

FPL Generating System EFOR % Impact By Designated Plant System 1984 - 1987

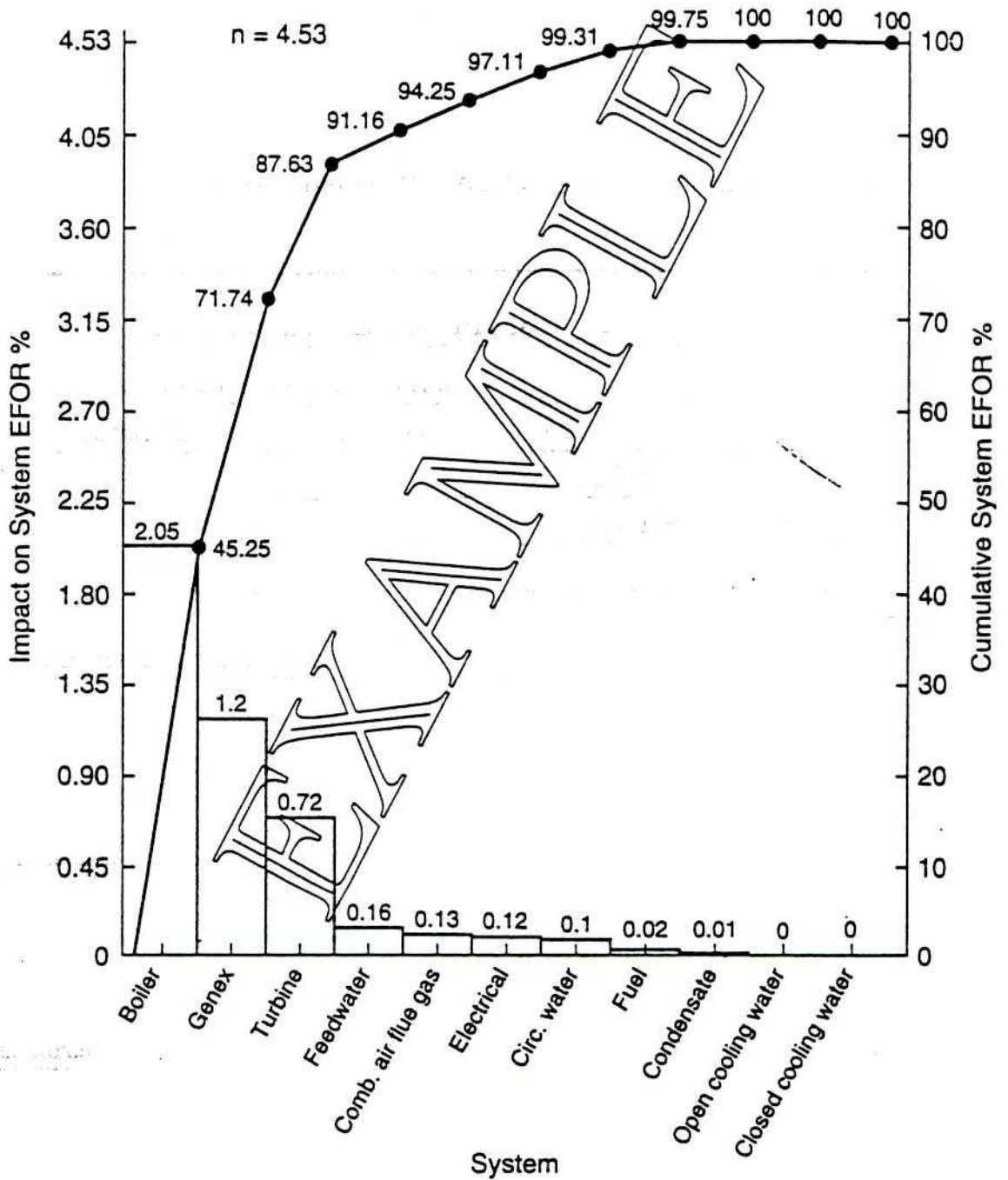
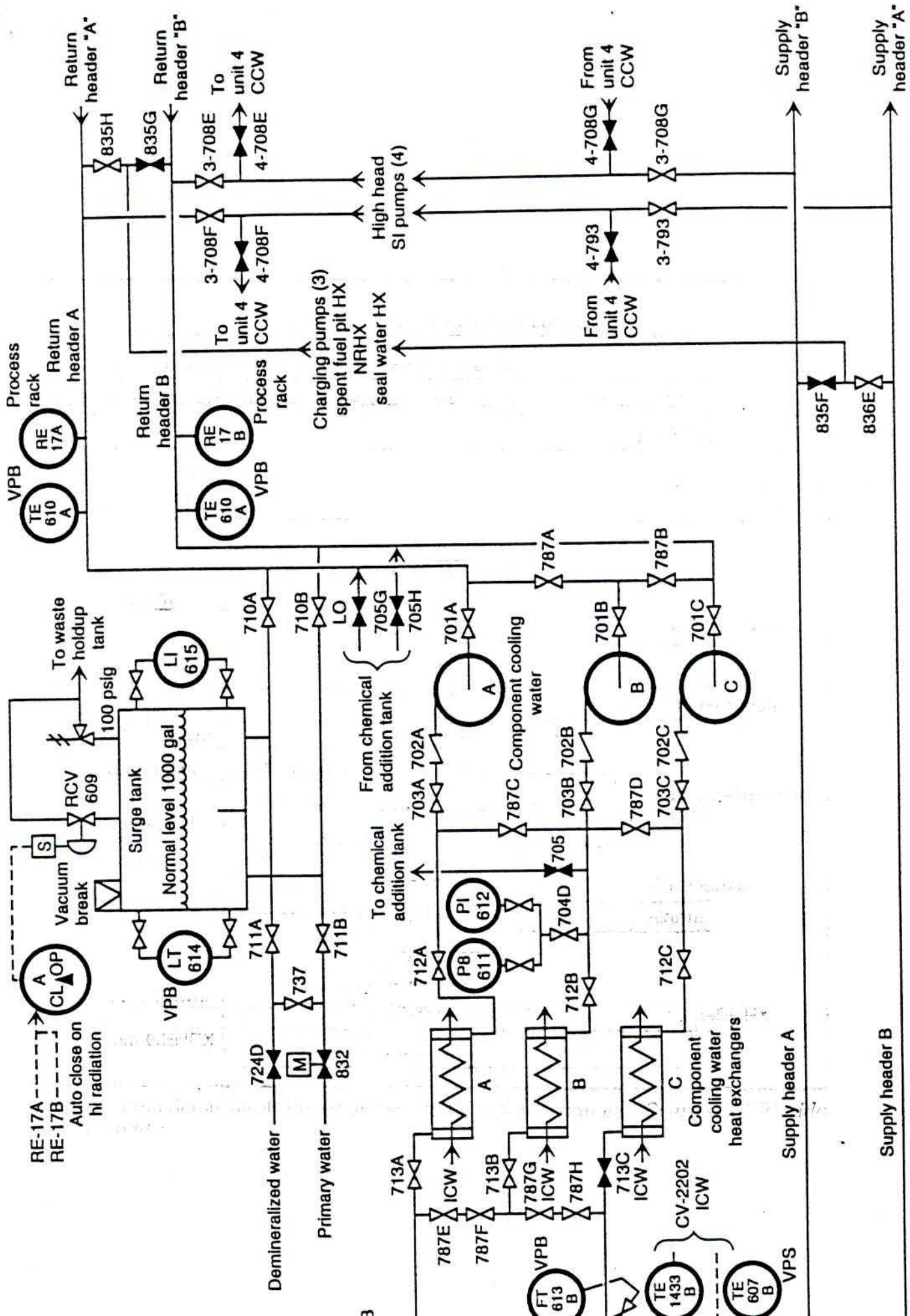


Figure 5.1 Typical EFOR Pareto diagram. (Courtesy of Florida Power & Light.)



Component cooling water P&ID.

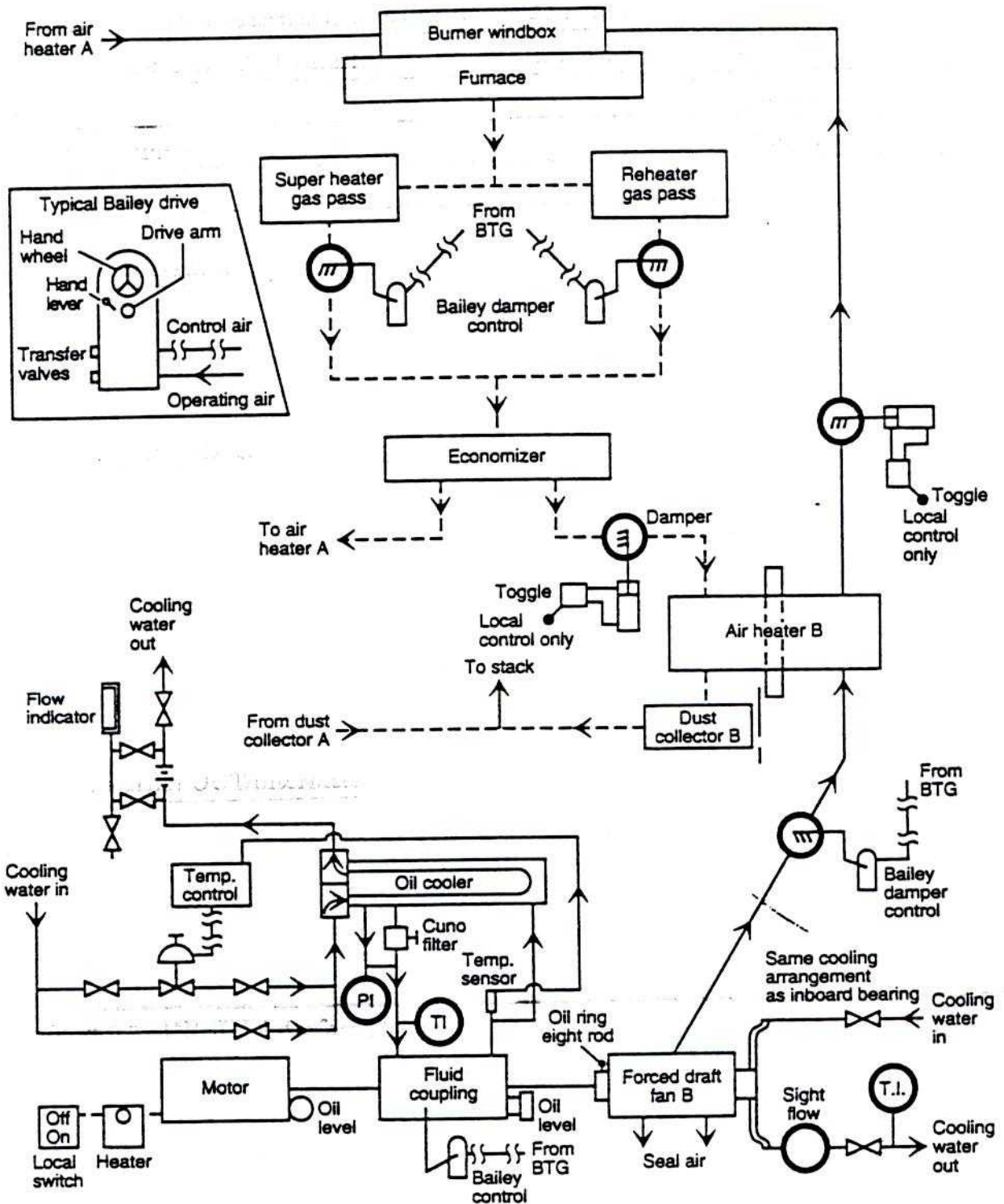


Figure 5.3 Typical system schematic. (Courtesy of Florida Power & Light.)

RCM—Systems Analysis Process		
Step 2-1: System boundary definition		
Information: Boundary overview	Rev. no.: 0	Date: September 10, 1991
Plant: IEC Sayreville		Plant ID: IECS
System name: Condenser and air removal		System ID: ACC
Analysts: Smith, Worthy		
<p><u>1. Major equipment included:</u></p> <ul style="list-style-type: none"> Fans, tube modules, and all associated ductwork Vacuum deaerator and associated equipment Condenser receiver tank Hogging and two-stage holding air ejectors <p><u>2. Primary physical boundaries:</u></p> <p>Start with:</p> <ul style="list-style-type: none"> Steam turbine exhaust flange Outlet of steam bypass desuperheaters Inlet side of condensate makeup valves H.P. steam supply to air removal system <p>Terminate with:</p> <ul style="list-style-type: none"> Condensate outlet of condenser receiver tank Air vent to atmosphere <p><u>3. Caveats of note:</u></p> <ul style="list-style-type: none"> Air removal here refers only to condensate water delivered to suction side of condensate pumps (not deaeration of feedwater). This system does not include condensate pump. Condensate pump minimum flow considers only ejector condenser function, not condensate pump protection or gland steam condenser function. 		

Figure 5.4 System boundary definition—overview with typical example. (Courtesy of Westinghouse.)

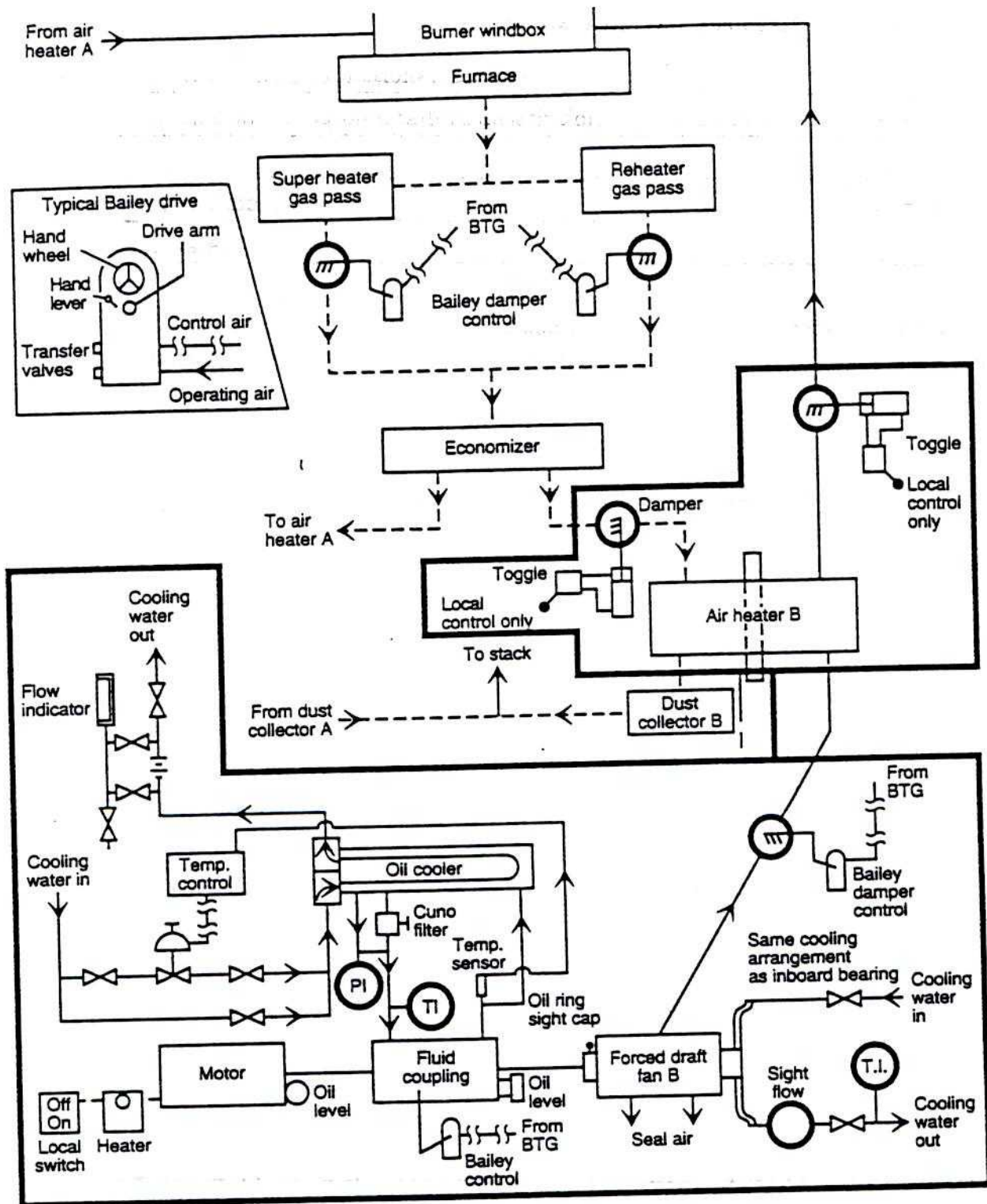


Figure 5.6 Typical system schematic indicating system boundaries. (Courtesy of Florida Power & Light.)

RCM—Systems Analysis Process		
Step 3: System description/functional block diagram		
Information: System description	Rev. no.:	Date:
Plant:		Plant ID:
System name:		System ID:
Analysts:		
<ol style="list-style-type: none"> <li style="margin-bottom: 20px;"><u>1. Functional description/key parameters</u> <li style="margin-bottom: 20px;"><u>2. Redundancy features</u> <li style="margin-bottom: 20px;"><u>3. Protection features</u> <li style="margin-bottom: 20px;"><u>4. Key instrumentation features (e.g., control)</u> 		

Figure 5.7 System description form.

RCM—Systems Analysis Process

Step 3: System description/functional block diagram

Information: Functional block diagram

Rev. no.: 0

Date: 5/21/91

Plant: Martin

Plant ID: PMR

System name: Turbine

System ID: 01

Analysts: JW, GRH

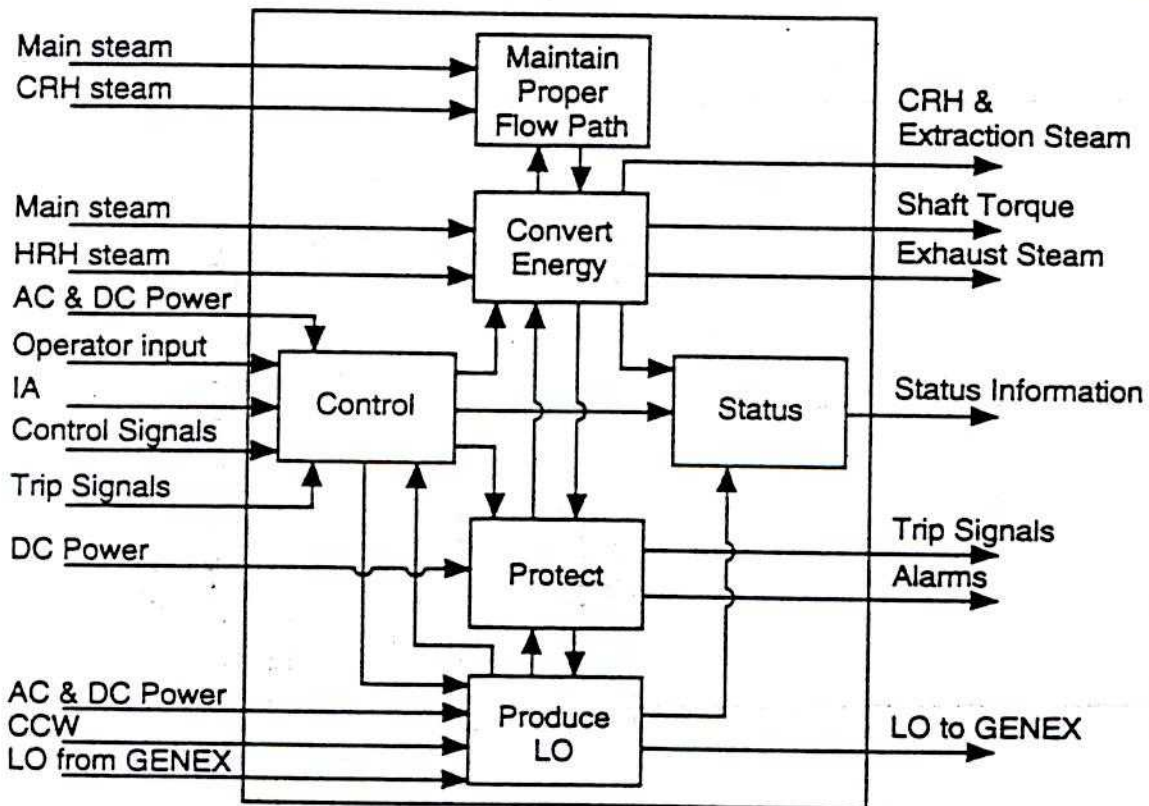


Figure 5.8 Functional block diagram form with typical example. (Courtesy of Florida Power & Light.)

RCM—Systems Analysis Process		
Step 3: System description/functional block diagram		
Information: System work breakdown structure	Rev. no.: 0	Date: 9/30/91
Plant: IEC Sayreville		Plant ID: IECS
System name: Condenser and air removal		System ID: ACC
Analysts: Smith, Worthy		
<u>Cooling Subsystem</u>		
<u>Noninstrumentation</u>		
Vapor ductwork (including expansion joints and rupture disk)		
K type tube modules (12) + D (4)		
Fan motors—K (12) + D (4)		
Fan motor starter—K (12) + D (4)		
Fan blade assembly—K (12) + D (4)		
Fan gearbox—K (12) + D (4)		
Flow valve FV01001 (for 86" damper) (2)		
—including inflatable seal		
Solenoid valve SV01001 (for 86" damper) (2)		
Air offtake header piping		
—condenser to condensate receiver tank		
Drain piping—vapor ductwork to condensate receiver tank		
Vacuum breaker FV01003		
Solenoid valve SV01003 for vacuum breaker		
<u>Instrumentation</u>		
PT-01001	Pressure transmitter + isolation valve (3)	
PT-01001	Pressure indicator + isolation valve (local) (1)	
TE-01001	Temperature element (2)	
TI-01001	Temperature indicator (local) (1)	
PS-01010	Pressure switch on gearbox (16)	
YS-01010	Vibration switch on gearbox (16)	
ZS-01001	Position (limit) switch on 86" damper (4)	
	—2 open, 2 closed	
TE-01011	Temperature element, condenser outlet @ 4/bank (16)	
TE-01015	Temperature element, vapor outlet @ 1/bank (4)	
TE-01003	Temperature element, ambient (2)	

RCM—Systems Analysis Process

Step 5: Failure mode and effects analysis	Rev no.:	Date:
Functional failure no.:	FF title:	
Plant:	Plant ID:	
System name:	System ID:	
Analysts:		

Component	Failure mode	Failure cause	Failure effect			LTA
			Local	System	Plant	

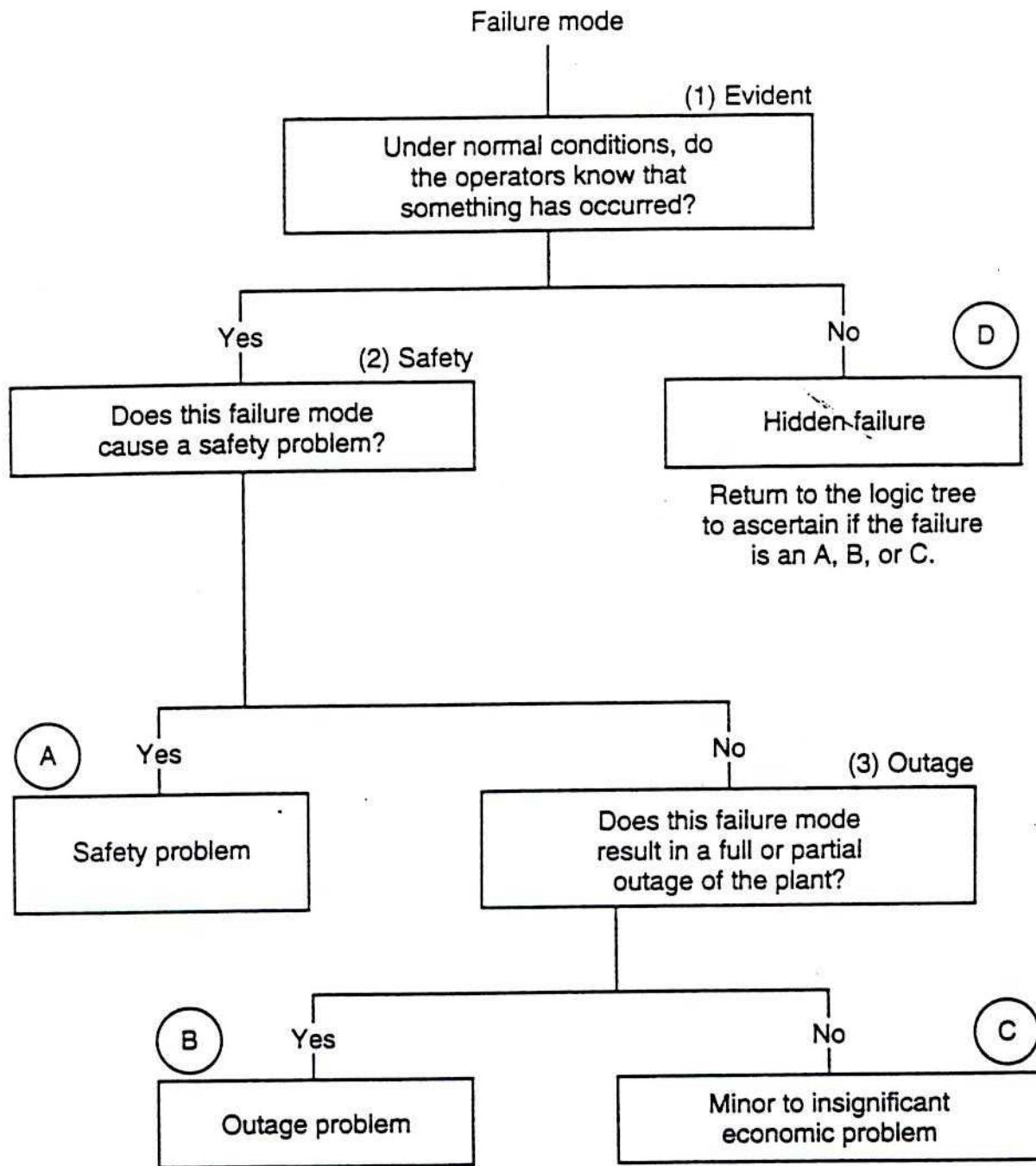


Figure 5.16 Logic tree analysis structure.

RCM—Systems Analysis Process		
Step 6: Logic tree analysis		
Information: Failure mode criticality	Rev no.:	Date:
Plant:	Plant ID:	
System name:	System ID:	
Analysts:		

Functional failure	Component and failure mode	Criticality analysis			Comment
		Evident?	Safety?	Outage?	

Figure 5.17 Logic tree analysis form.

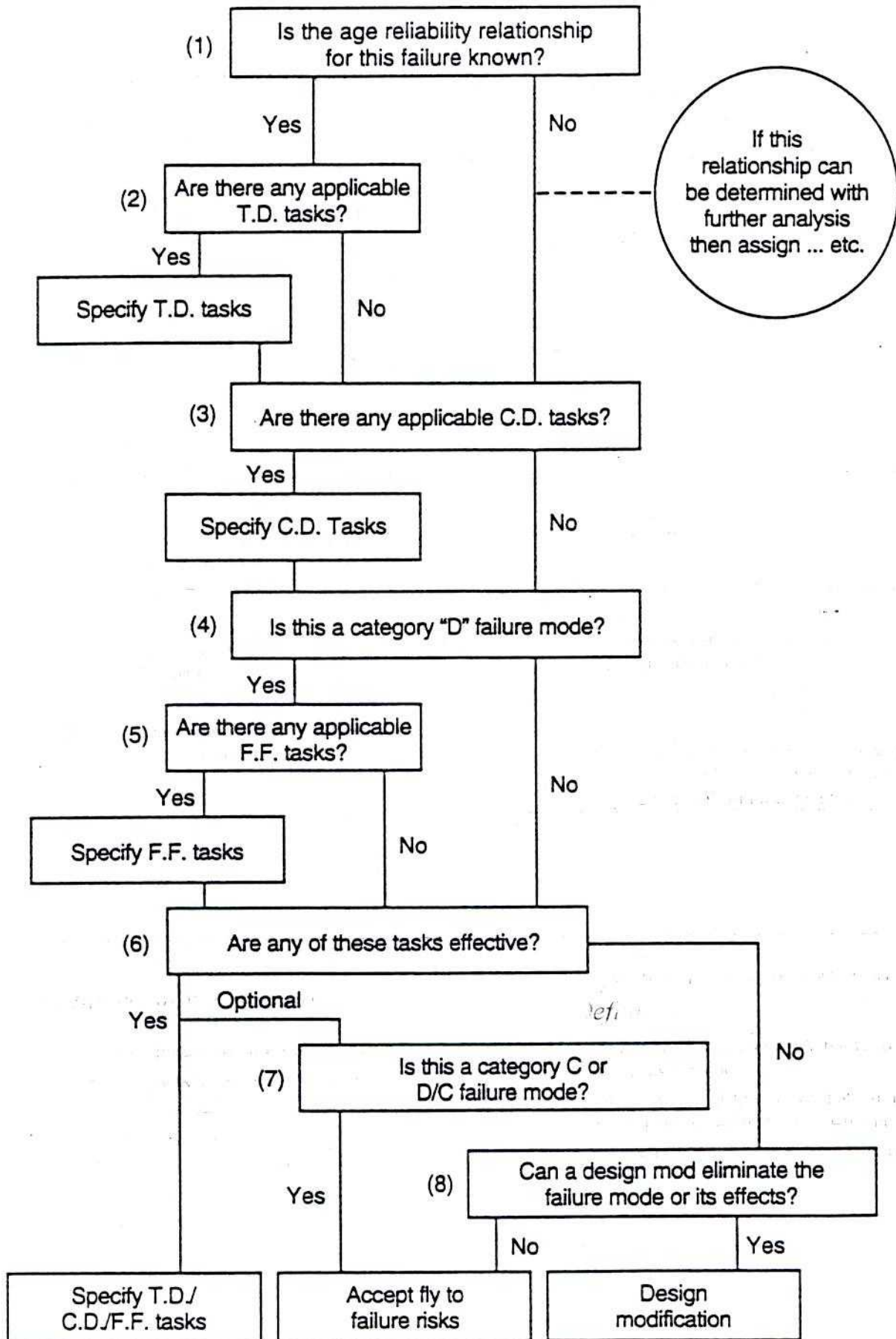


Figure 5.18 Task selection road map. (Developed in cooperation with Mississippi Power.)

RCM—Systems Analysis Process

Step 7: Task selection

Information: Selection process and decision

Rev no.: _____ Date: _____

Plant: _____

Plant ID: _____

System name: _____

System ID: _____

Analysts: _____

FF no.	Component and failure mode	Failure cause	Selection guide								Candidate tasks	Effective-ness info.	Sel. dec.	Est. freq.			
			1	2	3	4	5	6	7	8							

Figure 5.19 Task selection form.

RCM—Systems Analysis Process				
Step 7: Task selection				
Information: Comparison—RCM vs. current PM tasks			Rev no.:	Date:
Plant:			Plant ID:	
System name:			System ID:	
Analysts:				
Component and failure mode	RCM-based task description	Freq.	Current task description	Freq.

RCM—Systems Analysis Process		
Step 3: System description/functional block diagram		
Information: System work breakdown structure	Rev. no.: 0	Date: 9/30/91
Plant: IEC Sayreville	Plant ID: IECS	
System name: Condenser and air removal	System ID: ACC	
Analysts: Smith, Worthy		
<u>Cooling Subsystem</u>		
<u>Noninstrumentation</u>		
Vapor ductwork (including expansion joints and rupture disk)		
K type tube modules (12) + D (4)		
Fan motors—K (12) + D (4)		
Fan motor starter—K (12) + D (4)		
Fan blade assembly—K (12) + D (4)		
Fan gearbox—K (12) + D (4)		
Flow valve FV01001 (for 86" damper) (2) —including inflatable seal		
Solenoid valve SV01001 (for 86" damper) (2)		
Air offtake header piping —condenser to condensate receiver tank		
Drain piping—vapor ductwork to condensate receiver tank		
Vacuum breaker FV01003		
Solenoid valve SV01003 for vacuum breaker		
<u>Instrumentation</u>		
PT-01001	Pressure transmitter + isolation valve (3)	
PT-01001	Pressure indicator + isolation valve (local) (1)	
TE-01001	Temperature element (2)	
TI-01001	Temperature indicator (local) (1)	
PS-01010	Pressure switch on gearbox (16)	
YS-01010	Vibration switch on gearbox (16)	
ZS-01001	Position (limit) switch on 86" damper (4) —2 open, 2 closed	
TE-01011	Temperature element, condenser outlet @ 4/bank (16)	
TE-01015	Temperature element, vapor outlet @ 1/bank (4)	
TE-01003	Temperature element, ambient (2)	

RCM—Systems Analysis Process			
Step 3: System description/functional block diagram			
Information: Equipment history	Rev. no.:	Date:	
Plant:	Plant ID:		
System name:	System ID:		
Analysts:			
<u>Component</u>	<u>Date</u>	<u>Failure mode</u>	<u>Failure cause</u>

Figure 5.11. Equipment history form.

RCM—Systems Analysis Process								
Step 4: Functions/functional failures								
Information: Functional failure description	Rev. no.:	Date:						
Plant:		Plant ID:						
System name:		System ID:						
Analysts:								
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 5px;"><u>Function no.</u></th> <th style="text-align: left; padding: 5px;"><u>Functional failure no.</u></th> <th style="text-align: left; padding: 5px;"><u>Function or functional failure description</u></th> </tr> </thead> <tbody> <tr> <td style="height: 400px;"> </td> <td> </td> <td> </td> </tr> </tbody> </table>	<u>Function no.</u>	<u>Functional failure no.</u>	<u>Function or functional failure description</u>					
<u>Function no.</u>	<u>Functional failure no.</u>	<u>Function or functional failure description</u>						

Figure 5.12 Function/functional failure form.