Supporting Information

Bi-Objective Optimization of Interplant Integration Using Pinch Analysis

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Supporting Information

Supporting information for the manuscript is provided in this document.

Differentiating features of single plant and interplant integration

Table S1: Characteristics of single plant versus interplant integration

Characteristics	Single plant integration	Interplant integration
Freshwater conservation	Freshwater consumption is reduced	More freshwater can be conserved as compared to single plant integration
Piping cost	Insignificant due to short distances between processes	Large due to long distances between plants
Benefits	The plant is benefitted through freshwater saving	All plants might not be benefitted as freshwater is saved at the cost of additional piping and pumping requirements
Issues of conflicts	None	Sharing financial benefits, treatment of waste, maintenance of pipelines, operation of pumps, etc.
Process data sharing	Complete transparency	Incomplete data sharing (results in mixing of sources before transfer to the other plant)
Effects of downtime	Affected by its own downtime	Affected by its own downtime as well as the downtime of participating industries

Limiting process data for the Illustrative Examples

Table S2: Limiting process data for Example 1[52].

Plant	Sources	Flow rate (t/h)	Quality (ppm)	Demands	Flow rate (t/h)	Quality (ppm)
A	S1	20	100	D1	20	0
	S2	66.67	80	D2	66.67	50
	S3	100	100	D3	100	50
	S4	41.67	800	D4	41.67	80
	S5	10	800	D5	10	400
B	S6	20	100	D6	20	0
	S7	80	50	D7	80	25
	S8	50	125	D8	50	25
	S9	40	800	D9	40	50
	S10	300	150	D10	300	100

Table S3: Limiting process data for Example 2[5]

Plant	Sources	Flow rate (t/h)	Quality (ppm)	Demands	Flow rate (t/h)	Quality (ppm)
A	S1	20	100	D1	20	0
	S2	66.67	80	D2	66.67	50
	S3	72.7	100	D3	100	50
	S4	41.67	800	D4	41.67	80
	S5	10	800	D5	10	400
B	S6	20	100	D6	20	0
	S7	66.67	80	D7	66.67	50
	S8	25	400	D8	15.63	80
	S9	42.86	800	D9	42.86	100
	S10	6.67	1000	D10	10	200
				D11	6.67	400

Table S4: Limiting process data for Example 3[15]

Plant	Sources	Flow rate (Nm^3/h)	Purity (fraction)	Impurity (fraction)	Demands	Flow rate (Nm^3/h)	Purity (fraction)	Impurity (fraction)
A	CRU	17,303	0.8	0.2	HCU	93,306	0.8671	0.1329
	HCU	60,678	0.8	0.2	GOHT	82,656	0.8358	0.1642
	GOHT	55,281	0.75	0.25	RHT	39,164	0.8257	0.1743
	RHT	25,870	0.75	0.25	DHT	12,472	0.7487	0.2513
	DHT	8,004	0.7	0.30	NHT	5,726	0.7265	0.2735
	NHT	3,840	0.65	0.35				
B	SRU	50,303	0.93	0.07	HCU	2,01,197	0.8061	0.1939
	CRU	33,530	0.8	0.2	NHT	14,531	0.7885	0.2115
	HCU	1,45,305	0.75	0.25	DHT	44,707	0.7757	0.2243
	NHT	11,177	0.75	0.25	CNHT	58,117	0.7514	0.2486
	DHT	27,942	0.73	0.27				
	CNHT	36,885	0.7	0.30				

Table S5: Limiting process data for Example 4[23]

Plant	Sources	Flow rate (t/h)	Resistivity (MΩ)	Quality $(M\Omega)^{-1}$	Demands	Flow rate (t/h)	Resistivity (MΩ)	Quality $(M\Omega)^{-1}$
A	S1	250	1	1	D1	500	7	0.143
	S2	200	2	0.5	D2	450	8	0.125
	S3	350	3	0.333	D3	700	10	0.1
	S4	300	0.1	10	D4	350	5	0.2
	S5	200	2	0.5				
	S6	280	0.5	2				
B	S7	227.12	8	0.125	D5	182	16	0.0625
	S8	227.12	2	0.5	D6	159	10	0.1

Plots showing the reflected LCC of plant A* and LCC of plant B, along with the interplant flow line for intermediate points of the Pareto front.

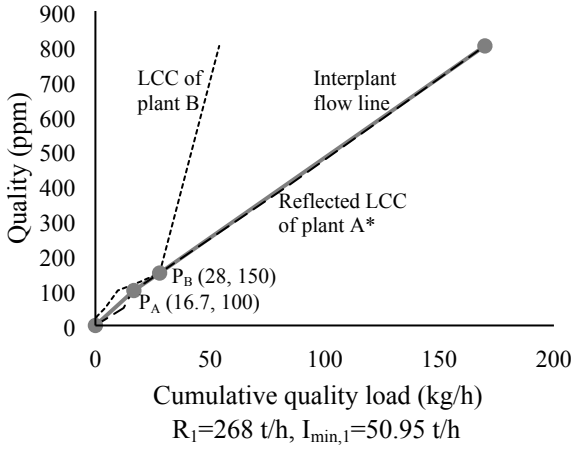
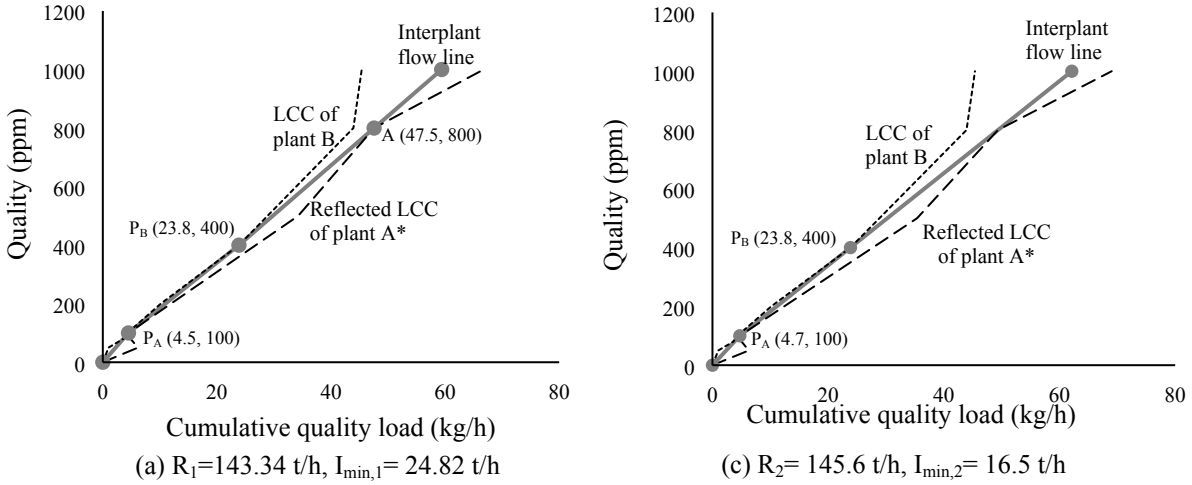


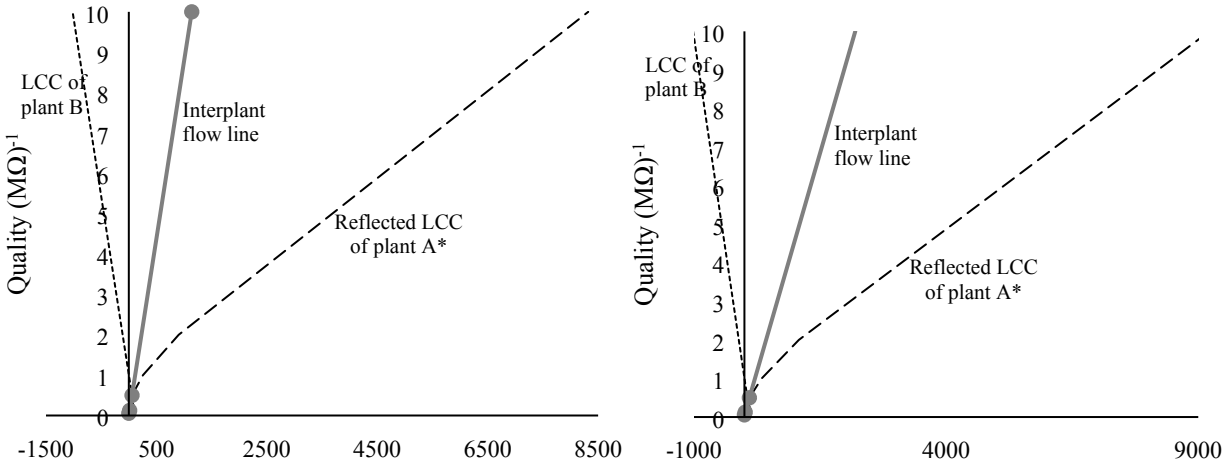
Figure S1: Interplant flow line for the second point on Pareto front for Example 1



(a) R_1=143.34 t/h, $I_{min,1}$= 24.82 t/h (c) R_2= 145.6 t/h, $I_{min,2}$= 16.5 t/h

Figure S2: Interplant flow line for the second and third point on Pareto front for Example 2

Plots showing the reflected LCC of plant A* and LCC of plant B, along with the interplant flow line for the points of the Pareto front.



(a) R_0=1647.1 t/h, $I_{min,0}$=107.16 t/h (b) R_1=1737.5 t/h, $I_{min\ 1}$=0 t/h

Figure S3: Interplant flow and freshwater consumption for Example 4