7	5	5	5	6	5.2	5.2	5.2	5.2	5.2	7	7	4		
SCRUBBER TYPE		(-)		Once through	Once through	Once through	Recirculating	Recirculating		Once Through	Once Through	Once Through	Recirculating	Recirculating			
WASTE GAS TO SCRUBBER		Kdscfm	570000	620	620	620	629	247	381	349	302	304	250	580			
WASTE GAS AFTER SCRUBBER		Kacfm	750	771	771	771	854	276	581	533	461	464	289	493	756	400	
SOLID RECYCLE TO THE PROCESS		(-)	No	Yes	Yes	Yes	Yes	No	Yes	Not given	no	Not given	Not given	Yes	NA		
RECYCLE LOCATION		(-)	N/A	Grinding Mills	Grinding Mills	Grinding Mills	Tailing Thickener	N/A	Green Ball Feed	Not given	Not given	Not given	Not given	Green Ball Feed			
modify recycle location:			no	no	no	no	yes	NO	yes	Yes	no	no	no	no			
lbs Hg /yr (at 8335 operating hours per year)			122	96	96	96	116	40	40	36	31	32	54	125	77	70	1030
Lb controlled (75% reduction)			30.5	23.9	23.9	23.9	29.1	9.9	9.9	9.1	7.9	7.9	10.8	25	19.3	17.5	249
Mercury reduction																	782
capital cost ACI																	
ACI injection rate		lb/mmacf	7	3	3	3	5	3	3	3	1.1	1.1	5	5	1.1	1.1	
ACI injection rate		lb/hr	315	139	139	139	256	50	105	96	30	31	87	148	50	26	
Pipe diameter							10		15	15			10	10		10	
	ACI system TCI		\$3,863,381	\$3,416,410	\$3,416,410	\$3,416,410	\$3,745,483	\$2,928,520	\$3,274,449	\$3,232,368	\$2,720,869	\$2,723,518	\$3,183,639	\$3,449,182		\$2,663,554	
	scrubber sludge reroute						\$190,000		\$265,000	\$265,000						\$190,000	
	Total Capital Investment		\$3,863,381	\$3,416,410	\$3,416,410	\$3,416,410	\$3,935,483	\$2,928,520	\$3,539,449	\$3,497,368	\$2,720,869	\$2,723,518	\$3,183,639	\$3,449,182	\$ -	\$2,853,554	\$42,944,190.52
Annual operating costs																	
	tons carbon /yr	8250	1,299	572	572	572	1,057	205	431	396	126	126	358	610	206	109	
	carbon purchase \$/ton	\$1,500	\$1,949,063	\$858,701	\$858,701	\$858,701	\$1,585,238	\$307,395	\$647,089	\$593,629	\$188,261	\$189,486	\$536,456	\$915,131	\$308,732	\$163,350	
	Fixed OM		\$19,549	\$17,287	\$17,287	\$17,287	\$18,952	\$14,818	\$16,569	\$16,356	\$13,768	\$13,781	\$16,109	\$17,453	\$ -	\$13,478	
	CRF (5%, n=20 years)	0.08024	\$309,998	\$274,133	\$274,133	\$274,133	\$315,783	\$234,984	\$284,005	\$280,629	\$218,323	\$218,535	\$255,455	\$276,762	\$ -	\$228,969	
TOTAL ANNUAL COST			\$2,278,609	\$1,150,121	\$1,150,121	\$1,150,121	\$1,919,973	\$557,198	\$947,663	\$890,613	\$420,351	\$421,802	\$808,021	\$1,209,346	\$308,732	\$405,797	\$13,618,466.98
Capital cost for Baghouse and ACI																	
ACI injection rate		lb/Mmacf					1.1	1.1	1.1	1.1			1.1	1.1		1.1	
ACI injection rate		lb/hr					56.4	18.2	38.3	35.2			19.1	32.5		26.4	
	scrubber sludge reroute						\$190,000		\$265,000	\$265,000						\$190,000	
	baghouse						\$10,000,000	\$10,000,000	\$10,000,000	\$10,000,000			\$10,000,000	\$10,000,000		10,000,000	
	ACI System						\$2,984,497	\$2,519,352	\$2,816,949	\$2,780,748			\$2,536,806	\$2,748,397		\$2,663,554	
	Total Capital Investment						\$13,174,497	\$12,519,352	\$13,081,949	\$13,045,748			\$12,536,806	\$12,748,397		\$12,853,554	
Annual Operating Cost--Baghouse							\$2,011,920	\$2,011,920	\$2,011,920	\$2,011,920			\$2,011,920	\$2,011,920		\$2,011,920	
Annual Operating Cost--ACI																	
	tons carbon /yr	8250					233	75	158	145			79	134		109	
	carbon purchase \$/ton	\$1,500					\$348,752	\$112,712	\$237,266	\$217,664			\$118,020	\$201,329		\$163,350	
	Fixed OM						\$15,102	\$12,748	\$14,254	\$14,071			\$12,836	\$13,907		\$13,478	
	CRF (5%, n=20 years)	0.08024					\$1,057,122	\$1,004,553	\$1,049,696	\$1,046,791			\$1,005,953	\$1,022,931		\$1,031,369	
TOTAL ANNUAL COST Baghouse + ACI							\$3,432,895	\$3,141,932	\$3,313,135	\$3,290,445			\$3,148,730	\$3,250,087		\$3,220,117	
Total Capital Investment in Mercury Control			\$3,863,381	\$3,416,410	\$3,416,410	\$3,416,410	\$13,174,497	\$12,519,352	\$13,081,949	\$13,045,748	\$2,720,869	\$2,723,518	\$12,536,806	\$12,748,397		\$12,853,554	\$109,517,298.63
Total Annual Cost of Mercury Control			\$2,278,609	\$1,150,121	\$1,150,121	\$1,150,121	\$3,432,895	\$3,141,932	\$3,313,135	\$3,290,445	\$420,351	\$421,802	\$3,148,730	\$3,250,087	\$308,732	\$3,220,117	\$29,677,198.35

Piping	Project needs	diameter			total direct project	Indirect	multiplier/retrofit
	1000	10	\$60lf	\$60,000	\$76,000	1.5	\$190,000
	1000	15	\$90lf	\$90,000	\$106,000	1.5	\$265,000
Valves	8		\$2,000ea	\$16,000			

Mesabi Nugget

Permit:	Mercury emissions	lb/hr	0.0085	74.46lbs/yr		lb/hr at 8760
	50% reduction			37.23lbs/yr	0.00425	hrs/yr
	75% reduction MN Hg TMDL			18.615lbs/yr	0.00212	5
Testing:		ug/dscm	lb/hr			
339,000dscfm	1/23/2012	14.9	0.019			
	12/12/2012	21.8	0.027			
	3/20/2013	10.3	0.013		0	
	50% reduction	3.39	0.0043			
	75% reduction MN Hg TMDL	1.69	0.0021			
Polishing baghouse	with ACI injection					