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APPENDICES

APPENDIX A

The data for design networks

The data for design networks can be list as follows;

Table A.1 The data for design networks in Alternative 1

	Pinch at 621/611				
		Tsupply			Ttarget
stream	W	Nominal	Max	Min	Nominal
H1	33	621	631	611	45
C1	32.24	65	75	55	621

Table A.2 The data for design networks in Alternative 2

Subnetwork-1

	Pinch at 621/611				
		Tsupply			Ttarget
Stream	W	Nominal	Max	Min	Nominal
H1	33	621	631	611	45
C1	32.24	65	75	55	621

Subnetwork-2

	Pinch at 155/145				
		Tsupply			Ttarget
Stream	W	Nominal	Max	Min	Nominal
H2	200	183	184	182	181
C2	91	145	155	145	193

Table A.3 The data for design networks in Alternative 3

Subnetwork-1

Alt 3	Pinch at 200/190				
		Tsupply			Ttarget
Stream	W	Nominal	Max	Min	Nominal
H1	33	621	631	611	45
C1	32.24	65	75	55	621
C3	59	190	200	190	215

Subnetwork-2

	Pinch at 155/145				
		Tsupply			Ttarget
Stream	W	Nominal	Max	Min	Nominal
H2	200	183	184	182	181
C2	91	145	155	145	193

Table A.4 The data for design networks in Alternative 4

	Pinch at 155/145				
			Tsupply		Ttarget
stream	W	Nominal	Max	Min	Nominal
H1	33	621	631	611	45
H2	200	183	184	182	181
C1	32.24	65	75	55	621
C2	91	145	155	145	193

Table A.5 The data for design networks in Alternative 5

Alt 5	Pinch at 155/145				
			Tsupply		Ttarget
stream	W	Nominal	Max	Min	Nominal
H1	33	621	631	611	45
H2	200	183	184	182	181
C1	32.24	65	75	55	621
C2	91	145	155	145	193
C3	59	190	200	180	215

Table A.6 The data for design networks in Alternative 6

Alt 6	Pinch at 155/145				
			Tsupply		Ttarget
stream	W	Nominal	Max	Min	Nominal
H1	33	621	631	611	45
H2	200	183	184	182	181
C1	32.24	65	75	55	621
C2	91	145	155	145	193
C3	59	190	200	180	215
C4	456	349.5	350	349	350.7

Table A.7 The Disturbance inlet Conditions

Conditions	Stream	H1	H2	C1	C2	C3	C4
1	D^0	330	200	322.4	910	590	228
	D^{u}	-	-	-	-	-	-
2	D^0	330	200	322.4	910	590	228
	D^{u}	100	100	100	100	100	100

Note that: All the inlet and target temperature and Heat capacity flowrates are given by simulation from Hysys Program.

APPENDIX B

The Cost Estimation

A preliminary economic analysis is performed for the overall plan. Due to lack of recent data, different cost estimates are done based on cost indices and capacity. However, the present analysis will give a fair idea about the profitability of the plant. Since the exact cost of the plant is not found, the calculations are done based on the purchased equipment cost.

Estimation of Capital Investment Cost:

Direct Costs: material and labour involved in actual installation of complete facility (70-85% of fixed-capital investment)

Equipment + installation + instrumentation + piping + electrical + insulation + painting (50-60% of Fixed-capital investment)

Cost of auxiliary reboiler = 4,260,000

Assume that Cost of Utility use in auxiliary is = 5407.35 /KW-year

Table B.1 The Cost of Equipment

Equipment	No.s	Cost in Rs.
Distillation Column	3	60,000,000
Condenser	3	3,459,000
Reboiler	3	12,780,000
Gas-Liquid Separators	1	3,637,500
Reactor	1	20,000,000
Furnace	1	4,000,000
Cooling Tower	1	1,500,000
FEHE	2	2,770,500

Total Purchased Equipment Cost = 108,147,000

APPENDIX C

The Addition of Propagation.

In case of we don't want to use the auxiliary units, this section will described the toleration of disturbance in network. It will be convenient if there is an example of Alternative 4 to show how the path of disturbances propagated. So there is a briefly figure to see that how to used the upstream unit to control the non-resilient networks that without auxiliary unit stream C2. Figure C.1 shows the disturbance load path for Alternative 4 that without auxiliary unit. Figure C.2 shows the use of upstream unit in controlling of non-resilient network of Alternative 4 which unsafe and difficult to control target temperature of stream.

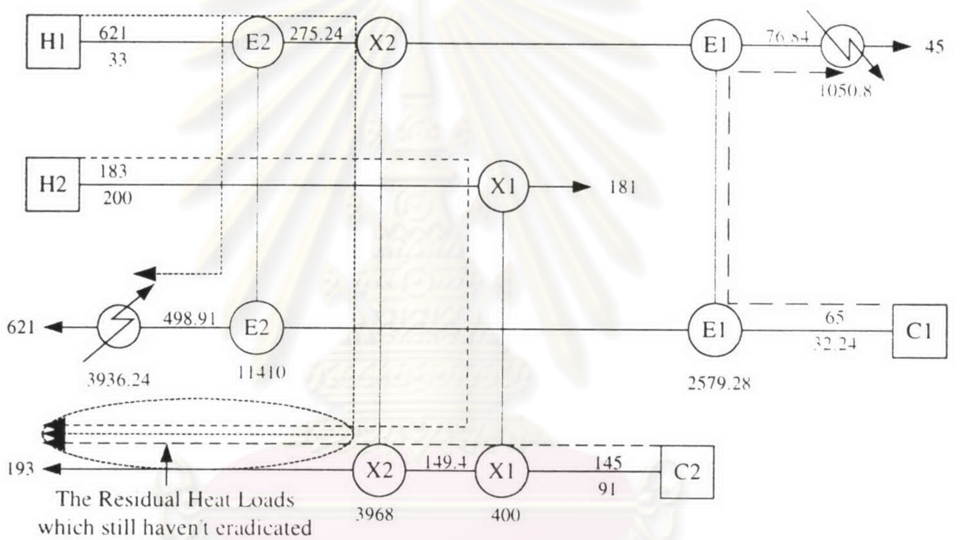

Figure C.1 Disturbance load propagation for the network of Alternative 4

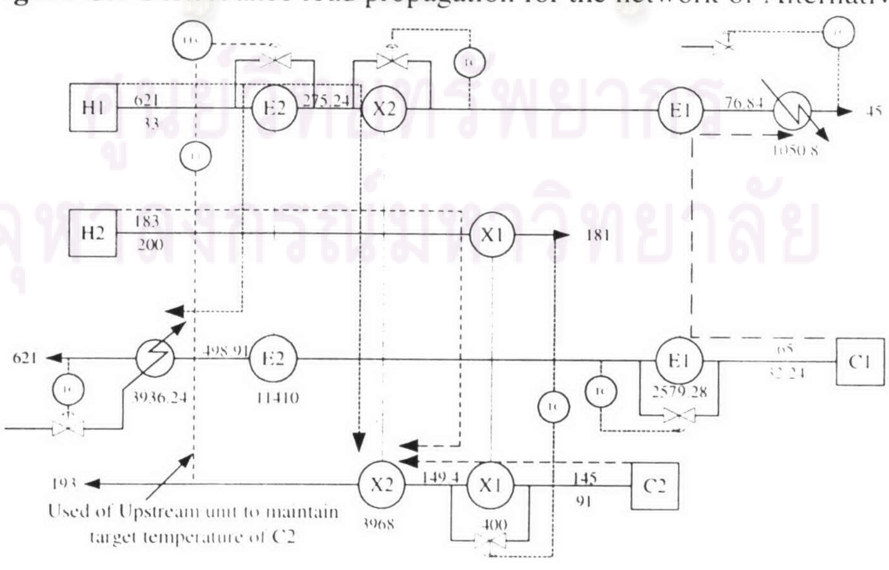

Figure C.2 Use of upstream unit for controlling non-resilient network

For Class C and D which are non-resilient patterns, if we are not need to install the auxiliary unit in the network then we need to use Feed forward Control in order to maintain the target temperature of stream. Figure C.3 and C.4 show the use of Feed Forward Control for both class of patterns which use upstream unit (Residual Load) with Feed forward Control in case of not installed auxiliary unit.

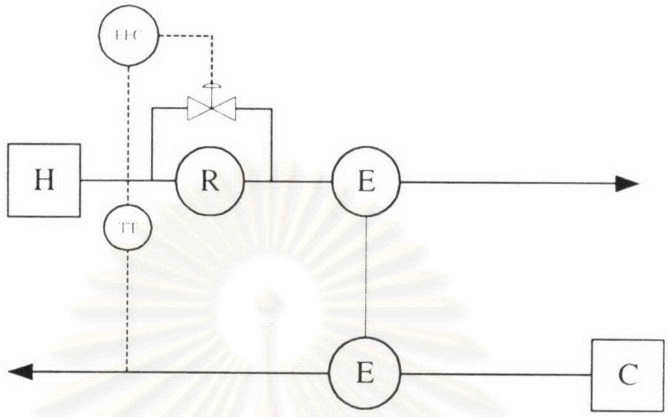

Figure C.3 Use of Feed forward Control for Class C

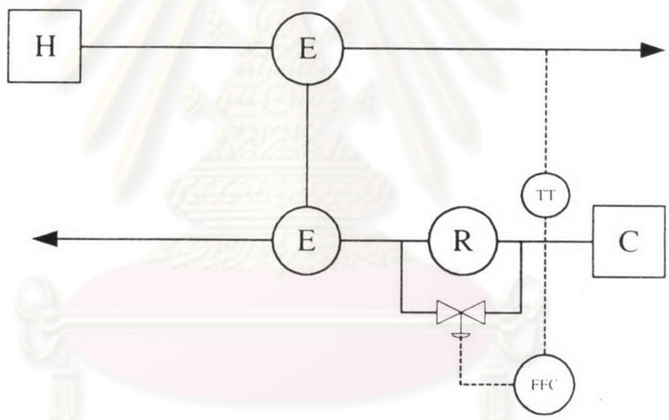

Figure C.4 Use of Feed forward Control for Class D

APPENDIX D

The Modify Resilience Index.

By concept of Resilience Index (RI), the RI will concentrated to resiliency of all streams in the networks and get the smallest one to be RI. This research, we find that in case of the same RI for the various designed networks need to compare which caused by the resiliency of the same stream. RI concept needs to modify for advantages. Wongsri (2004) proposed the Modified Resilience Index, MRI, be the new index to compared resiliency of networks for this case. The concept is look for the next smallest resiliency of stream and use the next smallest value to be MRI. By using the definition:

$$MRI = next \min\left\{R_{Si}\right\}$$

In order to compare the resiliency of several alternatives, if the resiliencies of the network tie, we use the next higher minimum stream resiliency values.

In this work, we need the network which resilient and save the cost for use in the real plant. Auxiliary utility installed will destroyed the different amount of disturbance. So we need to find the network, which use the smallest number of auxiliary utility and smallest size of auxiliary utility usage. Because of the more number of auxiliary utilities will be the more resiliency of the network. Then MRI will be the new index, which use in the next research for the case of the same RI.

VITA

Mr. Alongkorn Ploypaisansang was born in Kanchanaburi on 25 June 1979. Education levels are high school in 1994-1996 from Taweethapisek School, Bangkok, and Bachelor Degree of Science in Chemical Technology from Chulalongkorn University, Bangkok in 1996-2000. The last education is studying in Master Degree in Chemical Engineering, Chulalongkorn University that began in 2000.