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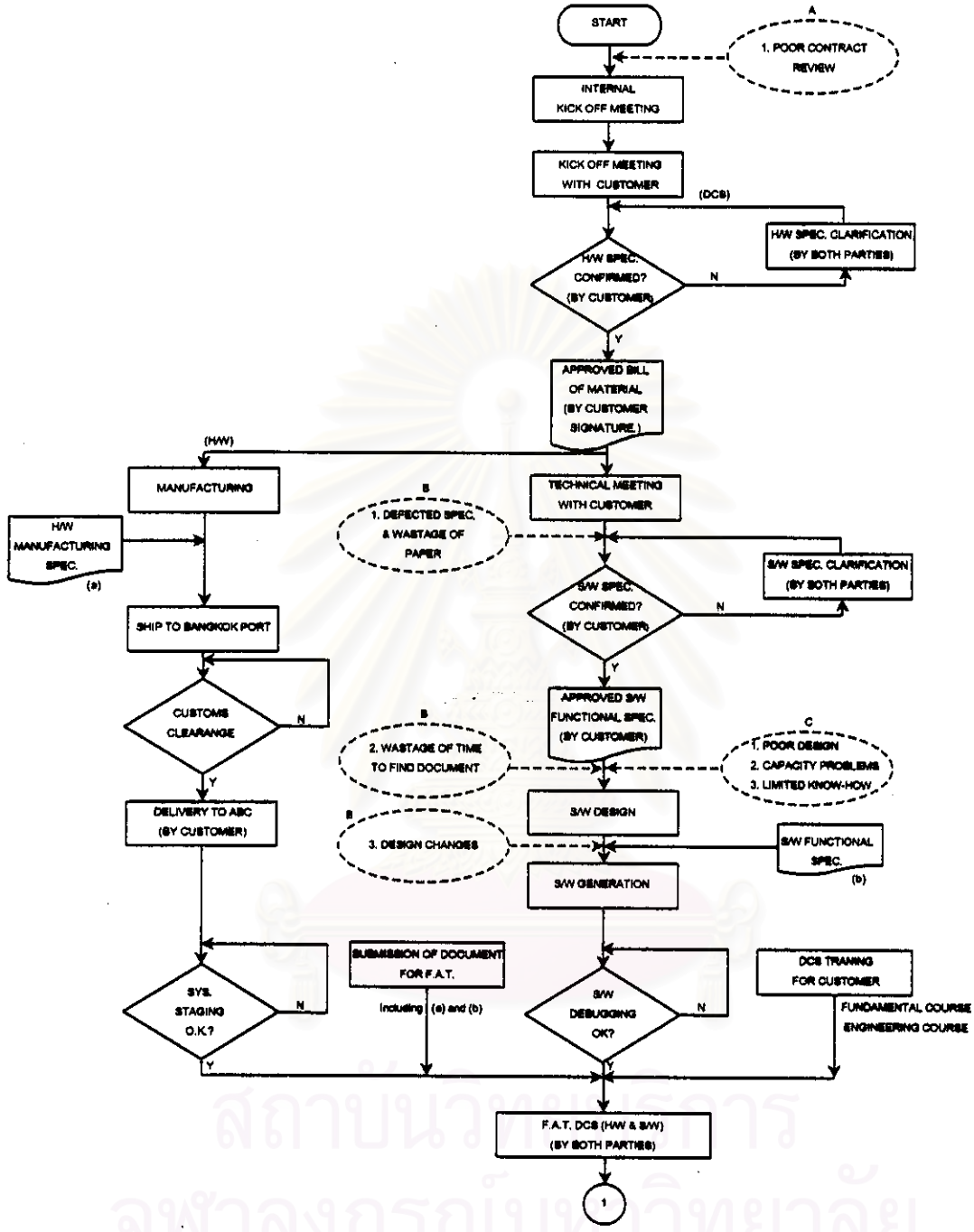
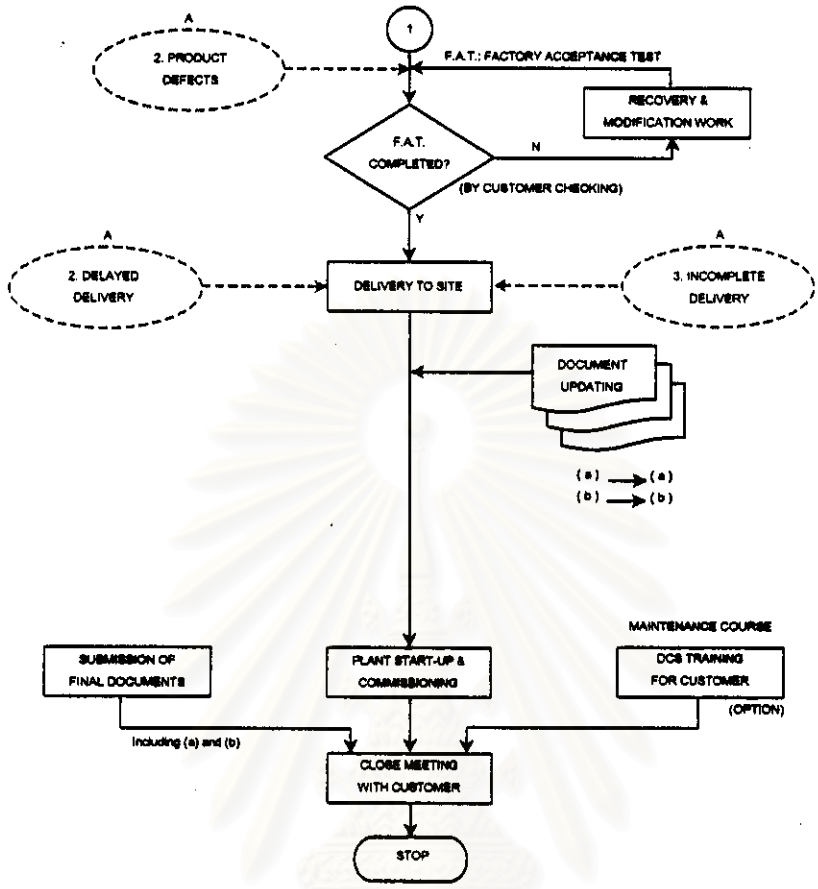
APPENDIX I

DCS PROJECT EXECUTION AND STATED PROBLEMS



NOTE:

S/W : DCS SOFTWARE
H/W : DCS HARDWARE
A : LACK OF PROCEDURES TO CONTROL THE PROJECT EXECUTION
B : LACK OF THE DOCUMENT AND DATA CONTROL
C : TECHNICAL PROBLEMS



NOTE:

S/W : DCS SOFTWARE
H/W : DCS HARDWARE
A : LACK OF PROCEDURES TO CONTROL THE PROJECT EXECUTION
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APPENDIX II

FAILURE MODE AND EFFECT ANALYSIS (FMEA)

AND

FAULT TREE ANALYSIS (FTA)

FOR DISTRIBUTED CONTROL SYSTEM PROJECT

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

Item DCS Project Process Responsibility DCS Project Process
DCS System Centum-XL Key Date 1 July 1998
Core Team 1. Sakchai 2. Pongsak 3. Sayom 4. Suniboon 5. Sayamol

FMEA Doc Number FMEA-PC-001
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Prepared By Sayom Surijamongkol
FMEA Date (Orig.) 10 June 1998
FMEA Date (Rev.) 20 December 1998

Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Internal Job Request from sales	Insufficient information receiving from sales	Lack of data to study and form the project team in EGD	2	Not enough information from customer (Technical specification)	3	None	10	60	-	-	No action	-	-	-	-
				Sales staff prepares to submit in the internal K.O.M.	7	None	10	140	Establish the formal procedure - Form - Document required	Sayom 15 Dec 98	Control Doc. D1 was implemented in RCA2 project	2	7	5	70
Data Study	Insufficient information to study	Fail to form the project team effectively	3	Not enough information from the customer - Do not know the DCS well - Give information lately	3	None	10	90	-	-	No action	-	-	-	-
Formation of the project team	The selected members are not quite suitable for the project	Take longer time to study the customer specification	2	The members who have no project are only choices for the selection	4	None	10	80	-	-	No action	-	-	-	-

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Dtec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Internal K.O.M.	Deviation between the Invitation to Bid and the contract is not discussed	Lead to the customer dissatisfaction	8	Project manager and engineers do not study the information before attend the meeting	9	None	10	720	Put the 'Prelim. Study of Internal K.O.M. Doc' in the work process	Sayamol and Sayom 15 Dec 98	Control Doc. D2 was implemented in RCA2 project	8	4	3	96
	Verbal commitments are not fully discussed	Lead to the customer dissatisfaction	5	Sales staff forgets the commitment	6	Internal K.O.M. Review Checklist	5	150	Put examples to the item 'Commitment' in the Internal K.O.M. Review Checklist	Sayamol and Sayom 15 Dec 98	Control Doc. D2 was implemented in RCA2 project	5	6	3	90
Internal K.O.M. (Kick Off Meeting)	Failure to understand all items in the Internal K.O.M. Review Checklist	Missing some information	2	Do not understand some words in the Internal K.O.M. Review Checklist	4	None	10	80	-	-	No action	-	-	-	-

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	S e v	Potential cause(s) / Mechanism(s) of Failure	O c c u r	Current Process Controls	D e t e c	R. P. N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	S e v	O c c	D e t	R. P. N.
Internal K.O.M. (Kick Off Meeting)	Do not seriously use the checklist	Missing some information	2	Do not think that the internal K.O.M. is important	4	None	10	80	-	-	No action	-	-	-	-
	Do not pro-ceed the follow-up actions for pending items	Missing some information	2	Do not think that the internal K.O.M. is important	4	None	10	80	-	-	No action	-	-	-	-
Comprehension of requisition proposal contract	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Preparation of document for customer K.O.M.	Typing errors	Rework	2	Difficult to read the engineers' handwriting and human error	5	Visual Check	3	30	-	-	No action	-	-	-	-
Set up an appointment with customer	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Dtec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Customer	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
K.O.M.															
Review data/	Failure to	Lead to the	5	Forget	7	None	10	350	To put the	Sayamol and	Control Doc.	5	3	3	45
document	check the	customer							data/document	Sayom	D3 was				
after K.O.M.	customer	dissatisfaction							verification in	15 Dec 98	implemented in				
	data/document								the work		RCA2 project				
	(any discre-								procedure						
	pancies)								Basic						
									Design Review						
									Checklist is						
									required						
	Not revise the	Difficult to	5	Do not take the	6	None	10	300	To put the	Sayamol and	Control Doc.	5	6	3	90
	project exe-	monitor and		project schedule					project exe-	Sayom	was				
	cution plan	control the		as a serious					cution plan	15 Dec 98	implemented in				
		project		matter					checking in		RCA2 project				
		effectively		Initial project					the work pro-						
		(may lead to		execution plan					cedure						
		the customer		is not specific											
		dissatisfaction)													
Technical	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
meeting															
(Input/Output															
confirmation)															

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Dec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Hardware spec design	Failure to finish the hardware spec design at a specified period	Delay to submit the hardware spec for approval	3	No planning	7	None	10	210	Planning before design, hardware design review checklist, and walkthrough list are required	Sayamol and Sayom 15 Dec 98	Control Doc. D4,D5,D6 and D7 were implemented in RCA2 project	3	4	3	36
	Input/Output quantity after design is not equal to the one specified in the bill of materials	Rework	4	Forget to check with the quantity agreed in the bill of materials (engineers forget to include spare)	5	Visual check	2	40	-	-	No action	-	-	-	-
	Over or under specify the quantity of instruction manual and software packages required	Rework	2	Do not fully understand the meaning of each instruction manual and software package	5	Visual check	2	20	-	-	No action	-	-	-	-

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Hardware spec design	Write wrong model, wrong ordering, and wrong format in the H/W spec blank form	Rework	2	Misunderstanding	6	Visual check	3	36	-	-	No action	-	-	-	-
	Typing errors	Rework	2	Human error	5	Visual check	3	30	-	-	No action	-	-	-	-
	The specified I/O card type does not match to the customer requirement	Rework	2	Misunderstanding	2	Compare with the customer requirement	2	8	-	-	No action	-	-	-	-
Submission of the hardware spec for approval	Number of document submitted for approval is not equal to the agreed number	Resend, May lead to the customer dissatisfaction	3	Do not check with the contract	3	Check with the contract	2	18	-	-	No action	-	-	-	-
Approval of the hardware spec	None														

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Dtec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Validation of the approved hardware spec	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Prepare document for DCS hardware ordering	Fill in the purchase requisition form incorrectly	Rework	1	Misunderstanding	5	Visual check	3	15	-	-	No action	-	-	-	-
	Send the document to Order Hand-ling in wrong format	Rework repeatedly, take long time to finish order requisition processing	3	No formal procedure	8	Visual check	5	120	Ordering procedure and list of required document are required	Sayamol and Sayom 15 Dec 98	Control Doc. D8 was implemented in RCA2 project	3	3	3	27
Purchase order to Singapore	Out of scope	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCS hardware manufacturing	Out of scope	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCS hardware delivered from Singapore to the company	Out of scope	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Technical meeting (control function requirement)	Misunder-standing the customer's control concept requirement	Design mistake	8	Do not study the requirement seriously and a lot of control detail is discussed in a short period	5	None	10	400	Verification of the data by senior engineer or project engineer is required	Sayamol and Sayom 15 Dec 98	implemented in RCA2 project	8	4	3	96
Software spec design	(see Design FMEA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Submission of software spec for approval	Number of document submitted for approval is not equal to the agreed number	Resend, May lead to the customer dissatisfaction	3	Do not check with the contract	3	Check with the contract	2	18	-	-	No action	-	-	-	-
Approval of the software spec	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Validation of the approved software spec	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DCS software design	(See Design FMEA)	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Monitoring of the project	Poor monitoring	Project delay and poor software design (it is designed in hurry manner)	7	Lack of the process to control project in detail	8	To ask the project members about project progress and do the monthly progress report	8	448	Walkthrough list is required to use together with the detail project schedule	Sayamol and Sayom 15 Dec 98	Control Doc. D4,D26,D27 were implemented in RCA2 project	7	4	3	84
				Do not use and follow the project schedule seriously	8	-			project progress monthly report is required						
				Project schedule is planned too general and in monthly (lack of tool to control it weekly)	8	-									

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	S e v	Potential cause(s) / Mechanism(s) of Failure	O c c u r	Current Process Controls	D e t e c	R. P. N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	S e v	O c c	D e t	R. P. N.
Monitoring of the project	Poor monitoring	Project delay and poor software design (it is designed in hurry manner)	7	Monthly progress report is varied from project to project and it is not specific	8	To ask the project members about project progress and do the monthly progress report	8	448	see page 9 of 16	Sayamol and Sayom 15 Dec 98	Control Doc. D4,D26,D27 were implemented in RCA2 project	7	4	3	84
Application of the staging area	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Software generation (Graphic)	Typing errors	Rework	3	Human error, the document for generation is not clear, and misunderstanding	6	Visual check (screen or printing paper)	3	54	-	-	No action	-	-	-	-
	Missing items	Rework	3												
	Mis-allocation of items	Rework	3												

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

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Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Dtec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Software generation (Graphic)	No consistency on the same items of different pages	Rework	3	Human error, the document for generation is not clear, and misunderstanding	6	Visual check (screen or printing paper)	3	54	-	-	No action	-	-	-	-
	Wrong align-ment of line, and arrows	Rework	3						-	-	No action	-	-	-	-
	Resolution effects	Rework	3						-	-	No action	-	-	-	-
	Wrong priority setting	Rework	3						-	-	No action	-	-	-	-
	Item overlap	Rework	3						-	-	No action	-	-	-	-
(DDC)	Typing errors at the I/O address, tag number, tag comment, and instrument ranges	Rework	4	Human error, unclear document	6	Visual check (screen or printing paper)	3	72	-	-	No action	-	-	-	-
(Sequence)	Typing errors	Rework	4	Human error, unclear document	6	Visual check (screen or printing paper)	3	72	-	-	No action	-	-	-	-

POTENTIAL
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Check the generated software	Errors exist but they cannot be found	Errors in debugging stage	3	Human errors	4	None (errors are found in debugging stage)	3	36	-	-	No action	-	-	-	-
DCS software debugging	Not enough time to debug all software	Uncompleted software and customer dissatisfaction	7	Poor monitoring and control the project leads to short time in debugging stage	7	Senior engineer to help system engineer debugging software	8	392	Walkthrough list, correction list or punch list, debugging review check-list, and software media handling procedure are required	Sayamol and Sayom 15 Dec 98	Control Doc. D4,D17,D18 D19 were implemented in RCA2 project	7	3	3	63
	Don't perform the integrated function test			No suitable form to list all errors and remind to correct them											
	Do not check the DCS hardware according to the F.A.T. procedure			No formal procedure for all projects											
	Do not test all possible conditions in software functional spec														

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DCS software debugging	Errors found are forgotten to correct	see previous page													
Preparation of the F.A.T. procedure	Typing errors	Rework	3	Human errors	3	Visual check	2	18	-	-	No action	-	-	-	-
Submission of the F.A.T. procedure document	Late to submit the document to the customer for their study and approval	Customer to study the document at the F.A.T. period (waste time)	2	No planning	4	None	10	80	-	-	No action	-	-	-	-
Factory Acceptance Test (F.A.T.) and recovery work	Fail to conduct the customer to test and finish at the specified time	Customer is compelled to accept the hardware and software test	6	F.A.T. period is too short Poor control	6	Follow the F.A.T. procedure	3	108	Follow the F.A.T. procedure with the F.A.T. schedule carefully	Sayamol and Sayom 15 Dec 98	implemented in RCA2 project	6	4	3	72

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	Uncompleted software	Customer dissatisfaction	8	Software is not debugged completely	7	Senior engineers to help system engineers modify and debug software	6	336	Internal F.A.T. is required (Internal inspection records and punch lists)	Sayamol and Sayom 15 Dec 98	implemented in RCA2 project	8	2	2	32
Acceptance of hardware and software	Customers do not accept the hardware and software	Re-F.A.T. and rework	8	Uncompleted software	7	None	10	560	Same above and certificate of completion is required	Sayamol and Sayom 15 Dec 98	Control Doc. D21 was implemented in RCA2 project	8	2	2	32
Prepare DCS for delivery	Some hardware items are forgotten to deliver to site	To deliver the missing items again	5	The hardware items are kept in hurry manner	6	Visual check	4	120	Pre-delivery review checklist is required	Sayamol and Sayom 15 Dec 98	Control Doc. D22 was implemented in RCA2 project	5	2	2	20
	Do not complete the F.A.T. punch items	To continue doing the punch items at office and go to load the software later	3	The time after F.A.T completion to delivery date is short	7	None	10	210	Internal F.A.T. is required (Internal inspection records and punch lists)	Sayamol and Sayom 15 Dec 98	implemented in RCA2 project	3	4	2	24

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

Item DCS Project Process Responsibility DCS Project Process
DCS System Centum-XL Key Date 1 July 1998
Core Team 1. Sakchai 2. Pongsak 3. Sayom 4. Suniboon 5. Sayamol

FMEA Doc Number FMEA-PC-001
Page 15 of 16
Prepared By Sayom Surijamongkol
FMEA Date (Orig.) 10 June 1998
FMEA Date (Rev.) 20 December 1998

Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	S e v	Potential cause(s) / Mechanism(s) of Failure	O c c u r	Current Process Controls	D e t e c	R. P. N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
											Actions Taken	S e v	O c c	D e t	R. P. N.
Handover of hardware and software to admin for delivery	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Delivery to site	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Inform about shipment completion	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
External invoice	Out of scope	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Final document preparation	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Submission of the final document	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Installation/ startup and commissioning	Out of scope	-	-	-	-	-	-	-	-	-	-	-	-	-	-

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (PROCESS FMEA)

Item DCS Project | Process Responsibility DCS Project Process
DCS System Centum-XL | Key Date 1 July 1998
Core Team 1. Sakchai 2. Pongsak 3. Sayom 4. Suniboon 5. Sayamol

FMEA Doc Number FMEA-PC-001
Page 16 of 16
Prepared By Sayom Surijamongkol
FMEA Date (Orig.) 10 June 1998
FMEA Date (Rev.) 20 December 1998

Process Function and Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Project review	The important points are forgotten to write in the job summary records (e.g. specially written software)	Service engineers do not know these important points It takes time to remember or study these points	2	Engineers do not think that this process is important	6	To remind engineers verbally	7	84	-	-	No action	-	-	-	-
As-built document preparation	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Submission of the as-built document	None	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Criteria for FMEA Process

Severity (S) Evaluation Criteria

Effect	Criteria	Ranking
Hazardous Effect	Hazardous effect. Safety-related -- sudden failure. Noncompliance with government regulation.	10
Serious Effect	Potential hazardous effect. Able to stop product without mishap; safety-related ; time-dependent failure. Disruption to subsequent process operations. Compliance with government regulation is in jeopardy.	9
Extreme Effect	Customer very dissatisfied. Extreme effect on process; equipment damaged. Product inoperable but safe. System inoperable.	8
Major Effect	Customer dissatisfied. Major effect on process; rework/repairs on part necessary. Product/process performance severely affected but functionable and safe. Subsystem inoperable.	7
Significant Effect	Customer experiences discomfort. Product/process performance degraded, but operable and safe. Nonvital part inoperable.	6
Moderate Effect	Customer experiences some dissatisfaction. Moderate effect on product/ process performance. Fault on nonvital part requires repair.	5
Minor Effect	Customer experiences minor nuisance. Minor effect on product/process performance. Fault does not require repair. Nonvital fault always noticed.	4
Slight Effect	Customer slightly annoyed. Slight effect on product or process performance. Nonvital fault noticed most of the time.	3
Very Slight Effect	Customer more likely will not notice the failure. Very slight effect on product/ process performance. Nonvital fault noticed sometimes.	2
No Effect	No effect on product or subsequent processes.	1

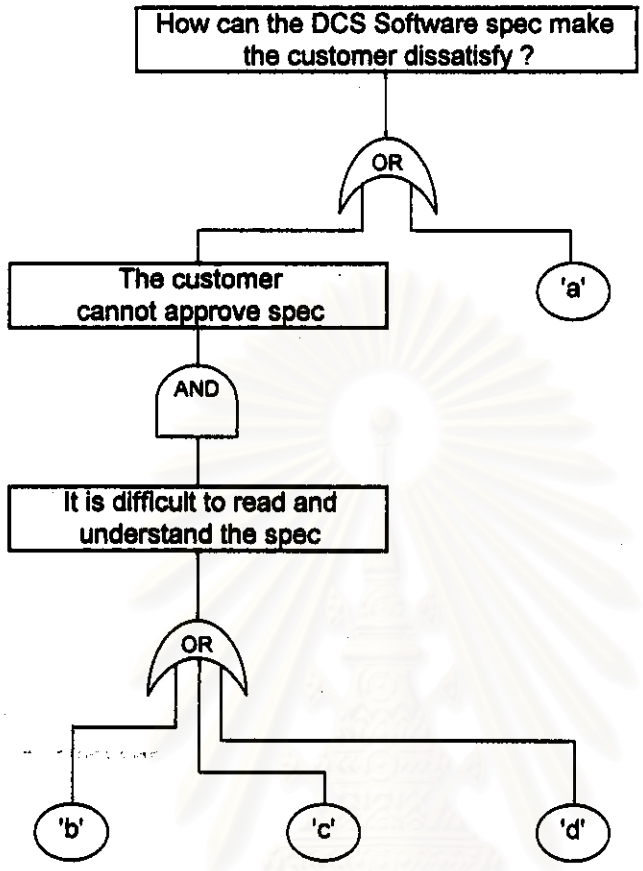
Occurrence (O) Evaluation Criteria

Occurrence	Criteria	Ranking
Almost Certain	Failure almost certain. History of failures exists from previous or similar design	10
Very High	Very high number of failures likely.	9
High	High number of failures likely.	8
Moderately High	Frequent high number of failures likely.	7
Medium	Moderate number of failures likely.	6
Low	Occasional number of failures likely.	5
Slight	Few failures likely.	4
Very Slight	Very few failures likely.	3
Remote	Rare number of failures likely.	2
Almost never	Failure unlikely. History shows no failures.	1

Detection (D) Evaluation Criteria

Occurrence	Criteria	Ranking
Almost Impossible	No known controls available to detect the failure.	10
Remote	Remote likelihood current controls will detect the failure.	9
Very Slight	Very slight likelihood current controls will detect the failure.	8
Slight	Slight likelihood current controls will detect the failure.	7
Low	Low likelihood current controls will detect the failure.	6
Medium	Medium likelihood current controls will detect the failure.	5
Moderately High	Moderately high likelihood current controls will detect the failure.	4
High	Good likelihood current controls will detect the failure.	3
Very High	Very high likelihood current controls will detect the failure.	2
Almost Certain	Current controls almost always will detect the failure. Reliable detection controls are known and used in similar processes.	1

Fault Tree Analysis for the DCS Software Specification Design



'a' = Typing errors

'b' = No relationship of the switch used between pages of the software spec.

'c' = The command used in the flowchart is the machine code. The customer does not understand it.

'd' = The customer does not understand the abbreviations used in the spec.

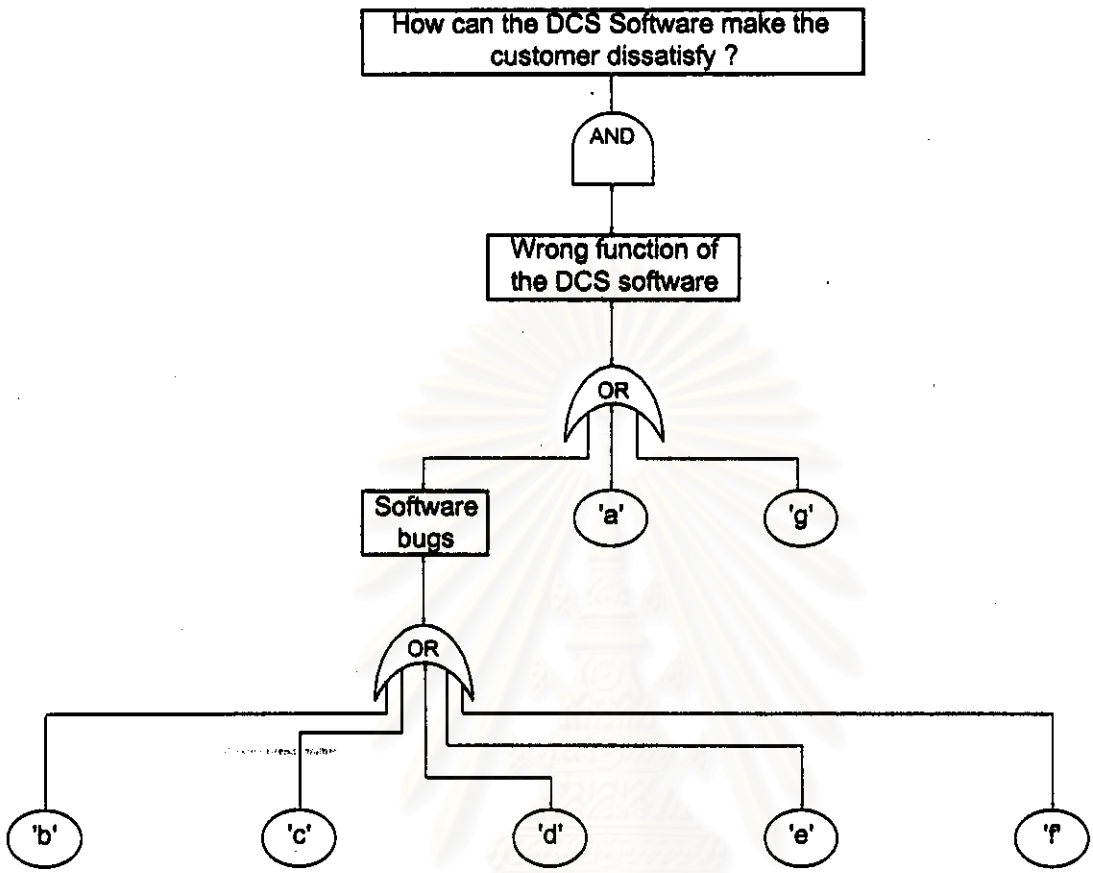
POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (DESIGN FMEA)

Item Software Spec Design Process Responsibility Software Specification Design Process
DCS System Centum-XL Key Date 1 July 1998
Core Team 1. Sakchai 2. Pongsak 3. Sayom 4. Suniboon 5. Sayamol

FMEA Doc Number FMEA-DS-001
Page 1 of 1
Prepared By Sayom Surijamongkol
FMEA Date (Orig.) 10 June 1998
FMEA Date (Rev.) 20 December 1998

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Easy to read and approve the software spec	No relationship of the switch used between pages of the spec	Difficult to read	6	No standard form for software spec has been established	8	None	10	480	Standard software spec, planning, software spec design review checklist, and walkthrough list are required	Suniboon and Sayom 15 Dec 98	Control Doc. D4,D9,D10,D11, and D12 were implemented in RCA2 project	6	3	4	72
	The command used in the flowchart is the machine code	The customer do not understand	7					560	Same as above	Same as above	Same as above	7	3	4	84
	The abbrevia-tion used have no explanation	The customer does not understand	6					480	Same as above	Same as above	Same as above	6	3	4	72
	Inconsistency between the software spec of each project	Inconsisten-cies	5					400	Same as above	Same as above	Same as above	5	3	4	60
	Typing errors	Rework	3	Human errors	5	Visual check	2	30	-	-	No action	-	-	-	-

Fault Tree Analysis for the DCS Software Design



'a' = Not fulfil the customer's requirements

'b' = Poor software structure (e.g. sequence table structure)

'c' = Mis-use of the software modules (e.g. using stepless instead of the step in the sequence table)

'd' = Use wrong buffers for sending data (e.g. data sending to batch report)

'e' = Typing errors

'f' = Engineers design software in hurry manner

'g' = Customer changes the approved specification

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (DESIGN FMEA)

Item Software Design Process Responsibility Software Design Process
DCS System Centum-XL Key Date 1 July 1998
Core Team 1. Sakchai 2. Pongsak 3. Sayom 4. Suniboon 5. Sayamol

FMEA Doc Number FMEA-DS-002
Page 1 of 2
Prepared By Sayom Surijamongkol
FMEA Date (Orig.) 10 June 1998
FMEA Date (Rev.) 20 December 1998

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Perform the functions according to the customer's requirement	Poor software structure	Difficult to do the software modification	7	No experience	6	None	10	420	Standard structure, tool, walkthrough list, planning and software design review checklist are required	Suniboon and Sayom 15 Dec 98	Control Doc. D4,D13,D14,D15 and D16 were implemented in RCA2 project	7	6	5	210
	Mis-use of the software modules	Mis-function, rework	7	Do not study the instruction manual (IM)	5	Debug	2	70	-	-	No action	-	-	-	-
	Use wrong buffers for sending data	Mis-function	8	Using many buffers without buffer list or spec	4	None	10	320	Buffers to be used must be put in the software spec	Same as above	Same as above	8	4	2	64
	Typing errors	Rework	6	Human errors	5	Visual check	3	90	-	-	No action	-	-	-	-
	Engineers design s/w in hurry manner	Software bugs, rework	6	Human errors	5	Debug	2	60	-	-	No action	-	-	-	-
	Not fulfil the customer's requirements	Rework	8	Short technical meeting period Misunderstand the customer's concepts	5	None	10	400	Verification of the software design is put in the work process	Same as above	Same as above	8	4	5	160

POTENTIAL
FAILURE MODE AND EFFECTS ANALYSIS (DESIGN FMEA)

Item Software Design | Process Responsibility Software Design Process
DCS System Centum-XL | Key Date 1 July 1998
Core Team 1. Sakchai 2. Pongsak 3. Sayom 4. Suniboon 5. Sayamol

FMEA Doc Number FMEA-DS-002
Page 2 of 2
Prepared By Sayom Surijamongkol
FMEA Date (Orig.) 10 June 1998
FMEA Date (Rev.) 20 December 1998

Item / Function	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Potential cause(s) / Mechanism(s) of Failure	Occur	Current Process Controls	Dec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results: Actions Taken	Sev	Occ	Det	R.P.N.
Perform the functions according to the customer's requirement	Customer changes the approved spec	Re-design	8	Customer changes control concept	5	None	10	400	Change order procedure and form are required	Suniboon and Sayom 15 Dec 98	Control Doc. D15 was implemented in RCA2 project	8	3	4	96

Criteria for FMEA Design

Severity (S) Evaluation Criteria

Effect	Criteria	Ranking
Hazardous without warning	Very high severity ranking when a potential failure mode affects safe DCS control operation and/or involves noncompliance with government regulation without warning.	10
Hazardous with warning	Very high severity ranking when a potential failure mode affects safe DCS control operation and/or involves noncompliance with government regulation with warning.	9
Very High	DCS control operation inoperable, with loss of primary function.	8
High	DCS control operation operable, but at reduced level of performance. Customer dissatisfied.	7
Moderate	DCS control operation operable, but comfort/convenience item(s) inoperable. Customer experiences discomfort.	6
Low	DCS control operation operable, but comfort/convenience item(s) operable at reduced level of performance. Customer experiences some dissatisfaction.	5
Very Low	Small item does not conform. Defect noticed by most customers.	4
Minor	Small item does not conform. Defect noticed by average customer.	3
Very Minor	Small item does not conform. Defect noticed by discriminating customer.	2
None	No effect.	1

Occurrence (O) Evaluation Criteria

Occurrence	Possible Failure Rates	Ranking
Very High:Failure is almost inevitable	> 1 in 2	10
	1 in 3	9
High:Repeated failures	1 in 8	8
	1in 20	7
Moderate: Occasional failures	1 in 80	6
	1 in 400	5
Low: Relatively few failures	1in 2,000	4
	1 in 15,000	3
Remote: Failure is unlikely	1 in 150,000	2
	< 1 in 1,500,000	1

Detection (D) Evaluation Criteria

Detection	Criteria	Ranking
Absolute Uncertainty	Design control will not and/or can not detect a potential cause/mechanism and subsequent failure mode; or there is no design control.	10
Very Remote	Very remote chance the design control will detect a potential cause/mechanism and subsequent failure mode	9
Remote	Remote chance the design control will detect a potential cause/mechanism and subsequent failure mode.	8
Very Low	Very low chance the design control will detect a potential cause/mechanism and subsequent failure mode.	7
Low	Low chance the design control will detect a potential cause/mechanism and subsequent failure mode.	6
Moderate	Moderate chance the design control will detect a potential cause/mechanism and subsequent failure mode.	5
Moderately High	Moderately high chance the design control will detect a potential cause/mechanism and subsequent failure mode.	4
High	High chance the design control will detect a potential cause/mechanism and subsequent failure mode.	3
Very High	Very high chance the design control will detect a potential cause/mechanism and subsequent failure mode.	2
Almost Certain	Design control will almost certainly detect a potential cause/mechanism and subsequent failure mode.	1

APPENDIX III

THE STANDARDS, PROCEDURES, AND GUIDELINES FOR DISTRIBUTED CONTROL SYSTEM PROJECT (DOCUMENT D1 TO D28)

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

DCS PROJECT REQUEST FORM

(D1)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D1-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

Filename : D1_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

INTERNAL K.O.M. REVIEW CHECKLIST

(D2)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

BASIC DESIGN REVIEW CHECKLIST

(D3)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [6]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D3-001	1	2	0

Filename : D3_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

WALK THROUGH LIST PROCEDURE AND FORM

(D4)

TOTAL NO. OF PAGES [5]

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

H/W SPEC DESIGN PLANNING SHEET

(D5)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [3]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D5-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

INPUT ENGINEERING DOCUMENT CHECKLIST FOR HARDWARE SPEC DESIGN

(D6)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [2]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D6-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

H/W SPEC DESIGN REVIEW CHECKLIST

(D7)

PARTICIPANTS

REVIEWED BY	: _____
DATE	: _____

TOTAL NO. OF PAGES [2]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D7-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

ORDERING PROCEDURE

(D8)

TOTAL NO. OF PAGES [4]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
		ABC-D8-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

S/W SPEC DESIGN PLANNING SHEET

(D9)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [4]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D9-001	1	2	0

Filename : D9_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

INPUT ENGINEERING DOCUMENT CHECKLIST FOR SOFTWARE SPEC DESIGN

(D10)

PARTICIPANTS

REVIEWED BY : _____
DATE : _____

TOTAL NO. OF PAGES [2]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D10-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

STANDARD SOFTWARE SPECIFICATION FOR SYSTEM ENGINEERING GUIDELINE

(D11)

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

S/W SPEC DESIGN REVIEW CHECKLIST

(D12)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [6]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D12-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

S/W DESIGN PLANNING SHEET

(D13)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [2]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D13-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

INPUT ENGINEERING DOCUMENT CHECKLIST FOR SOFTWARE DESIGN

(D14)

PARTICIPANTS

REVIEWED BY	:	
DATE	:	

TOTAL NO. OF PAGES [2]

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

CHANGE ORDER FORM

(D15)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D15-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

Filename : D15_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

S/W DESIGN REVIEW CHECKLIST

(D16)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

TOTAL NO. OF PAGES [6]

	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
ABC (THAILAND) LTD.		ABC-D16-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

S/W MEDIA HANDLING PROCEDURE

(D17)

TOTAL NO. OF PAGES [5]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D17-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

PUNCH LIST FORM

(D18)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
		ABC-D18-001	1	2	0

Filename : D18_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

DEBUGGING REVIEW CHECKLIST

(D19)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

INTERNAL INSPECTION RECORDS

(D20)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D20-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

Filename : D20_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

CERTIFICATE OF THE FAT COMPLETION

(D21)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D21-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

PRE-DELIVERY REVIEW CHECKLIST

(D22)

PARTICIPANTS

REVIEWED BY : _____

DATE : _____

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

FINAL SAVE PROCEDURE

(D23)

TOTAL NO. OF PAGES [3]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
		ABC-D23-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

DOCUMENT AND DATA CONTROL SYSTEM

(D24)

TOTAL NO. OF PAGES [14]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D24-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

DOCUMENT SCHEDULE

(D25)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D25-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

Filename : D25_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

DETAIL PROJECT SCHEDULE

(D26)

TOTAL NO. OF PAGES [5]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D26-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

Filename : D26_1.doc

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

PROJECT PROGRESS MONTHLY REPORT

(D27)

TOTAL NO. OF PAGES [4]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO :	SHT NO.	CONT'D SHT NO.	REV
		ABC-D27-001	1	2	0

CUSTOMER : _____

END USER : _____

PROJECT NAME / NO. : _____

NOTICE OF JOB MILESTONE

(D28)

TOTAL NO. OF PAGES [2]

ABC (THAILAND) LTD.	DOCUMENT APPROVED BY :	DOC NO : ABC-D28-001	SHT NO. 1	CONT'D SHT NO. 2	REV 0

Filename : D28_1.doc

APPENDIX IV

ENGINEERING DATABASE POOL (EDP)

ENGINEERING DATABASE POOL (EDP)

The Engineering Database Pool (EDP) is a software application written for using in the engineering department of the ABC Company. The purpose of the EDP is to serve as a place for database sharing between engineers in the department. The EDP stores the engineering knowledge of the department and the DCS software applications of the past DCS projects. Therefore engineers can enhance their engineering knowledge and also can reuse the software that matches to their requirement for their current DCS project without to redesign the programme again. As a result, the duration of the DCS design process in long term should decrease.

The software is written with the programming language called 'LEVEL 5 OBJECT'. The LEVEL 5 OBJECT is an expert system application development tool that integrates object-oriented techniques and expert system technology with traditional, procedural programming. The 'LEVEL 5 OBJECT' is copyrighted by the Information Builders, Inc., New York (http://www.rulemachines.com/).

There are several graphic panels of the engineering database pool. The panel overviews of the EDP and its relationship between pages are shown on the figure below.

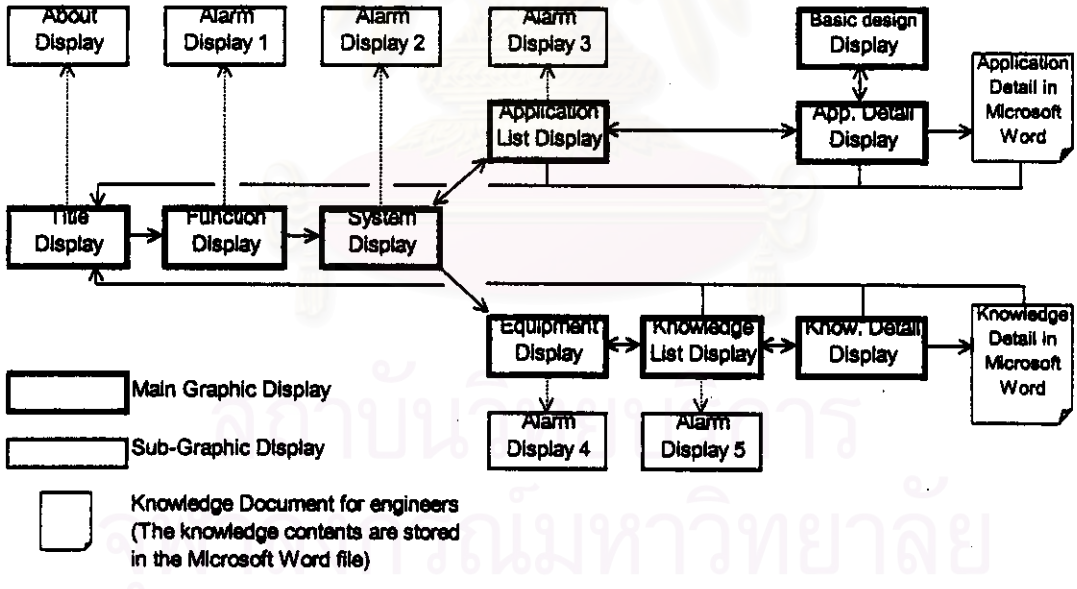


Figure IV-1 EDP Display Relationship

From the figure above, there are nine main graphic displays and six sub-graphic displays. The arrow in the figure represents the connection between panels. The arrow with both head and tail means users can forward to next graphic panels or return to the previous graphic panels whereas the arrow at one end means users can link to another display only in one direction. Each main and sub-graphic display is shown on the following page.

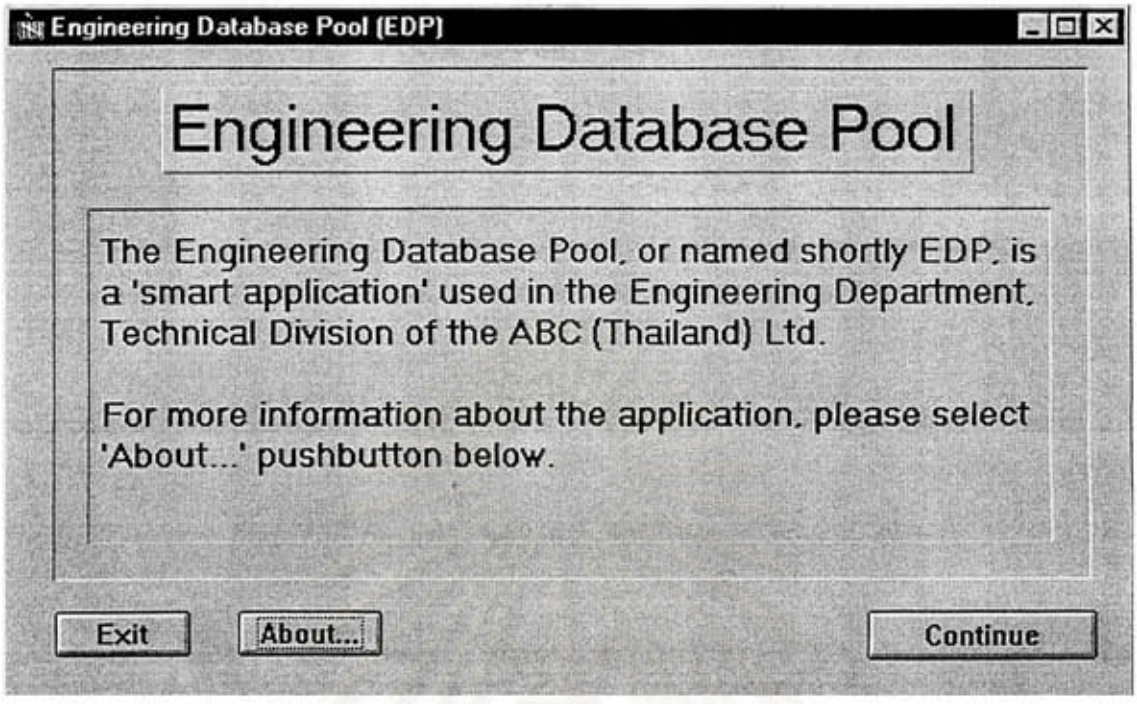


Figure IV-2 Title Display

Figure IV-3 About Display

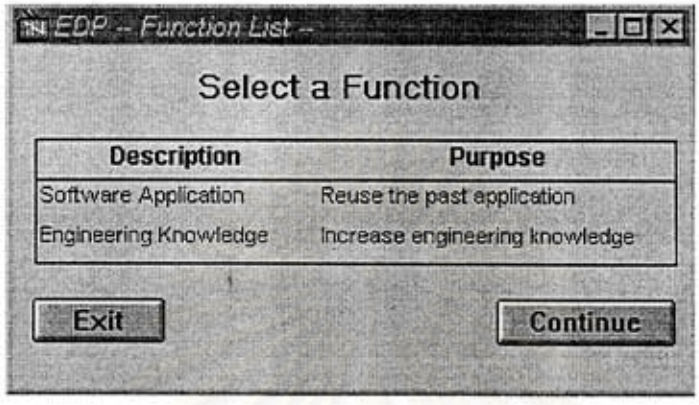


Figure IV-4 Function Display

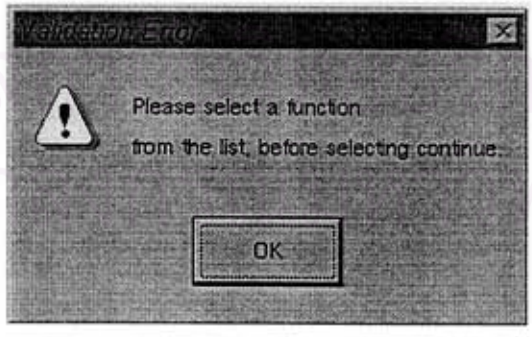


Figure IV-5 Alarm Display 1

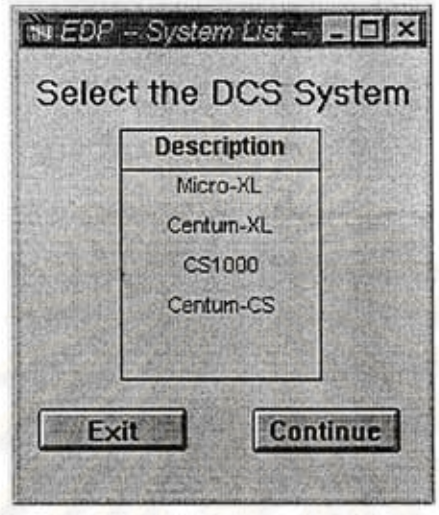


Figure IV-6 System Display

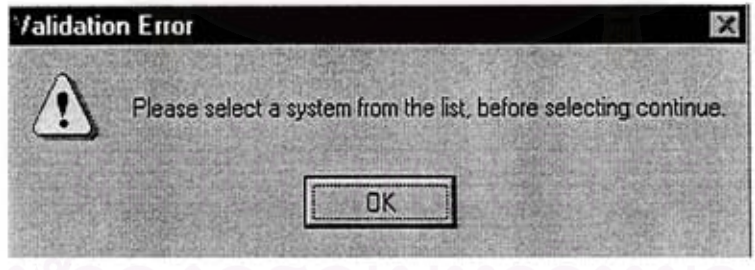


Figure IV-7 Alarm Display 2

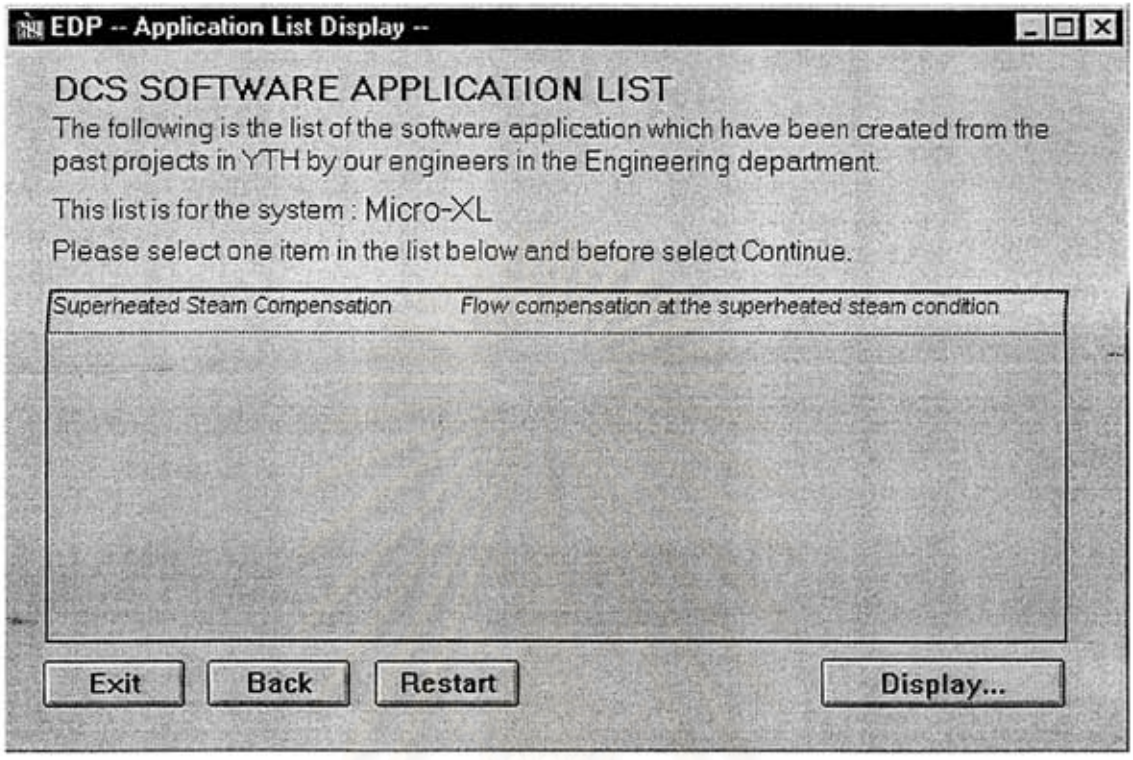


Figure IV-8 Application List Display

Figure IV-9 Alarm Display 3

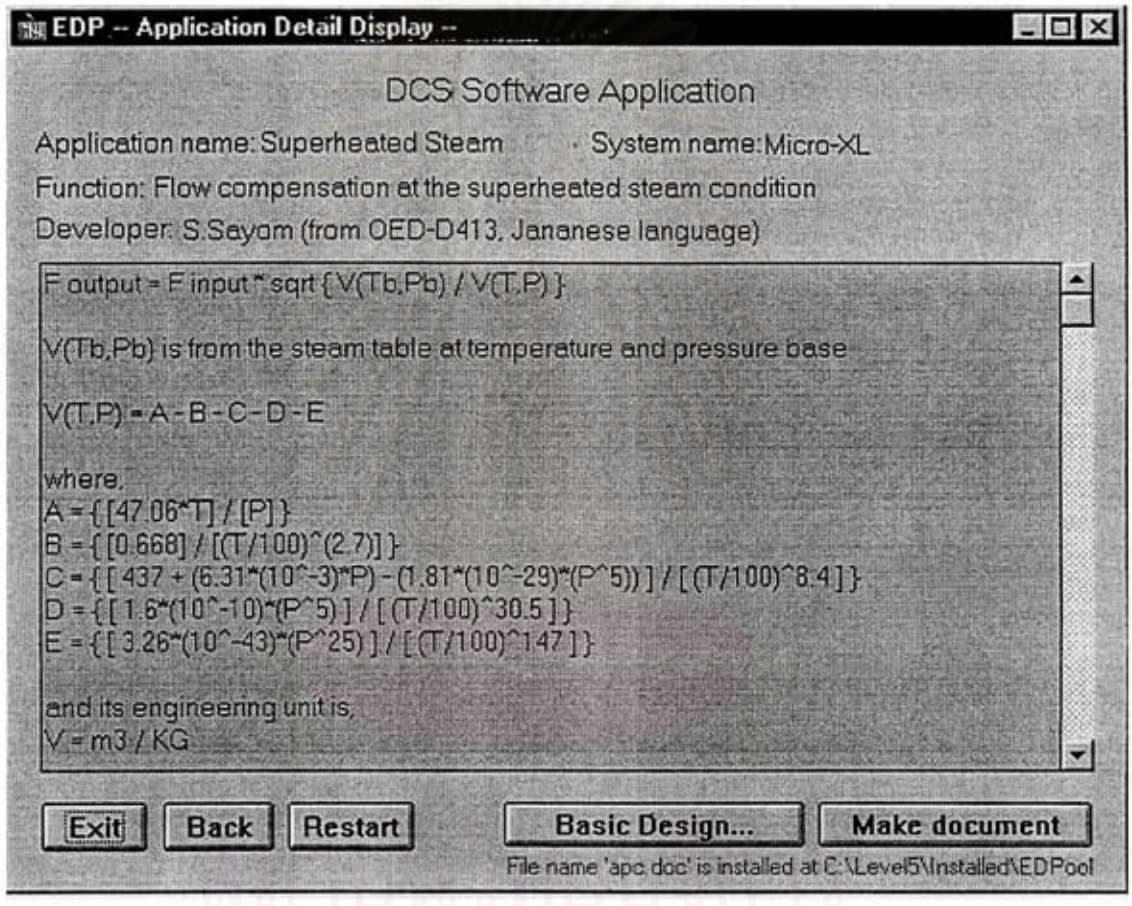


Figure IV-10 Application Detail Display

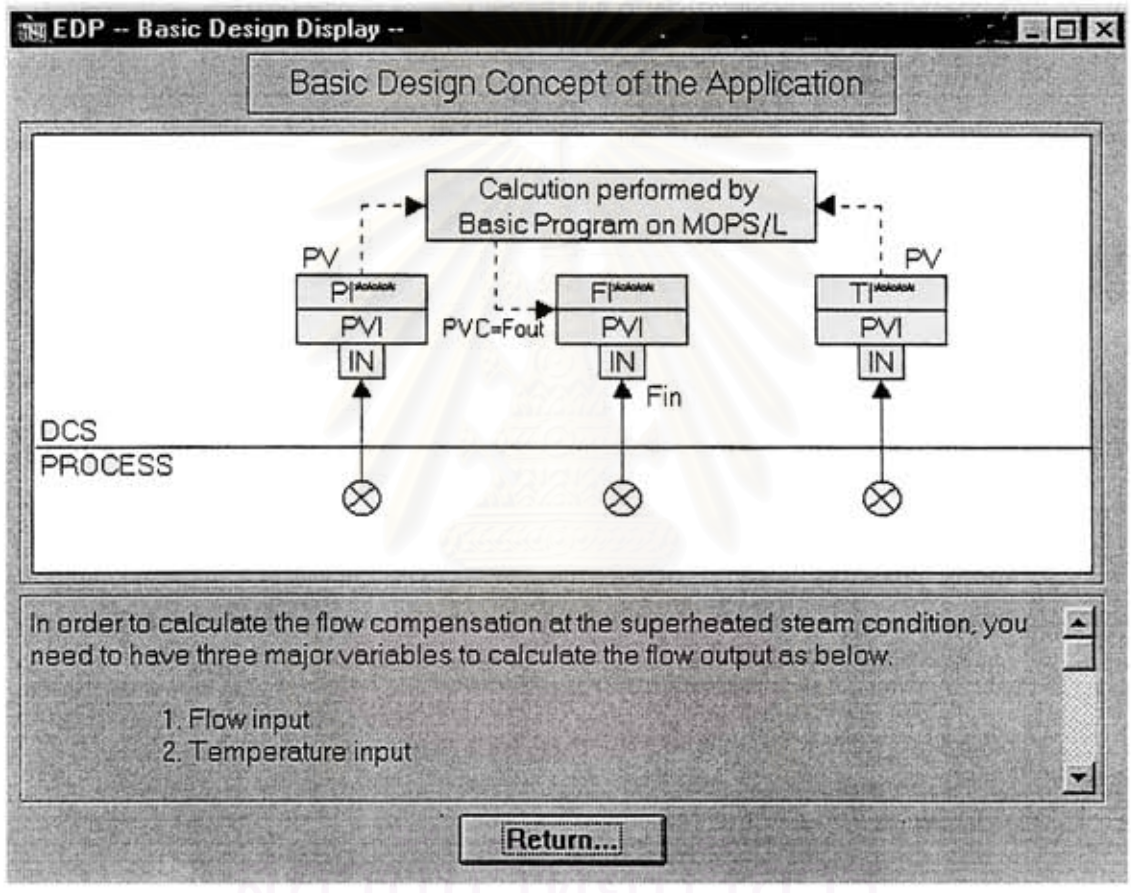


Figure IV-11 Basic Design Display

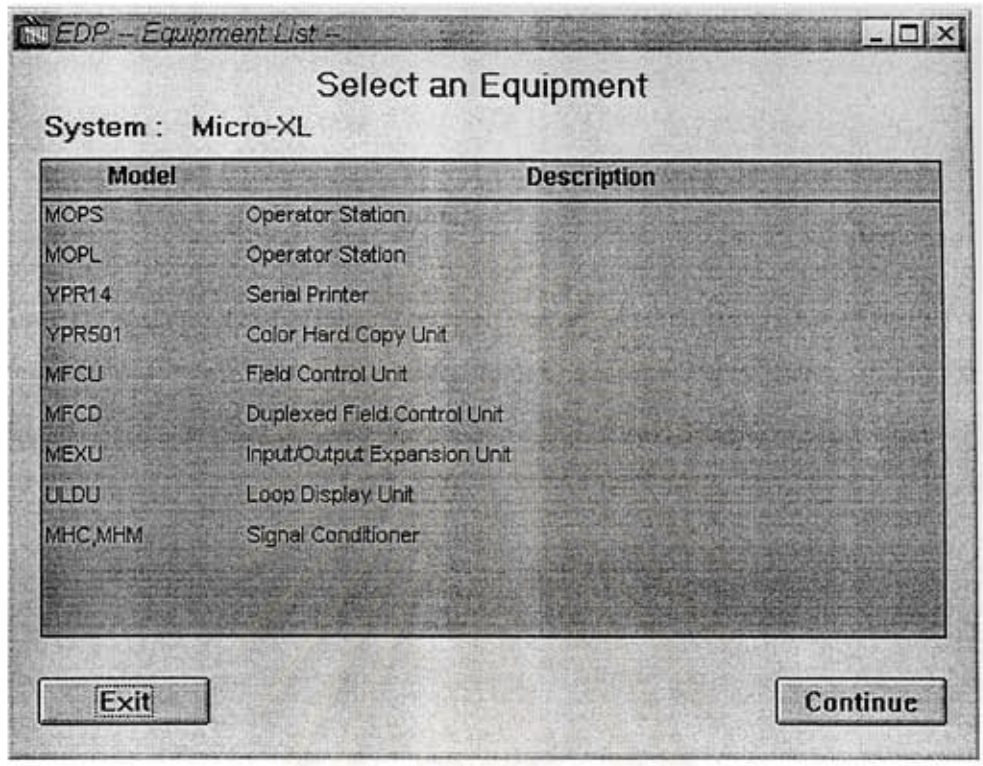


Figure IV-12 Equipment Display

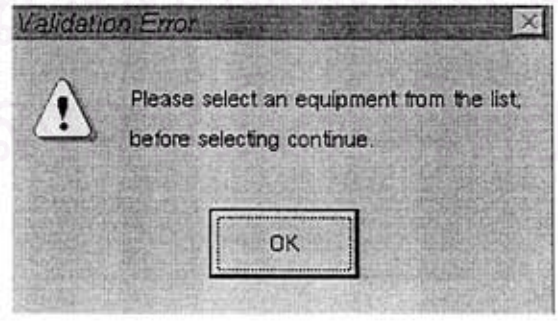


Figure IV-13 Alarm Display 4

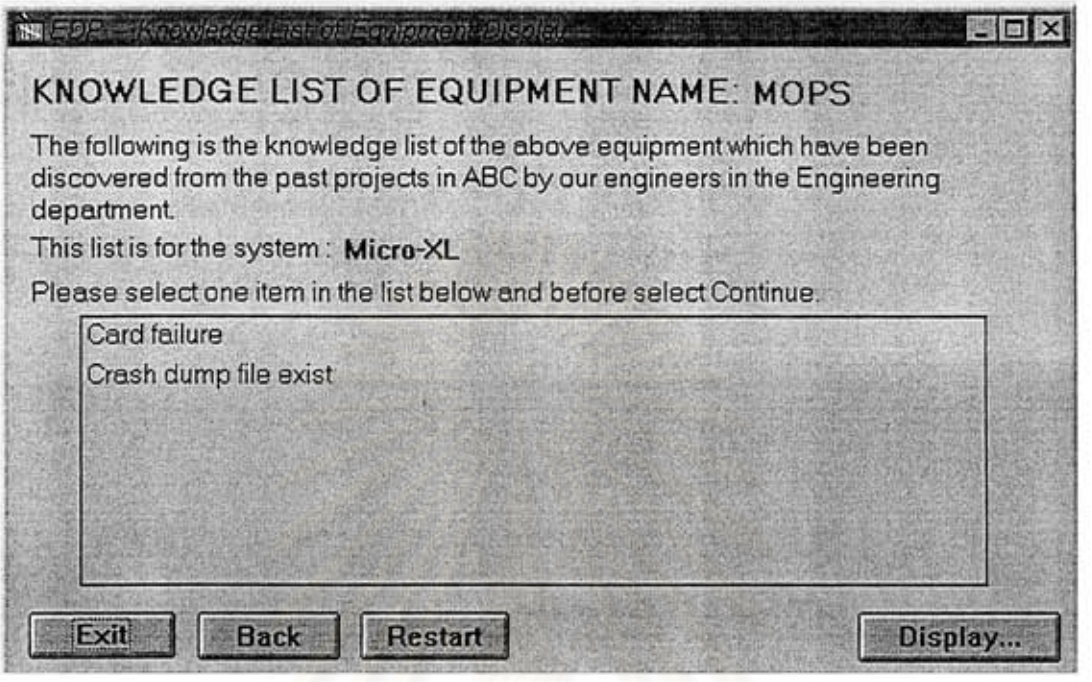


Figure IV-14 Knowledge List Display

Figure IV-15 Alarm Display 5

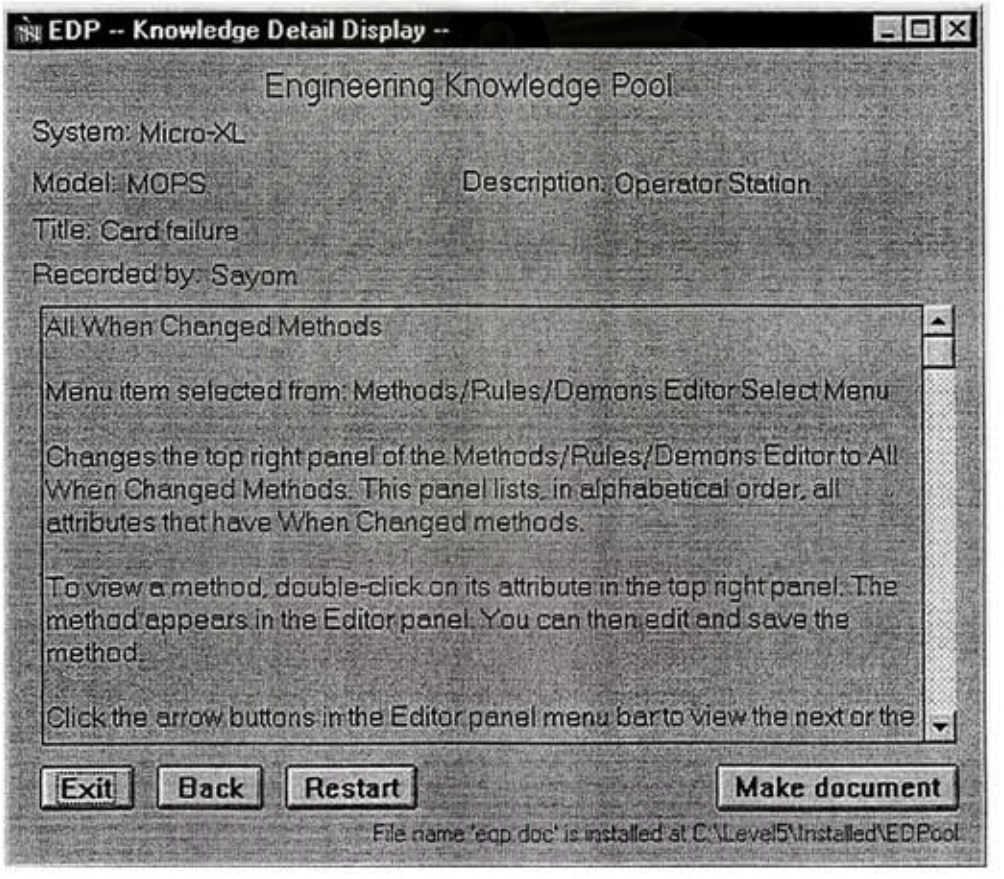


Figure IV-16 Knowledge Detail Display

APPENDIX V

EXAMPLES OF THE CONTROL DOCUMENT IMPLEMENTED IN RCA2 PROJECT

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 17 August 1998

Walk-Through List No : 001

Date Of Next Walk-Through : 24 August 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To study the Flow compensation concept and give the explanation to K.Duangporn	18 Aug. 98 (till 12 PM)	Sayamol	*O.K. 27 Aug. 98*	*Sayom 28 Aug. 98*
1.2	To study the concept of HCl Systhesis Unit (Including giving the explanation to K. Duangporn)	19 Aug. 98	Sayamol	*O.K. 27 Aug. 98*	*Sayom 28 Aug. 98*
1.3	To study the concept of the 2nd Brine Purification.	21 Aug. 98	Sayamol	*75 % completed (waiting for S/W package)*	*Sayom 28 Aug. 98*
2.1	To generate the DDC loops and one basic program of the flow compensation.	18 Aug. 98	Duangporn	*O.K. 27 Aug. 98*	*Sayom 28 Aug. 98*
2.2	To study and generate the input alarm	19 Aug. 98	Duangporn	*O.K. 25 Aug. 98*	*Sayom 28 Aug. 98*
2.3	To study and generate the on/off control pump.	20 Aug. 98	Duangporn	*O.K. 26 Aug. 98*	*Sayom 28 Aug. 98*
2.4	To study and generate the CO-0501, and SP-0503	21 Aug. 98	Duangporn	*O.K. 25 Aug. 98*	*Sayom 28 Aug. 98*
3.1	To complete the relay spec.	17 Aug. 98	Rattanasak	*O.K. 20 Aug. 98 (18-19 Aug. 98 did the shutdown job (ICI)*	*Sayom 25 Aug. 98*
3.2	To complete the interposing relay spec.	20 Aug. 98	Rattanasak	*O.K. 26 Aug. 98*	*Sayom 31 Aug. 98*
3.3	To complete the marshaling spec-1st part	24 Aug. 98	Rattanasak	*Still working*	*Sayom 28 Aug. 98*

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2

Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 24 August 1998

Walk-Through List No : 002

Date Of Next Walk-Through : 31 August 1998

Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To start design (worksheet entry) for S/D matrix	28 Aug. 98	Sayamol	***Still working***	***Sayom 31 Aug. 98***
2.1	To study liquid chlorine process	25 Aug. 98	Duangporn	***O.K. 25 Aug. 98***	***Sayom 31 Aug. 98***
2.2	To study and generate HCl synthesis process	28 Aug. 98	Duangporn	***O.K. 25 Aug. 98***	***Sayom 31 Aug. 98***
3.1	Continue to complete the interposing relay spec	26 Aug. 98	Rattanasak	***O.K. 31 Aug. 98***	***Sayom 31 Aug. 98***
3.2	To complete the marshaling spec-2 parts	31 Aug. 98	Rattanasak	***Still working (K.Nuchsara also helped him)***	***Sayom 31 Aug. 98***

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 31 August 1998

Walk-Through List No : 003

Date Of Next Walk-Through : 7 September 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To continue the S/D matrix design	4 Sep. 98	Sayamol	***Still working (attend the meeting on 1-2 Sep.98)***	***Sayom 7 Sep. 98***
2.1	To generate and test 2nd Brine	4 Sep. 98	Duangporn	***Waiting for S/W package***	***Sayom 7 Sep. 98***
3.1	To complete the marshaling spec	4 Sep. 98	Rattanasak	***Still working (attend the meeting on 1-2 Sep.98)***	***Sayom 7 Sep. 98***

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 7 September 1998

Walk-Through List No : 004

Date Of Next Walk-Through : 14 September 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	RCA1 S/W modification both graphic and sequence table. (S/D matrix of RCA2 is pending, to be done next week)	11 Sep. 98	Sayamol	***Additional job***	***Sayom 14 Sep. 98***
2.1	To complete HCl and Liquid Cl2 and test	8 Sep. 98	Duangporn	***O.K. 8 Sep. 98***	***Sayom 14 Sep. 98***
2.2	To start graphic generation	11 Sep. 98	Duangporn	***Still working***	***Sayom 14 Sep. 98***
3.1	To complete the marshaling spec.	7 Sep. 98	Rattanasak Nuchsara	***Still working (facing problems of document revised by customer)***	***Sayom 14 Sep. 98***

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2

Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 14 September 1998

Walk-Through List No : 005

Date Of Next Walk-Through : 21 September 1998

Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To continue worksheet entry for S/D matrix	18 Sep. 98	Sayamol	***Currently, 85 % design completion, and 15 % generation***	***Sayom 21 Sep. 98***
2.1	To continue graphic generation	18 Sep. 98	Duangporn	***Still working Now, 28 of 43 pages finished***	***Sayom 21 Sep. 98***
3.1	To continue the marshaling spec.	18 Sep. 98	Rattanasak	***Still working (Problems of revised document heavily affected to the marshaling spec.)***	***Sayom 21 Sep. 98***

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 21 September 1998

Walk-Through List No : 006

Date Of Next Walk-Through : 28 September 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To continue worksheet entry for S/D matrix	27 Sep. 98	Sayamol	***Still working***	***Sayom 28 Sep. 98***
2.1	To continue graphic generation and start MMI	25 Sep. 98	Duangporn	***Still working***	***Sayom 28 Sep. 98***
3.1	To finish revising the panel document.	27 Sep. 98	Rattanasak	***Still working***	***Sayom 28 Sep. 98***

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 28 September 1998

Walk-Through List No : 007

Date Of Next Walk-Through : 5 October 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To continue worksheet entry for S/D matrix	2 Oct. 98	Sayamol	*O.K. 2 Oct. 98*	*Sayom 5 Oct. 98*
2.1	To finish graphic generation and MMI	2 Oct. 98	Duangporn	*O.K. 2 Oct. 98*	*Sayom 5 Oct. 98*
3.1	To finish revising the panel document.	2 Oct. 98	Rattanasak	*O.K. 2 Oct. 98*	*Sayom 5 Oct. 98*

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 5 October 1998

Walk-Through List No : 008

Date Of Next Walk-Through : 12 October 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To check %AN of the shutdown matrix and revise to the functional spec	5 Oct. 98	Sayamol	*O.K. 5 Oct. 98*	*Sayom 12 Oct. 98*
1.2	To generate the calculation (sum, diff, and average) for the graphic	6 Oct. 98	Sayamol	*O.K. 6 Oct. 98*	*Sayom 12 Oct. 98*
1.3	To study and generate Logging	9 Oct. 98	Sayamol	*Still working*	*Sayom 12 Oct. 98*
2.1	To debug the graphic	9 Oct. 98	Duangporn	*Still working*	*Sayom 12 Oct. 98*
3.1	To check the panel document and control sub-contractor mounting the equipment to cubicles	9 Oct. 98	Rattanasak	*Still working*	*Sayom 12 Oct. 98*

Sheet 1 Of 1

Walk-Through List

Project Name : Thasco-RCA2 Job Number : D8SJN-001

Attendance : M/S Sayamol (1), Duangporn (2), and Rattanasak (3)

Date : 12 October 1998

Walk-Through List No : 009

Date Of Next Walk-Through : 19 October 1998 Reviewed By : Sayom

S/No.	Items To Be Done	Due Date	Person In Charge	Remarks	Checked By /Date
1.1	To continue generating Logging	16 Oct. 98	Sayamol	*Still working*	*Sayom 19 Oct. 98*
2.1	To continue debugging the graphic	16 Oct. 98	Duangporn	*Still working*	*Sayom 19 Oct. 98*
3.1	To continue checking the panel document and controlling sub-contractor mounting the equipment to cubicles	16 Oct. 98	Rattanasak	*Still working*	*Sayom 19 Oct. 98*

PUNCH LIST FORM (D18)

FOR ( ) DEBUGGING (X) INTERNAL F.A.T. ( ) F.A.T.

Written by: Sayamol/Ooy
Witnessed by: Sayom
Date: 29~30 Oct 98

S/No.	Punch Item	Cause *	Resolution	Action by	Date of Completion	Checked by (ABC)	Acknowledged (Client)
1	To put %SW0023.PV = 1 at action of the sequence table, execute every second (Station 11 and 12)	A	Put it at %ST001 of both stations	Ooy	29-Oct-98	Sayom	-
2	Calculation of the electrolizer that relates to graphic page 115 has to provide 2 sets: 1. For current use (2 cells) 2. For future use (3 cells)	M	The function is done in two sequence table. One for current use, the other for future use. To change from 2 to 3 cells, scan on/off setting at ENGS is required	Sayamol	10-Nov-98	Sayom	-
3	IOP function of tag EDI*** and EI*** should be set to 'NO' (not check IOP)	O	Done	Sayamol	30-Oct-98	Sayom	-
4	EOPS station no.28, alarm message is 'tag overflow'.	O	Re-assign number of required tag of station 4 and 5: 16000 tags/one EOPS	Sayamol	30-Oct-98	Sayom	-
5	Prepare spare sheet of DDC loop for station 11 and 12 at least one sheet	A	Done	Ooy	4-Nov-98	Sayom	-
6	Prepare logic sequence for SIREN and BUZZER1 function	D	The function is done sequence table	Sayamol	11-Nov-98	Sayom	-
7	Prepare the compensation calculation of H2SO4 (UI)	A	The calculation is done in basic program named RCA2CALC: run at task 6	Sayamol	10-Nov-98	Sayom	-
8	Adding timer in shutdown logic	M	Done	Sayamol	9-Nov-98	Sayom	-
9	Prepare tag no of 2nd Brine filter and timer for graphic	D	The tags for EFGW have already been prepared	Sayamol	5-Nov-98	Sayom	-
10	Prepare Logging doc	A	Done	Sayamol	6-Nov-98	Sayom	-

Legend * D: Deviation M: Modification A: Addition O: Others

Filename: pl-001

PUNCH LIST FORM (D18)

FOR ( ) DEBUGGING (X) INTERNAL F.A.T. ( ) F.A.T.

Written by: Sayamol/Ooy
Witnessed by: Sayom
Date: 4~5 Nov 98

S/No.	Punch Item	Cause *	Resolution	Action by	Date of Completion	Checked by (ABC)	Acknowledged (Client)
11	Swap I/O address of FI0603 and FI0602	M	FI0603: V-5-5-13	Ooy	10-Nov-98	Sayom	-
	Current address is:		FI0602: V-5-5-12				
	FI0603: V-5-5-12						
	FI0602: V-5-5-13						
12	To change control action of following	D	Correction has been made at:	Ooy	11-Nov-98	Sayom	-
	tags:						
	AIC0107A REV to DIR		DDC003				
	AIC0107B DIR to REV		DDC003				
	AIC0301 REV to DIR		DDC003				
	AIC0303 REV to DIR		DDD004				
	LIC0103 DIR to REV		DDC011				
	LIC0321 REV to DIR		DDC011				
	LIC0503 REV to DIR		DDC011				
	PIC0502 REV to DIR		DDC007				
	PIC0504 REV to DIR		DDC007				
	TIC0331B REV to DIR		DDC021				
	TIC0332B REV to DIR		DDC021				
	PIC0604 REV to DIR		DDC034				
13	To change output processing of	D	Correction has been made at:	Ooy	11-Nov-98	Sayom	-
	following tags:						
	PIC0502 DIR to REV		DDC007				
	PIC0505 DIR to REV		DDC017				
	PIC0803 DIR to REV		DDC018				
	PIC0804 DIR to REV		DDC016				
	PDIC0520 DIR to REV		DDC026				
	FIC0706 DIR to REV		DDC029				
	PIC0603 DIR to REV		DDC032				
	PIC0604 DIR to REV		DDC034				

Legend * D: Deviation M: Modification A: Addition O: Others

PUNCH LIST FORM (D18)

FOR ( ) DEBUGGING (X) INTERNAL F.A.T. ( ) F.A.T.

Written by: Sayamol/Ooy
Witnessed by: Sayom
Date: 6~9 Nov 98

S/No.	Punch Item	Cause *	Resolution	Action by	Date of Completion	Checked by (ABC)	Acknowledged (Client)
14	To put FS0303 and its sequence logic (Refer page 10, Cell Feed Brine PH control)	D	Done	Sayamol	6-Nov-98	Sayom	-
15	Graphic page 101,102,103 when we touched OUTPUT, it didn't connect to graphic page 105 and touched INPUT, it didn't connect to page 104	M	Done	Sayamol	6-Nov-98	Sayom	-
16	11SW1010 should be reset at %CL116	M	Add PV(11SW1010)=0 at %CL116	Sayamol	6-Nov-98	Sayom	-
17	Duplicating text at DDC048 at tag no 11BD002.J04	M	Done	Ooy	9-Nov-98	Sayom	-
18	To correct DDC CALC of FI0603 at sheet no DDC034, second line from 6.000 to be 10.0	M	Done	Ooy	9-Nov-98	Sayom	-
19	The summation of A+B+C+... in %CL020 should be kept in buffer ranging from 0.0 to 240.0, otherwise the sum would clamp at 128. Problems of FI0311B~FI0316B	M	Done	Sayamol	10-Nov-98	Sayom	-
20	FI0311A~FI0316A range should be changed to 0.0~20.0, not 0~20	M	Done	Ooy	9-Nov-98	Sayom	-
21	FI0311B~FI0316B range should be changed to 0.0~40.0, not 0~40	M	Done	Ooy	9-Nov-98	Sayom	-

Legend * D: Deviation M: Modification A: Addition O: Others

PUNCH LIST FORM (D18)

FOR ( ) DEBUGGING (X) INTERNAL F.A.T. ( ) F.A.T.

Written by: Sayamol/Ooy
Witnessed by: Sayom
Date: 9-Nov-98

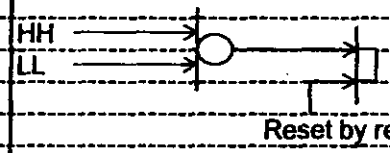
S/No.	Punch Item	Cause *	Resolution	Action by	Date of Completion	Checked by (ABC)	Acknowledged (Client)
22	EI0311~EI0313 have problems when	D	Done	Sayamol	10-Nov-98	Sayom	-
	EI0311=80%, EI0312=75%, and						
	EI0313=60%						
	The DIFF should be 63, not 62						
23	II0301=60%, II0302=55%, and	D	Done	Sayamol	10-Nov-98	Sayom	-
	II0303=42%						
	The TOTAL should be 31.4, not 30.0						
24	II0301=59%, II0302=45%, and	D	Done	Sayamol	10-Nov-98	Sayom	-
	II0303=72%						
	The TOTAL should be 35.3, not 30.0						
25	EDI03511~EDI03518, range should be	M	Done	Ooy	9-Nov-98	Sayom	-
	0.0~50.0, not 0~50						
26	Similar to previous item, this applies to	M	Done	Ooy	9-Nov-98	Sayom	-
	EDI03521~EDI03528						
	EDI03531~EDI03538						
	EDI03541~EDI03548						
	EDI03551~EDI03558						
	EDI03561~EDI03568						
	Range should have one digit after						
	decimal						
27	Functional Spec page 13, SV(FIC0701)	M	Done	Ooy	10-Nov-98	Sayom	-
	should be PV(FIC0701)						
28	Correct divide scale of UI0511	M	Done	Sayamol	10-Nov-98	Sayom	-

Legend * D: Deviation M: Modification A: Addition O: Others

PUNCH LIST FORM (D18)

FOR ( ) DEBUGGING (X) INTERNAL F.A.T. ( ) F.A.T.

Written by: Sayamol/Ooy
Witnessed by: Sayom
Date: 9-12 Nov 98

S/No.	Punch Item	Cause *	Resolution	Action by	Date of Completion	Checked by (ABC)	Acknowledged (Client)
29	To put reset %SW in sequence table (its action in the sequence table should be " ,H" and must have "N") Correct at:11ST113, and 11ST114	M	Done	Sayamol	10-Nov-98	Sayom	-
30	To correct %ST change ",H" to ",L" Correct at:11ST119, 11ST120, 11ST121 and 11ST122	M	Done	Sayamol	10-Nov-98	Sayom	-
31	FI0312B uses wrong address V-3-5-11 should be V-3-5-13 and FI0314B: V-3-5-12 should be V-3-5-14	D	Done	Sayamol	11-Nov-98	Sayom	-
32	Delete unnecessary timer in main S/D	M	Done	Sayamol	12-Nov-98	Sayom	-
33	To add this following function: 	A	Done	Sayamol	12-Nov-98	Sayom	-
34	To check page 9/12 in checksheet which has already revised instrument's ranges with the hardware spec with was commented by customer before do any revision	O	Done	Sayamol	12-Nov-98	Sayom	-

Legend * D: Deviation M: Modification A: Addition O: Others

Filename: pl-001

PUNCH LIST FORM (D18)

FOR ( ) DEBUGGING (X) INTERNAL F.A.T. ( ) F.A.T.

Written by: Sayamol/Ooy
Witnessed by: Sayom
Date: 13 Nov 98

S/No.	Punch Item	Cause *	Resolution	Action by	Date of Completion	Checked by (ABC)	Acknowledged (Client)
35	At graphic page 115, when cell 5 or 6 is IOP, the PV should be black	M	Done	Ooy	13-Nov-98	Sayom	-
36	FI8621's engineering unit should be KG/HR	D	Done	Ooy	13-Nov-98	Sayom	-
37	The modification of H0300B in graphic page 103 should be corrected	M	Done	Sayamol	13-Nov-98	Sayom	-

Legend * D: Deviation M: Modification A: Addition O: Others

Filename: pl-001

BIOGRAPHY

Mr. Sayom Surijamongkol was born on 12 February 1970 in Bangkok, Thailand. He graduated a Bachelor degree in Electronics Engineering with the second class honors from King Mongkut's Institute of Technology Ladkrabang (KMIT'L) since 1992. He has joined with a global company, which specialises in control, measurement, and instrumentation. He has experienced in the DCS application software development and DCS project management about seven years till now (1999).