



MAINTENANCE 2000

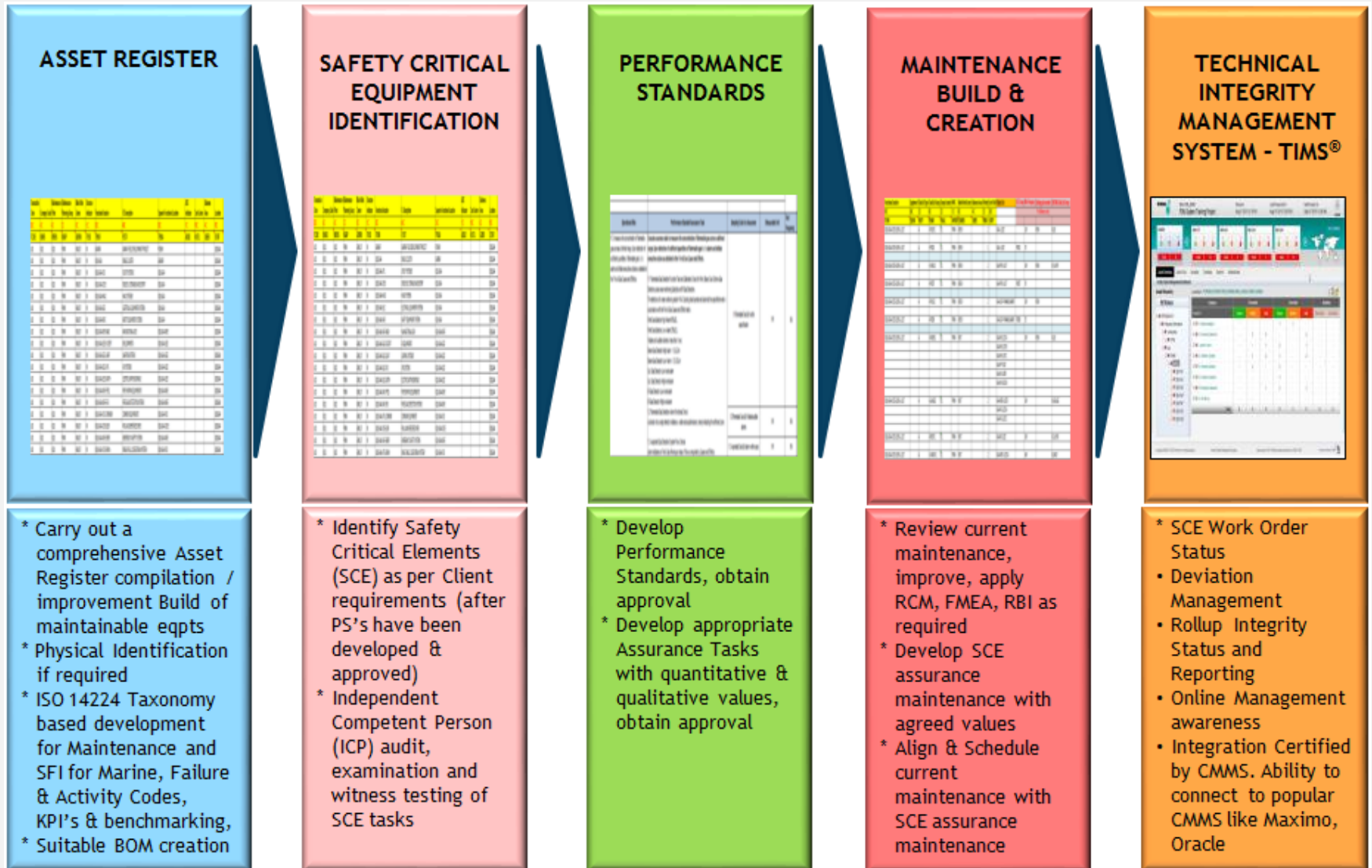
Maintenance & Integrity Management

Maintenance Build & SCE Management

“Effective M&I Management requires an up-to-date asset register, correct SCE maintenance tasks and intervals, clear performance standards and continuous online monitoring”



Maintenance Build and SCE Management



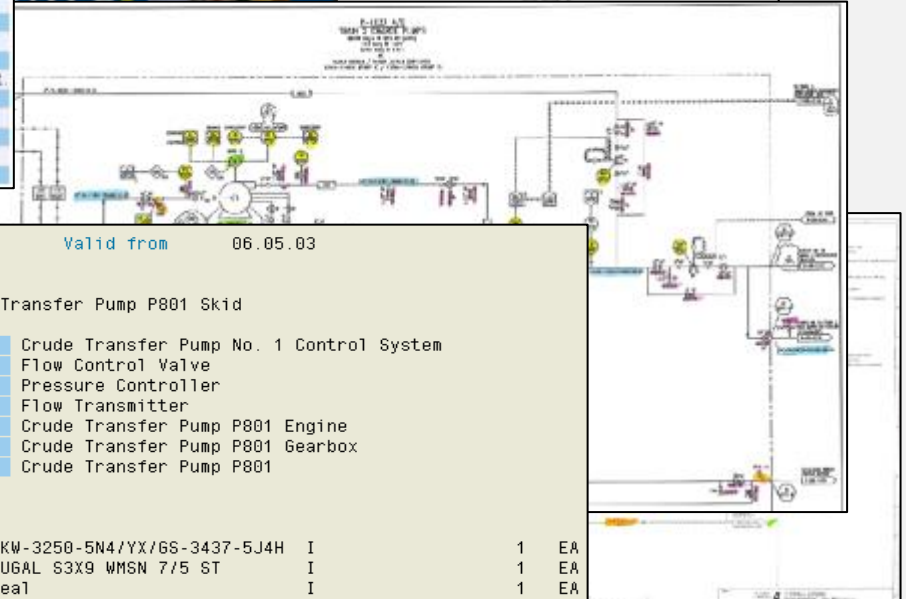
Effective Asset Integrity Management requires a complete asset register, suitable maintenance tasks, clear performance standards with continuous online monitoring

Asset Register

ASSET REGISTER

- * Carry out a comprehensive Asset Register compilation / Improvement Build of maintainable eqpts
- * Physical Identification if required
- * ISO 14224 Taxonomy based development for Maintenance and SFI for Marine, Failure & Activity Codes, KPI's & benchmarking,
- * Suitable BOM creation

FuncLocation	MY.F23.PKA
Description	F23 Production Compressor Platform A
Level1	EP Shell EAP Group Companies
Level2	EP.MY Shell Malaysia Exploration & Production
Level3	MY.FNC Shell Malaysia EAP Functional Assets
Level4	MY.F23 F23 Field
Level5	MY.F23.DFA F23 Drilling Platform A
Level5	MY.F23.PKA F23 Production Compressor Platform A
Level6	MY.F23.PKA.GHD SAS HANDLING
Level7	MY.F23.PKA.GHD.K2400 Gas Compressor Skid
Level8	<ul style="list-style-type: none"> MY.F23.PKA.GHD.K2400-CS Gas Compressor Control System MY.F23.PKA.GHD.K2400-GB Gas Compressor - Gearbox MY.F23.PKA.GHD.K2400-GT Gas Compressor - Turbine Driver MY.F23.PKA.GHD.K2400-HSU Gas Compressor - Turbine Hydraulic Syst. MY.F23.PKA.GHD.K2400-K Gas Compressor MY.F23.PKA.GHD.K2400-MLD Gas Compressor - Main Lube Oil System MY.F23.PKA.GHD.K2400-SC Gas Compressor



FuncLocation	MY.SJO.PPA.OEX.P801	Valid from	06.05.03
Description	Crude Transfer Pump P801 Skid		
<ul style="list-style-type: none"> MY.SJO.PPA.OEX.P801 Crude Transfer Pump P801 Skid <ul style="list-style-type: none"> MY.SJO.PPA.OEX.P801-CS Crude Transfer Pump No. 1 Control System MY.SJO.PPA.OEX.P801-CS-FCV801 Flow Control Valve MY.SJO.PPA.OEX.P801-CS-FIC801 Pressure Controller MY.SJO.PPA.OEX.P801-CS-FT801 Flow Transmitter MY.SJO.PPA.OEX.P801-EN Crude Transfer Pump P801 Engine MY.SJO.PPA.OEX.P801-GB Crude Transfer Pump P801 Gearbox MY.SJO.PPA.OEX.P801-P Crude Transfer Pump P801 31000010659 CENTRIFUGAL PUMP <ul style="list-style-type: none"> 1000221977 SEAL, MECH. UKW-3250-5N4/YX/6S-3437-5J4H I 1 EA 2510002433 PUMP CENTRIFUGAL S3X9 WMSN 7/5 ST I 1 EA 2510002596 Mechanical Seal I 1 EA 			

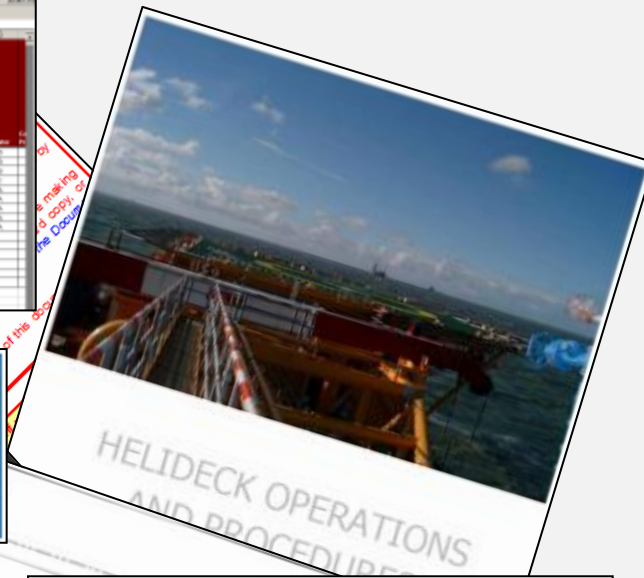
Safety Critical Equipment

SAFETY CRITICAL EQUIPMENT IDENTIFICATION

Asset ID	Asset Name	Asset Type	Asset Location	Asset Category	Asset Status	Asset Age	Asset Value	Asset Risk	Asset Criticality
001	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter
002	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter	Flowmeter
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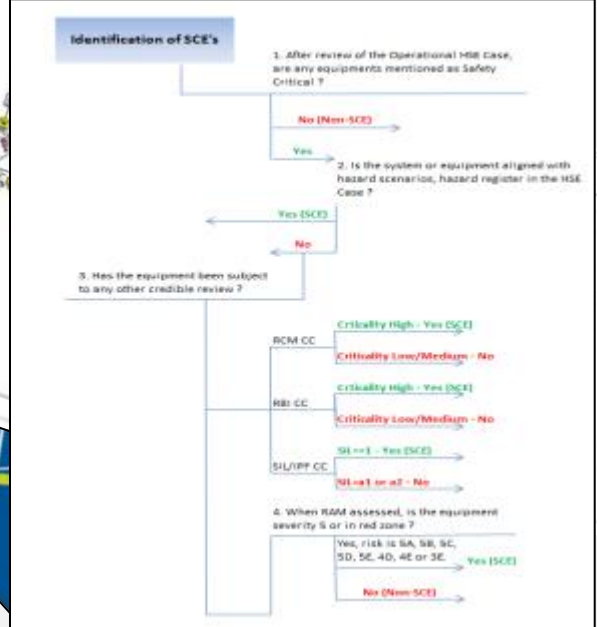
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Likelihood	Severity	Impact				
		1 Significant	2 Minor	3 Moderate	4 Major	5 Catastrophic
E Almost Certain	Happens several times per year at location	E1	E2	E3	E4	E5
D Likely	Happens several times per year in company	D1	D2	D3	D4	D5
C Possible	Incident has occurred in our company	C1	C2	C3	C4	C5
B Unlikely	Heard of incident in industry	B1	B2	B3	B4	B5
A Remotely Likely to Happen	Never heard of in industry	A1	A2	A3	A4	A5

Figure 1: HSE Risk Matrix



- Identify Safety Critical Elements (SCE) as per Client requirements (after PS's have been developed & approved)
- Independent Competent Person (ICP) audit, examination and witness testing of SCE tasks

Independent Competent Person (ICP) audit, examination and witness testing of SCE tasks

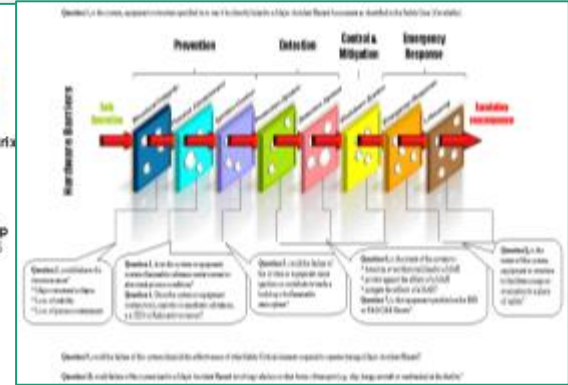
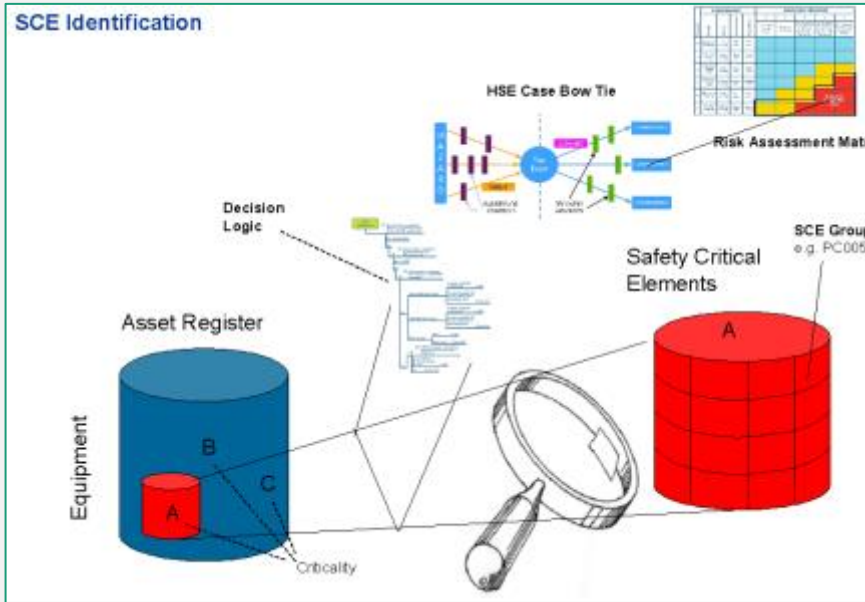
Performance Standards

To ensure all hardware barriers necessary to control & mitigate Major Accident Hazards (MAH's) are correctly identified in the Duty Holder's Maintenance Database (CMMS) as SCE's at the appropriate level of granularity.

They are classified into the most relevant SCE Group whereby inspection, maintenance and testing can be planned and scheduled.

PERFORMANCE STANDARDS

Item No	Maintenance Reference	Inspection Interval	Tested At	Tested By
1
2
3



- * Develop Performance Standards, obtain approval
- * Develop appropriate Assurance Tasks with quantitative & qualitative values, obtain approval

PERFORMANCE STANDARD TEMPLATE			
BARRIER/REFERENCE	IMPACT/RESPONSE	PERFORMANCE STANDARD/ CRITERIA	Check/audit To be Done/By
SAFETY CRITICAL ELEMENT GROUP	EMERGENCY POWER	To provide an emergency power supply to support essential facilities during an emergency following loss of the normal power supply.	Review of Design of Protection
SEE GOAL			Review of Design of Protection
Function No.	Functional Criteria	Minimum Assurance Task	Assurance Value
1	The Emergency Generator shall start upon demand.	<p>1.1 Emergency Generator start</p> <p>1.2 Emergency Generator shall start within the following maximum time limits:</p> <ul style="list-style-type: none"> 1.2.1 Standby mode (start/ready mode) 1.2.2 Standby mode (start/ready mode) 1.2.3 Standby mode (start/ready mode) 	1.00
2	The Emergency Generator shall be capable of supplying power to the emergency equipment for the duration of the emergency.	<p>2.1 Emergency Generator shall be capable of supplying power to the emergency equipment for the duration of the emergency.</p> <p>2.2 Emergency Generator shall have a sustained supply of diesel fuel for a specified time period.</p> <p>2.3 Emergency Generator shall have a sustained supply of diesel fuel for a specified time period.</p>	1.00

Item	System	Reference	Review	Item	System	Reference	Review
1	Design System	MECH 0001	1.00	1	Emergency Response	EMER 0001	1.00
2	Fire Protection	STRUCT 0001	1.00	2	Emergency Response	EMER 0002	1.00
3	Process Control	MECH 0002	1.00	3	Emergency Response	EMER 0003	1.00
4	Process Control	MECH 0003	1.00	4	Emergency Response	EMER 0004	1.00
5	Process Control	MECH 0004	1.00	5	Emergency Response	EMER 0005	1.00
6	Process Control	MECH 0005	1.00	6	Emergency Response	EMER 0006	1.00
7	Process Control	MECH 0006	1.00	7	Emergency Response	EMER 0007	1.00
8	Process Control	MECH 0007	1.00	8	Emergency Response	EMER 0008	1.00
9	Process Control	MECH 0008	1.00	9	Emergency Response	EMER 0009	1.00
10	Process Control	MECH 0009	1.00	10	Emergency Response	EMER 0010	1.00
11	Process Control	MECH 0010	1.00	11	Emergency Response	EMER 0011	1.00
12	Process Control	MECH 0011	1.00	12	Emergency Response	EMER 0012	1.00
13	Process Control	MECH 0012	1.00	13	Emergency Response	EMER 0013	1.00
14	Process Control	MECH 0013	1.00	14	Emergency Response	EMER 0014	1.00
15	Process Control	MECH 0014	1.00	15	Emergency Response	EMER 0015	1.00
16	Process Control	MECH 0015	1.00	16	Emergency Response	EMER 0016	1.00
17	Process Control	MECH 0016	1.00	17	Emergency Response	EMER 0017	1.00
18	Process Control	MECH 0017	1.00	18	Emergency Response	EMER 0018	1.00
19	Process Control	MECH 0018	1.00	19	Emergency Response	EMER 0019	1.00
20	Process Control	MECH 0019	1.00	20	Emergency Response	EMER 0020	1.00

Summary of SCEs	Count
Total Number of SCEs in CMMS	15
Total Number of Active SCEs	10
Total Number of Inactive SCEs	5

Maintenance Plan Build

To ensure all Safety and Non-Safety Maintainable Equipment (Functional Locations) have the appropriate maintenance in-place at the correct frequency as to limit failures but also to mitigate against maintenance induced failures. Assurance Task Values are monitored to eradicate any potential failures in Safety Critical Equipment

*Doing the right task at the right time...
to the right quality!*

MAINTENANCE BUILD & CREATION

Asset ID	Asset Name	Asset Type	Asset Category	Asset Location	Asset Status	Asset Value
ASSET001	ASSET001	ASSET001	ASSET001	ASSET001	ASSET001	ASSET001
ASSET002	ASSET002	ASSET002	ASSET002	ASSET002	ASSET002	ASSET002
ASSET003	ASSET003	ASSET003	ASSET003	ASSET003	ASSET003	ASSET003
ASSET004	ASSET004	ASSET004	ASSET004	ASSET004	ASSET004	ASSET004
ASSET005	ASSET005	ASSET005	ASSET005	ASSET005	ASSET005	ASSET005
ASSET006	ASSET006	ASSET006	ASSET006	ASSET006	ASSET006	ASSET006
ASSET007	ASSET007	ASSET007	ASSET007	ASSET007	ASSET007	ASSET007
ASSET008	ASSET008	ASSET008	ASSET008	ASSET008	ASSET008	ASSET008
ASSET009	ASSET009	ASSET009	ASSET009	ASSET009	ASSET009	ASSET009
ASSET010	ASSET010	ASSET010	ASSET010	ASSET010	ASSET010	ASSET010

Maintenance Work Order Title: -
Certified Electrical Equipment Inspection

Maintenance Work Order Text: -
The purpose of this Work Order is to demonstrate the Ongoing Suitability of a Safety Critical Element. This is to provide assurance that Performance Standard Acceptance Criteria are met. The Acceptance Criteria are shown below.

Read the Acceptance Criteria before you start work and ensure you understand what is to be recorded at the end, and how you determine the PASS, FAILED & FIXED or FAILED status of the Safety Critical Element.

Record the results of the work in the space provided and record your name and date of test.

If the result is FAILED, you MUST report the result to the WORKS SUPERVISOR for follow-on action.

PS-IC003 CERTIFIED ELECTRICAL EQUIPMENT
Performance Standard Assurance Task:

Certified Electrical Equipment

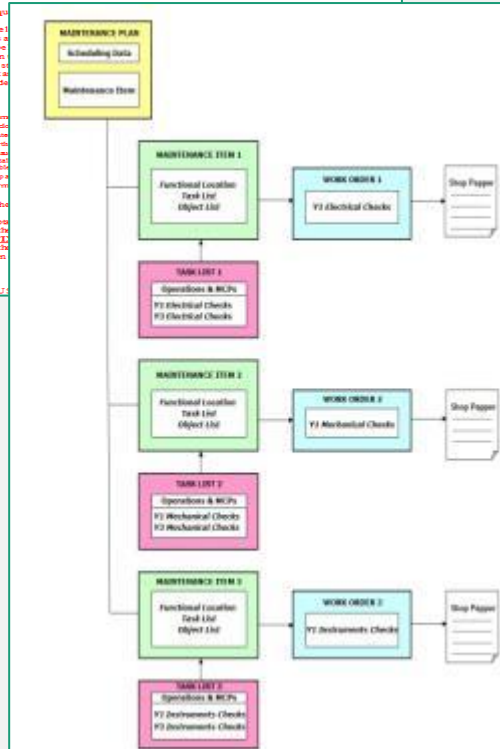
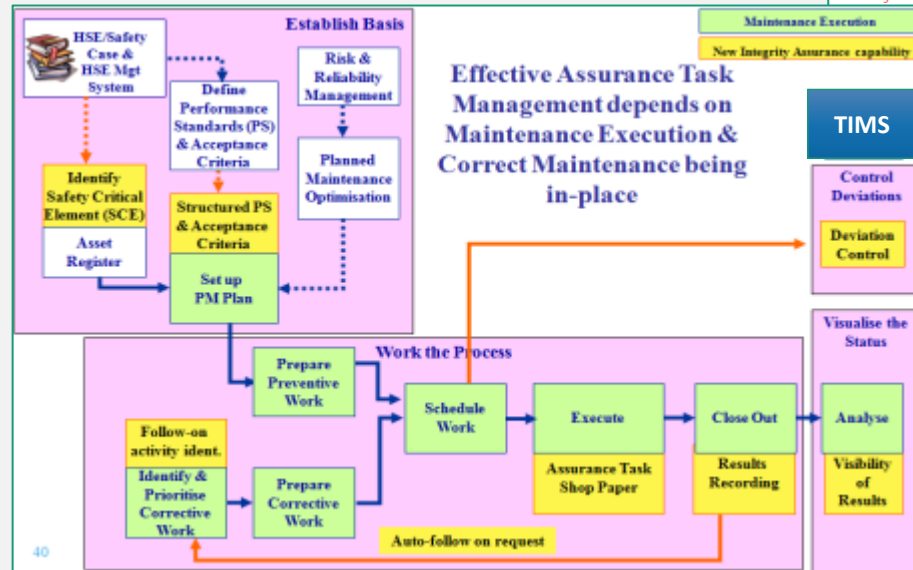
- All certified equipment requirements
- There shall be
- All devices in the performance

NOTE: A significant list below and de

Fault Code

1	Flam
2	Excess
3	Worn
4	Earth
5	Unsafe
6	Control
7	Appr
8	Term

- * Review current maintenance, improve, add, delete if required
- * Develop SCE assurance maintenance with agreed values
- * Align & Schedule current maintenance with SCE assurance maintenance



SCE Management Tool... TIMS® Dashboard

TIMS® - Technical Integrity Monitoring System

TECHNICAL INTEGRITY MANAGEMENT SYSTEM – TIMS®

TIMS v3.2 is a web based interactive tool for Asset Managers, TA's and supervisors

Report the Preventive & Corrective WO status in a traffic light feature

Provide deviation management

First implemented for client in 2005 to monitor Work Orders for SCE and Non SCE equipment's



Asset Hierarchy

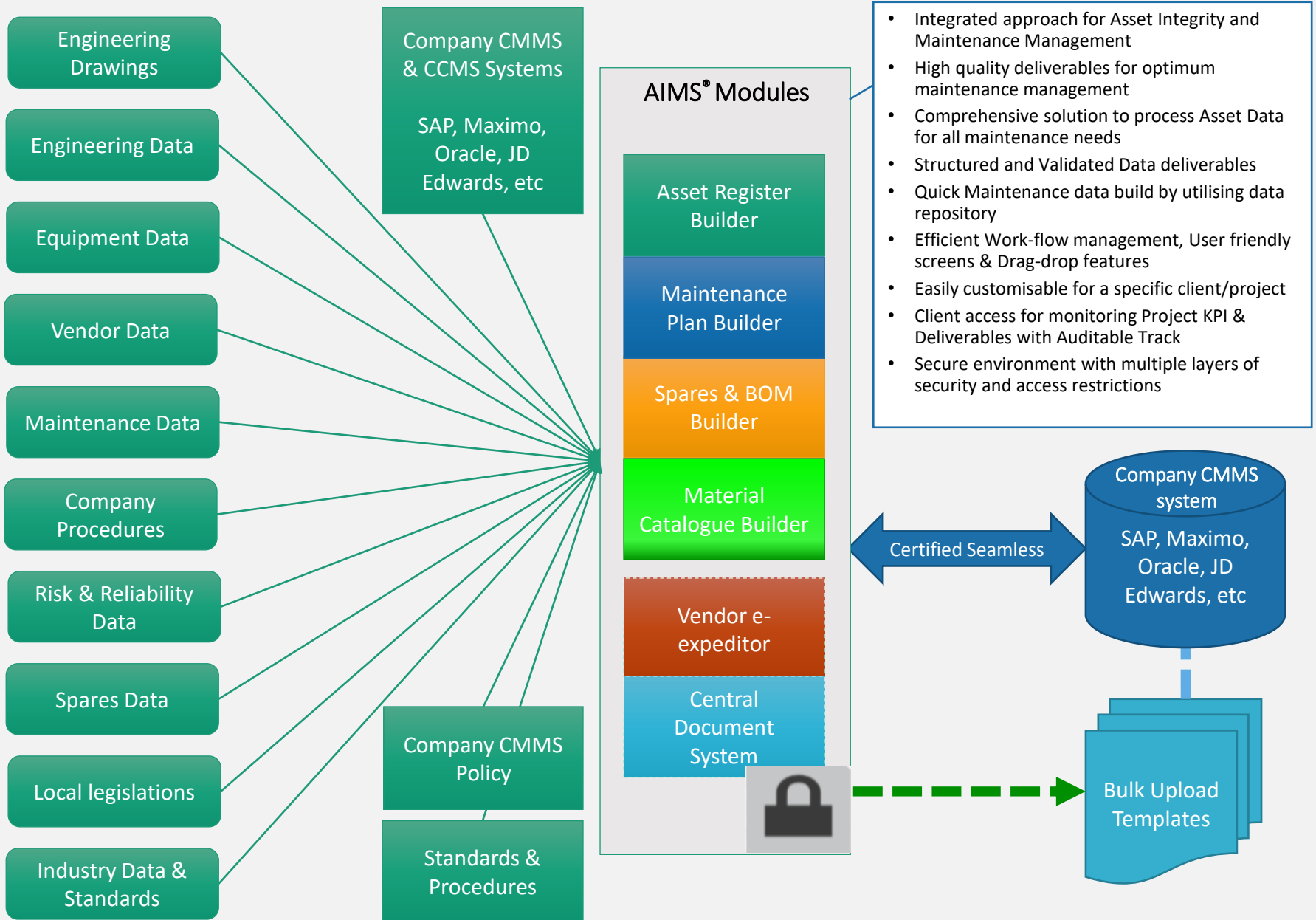
- PETRONAS
 - Production International
 - PC1M
 - PC2M
 - PC3M
 - PC4M
 - PC5M
 - PC6M
 - PC7M
 - PC8M
 - PC9M
 - PC10M

Support ID	Preventive			Corrective			Deviation	
	Open	Assign	Post	Open	Assign	Post	Preventive	Corrective
01 - Structural Integrity	0	0	0	1	1	2	0	0
02 - Process Disturbance	0	0	0	0	0	0	0	0
03 - Ignition Control	0	0	0	0	0	0	0	0
04 - Instrument Systems	0	0	0	0	0	0	0	0
05 - Process Control	0	0	0	0	0	0	0	0
06 - Production Systems	0	0	0	0	0	0	0	0
07 - Emergency Response	0	0	0	0	0	0	0	0
08 - LRU/IRVing	0	0	0	0	0	0	0	0
Total	0	0	0	1	1	2	0	0

- * SCE Work Order Status
- Deviation Management
- Rollup Integrity Status and Reporting
- Online Management awareness
- Integration Certified by SAP. Ability to connect to popular CMMS like Maximo, Oracle

125401	125402	125403	125404	125405	125406	125407	125408	125409	125410
300021	300022	300023	300024	300025	300026	300027	300028	300029	300030

Asset Integrity & Maintenance Management Suite[®]



M2K Contacts

Detailed presentations can be arranged. Please contact:

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Thank You!

