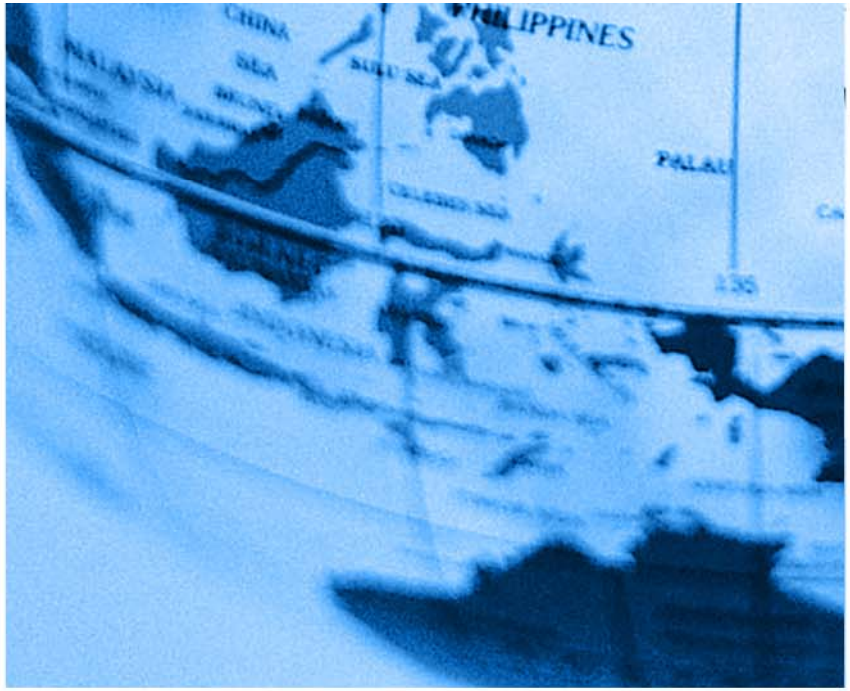



CONFIDENTIAL

PERTAMINA
Always There

ECA FSCA Application Report

RCC dan Utilities

Kuningan 3 – 7 May, 2009

OPI

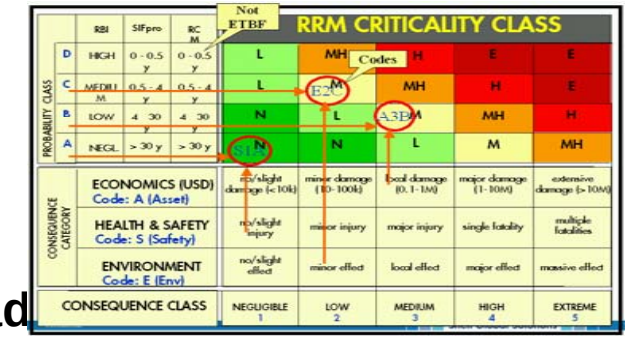
Workshop Objectives

- **Mengerti secara jelas proses dan tools FSCA & ECA**
- **Membangun pengalaman dan pengetahuan dengan melakukan penyusunan FSCA-ECA RCC dan Utilities**
- **Mendapatkan Equipment Critical untuk peralatan di Unit RCC dan Utilities.**

Pengertian Methodology secara umum
- The ECA process & tools

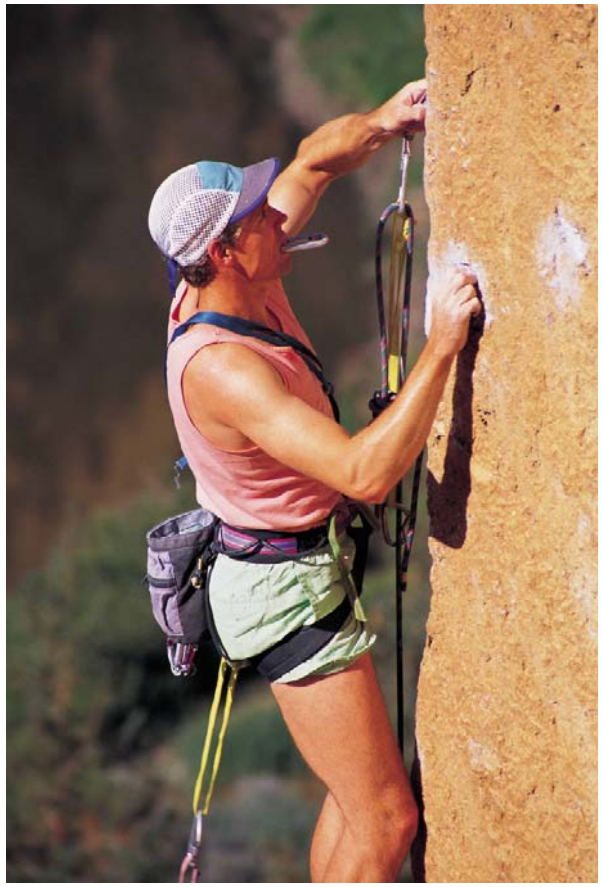
Tim Member saat ini sudah mengerti metodology untuk :

- → **Functional Systems and Functional Failures Modes**
- → **Equipment Failure Modes**
- → **Equipment Criticality Assessment dan penggunaan dari RAM untuk Consequence and Likelihood dari kejad**
- → **Form dan bagaimana menggunakan :**
  - ✓**FCA assessment worksheets**
  - ✓**ECA assessment worksheets**
  - ✓**FCA and EC summary sheets**
- → **Filing structure**



Refreshing .

- Introduction prinsip manajemen resiko
- Functional/Equipment Criticality Assessment



Objectives of Risk Management …

- **Untuk mengontrol dari bisnis untuk lebih aktif me-manage Risk dengan pemanfaatan metodologi yang terstruktur.**
- **Prioritisasi dan keuntungan yang realistis melalui penerapan Risk Management teknis yang terstruktur. Bukan untuk mendapatkan risk yang tidak terkontrol.**
- **“Managing *Risk* adalah bagaimana mengambil keputusan yang smart.”**

Kita mengatakan kepada anda re we telling you to take uncontrolled RISKS ??

NO !! **You are already taking risks…**

We ARE telling you that you can realise benefits by ... managing your risks…

Risk Assessment..

Before we can manage RISKs we must assess it..
And the first step to assessment is
“Quantification of Risks”

But the question is..

How do we Quantify Risks?

Definition of Some Terms

Threat (failure)- Kondisi/kejadian yang bisa kita cegah dari tujuan keinginan rapat.

Probability- chance/probability that a threat will occur.

Exposure- describes the degree of exposure we have to a particular threat.

Consequence -represents the business cost/impact that will be incurred if the threat actually occurs.

Consequences of the same event may not be the same for all companies !!

Applying Risk Management to Assess Functional and Equipment Criticality

Definition of Criticality..

Failure or malfunction of a high risk function which will result in:

- **HSE consequences**
- **Asset e.g. in restricted throughput, off-normal product quality, limped mode of operation, non-standard line up, or in the worst case shut down of the entire unit(s)/**
- **Reputation**

Criticality Assessment

FSCA
Assessment yang dilakukan berdasarkan matrik resiko (RAM) terhadap fungsi suatu sistem proses didalam satu unit & atau plant sehingga didapat : Functional system dan Criticallity Rating dari sistem proses tersebut (Functional System Criticallity Rating/ FSCR) sedangkan,

ECA
Assessment yang dilakukan berdasarkan matrik resiko (RAM) terhadap fungsi suatu Equipment/peralatan proses didalam satu rantai proses sehingga didapat : Equipment Criticallity Rating dari dari alat didalam rantai proses tersebut (Equipment Criticallity Rating/ ECR)

Why FCA & ECA ?

- **FCA identifies the functional systems which are critical to the business..**
  - ✓ **focused risk mitigation efforts….**

- **ECA provides a H,M,L classification of equipment…**
  - ✓ **to achieve focused maintenance efforts…**
  - ✓ **tool to aid prioritization of maintenance efforts..**
  - ✓ **ensuring focused monitoring by operators**
  - ✓ **input for other reliability/optimization efforts..**

Risk Assessment Matrix

PROBABILITY CLASS	RBI	SIFpro	RCM	RRM CRITICALITY CLASS				
D	HIGH	0 - 0.5 y	0 - 0.5 y	L	MH		E	E
C	MEDIUM	0.5 - 4 y	0.5 - 4 y	L	M	MH	H	E
B	LOW	4 - 30 y	4 - 30 y	N	L	M	MH	H
A	NEGL.	> 30 y	> 30 y	N	N	L	M	MH

Codes

E2C

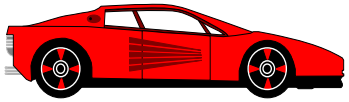
A3B

S1A

CONSEQUENCE CATEGORY					
ECONOMICS (USD) Code: A (Asset)	no/slight damage (<10k)	minor damage (10-100k)	local damage (0.1-1M)	major damage (1-10M)	extensive damage (>10M)
HEALTH & SAFETY Code: S (Safety)	no/slight injury	minor injury	major injury	single fatality	multiple fatalities
ENVIRONMENT Code: E (Env)	no/slight effect	minor effect	local effect	major effect	massive effect
CONSEQUENCE CLASS	NEGLIGIBLE 1	LOW 2	MEDIUM 3	HIGH 4	EXTREME 5

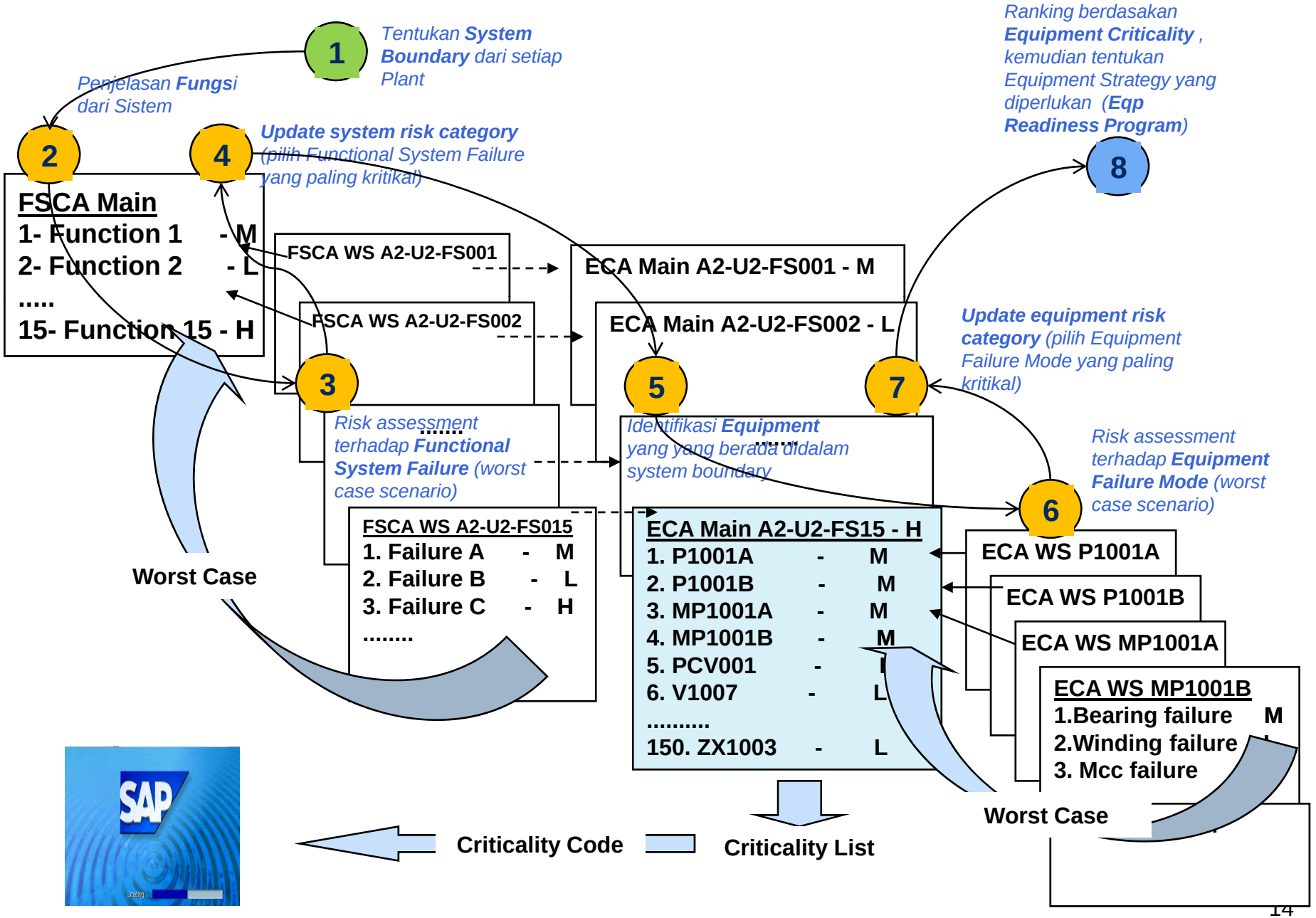
CONTOH BAGAIMANA MENGIDENTIFIKASI TINGKAT KEKRITISAN SUATU FASILITAS/SYSTEM DENGAN MEMPERHATIKAN TARGET

Critical Systems of a Car for a trip from Dumai to Pekanbaru

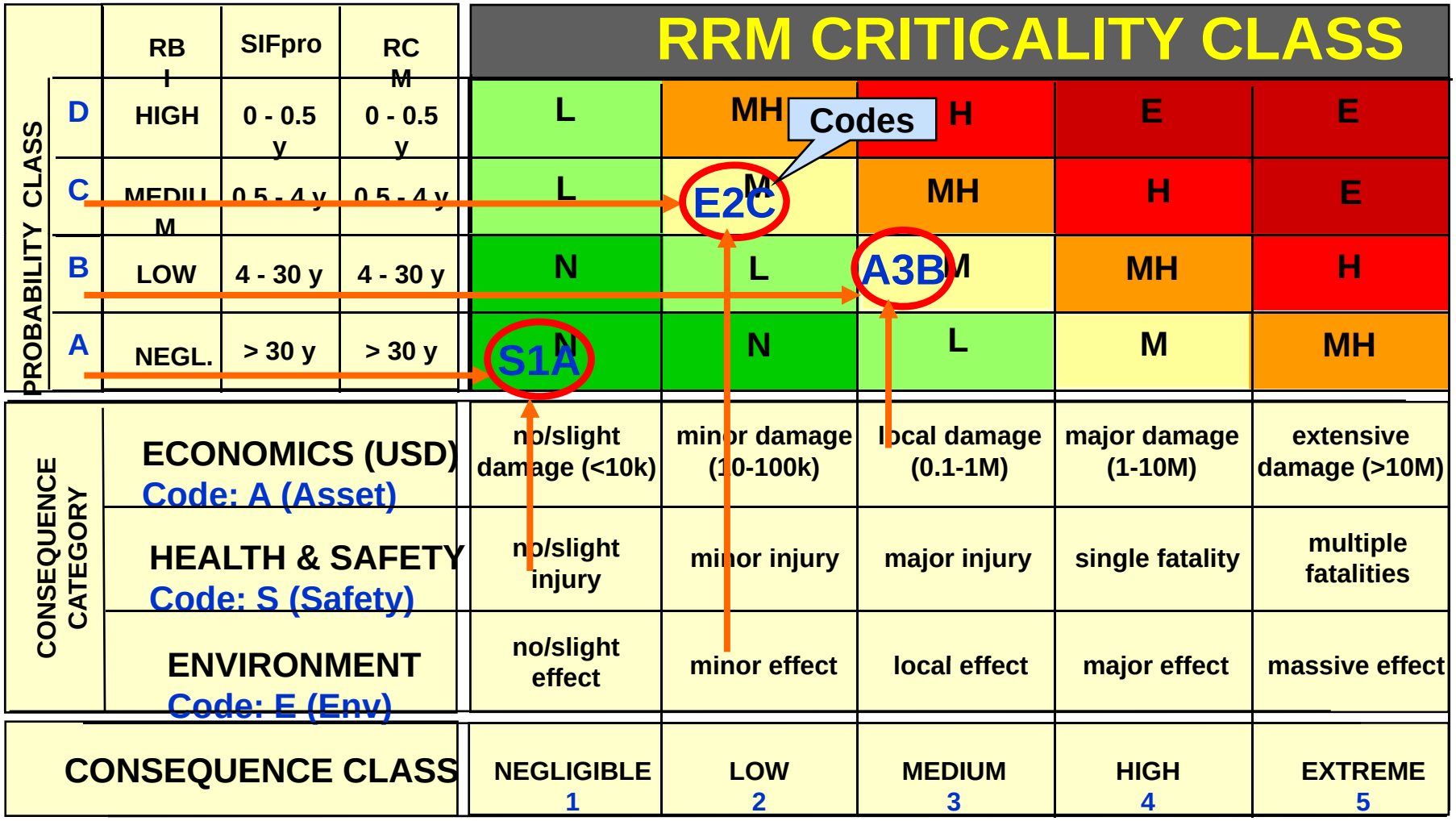


Requirements:	**Safe trip**	**Arrive in 5 hours**
-Brakes system	critical	critical
-Airbag system	critical	not critical
-Engine system	not critical	critical
-Air Con system	not critical	not critical
-CD player	not critical	not critical
-Tires	critical	not critical
-Spare tire	not critical	critical

METODOLOGI ECA

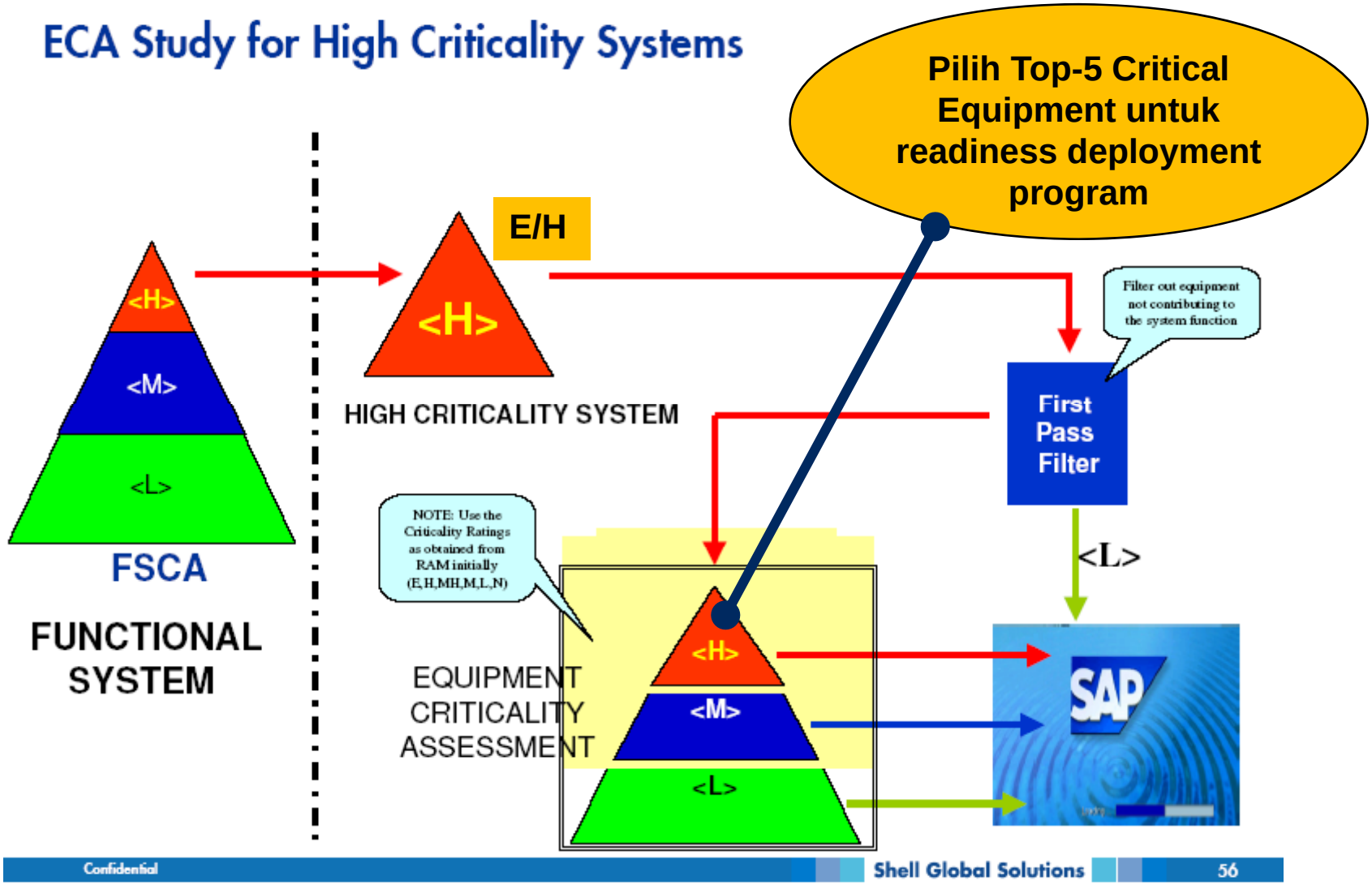


Risk & Reliability Management MATRIX

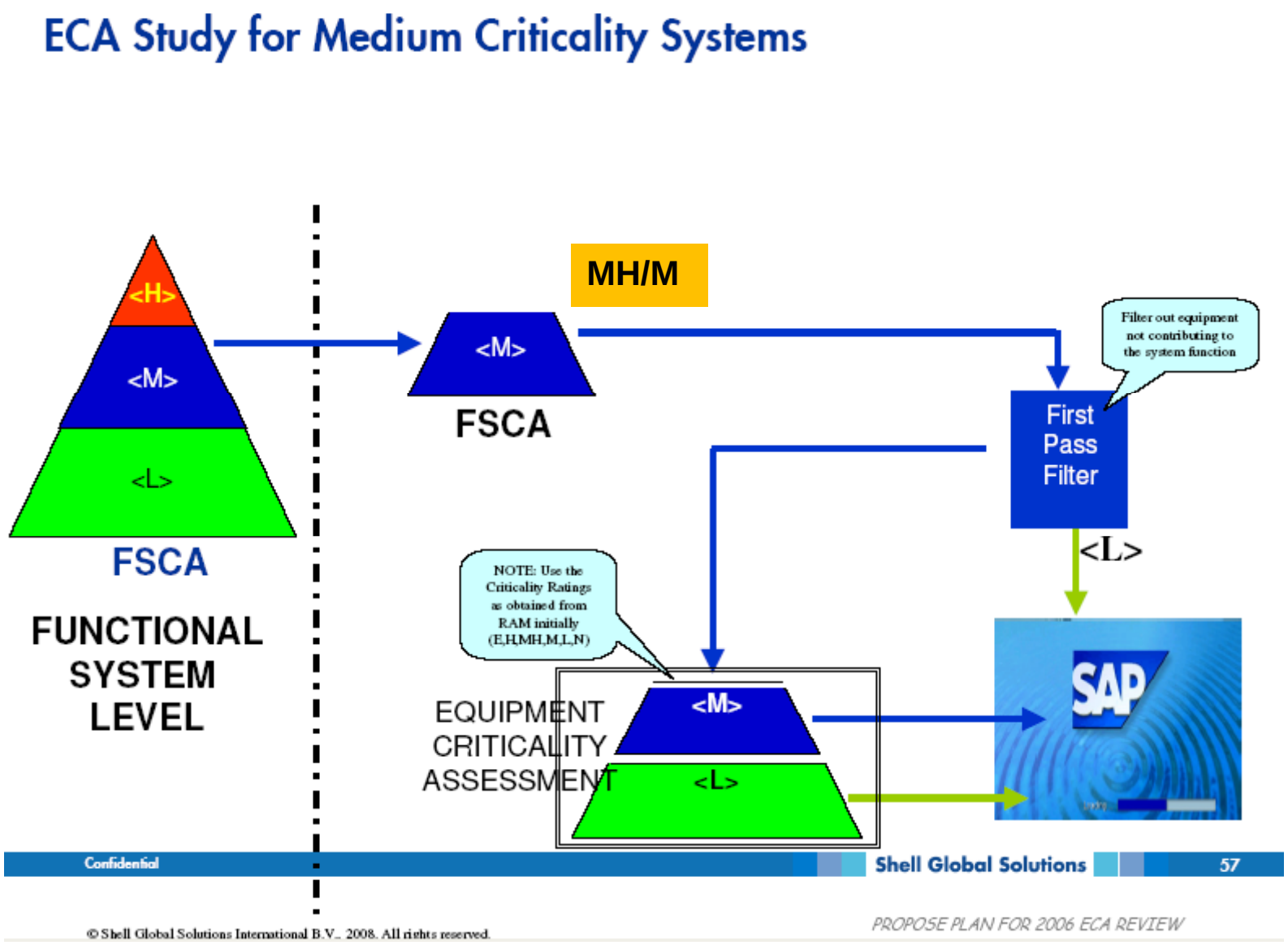


Bila pada level sama, maka yg diambil yg probabillity terjadi tinggi

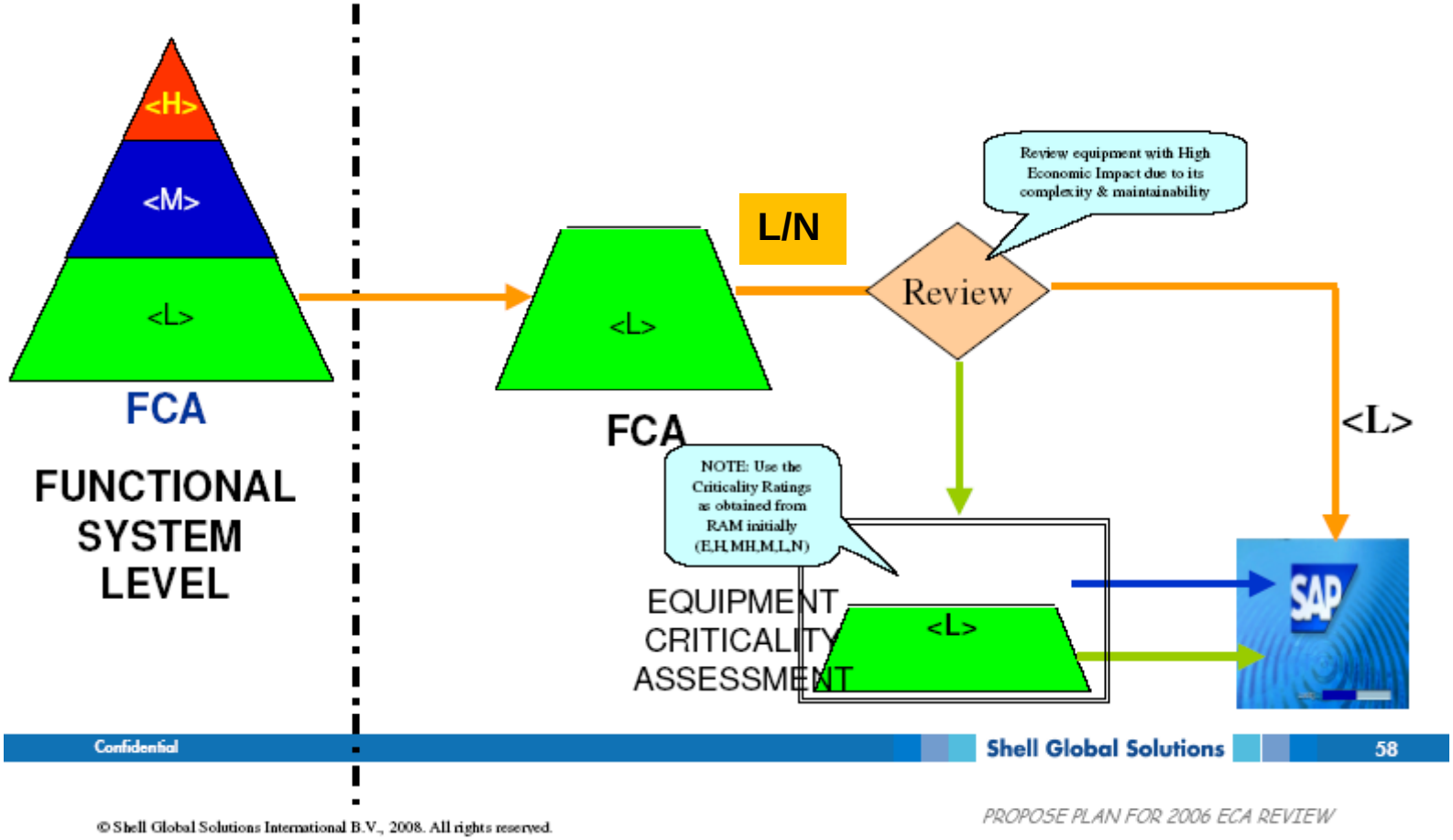
EQUIPMENT READINESS DEPLOYMENT PROGRAM UNTUK TOP-10 CRITICAL EQUIPMENT



ECA DARI HASIL FSCA KATEGORI “MH/M”, AKAN MENGHASILKAN KATEGORI (MH,M,L,N)



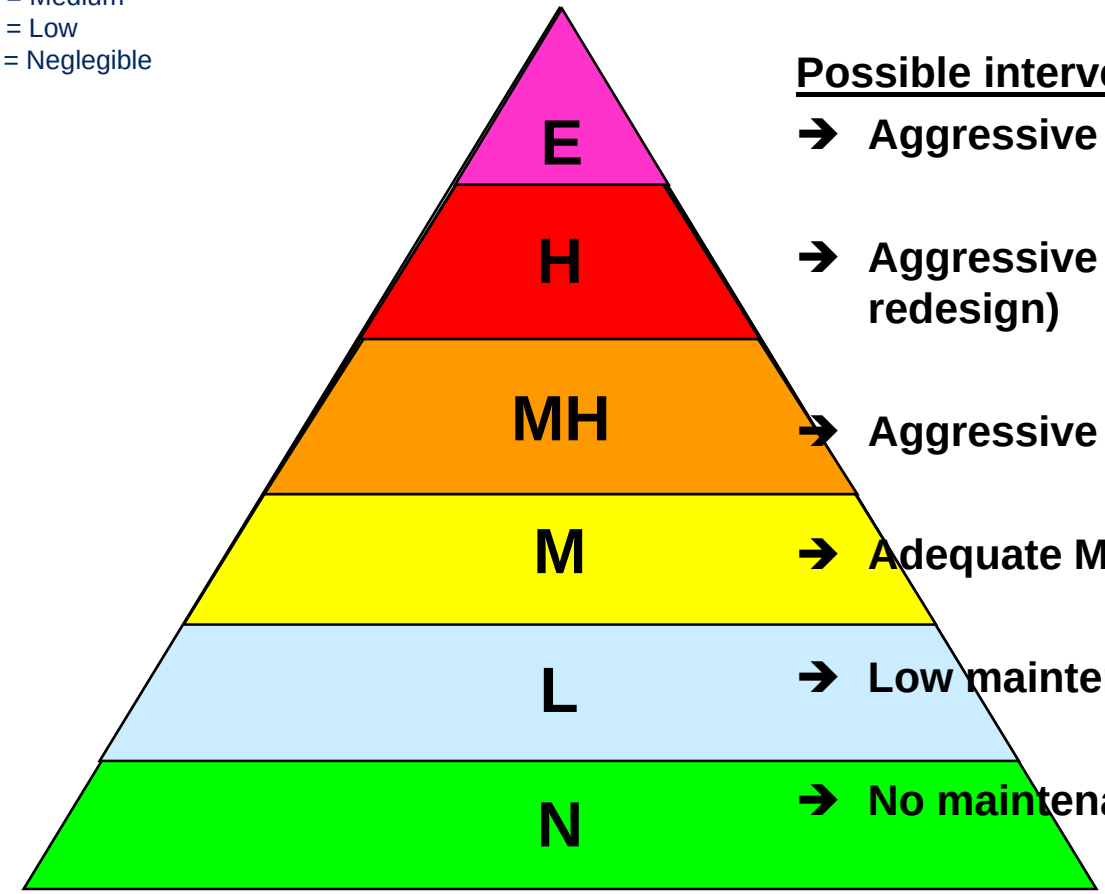
ECA DARI HASIL FSCA KATEGORI “L/N”, AKAN MENGHASILKAN KATEGORI (L,N)



EQUIPMENT STRATEGY MENURUT CRITICALITY RATING

RAM Category

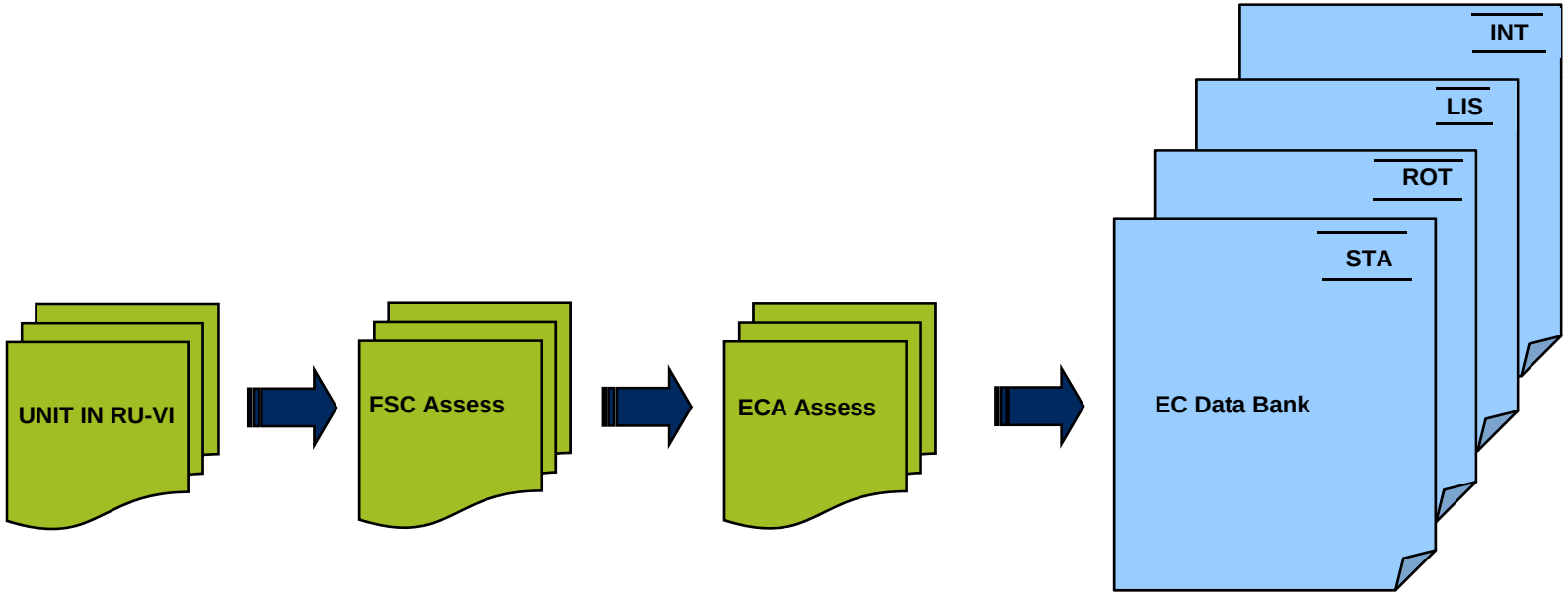
E = Exstreem
H = High
MH = Medium High
M = Medium
L = Low
N = Negligible



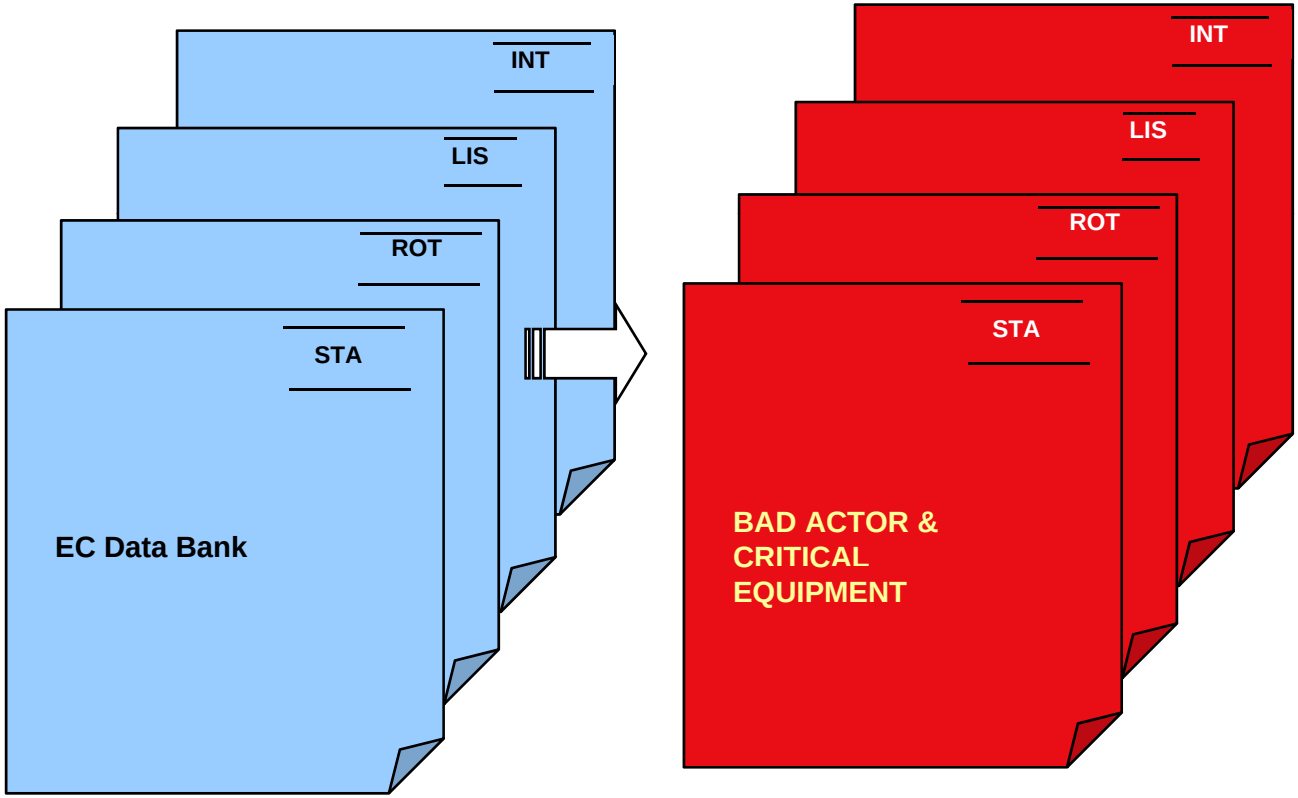
Possible interventions or countermeasures

- ➔ **Aggressive maintenance + REDESIGN**
- ➔ **Aggressive maintenance (+ maybe redesign)**
- ➔ **Aggressive maintenance**
- ➔ **Adequate Maintenance**
- ➔ **Low maintenance (or Run-to-Failure)**
- ➔ **No maintenance (Run-to-Failure)**

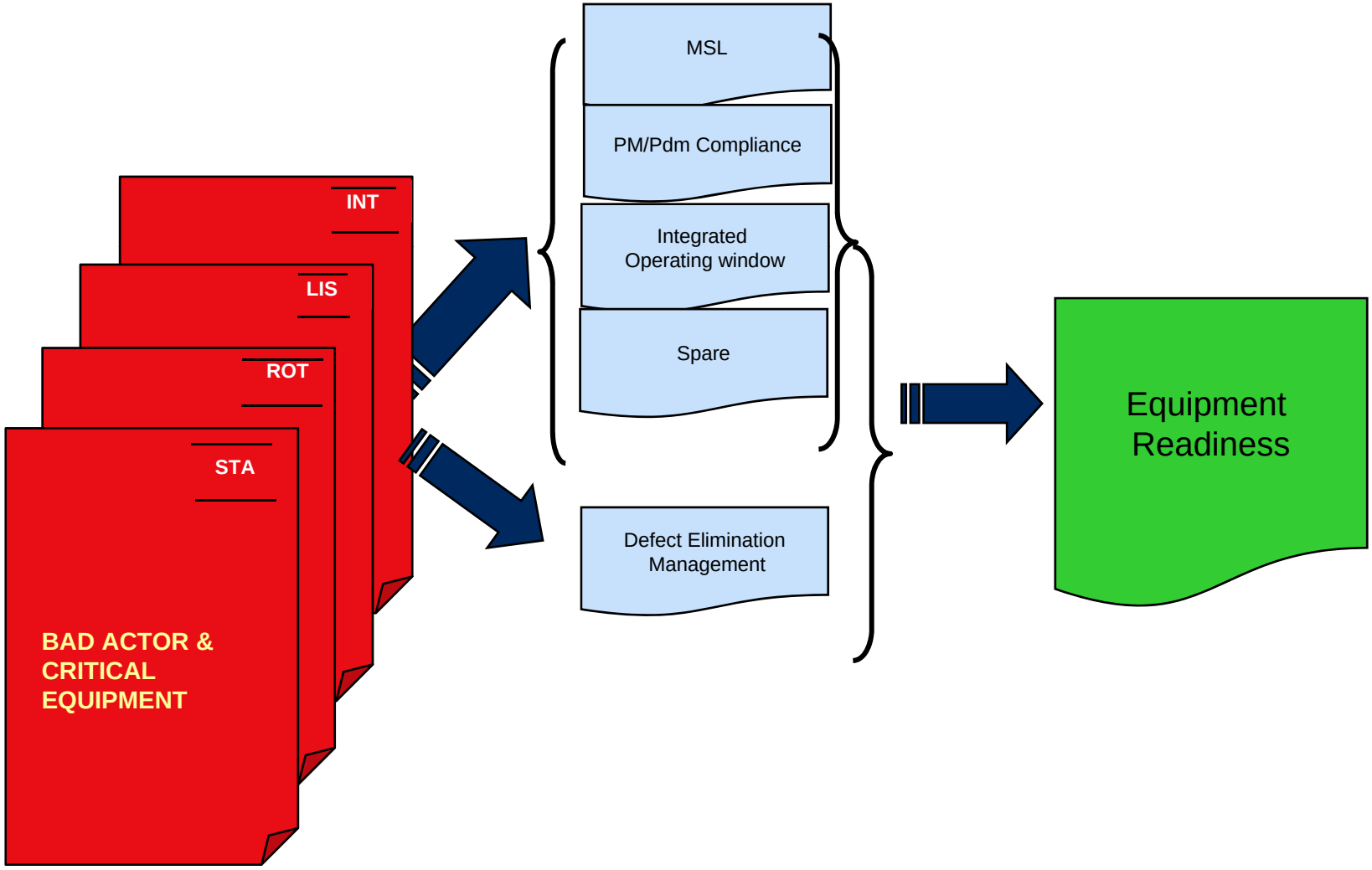
EQUIPMENT READINESS



EQUIPMENT READINESS



EQUIPMENT READINESS



METODOLOGI FSCA DAN ECA

Menentukan boundary system

FSCA berdasarkan functional syst failure mode

ECA berdasarkan worse case failure mode

AREA : 3 UNIT NO: # 3A UNIT DESCRIPTION HYDROCRACKER 3A
FUNCTIONAL SYSTEMS - CRITICALITY ANALYSIS

Drawing No.	Functional System Name	FS Code	Functional Description	Failure Scenario	Impact (Primary/Secondar	Consequences: Econ (at max in range)	Consequences: H&S	Consequences: Envi	Consequences: TOTAL	Likelihood	Crit. Code	RAM Criticality
03-DB-02	FEED SECTION	U03A-FS0002	To deliver fresh feed to reactor section and fractinator section									
03-DB-01	H2 COMPRESSION SECTION	U03A-FS0001	To provide H2 compression (180 Kg/cm2) for prosess catalityc									
03-DB-02	REACTOR SECTION	U03A-FS0003	To treating and catalytic crack hydrocarbon (Heavier HVGO) mixed Hydrogen become desirable product which deliver to fractinator , Normal press 180 Kg/cm2 and Temp 440 deg C. This system consist of Reactor (C-3-03A, C-3-04A, C-3-05A), Furnace (F-3-01), Effluent exchanger (E-3-01 A-H), Fin-fan	K-3-01 A failure due to liquid carry over from HPS	Liquid carry over lead to K-3-01A coupling failure (over torque) then shutdown unit	$ 39,790,820.00	-	-	$ 39,790,820.00	0.5 - 4 y	A5C	E

DETAILED WORKSHEET FOR FUNCTIONAL CRITICALITY ANALYSIS
FS CODE: U3A-FS0003 FS DESCRIPTION: REACTOR SECTION
SYSTEM FAILURE WORKSHEET

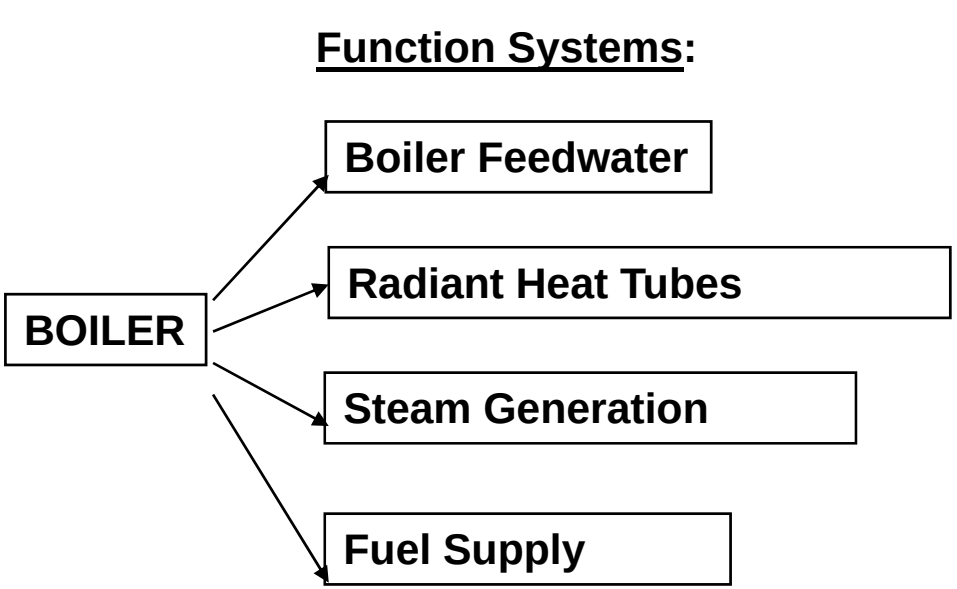
Sr.	Credible ways of system failure	Failure Impact	System Outage (Hrs)	ECONOMIC CONSEQUENCES (USD): Maint. Costs	Operational Consequences	Total Economic Impact	H&S Impact	Env. Impact	Total Consequences (USD)	Likelihood	Criticality Code	RAM Criticality
1	H2 recycle supply failure due to recycle compressor K-3-01A failured by dry gas seal	Shutdown unit	336	200,000	39,740,820	39,940,820		-	39,940,820	4 - 30 y	A4C	MH
2	Quenching Hydrogen failure due to 3A-FCV-015	Runaway reactor, lead to unit shutdown	504	1,000,000	59,611,230	60,611,230		-	60,611,230	4 - 30 y	A5B	H
3	Tube of F-3-01 burst (one tube)	Low flow of fresh feed to reactor lead to unit shutown	504	10,000	59,611,230	59,621,230		-	59,621,230	4 - 30 y	A5B	H
4	Malfunction termocouple bed 1 indicator (broken and low sensitivity)	Runaway reactor (undirect)	504	1,000,000	59,611,230	60,611,230		-	60,611,230	4 - 30 y	A5B	H
5	Leak one or more Fresh feed condensor Ea-3-02	Shutdown unit (in order to isolate the system-short term)	312	50,000	36,902,190	36,952,190	Major Injury	-	36,952,190	4 - 30 y	A5B	H
6	H2 recycle supply failure due to HPS control malfunction	Liquid carry over lead to K-3-01A coupling failure (over torque) then shutdown unit	336	50,000	39,740,820	39,790,820		-	39,790,820	0.5 - 4 y	A5C	E
7	Insufficient H2 recycle supply due to Compressor drive (Turbine KT-3-01A) governor, vacum , etc problem	Reducing capacity to 73%	48	0	10,730,021	10,730,021		-	10,730,021	0.5 - 4 y	A4C	H
8	Chaneling due to liquid improver distribution	Reducing capacity to 73%	720	0	10,730,021	10,730,021		-	10,730,021	4 - 30 y	A4B	MH
9	H2 recycle supply failure due to recycle compressor K-3-01A failured by lube oil system	Shutdown unit	336	200,000	39,740,820	39,940,820		-	39,940,820	0.5 - 4 y	A5C	E

DETAILED WORKSHEET FOR EQUIPMENT CRITICALITY ANALYSIS
FS CODE: U3A-FS0003 FS DESCRIPTION: REACTOR SECTION
Equip. Tag No: KT-3-01A/00

Sr.	Credible ways of equipment failure	Impact on the system	System Outage (Hrs)	ECONOMIC CONSEQUENCES (USD): Maint. Costs	Operational Consequences	Total Economic Impact	H&S Impact	Env. Impact	Total Consequences (USD)	Likelihood	Criticality Code	RAM Criticality
1	Governor Problem (not respond)	Turbine speed/compressor uncontrolable lead to reduce intake HCU become 60% in order to take corective action.	4	0	189,242	189,242	-	-	189,242	0.5 - 4 y	A3C	MH
2	High vibration due to bearing damage	Immediate stop Compressor, lead to HCU shutdown.	168	4,000	19,870,410	19,874,410	-	-	19,874,410	4 - 30 y	A5B	H
4	Excessive steam gland leak	Lube oil contaminated by steam condensate. Need conituous purifyng of lube	0	0	0	0	-	-	0	4 - 30 y	A1B	N
5	Steam inlet control valve stucked	Turbine speed/compressor uncontrolable, steady state at the latest position, loss opportunity to increase production at maximum capacity (loss 20% of maximum intake).	2	0	47,311	47,311	-	-	47,311	4 - 30 y	A2B	L

Definition of Functional Systems

- **A group of assets that deliver a specific purpose to the unit.**



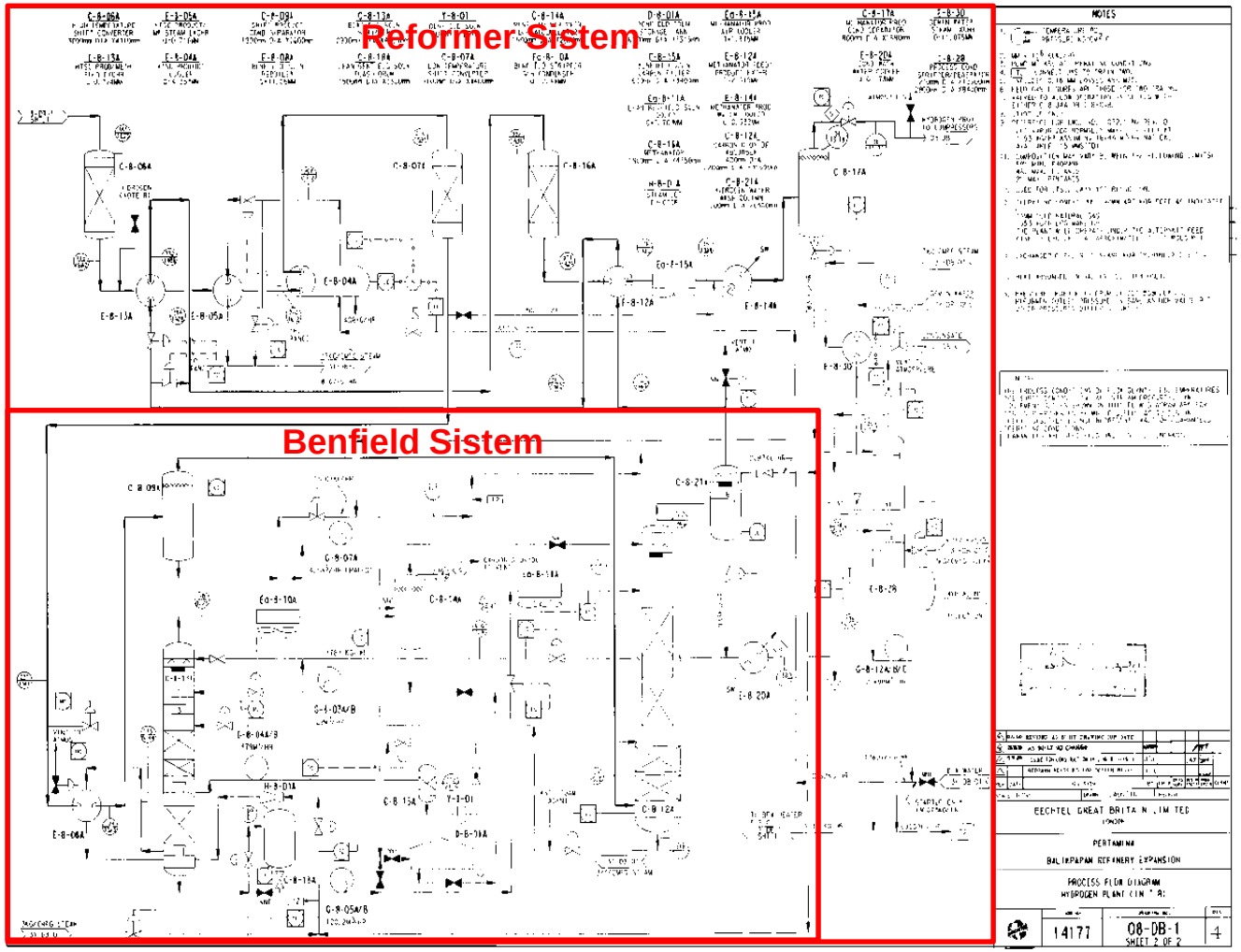
Function:

- **To provide BFW…**
- **To allow heat transfer…**
- **To produce steam…**
- **To provide fuel…**

PLANT-8A : SYSTEM BOUNDARIES

KUTIPAN

- Compression Feed System
- Reformer System
- Benfield System



FSCA (Functional System Criticality Assessment)

HCU-A
Unit Pengolahan V - Balikpapan

Plant-8A

AREA :	HCC	UNIT NO:	8A
FUNCTIONAL SYSTEMS - CRITICALITY ANALYSIS			
rawing N	Functional System Name	FS Code	Functional Description
	COMPRESSION FEED SYSTEM	A5-U08A-FS0001	Menyediakan natural gas dengan flow 9.3 ton/jam, tekanan 23.3kg/cm2 untuk kebutuhan reaksi pembentukan H2. Sistem ini terdiri dari compressor K-8-01 A/B/C, Inter stage cooler E-8-21 & Spill back Control valve, LPG Vaporizer dan flow control valve 08-PCV-017 & 039.
	REFORMER SYSTEM	A5-U08A-FS0002	Mereaksikan natural gas dengan steam untuk membentuk H2 pada temp 800°C dimana steam diperoleh dengan memanfaatkan fluida proses itu sendiri. Sistem ini terdiri dari Reformer, WHB , pompa sirkulasi BFW, desulpuriser,steam drum &dearator.
	BENFIELD SYSTEM	A5-U08A-FS0003	Memisahkan CO2 dari H2 hasil reaksi reforming melalui proses absorbsi. Sistem ini terdiri dari Absorber, Stripper dan pompa sirkulasi larutan benfield.

FSCA (Functional System Criticality Assessment), Plant-8A

DETAILED WORKSHEET FOR FUNCTIONAL CRITICALITY ANALYSIS
FS CODE: A5-U08A-FS0001 FS DESCRIPTION:COMPRESSION FEED SYSTEM
SYSTEM FAILURE WORKSHEET

				CONSEQUENCES (USD)								
				ECONOMIC (USD)								
Sr.	Credible ways of system failure	Failure Impact	System Outage (Hrs)	Maint. Costs	Operational Consequences	Total Economic Impact	H&S	Environment	Total Consequences (USD)	Likelihood	Crit. Code	RAM Criticality
U08A-FS0001	Kegagalan 2 of 3 Compressor K-8-01 A/B/C	Stop 1 Train HCU	72	50,000	1,500,000	$ 1,550,000.00	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 1,550,000.00	4 - 30 YRS	A4B	MH
U08A-FS0001	Sistem control Spill back kompressor	Turun intake 2 MB/day	168	-	509,091	$ 509,090.91	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 509,090.91	0.5 - 4 YRS	A3C	MH
A5-U08A-FS0001.1	Gangguan Inter stage cooling system	Kompresi ratio tinggi, tidak menyebabkan gangguan ops karena ada spare unit.	0	5000	0	$ 5,000.00	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 5,000.00	0.5 - 4 YRS	A1C	L

Comp Feed System

DETAILED WORKSHEET FOR FUNCTIONAL CRITICALITY ANALYSIS
FS CODE: A5-U08A-FS0002 FS DESCRIPTION: REFORMER SYSTEM
SYSTEM FAILURE WORKSHEET

				CONSEQUENCES (USD)								
				ECONOMIC (USD)								
Sr.	Credible ways of system failure	Failure Impact	System Outage (Hrs)	Maint. Costs	Operational Consequences	Total Economic Impact	H&S	Environment	Total Consequences (USD)	Likelihood	Crit. Code	RAM Criticality
U08A-FS0002	Kegagalan Deaereator system	Reformer trip sehingga Suplai H2 ke HCU terganggu mengakibatkan 2 Train HCU shutdown	120	1,000	2,500,000	$ 2,501,000.00	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 2,501,000.00	> 30 YRS	A4A	M
U08A-FS0002	Kegagalan Reformer *(Akibat Over heating tube)*	Stop1unit H2 Plant mengakibatkan turun intake 5MB/D	120	30,000	909,091	$ 939,090.91	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 939,090.91	0.5 - 4 YRS	A3C	MH
A5-U08A-FS0002.1	Kegagalan sirkulasi BFW di WHB system *(Akibat gangguan level control)*	Satu unit Reformer trip sehingga Suplai H2 ke HCU terganggu mengakibatkan Train HCU turun intake 5 MB/D	120	5,000	909,091	$ 914,090.91	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 914,090.91	0.5 - 4 YRS	A3C	MH

Reformer System

DETAILED WORKSHEET FOR FUNCTIONAL CRITICALITY ANALYSIS
FS CODE: A5-U08A-FS0003 FS DESCRIPTION: BENFIELD SYSTEM
SYSTEM FAILURE WORKSHEET

				CONSEQUENCES (USD)								
				ECONOMIC (USD)								
Sr.	Credible ways of system failure	Failure Impact	System Outage (Hrs)	Maint. Costs	Operational Consequences	Total Economic Impact	H&S	Environment	Total Consequences (USD)	Likelihood	Crit. Code	RAM Criticality
U08A-FS0003	Kegagalan Sirkulasi Benfield System (kegagalan PCV 253)	Runway Methanator sehingga HCU turun intake 5 MB/D	120	30,000	909,091	$ 939,090.91	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 939,090.91	0.5 - 4 YRS	A3C	MH
A5-U08A-FS0003.1	Kegagalam Reboiler System (bocor piping corosion)	Shut down H2 Plant sehingga turun intake HCU 5 MB/D	72	5,000	545,455	$ 550,454.55	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 550,454.55	4 - 30 YRS	A3B	M
A5-U08A-FS0003.2	Kegagalan fungsi Absorber atau Stripper	Shut down H2 Plant sehingga turun intake HCU 5 MB/D	192	20,000	1,454,545	$ 1,474,545.45	NO / SLIGHT INJURY	NO / SLIGHT EFFECT	$ 1,474,545.45	4 - 30 YRS	A4B	MH

Benfield System

HASIL ECA (Equipment Criticality Assessment) – 1/2

ROTATING

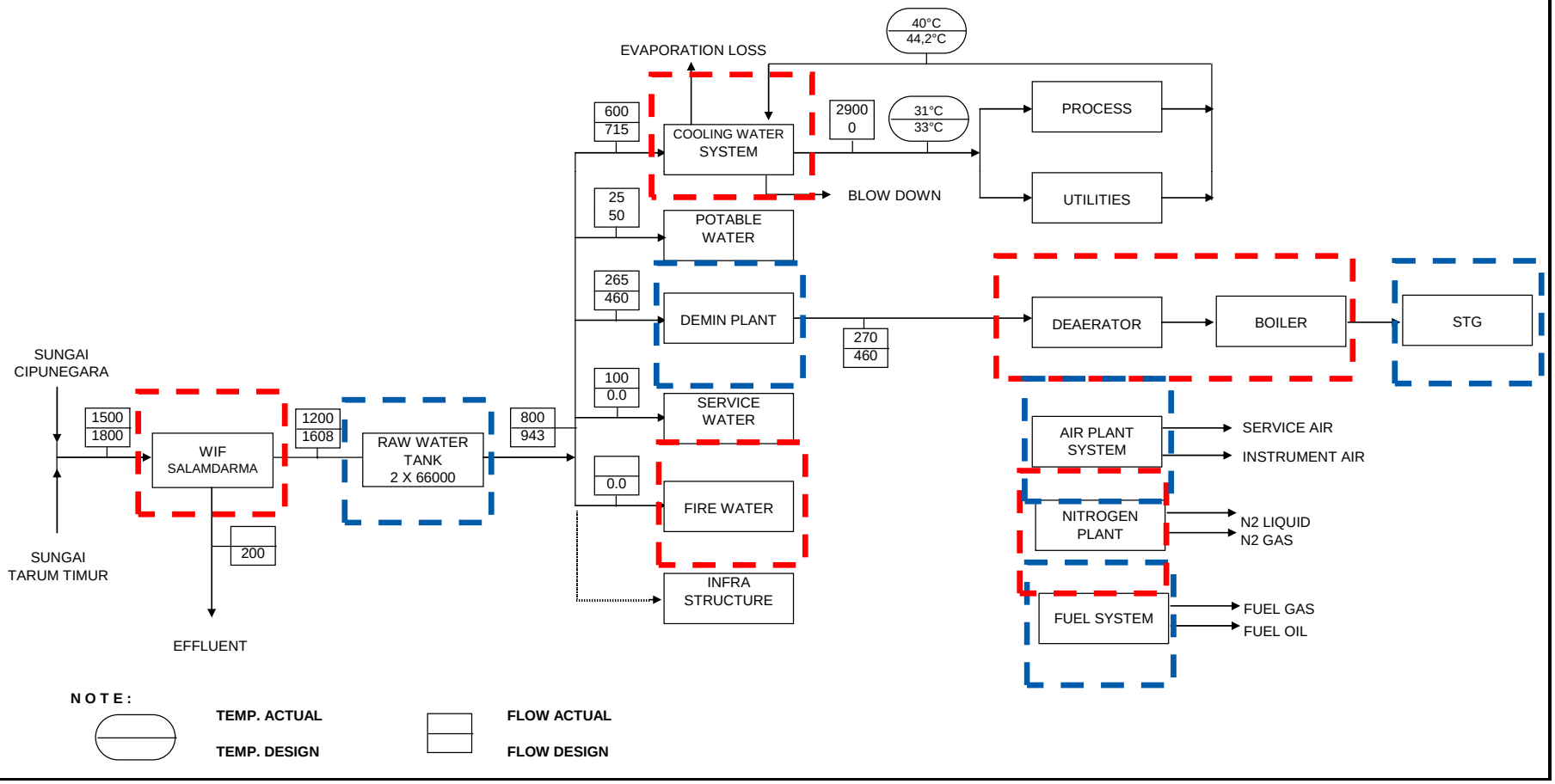
Functional Location		Equip Tag	Equip. Type	Equipment Description	Impact on the FS	Spared (Y/N)	Duty/ Stand-by	Detailed Analysis (Y/N)	CONSEQUENCES (USD)						Likelihood	Crit. Code	RAM Criticality
									ECONOMIC			Consequences					
									Maint. Costs	Operational Consequences	Econ (at max in range)	H&S	Environment	TOTAL			
K-19-01A	A5-U0U-FS0001.3.1	K-19-01A/00	1905	OFF GAS COMPRESSOR	Stop unit sehinggamenyebabkan loss production	Y	Duty	Y	100000	280000	$ 380,000.00		MINOR EFFECT2	$ 380,000.00	0 - 0.5 YRS4	S3D	H
K-19-01A	A5-U0U-FS0001.3.2	E-19-01/00		AFTER COOLER	Stop Compressor, pindah ke stand by compressor	N	N/A	Y	5000	280000	$ 285,000.00	NO / SLIGHT INJURY1	LOCAL EFFECT3	$ 285,000.00	0.5 - 4 YRS3	A3C	MH
K-19-01A	A5-U0U-FS0001.3.3	E-19-02/00		INTER STAGE COOLER	Stop Compressor, pindah ke stand by compressor	N	N/A	Y	5000	280000	$ 285,000.00	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 285,000.00	0.5 - 4 YRS3	A3C	MH
K-19-01A	A5-U0U-FS0001.3.4	PLC		Panel Control PLC Plant 19 & 38	Stop Compressor, pindah ke stand by compressor	N	N/A	Y	30000	200000	$ 230,000.00	NO / SLIGHT INJURY1	MINOR EFFECT2	$ 230,000.00	0.5 - 4 YRS3	A3C	MH
K-3-02A	A5-U03A-FS0001.1.1	03-LP-001/00		LOKAL PANEL KONTROL KOMPRESSOR K-3-02A		Y	Y	Y			$ -			$ -		A1	N
K-3-02A	A5-U03A-FS0001.1.2	E-3-35A/00		SURFACE CONDENSER KT-3-02A		N	N	Y		0	$ -	NO / SLIGHT INJURY1		$ -	0 - 0.5 YRS4	E1D	L
K-3-02A	A5-U03A-FS0001.1.3	K-3-02A/00		HYDROGEN MAKE UP COMPRESSOR		N	N	Y	100000	1500000	$ 1,600,000.00			$ 1,600,000.00	0.5 - 4 YRS3	A4C	H
K-3-02A	A5-U03A-FS0001.1.4	KK-3-02A/00		GEARBOX FOR COMPRESSOR K-3-02A		N	N	Y	15000	1500000	$ 1,515,000.00			$ 1,515,000.00	0.5 - 4 YRS3	A4C	H
K-3-02A	A5-U03A-FS0001.1.5	KT-3-02A/00		TURBINE DRIVER FOR COMPRESSOR K-3-02A		N	N	Y			$ -			$ -		A1	N
G-3-01A	A5-U03A-FS0002.1.1	G-3-01A/00		FRESH FEED CHARGE PUMP		Y	Y	Y	15000	2500000	$ 2,515,000.00	MINOR INJURY2		$ 2,515,000.00	4 - 30 YRS2	E4B	MH
G-3-09A	A5-U03A-FS0002.2.1	G-3-09A/00		RECYCLE CHARGE PUMP					15000	2500000	$ 2,515,000.00	NO / SLIGHT INJURY1		$ 2,515,000.00	0.5 - 4 YRS3	E4C	H
G-3-09A	A5-U03A-FS0002.2.2	GT-3-09A/00		TURBINE DRIVER FOR G-3-09A					17500	2000000	$ 2,017,500.00	NO / SLIGHT INJURY1		$ 2,017,500.00	0.5 - 4 YRS3	E4C	H
G-3-08A	A5-U03A-FS0004.2.1	G-3-08A/00		FRACTIANATOR BOTTOM PUMP					10000	272727.27	$ 282,727.27	MAJOR INJURY3		$ 282,727.27	0.5 - 4 YRS3	E3C	MH

STATIONARY

Functional Location		Equip Tag	Equip. Type	Equipment Description	Impact on the FS	Spared (Y/N)	Duty/ Stand-by	Detailed Analysis (Y/N)	CONSEQUENCES (USD)						Likelihood	Crit. Code	RAM Criticality
									ECONOMIC			Consequences					
									Maint. Costs	Operational Consequences	Econ (at max in range)	H&S	Environment	TOTAL			
H-2-02A	U02-FS0003.1.1	H-2-02A/00	O	2/3 RD-2ND STAGE EJECTOR	Kegagalan kevacuuman C-2-01 sehingga Unit HVU 2	Y	Stand-by	Y	100	1,883,333	$ 1,883,433.33	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,883,433.33	4 - 30 YRS2	A4B	MH
H-2-02A	U02-FS0003.1.2	H-2-02A/00	O	2/3 RD-2ND STAGE EJECTOR	Kegagalan kevacuuman C-2-01 sehingga Unit HVU 2	Y	Stand-by	Y	100	1883333.333	$ 1,883,433.33	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,883,433.33	0.5 - 4 YRS3	A4C	H
E-2-09	U02-FS0001.3.2	E-2-09/00	V	VACUUM AND HEAT TRANSFER	Kegagalan kevacuuman C-2-01 sehingga Unit HVU 2	N	N/A	Y	30000	1800000	$ 1,830,000.00	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,830,000.00	0.5 - 4 YRS3	A4C	H
E-2-10	U02-FS0001.3.3	E-2-10/00	V	VACUUM AND HEAT TRANSFER	Kegagalan kevacuuman C-2-01 sehingga Unit HVU 2	N	N/A	Y	30000	1800000	$ 1,830,000.00	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,830,000.00	0.5 - 4 YRS3	A4C	H
E-2-11	U02-FS0001.3.4	E-2-11/00	V	VACUUM AND HEAT TRANSFER	Kegagalan kevacuuman C-2-01 sehingga Unit HVU 2	N	N/A	Y	30000	1800000	$ 1,830,000.00	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,830,000.00	0.5 - 4 YRS3	A4C	H
C-2-01	U02-FS0004.1.1	C-2-01/00	O	VACUUM COLUMN	Stop Unit HVU II dan 1 Train IICU	N	N/A	Y	30000	1800000	$ 1,830,000.00	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,830,000.00	0.5 - 4 YRS3	A4C	H
K-3-02	U02-FS0001.3.2	31-HS-12-E1	O	HS-Steam Piping	Compressor di tripkan satu sehingga 1 unit HCU di	N	N/A	Y		1000000	$ 1,000,000.00	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 1,000,000.00	0 - 0.5 YRS4	A4D	E
C-3-16	U03A-FS0004.1.1	EA-3-11	E	FRACTIONATOR OVERHEAD CONDENSER	Turun intake 5MB/D	N	N/A	Y	5000	272727.2727	$ 277,727.27	NO / SLIGHT INJURY1	NO / SLIGHT EFFECT1	$ 277,727.27	0 - 0.5 YRS4	A3D	H

Functional and Equipment Criticality Assessment
RCC & UTL RU-VI

UTILITIES RU-VI BALONGAN



Overview of FSCA- UPVI Utilities

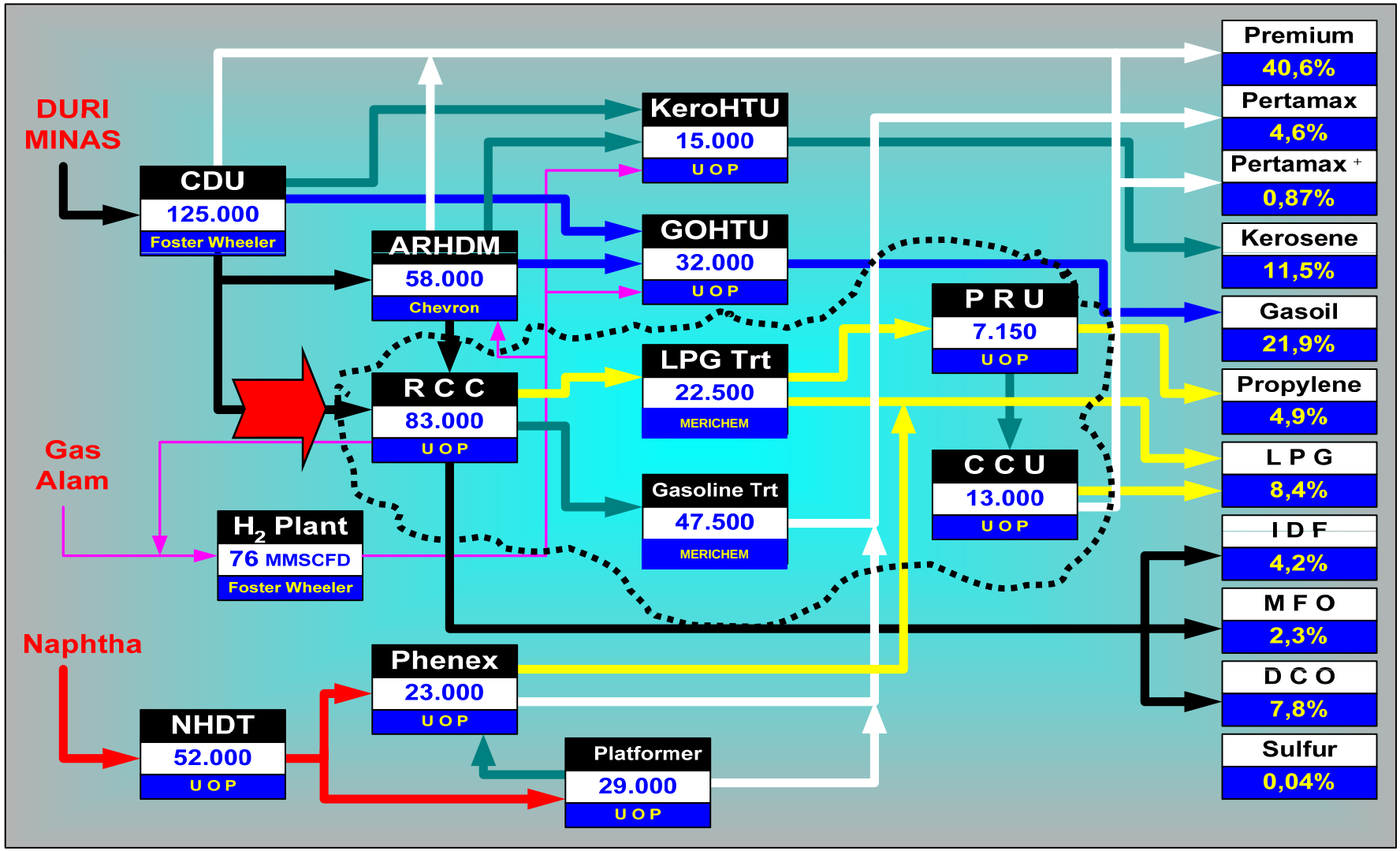
Group: Leader: Facilitator:

NO	Functional System Name	FS Code	Functional Description	Failure Scenario	Crit. Code	RAM Criticality
1	WATER INTAKE FACILITY SALAM DARMA	**A6 - U53 - FS001**	Unit yang menyediakan Raw Water untuk kebutuhan operasi kilang dan perumahan sebesar 1300 m3/jam. Sistem ini mempunyai kapasitas design 1.608 m^3/jam dengan kualitas raw water.	**2 Engine pompa transfer 53P102 failed, 1 pompa running**	**A5C**	**E**
2	DEMIN PLANT (POMPA DECARBONATOR)	**A6 - U55 - FS003**	Untuk menghasilkan demin water yang digunakan sebagai air umpan Boiler dengan flow rate 300 m3/jam. Sistem ini mempunyai 3 buah train dengan kapasitas 2 x 230 m^3/jam dan 1 x 110 m3/jam serta 3 tangki demin water dengan kapasitas 2 x 1400 m3 dan 1 x 2000 m	**1 pompa decarbonator 55A101A/B-P1 failed, train C online**	**A4D**	**E**
3	DEMIN PLANT (REGEN SYSTEM)	**A6 - U55 - FS003**	Untuk menghasilkan demin water yang digunakan sebagai air umpan Boiler dengan flow rate 300 m3/jam. Sistem ini mempunyai 3 buah train dengan kapasitas 2 x 230 m^3/jam dan 1 x 110 m3/jam serta 3 tangki demin water dengan kapasitas 2 x 1400 m3 dan 1 x 2000 m	**storage Acid bocor**	**A4C**	**H**
4	COOLING WATER SYSTEM	**A6 - U56 - FS004**	Untuk menghasilkan cooling water dengan temperatur < 33 ^oC dan pressure 4.3 kg/cm^2 kemudian mendistribusikan ke unit proses dan utilities dengan total flowrate design 33000 $m^{3/}$jam. Sistem ini mempunyai 12 banks pendingin dan 7 unit pompa dengan kapasitas	**chemical injection system failed**	**A3D**	**H**
5	POWER AND DISTRIBUTION	**A6 - U51 - FS007**	Untuk menghasilkan power listrik untuk mensulai power ke unit proses sebesar 60 MW dengan sistem distribusi terdiri dari 20 kV, 3 kV dan 400 V. Sistem ini dilengkapi dengan 6 buah STG kapasitas @ 22 MW 10 kV 50 Hz dan EDG kapasitas 3.6 MW 3 kV 50 Hz.	**Salah satu STG 51G101 Fail (jamed)**	**A4C**	**H**
6	AIR PLANT SYSTEM	**A6 - U58 - FS009**	Untuk menyediakan kebutuhan plant air dan intrument air dengan tekanan 8 kg/cm2 dan flow rate 8500 Nm3/Jam	**3 kompresor 58K101 failed, 1 trip, 1 gagal start dan 1 stop repair.**	**A4C**	**H**
7	NITROGEN SYSTEM	**A6 - U59 - FS010**	Menyediakan kebutuhan Nitrogen untuk unit existing dan KLBB. Sistem ini mempunyai 2 buah train dengan kapasitas @ 700 kNm3/jam produk N2 gas dan 3 buah N2 storage yang dapat disupport dari external supply.	**Cold Box 59-A-101A/B-A1 N2 train A/B failed**	**A3D**	**H**

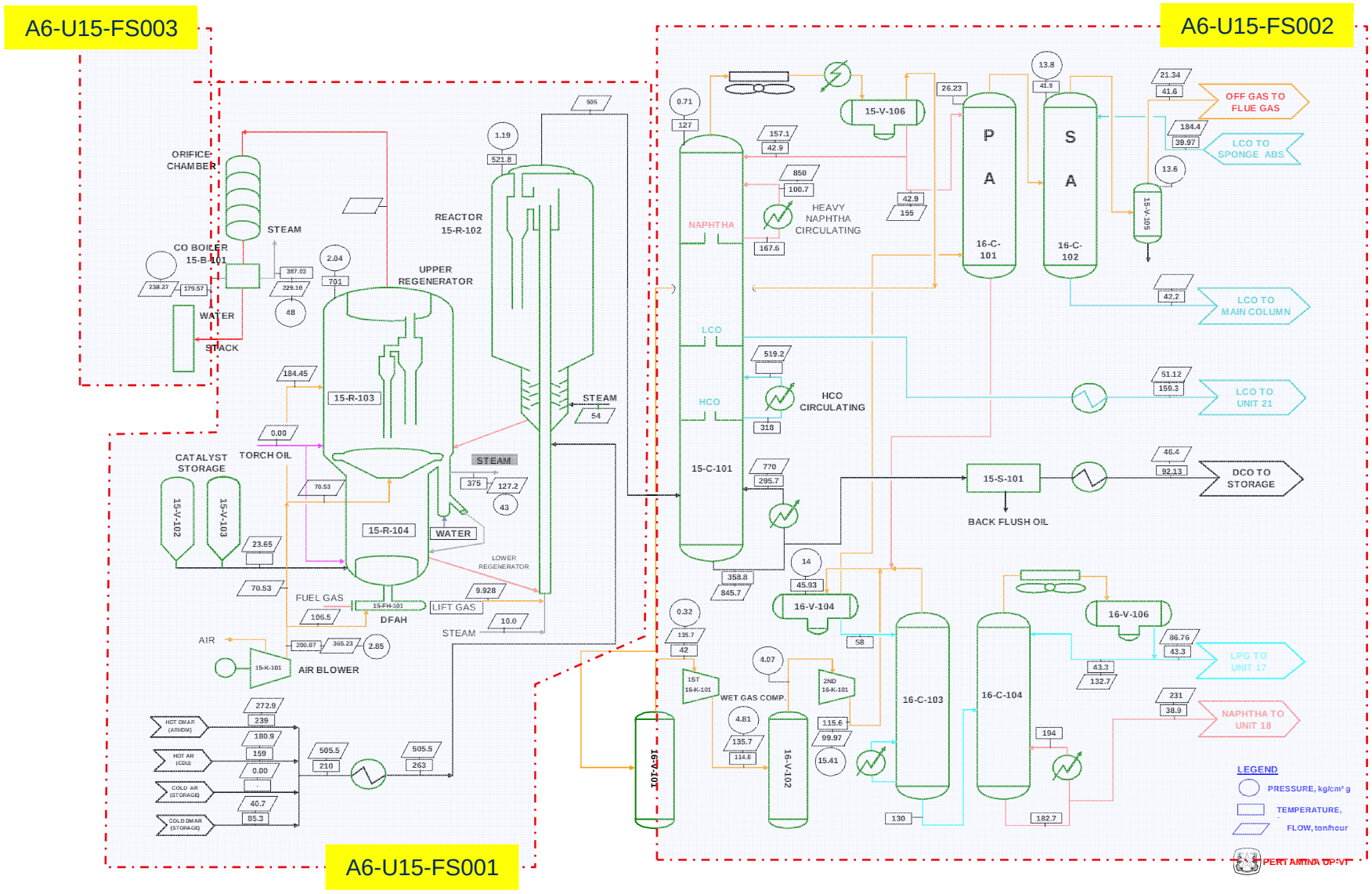
Overview of ECA- UPVI Utilities

Sr	Functional Location	Equip Tag	Equipment Description	Impact on the FS	Criticality Code	RAM Criticality
1	53-P-102A/B/C	53-P-102 A/B/C EN	Engine pompa transfer 53-P-102 A/B/C WIF Salam Darma design driver power 790 kW dengan speed 1830 rpm.	Transfer raw water turun sampai 1000 m3/jam sehingga ketahanan level 54T101 di Balongan hanya bertahan 7 hari, setelah itu emergency shut down unit proses, lama perbaikan selama 30 hari/engine.	A5C	E
2	55-A-101A/B (POMPA DECARBONATOR)	55-A-101A/B-P1	Pompa Decarbonator Demin Train A/B	Salah satu Demin Train A/B Stop (train C ops), pasokan berkurang dari 300 menjadi 270 T/J, ketahanan supply 80 jam, lama perbaikan 4 hari, action awal Unit GO-HTU stop disusul seluruh Unit Ops Kilang.	A4D	E
3	55-A-101A/B (REGEN SYSTEM)	55-A-101A-V3	Sulfuric acid drum Train A/B	Stock acid untuk regenerasi train A/B shortage sehingga tidak dapat melakukan proses regenerasi dan produksi demin water menurun, ketahanan supply demin water 11 jam lama perbaikan 4 hari	A4C	H
4	56-CT-101A/B	56-A-201	Cl2 injection, berfungsi untuk mempertahankan laju pertumbuhan mikroorganisme di cooling water system.	injeksi Cl2 stop sehinga pertumbuhan lumut di sitem cooling water meningkat dan potensi terakumulasi di fill pack Cooling Tower, lama perbaikan 2 hari	A3D	H
5	51-G-101	51-G-101A-P1A-T/00	MAIN LUBE OIL PUMP 51-G-101A-P1A	Pressure main L/O pump menurun sehingga Pompa Aux. Akan auto start	A3D	H
6	58-K-101	58-K-101A-E	Kompresor air plant dengan penggerak turbin HP steam, menyediakan kebutuhan plant air dan intrument air dengan tekanan 8 kg/cm2 dan flow rate 8500 Nm3/Jam	Kompresor 58-K-101 trip sehingga shortage Instrument Air sehingga kompresor N2 Train A/B digunakan sebagai back up air plant system, kemudian jika press IA masih rendah maka sebagian unit turun kapasitas & persiapan emergency shut down, lama perbaikan 14	A4C	H
7	59-A-101A/B-A1	59-A-101-DO1	Turbin expander yang berfungsi untuk mencapai temperature pemisahan N2 dalam Cold Box, design temperature -174 oC	expander trip sehingga N2 plant shut down dan tidak ada produksi N2, kebutuhan N2 disuplai dari eksternal supply, lama perbaikan 7 hari & recovery 4 hari.	A3D	H

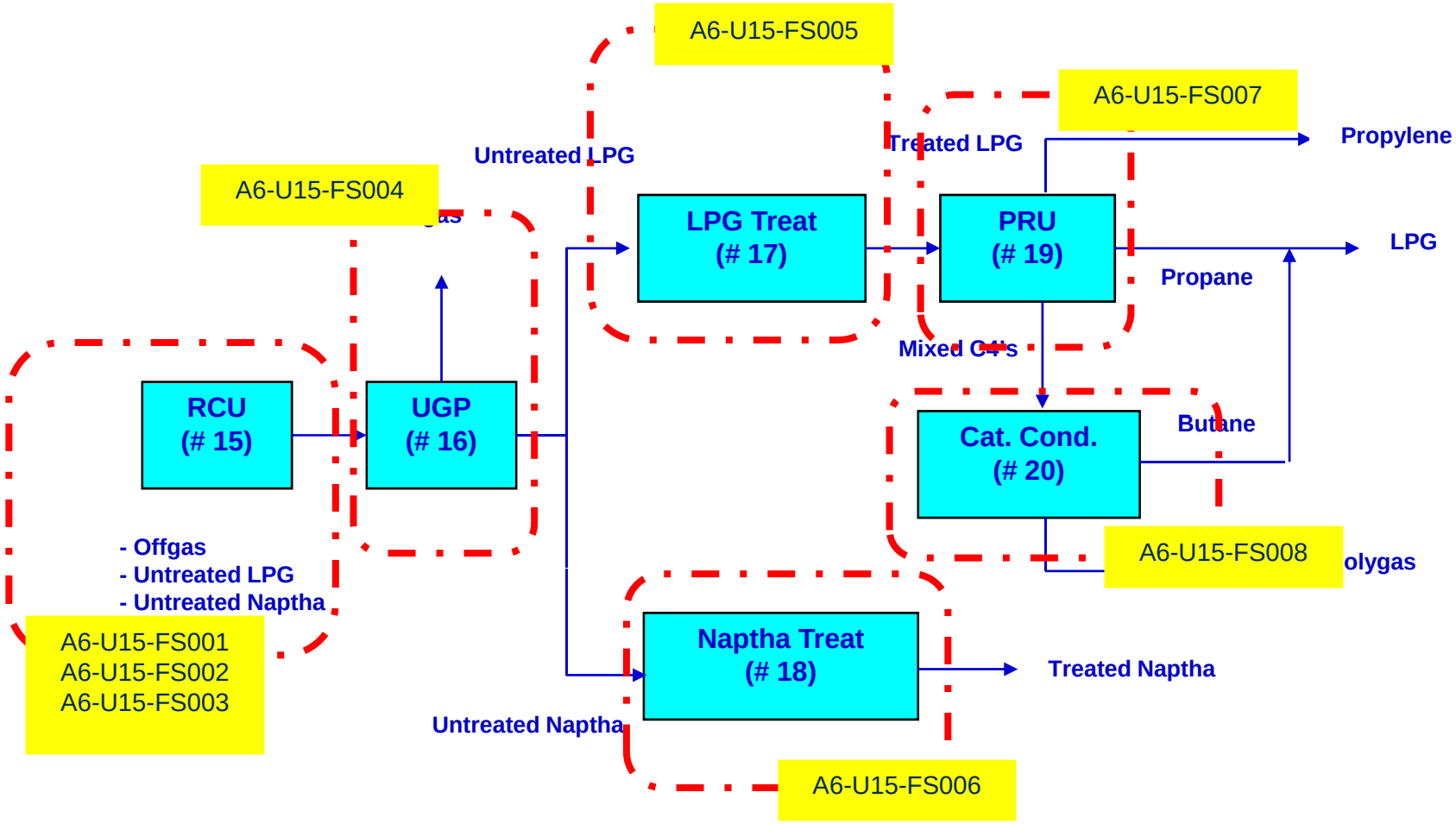
DIAGRAM ALIR UP-VI BALONGAN



FLOW DIAGRAM RCC & UNSATURATED GAS PLANT



LIGHT END UNIT



FUNCTIONAL SYSTEMS - CRITICALITY ANALYSIS

Drawing No.	Functional System Name	FS Code	Functional Description	Failure Scenario	Impact (Primary/Secondary)	Crit. Code	RAM Criticality
	Reactor Regenerator System	A6 - U15 - FS001	Mengkonversi Combine Feed Residue sebesar 83.000 BPSD menjadi High Value Product.	Catalyst Cooler bocor	RCC Shut down untuk penggantian Catalyst Cooler selama 28 hari (5+16+7) dan harus evakuasi catalyst	A5B	H
	Fractionator System	A6 - U15 - FS002	Memisahkan Effluent Reactor RCC menjadi fraksi-fraksinya yaitu LP Gas, RCC Naphtha, LCO, dan DCO	DCO Pump 15-P-102 Trouble dimana tidak ada pompa available	Level column 15-C-101 dan 15-C-102 naik, kapasitas RCC Reduce ke 68%, diperlukan penggantian pompa spare 1 hari, dan normalisasi kapasitas 1 hari, Total reduce kapasitas 2 hari	A4B	MH
	CO Boiler	A6 - U15 - FS003	Memanfaatkan Flue Gas eks Regen untuk menghasilkan HP Steam dengan kapasitas 212 T/H pada tekanan 43 kg/cm2	Intrumentation Trouble (BMS, Flame Detector, Level Switch)	COB Trip loss of steam product ± 240 T/H yang berdampak kepada naiknya beban steam Utilities, dan paparan gas CO ke lingkungan. Untuk start kembali menggunakan FDF yang standby diperlukan waktu sekitar 2 hari untuk menstabilkan pressure Header Steam UTL, Divert Flue Gas RG, start kembali COB	A3D	H
	Unsaturated Gas System	A6 - U16 - FS004	Me-recover Wet Gas RCC untuk menghasilkan HOMC dengan ON 92-94 sebesar 47.500 BPSD dan men-treatment off gas	WGC 16-K-101 Trip	Unsaturated Gas RCC dibuang langsung ke Flare sehingga Loss produk LPG, Propylene dan Polygasoline. Evakuasi HC ke Flare. Loss Production 5 hari (2 mechanical + 3 Onstream produk)	A4C	H
	RCC - LPG Treatment	A6 - U17 - FS005	Mereduksi kandungan sulfur dan impurities dalam LPG Product menggunakan larutan caustic soda sampai 11 ppm maksimun untuk feed PRU dan 150 ppm untuk LPG Commersial	Caustic Recycle Pompa (17-P-101, 102, 103) Fail, Standby pump un-available	RCC minimum kapasitas (68%) dan temperature reaktor turun, LPG produk off spec karena Sulfur Content dan down grade ke fuel gas,	A3A	L
	RCC - Naphtha Treatment	A6 - U18 - FS006	Mereduksi kandungan sulfur dan impurities dalam RCC Naphtha dengan menggunakan larutan caustic soda sebesar 47.500 BPSD	Fiber Film Contactor Kotor	Produk Treated Naphta tetap, namun terjadi Excessive Caustic Consumption	E2A	N
	Propylene Recovery Unit	A6 - U19 - FS007	Me-recover Propylene dari treated LPG untuk menghasilkan Propylene Produk sebesar 720 Ton/Day	Pipa bocor karena Corrosion Under Insulation	Unit 19 dan 20 Stop dan flaring, sehingga loss Product Propylene dan Polygasolene sehingga down grade menjadi produk LPG. Diperlukan waktu 10 hari untuk recovery produk (2+5+3 hari)	A4C	H
	Catalytic Condensation Unit	A6 - U20 - FS008	Mengkonversi Mixed Butane sebesar 13.000 BPSD menjadi Polygasolene dengan ON 98-99	Pipa bocor karena CUI	Unit 20 stop, losses produk Polygasolene dan down grade ke LPG. Recovery produk selama 5 Hari (2 HCF + 2 MD + 1 start normalisasi)	A4C	H

Sr	Functional Location	Equip Tag	Equip. Type	Equipment Description	Impact on the FS	Crit. Code	RAM Criticality
1	15-K-101	15-K-101	Rotating	Main Air Blower	RCC Shut down 23 hari (5+11+7) dan harus evakuasi catalyst	A5A	MH
2	15-SLV-105	15-SLV-105	Stationary	Flue Gas Slide valve	RCC Shut down 16 hari (5+4+7) dan harus evakuasi catalyst	A5B	H
3	15-E-113A/B/C/D	15-E-113A/B/C/D	Stationary	Catalyst Cooler	RCC Shut down untuk penggantian Catalyst Cooler selama 28 hari (5+16+7) dan harus evakuasi catalyst	A5B	H
4	15-L-108	15-L-108	Stationary	Reactor Riser	RCC shut down 18 hari dengan mechanical day 6 hari	A5B	H
5	15-R-103	15-R-103	Stationary	Upper Regenerator	RCC shut down karena slide valve terganjal oleh internal part yang lepas, perlu perbaikan selama 20 hari (5+8+7)	A5B	H
6	15-R-104	15-R-104	Stationary	Lower Regenerator	RCC Shut Down selama 23 hari karena refractory spalling dan shell bulging	A5B	H
7	15-A-202BA~BT	15-A-202BA~BT	Stationary	Secondary Cyclone	Loss Catalyst 34 ton/hari dengan nilai USD 2.000/ton, dan RCC Shut Down untuk perbaikan sementara Cyclone (insert patch) selama 19 hari (5+7+7)	A5B	H
8	15-K-101	15-PSL-716	Instrument	Receiver Pressure Low Switch	Bilamana terjadi gangguan pada MOP maka RCC Shut Down	A2B	L
9	15-K-101	15-K-101T	Rotating	MAB Steam Turbine	FS Shut Down	A4C	H
10	15-K-101	15-XV-701	Instrument	MAB Blow Off Valve	FS Shut Down	A3A	L
11	15-K-101	15-UCV-702A	Instrument	MAB Snort Valve	FS Shut Down	A3A	L
12	15-K-101	15-UCV-702B	Instrument	MAB Snort Valve	FS Shut Down	A3A	L
13	15-K-101	15-UCV-702C	Instrument	MAB Snort Valve	FS Shut Down	A3A	L
14	15-K-101	15-XIC-001	Instrument	Anti Surge Controler	FS Shut Down	A5B	H

DISTRIBUSI SYSTEM/EQP CRITICALITY UTILITIES

No	System	E	H	MH	M	L/N
1.	WIF	53 –P 102 A/B/C EN		53-P-!02 A/B/C		53 –RW-0204-MS23-24
2.	Demin Plant	55-A-101A/B-P1	55A101A/B-V3 55-A-101A/B-V5	55-A-101A/B -P1M 55-A-101A/B-V4	55-A-101A/B-V6 Panel 55-A-101A/B	55-LV-101A/B 55-FV-104A/B 55-A-101A/B-P2 55-A-101A/B-P2M
4.	Steam Turbine Generator		51-G-101-P1A-T/00 51-G-101-E3B/00	51-G-101-P1A/00 51-G-101-P1B-M/00 51-G-101-P1B-00 51-G-101-P1C-M/00 51-G-101-P1C/00		51-G-101-SRB1A/00 51-G-101-SRB1B/00
5.	Cooling Water System Chlorine Insjection		56-A-201			56-A-202
7.	Instrument Air System		58-K-101A/B/C/D/E-E1-2	58-K-101C/D-T	58-K-101A/B/E-M	
8.	Nitrogen Plant		59-A-101A/B-D01	59-A-101A/B-K01	59-A-101A/B-E01	

TOP-5 CRITICAL EQUIPMENT UTILITIES

Dipilih dari hasil ECA dengan RAM Criticality“H” (High) dan “E” (Extreme)

	EQUIPMENT DESCRIPTION		TYPE	CRIT.CODE	CLASS
5	53 – P-102A/B/C EN	Engine for Pompa Transfer Raw Water	ROT	A5C	Extrem
1 •	55-A-101A/B-P1	Pompa Decarbonator Demin Plant A/B	ROT	A4D	Extrem
2 •	55-A-101A/B-V3/V5	Vessel Acid Demin Plant	STA	A4C	High
3 •	56-A-201	Clorine Injection System	INST	A3D	High
4 •	58-K-101A/B/C/D/E-E1-2	Intercoller Compressor	ROT	A3D	High
5					

DISTRIBUSI SYSTEM / EQP CRITICALITY RCC

No	System	E	H	MH	M	L/N
1.	Reactor Regenerator System	-	•15-SLV-105, •15-E-113ABCD •15-R-103 •15-R-104 •15-A-202BA~BT •15-K-101T •15-XIC-001 •15-L-108	15-K-101		•15-PSL-716 •15-XV-701 •15-UCV-702ABC
2.	Co Boiler	-	•15-K-102AB •LLCP-DC-900917-502 (BMS)	•15-K-102BT •15-P-118ABC •15-P-118AB-T	•KB91/3337A~F (BURNER) •15-FE-028	•15-HC-048/049 •15-K-102AM •15-P-118C-M
3.	Unsaturated Gas System	-	•16-K-101T	•16-K-101		
4.	Propylene Recovery Unit	-	•19-PG-0909-A2A1-3-H40 •19-PG-102-A2A1-6-H30 •19-PG-0204-A2A1-4-H25	•19-P-102AB •19-K-101T •19-K-101	•19-P-101AB	
5.	Catalytic Condensation Unit	-	20-PL-0302-A1A1-6-H40			

TOP-5 CRITICAL EQUIPMENT RCC

Dipilih dari hasil ECA dengan RAM Criticality“H” (High) dan “E” (Extreme)

		EQP DESC	CLASS	CRIT.CD	RISK CAT
1	15-K-101T	MAB (MAIN AIR BLOWER) STEAM TURBINE	ROT	A4C	H
2	15-K-102A/B	COB FORCE DRAFT FAN	ROT	A3D	H
3	19-PG-0204-A2A1-H25	LPG LINE PIPE	STA.	A4C	H
4	16-K-101T	WET GAS COMPRESSOR	ROT	A4C	H
5	LLCP-BC900917-502	BMS (BURNER MANAGEMENT SYSTEM) CO BOILER	INT	A4C	H

NEXT PLAN..

1. Menyusun Equipment Readiness Program (Mei~Juni 2009)
   - Condition Monitoring
   - PM/PdM
   - MSL

2. Menyusun FSCA ECA unit-unit (Juli~Agustus 2009)
   - CDU
   - DHC
   - HSC
   - ITP & Marine
   - PLM

Equipment Readiness Program
Top 5 Critical Equipment UTL

TOP 10 Critical Equipment Readiness Program

ECA DEPLOYMENT

FS Code	A6-U53-FS003-01	Equipment : Transfer Water Pump	Asset Holder	UTILITY

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
55-A-101A/B-P1	Radiator bocor	Overheating, stop engine pompa transfer raw water to Balongan, ketahanan supply raw water selama 7 hari	475,0400909	0.5 - 4 YRS	A1C	L
	Gasket Cylinder head leakage	Overheating, stop engine pompa transfer raw water to Balongan, ketahanan supply raw water selama 7 hari	1043,767636	0.5 - 4 YRS	A1C	L
	Cylinder head damaged	terjadi kebocoran, stop engine pompa transfer raw water to Balongan, ketahanan supply raw	10848558,41	0.5 - 4 YRS	A5C	E
	Turbocharge damaged	loss power, engine pompa stop, ketahanan supply raw water selama 7 hari	2832,909091	0.5 - 4 YRS	A1C	L
	crank shaft patah	engine pompa jamed, transfer raw water stop, ketahanan supply 7 hari	49650758,89	4 - 30 YRS	A5B	H
	Clutch coupling damage	pompa transfer stop operasi, ketahanan supply 7 hari	1454,545455	0.5 - 4 YRS	A1C	L
	Supply FO dari Tank Car Shortage	Engine pompa transfer & generator stop, ketahanan FO 7 hari, ketahanan supply Raw Water	0	0.5 - 4 YRS	A1C	L
	Injection Pump rusak	Engine pompa transfer stop, ketahanan supply Raw Water 7 hari.	1335,363636	0.5 - 4 YRS	A1C	L

Strategi			Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
Maint. & Reliabilities	PdM	1	Monitoring Vibrasi Engine	Max vibrasi 18mm/s rms	Eng.Pem	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		2	Monitoring Temp. Engine	Engine terjadi overheating	Eng.Pem	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		3	Monitoring L/O Engine	Pelumasan Engine tidak	Pem 3	Weekly	√	√	√	√	√	√	√	√	√	√	√	√	
	PM	1	Pengecnekan air radiator	Engine terjadi overheating	Pem 3	Weekly	√	√	√	√	√	√	√	√	√	√	√	√	
		2	Pengecekan metal stream coupling	Metal stream patah dan menimbulkan vibrasi	Pem 3	Mid Yearly						√						√	
		3	Pengecekan alignment clutch dan pompa	Engine Vibrasi	Pem 3	Mid Yearly						√						√	
		4	Panggantian air filter	Engine Stop karena udara yang masuk tertahan/kurang	Pem 3	3 Mounthly			√			√			√			√	
		5	Panggantian L/O filter	Pelumasan Engine tidak sempurna dan terjadi overheating	Pem 3	4 Mounthly			√			√			√			√	
		6	Panggantian F/O filter	Flow F/O tertahan dan tidaka ada pembakaran (engine mati)	Pem 3	5 Mounthly			√			√			√			√	
		7	Pengukuran SG Battery	Engine tidak bisa start	Pem 3	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		8	Monitoring level air battery	Engine tidak bisa start	Pem 3	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
Operational	PdM	1	Monitoring Temp	Engine terjadi overheating	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		2	Monitoring Level L/O	Pelumasan Engine tidak	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		3	Monitoring Level Radiator	Engine terjadi overheating	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		4	Monitoring Level F/O	Flow F/O tertahan dan tidaka	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		5	Monitoring Ammeter Batt. Charger	Engine tidak bisa start	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		6	Monitoring RPM	Flow pompa tidak tercapai	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		7	Monitoring Delta Pressure Filter																
Improvement			Menaikkan Kapasitas Engine menjadi 1.2MW																Saat ini Engine tidak mampu beroperasi diatas 1600rpm

Matl Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.													

OPI COACH

Approval

MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK

TOP 10 Critical Equipment Readiness Program

ECA DEPLOYMENT

FS Code	A6-U55-FS003-01	Equipment : Decarbonator Pump	Asset Holder	UTILITY

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (U$D)	Likelihood	Crit. Code	RAM Crit.
55-A-101AB-P1	Bearing dan Bearing Housing Damage	Salah satu Demin Train A/B Stop (train C ops), pasokan berkurang dari 300 menjadi 270 T/J, ketahanan supply 80 jam, lama perbaikan 4 hari (Kilang akan stop)	1439356,90	0 - 0.5 YRS	A4D	E
	Impeller damage / unbalance	Salah satu Demin Train A/B Stop (train C ops), pasokan berkurang dari 300 menjadi 270 T/J,	1437677,93	0.5 - 4 YRS	A4C	H
	Baud Coupling patah	Tidak ada Impact karena durasi perbaikan masih dibawah ketahanan unit	4,27	0.5 - 4 YRS	A1C	L
	Expantion Bellows pecah	Tidak ada Impact karena durasi perbaikan masih dibawah ketahanan unit	2254,63	0.5 - 4 YRS	A1C	L
	Strainer rusak	Tidak ada Impact karena durasi perbaikan masih dibawah ketahanan unit	499,09	0.5 - 4 YRS	A1C	L

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
Maint. & Reliabilities	PdM 1.	Monitoring Vibrasi Pompa dan Motor	Vibrasi max. 4.5mm/s rms	Eng.Pem	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring Temp. Pompa dan Motor	Temp. Max. 85°C	Eng.Pem	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring Arus Motor	Motor over load, max, arus ...	Pem 3	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring L/O Pompa	Level dibawah setting	Pem 3	Mountly	√	√	√	√	√	√	√	√	√	√	√	√	
		Penggantian L/O	Bearing pompa damage	Pem 3	Mid Yearly					√						√		
		Regreasing Bearing Motor	Bearing pompa damage	Pem 3	Mid Yearly					√						√		
		Pengecekan metal stream coupling	Metal stream patah dan	Pem 3	Mid Yearly					√						√		
		Pengecekan allignment	Pompa Vibrasi	Pem 3	Mid Yearly					√						√		
		Pengecekan proteksi motor	Winding motor terbakar	Pem 3	Yearly					√						√		
		Pengecekan terminasi motor	Loss Contact pada motor	Pem 3	Mid Yearly					√						√		
		Pengecekan Push Button	Pompa tidak bisa start atau	Pem 3	Mid Yearly					√						√		
		Insulation test Motor (Megger)	Winding motor short to	Pem 3	Mid Yearly					√						√		
Operational		Monitoring Arus Motor	Motor over load, max, arus ...	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring L/O Pompa	Level dibawah setting	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring Pressure	Min Press. 3Kg/cm²	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
				UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
Improvement																		

Matl. Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.	Bearing	2	PCS			2							
	Housing Bearing	1	Set			1							

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MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK

TOP 10 Critical Equipment Readiness Program

ECA DEPLOYMENT

F$ Code	A6-U55-FS003-05	Equipment : Storage Acid Drum	Asset Holder	UTILITY

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sycytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
55-A-101AB-V3	storage Acid bocor	Stock acid untuk regenerasi train A/B shortage sehingga tidak dapat melakukan proses regenerasi dan produksi demin water menurun, ketahanan supply demin water 11 jam lama perbaikan 4 hari	7634685,852	0.5 - 4 YRS	A4C	H
	Level Glass storage acid buntu	Tidak dapat mengetahui stock acid yang bepotensi shortage acid sehingga tidak dapat melakukan proses regenerasi train A/B dan produksi demin water menurun, lama perbaikan 6 jam	1363,636364	0.5 - 4 YRS	A1C	L
	loading connection to storage rusak	Stock acid untuk regenerasi shortage sehingga tidak dapat melakukan proses regenerasi train A/B dan produksi demin water menurun, ketahanan supply demin water 11 jam, lama perbaikan 4 jam	181,8181818	0 - 0.5 YRS	A2D	MH
	valve outlet storage acid macet	Tidak ada acid untuk regenerasi sehingga tidak dapat melakukan proses regenerasi train A/B dan produksi demin water menurun, ketahanan supply demin water 11 jam lama evakuasi pengosongan dan perbaikan 24 jam	1167870,67	4 - 30 YRS	A4B	MH
	Fasilitas N2 purge rusak	Korosi di line loading acid yang berpotensi tidak dapat melakukan loading unruk train A/B, ketahanan supply demin water 11 jam, lama perbaikan 4 jam	318,1818182	4 - 30 YRS	A1B	M
	valve drain storage to netralizing pit	losses acid, lama perbaikan 3 hari	5479068,67	4 - 30 YRS	A4B	MH

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
Maint. & Reliabilitas	PdM	1. Pengukuran NDT	Ketebalan Vessel ...	Pen.Rel	Yearly				√									
Operational		Monitoring Level Tank	Bila buntu level tidak bisa	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring Leakage acid	Bila terjadi leakage akan	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
Improvement		Penambahan Lampu level glass	Memudahkan monitoring	Eng.Bang														

Matl Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.													

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MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK

TOP 10 Critical Equipment Readiness Program

ECA DEPLOYMENT

F$ Code	A6 - U56 - FS004 - 01	Equipment : INJECTION CHLORINATOR	Asset Holder	UTILITY

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
56-A-201	connector storage bocor	Cl2 injection stop sehingga pertumbuhan lumut di sistem cooling water meningkat dan	91	0.5 - 4 YRS	A3C	MH
	Nedle valve rusak	Cl2 injection stop sehingga pertumbuhan lumut di sistem cooling water meningkat dan	136	0.5 - 4 YRS	A3C	MH
	vacum elector bocor	Cl2 injection stop sehingga pertumbuhan lumut di sistem cooling water meningkat dan	32.255	0.5 - 4 YRS	A3C	MH
	vacum regulator dan filter bocor	Cl2 injection stop sehingga pertumbuhan lumut di sistem cooling water meningkat dan	62.601	0.5 - 4 YRS	A3C	MH
	heater matl	Cl2 injection stop sehingga pertumbuhan lumut di sistem cooling water meningkat dan	455	4 - 30 YRS	A3B	M
	Pressure Gauge rusak	Cl2 injection masih tetap beroperasi tetapi tekanan yang ke vacum regulator tidak diketahui	127	0.5 - 4 YRS	A1C	L
	Rotameter bocor	Cl2 injection stop sehingga pertumbuhan lumut di sistem cooling water meningkat dan	60.964	0 - 0.5 YRS	A3D	H

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
	PdM	1.																
Maint. & Reliabilitas																		
Operational		Monitoring Pressure	Max. Pressure 3Kg/cm²	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring Flow Chlorine	Max. Flow 15Kg/h	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring Temperature	Max. Temp. 50°C	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring kevacuman	----	UTL	Daily	√	√	√	√	√	√	√	√	√	√	√	√	
		Monitoring leakage	Nil															
Improvement		Pemasangan Temperature Indicator	Saat temperature tidak termonitor	Eng.Bang														
		Pemasangan detector leakage chlorine	Bila terjadi kebocoran saat ini tidak ada indikasi/alarm	Eng.Bang														

Matl. Req.

Kmap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1													

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MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK

Equipment Readiness Program
Top 5 Critical Equipment RCC

TOP 5 Critical Equipment Readiness Program

ECA DEPLOYMENT

FS Code : A6-U15-FS001	Equipment MAB Steam Turbine	Asset Holder

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
15-K-101T	Fouling problem pada tahun 2004, 2007, 2008	RCC Shut down 3 hari dan perlu wet washing (36 jam)	2.096.545,25	0.5 - 4 YRS3	A4C	H

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
Maint. & Relabilitas	1.	Monitoring vibrasi trusth bearing	Vibrasi tinggi yang di akibatkan adanya kenaikan pressure pada 1st stage discharge MAB (normal	JPK,Rel	1 minggu													
	2.	Penggantian catridge filter lube oil	Adanya kenaikan delta P lube o	JPK	6 bulan													
Operational		Monitoring analisa steam product	Ada kenaikan silica content dalam steam product	Ops.	1/ hari													
		Mengatur injeksi chemical	Ada kenaikan silica content dalam steam product	Ops.	1/ hari													
		Mengatur level HBW di steam drum (15-V-101/101B/117) & mengatur continuos blowdown	Ada kenaikan silica content dalam steam product	Ops.	1/ hari													
		Monitoring temperatur lube oil	Adanya kebuntuan di seal cooler lube oil	Ops.	2/shift													
		Monitting pressure lube oil	Ada kebuntuan di filter lube oil	Ops.	2/shift													
		Monitoring level lube oil	Adanya kebocoran lube oil di sistem	Ops.	2/shift													
		Analisa Lube Oil	lube oil mengalami kontaminasi	Ops.	1 bulan													
		Menjalankan oil purifier pump secara berkala	water content pada lube oil melibihi batas maksimum	Ops.	1 bulan													
Improvement		Injeksi chemical	Adanya deposit silica pada turbi	Ops.	continue													
		Memasang fasilitas wet washing	Adanya deposit silica pada turbi	JPK	1x pog													

Matl Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.	Shoe assembly off Journal bearing assembly												
2.	Thrust Pad set												

OPI COACH

Approval

MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK
Iwan Soemantri	Syahyuli SB	Nur Hendro

TOP 5 Critical Equipment Readiness Program

ECA DEPLOYMENT

FS Code : A6-U15-FS001	Equipment COB Force Draft Fan	Asset Holder

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
15-K-102A/B	Adanya kenaikan vibrasi pda Bearing blower.	Steam product loss ±	232.267	0 - 0,5yrs	A3D	H

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
	1.	Bearing Inspection and recorded PDF	Adanya kenaikan vibrasi	Rel.	1/minggu													
	2.	Axial vibration Monitoring	Adanya kenaikan vibrasi krn bearing lock nut loose	Rel.	1/minggu													
	3.	Bearing temperature monitoring	Adanya kenaikan temperatur	Rel.	1/minggu													
	4.	Regreasing	Grease berkurang/kotor, viskositas berubah	JPK	2/minggu													
Operational	1.	Pengaturan discharge pressure	Adanya kenaikan vibrasi	OPS	Continue													
Improvement	1.	Memasang jaringan speed indikator yang dapat dimonitoring di DCS	Adanya indikasi flow yang tidak stabil	JPK	1 kali													

Matl Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.													

OPI COACH

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MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK
Iwan Soemantri	Syahyuli SB	Nur Hendro

TOP 5 Critical Equipment Readiness Program

ECA DEPLOYMENT

FS Code : A6-U15-FS001	Equipment Wet Gas Compressor	Asset Holder

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
16-K-101	Governor & Bearing Problem	Loss product LPG,Propylene , & polygasoline	7.929.833	0,5 -4 yrs	A4C	H

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
Maint. & Reliabitas	1.	Monitoring vibrasi trusth bearing	Vibrasi tinggi yang di akibatkan adanya kenaikan pressure pada 1st stage discharge MAB (normal pressure 14 kg/cm^2)	JPK,Rel	1 minggu													
	2.	Penggantian catridge filter lube oil	Adanya kenaikan delta P lube oil	JPK	6 bulan													
Operational	3.	Monitoring analisa steam product	Ada kenaikan silica content dalam steam product	Ops.	1/ hari													
	4.	Mengatur injeksi chemical	Ada kenaikan silica content dalam steam product	Ops.	1/ hari													
	5.	Mengatur level HBW di steam drum (15-V-101/101B/117) & mengatur continuos blowdown	Ada kenaikan silica content dalam steam product	Ops.	1/ hari													
	6.	Monitoring temperatur lube oil	Adanya kebuntuan di seal cooler lube oil	Ops.	2/shift													
	7.	Moniting pressure lube oil	Ada kebuntuan di filter lube oil	Ops.	2/shift													
	8.	Monitoring level lube oil	Adanya kebocoran lube oil di sistem	Ops.	2/shift													
	9.	Analisa Lube Oil	lube oil mengalami kontaminasi	Ops.	1/ bulan													
	10.	Menjalankan oil purifier pump secara berkala	water content pada lube oil melbihi batas maksimum (max. 0,5% volume)	Ops.	1/bulan													
Improvement		injeksi chemical	Adanya deposit silica pada turbin	Ops.	continue													
		Memasang fasilitas wet washing	Adanya deposit silica pada turbin	JPK	1x psg													

Matl Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.	Shoe assembly off Journal bearing assembly												
	Thrust Pad set												

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MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK
Iwan Soemantri	Syahyuli SB	Nur Hendro

TOP 5 Critical Equipment Readiness Program

ECA DEPLOYMENT

FS Code :	Equipment LPG Piping	Asset Holder

Failure Mode Risk Assessment

Sequence Number	Credible Ways of Equipment Failure	Impact On The Sysytem	Total Cons. (USD)	Likelihood	Crit. Code	RAM Crit.
19-PG-0204-A2A1-4"-H25	Pipa mengalami Corrosion Under Insulation	Unit 19 & stop	2.822.590	4-30 yrs	A4B	H

Strategi		Action	Critical Issue	PIC	Frek	1	2	3	4	5	6	7	8	9	10	11	12	Remark
Maint. & Reliabitas	1.	Mengganti pipa	Pipa bocor	JPK	1X													
	2.	Melapisi pipa dgn primer coat	Barrier rusak	JPK	1X													
	3.	Mengganti Isolasi	Isolasi rusak/terkontaminasi air	JPK	1X													
	4.	Monitoring CUI	CUI tidak terkontrol	Rel	1/bulan													
Operational																		
Improvement		Analisa penggunaan Insulation coating	Potensi Insul. terkontaminasi tinggi	REL,JPK	1													

Matl Req.

Kimap	Description	QTY Req.	UI	PM	RUTIN	QTY MSL	Q1	Q2	Q3	Q4	STATUS	PIC	Remark
1.	Rockwool												
	Metal Jacketing												
	Tapping Screw												
	Sealant												
	Pipa CS A53 4"												
	Primer coat												

OPI COACH

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MANAJER PRODUKSI	MANAJER RELIABILITY	MANAJER JPK
Iwan Soemantri	Syahyuli SB	Nur Hendro


WORKSHOP
FINALISASI FSCA & ECA
Unit UTL – RCC RU-VI
PERTAMINA
Always There
Kuningan, 03 Mei 2009


WORKSHOP AGENDA


Sebelum Workshop FSCA ECA
RAMSA

TERIMAKASIH