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Data Preparation for Asset Performance Management (APM)

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Sunwater

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An SAPinsider Company

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11 November 2024

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Business Process Lead (EAM)

Agenda

- Introduction
- Questions for the audience
- Background on APM
- Data ingested from S/4 to APM
- Data requirements for Risk & Criticality in APM
- What data do I already have for Risk & Criticality?
- Data Model (what data is where?)
- What next?

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We service more than

5000

customers

700+ people across 33 locations

We operate

365 days

per year to deliver the **lifeblood** of regional Queensland

Irrigation

Industrial

Urban

We supply around

40%

of the water used commercially in Queensland

33%

of our people live and work in regional Queensland

Capacity of

6715 gigalitres

of water storage in dams, weirs and barrages

19 dams

65 weirs and barrages

595 kilometres of water channels

70 major pumping stations

1951 kilometres of pipelines

5 water treatment plants

Questions for the audience

- Do you currently store Criticality against your assets?
- Do you currently Risk Assess your assets using RCM or FMEA?
- Are you thinking about implementing APM?

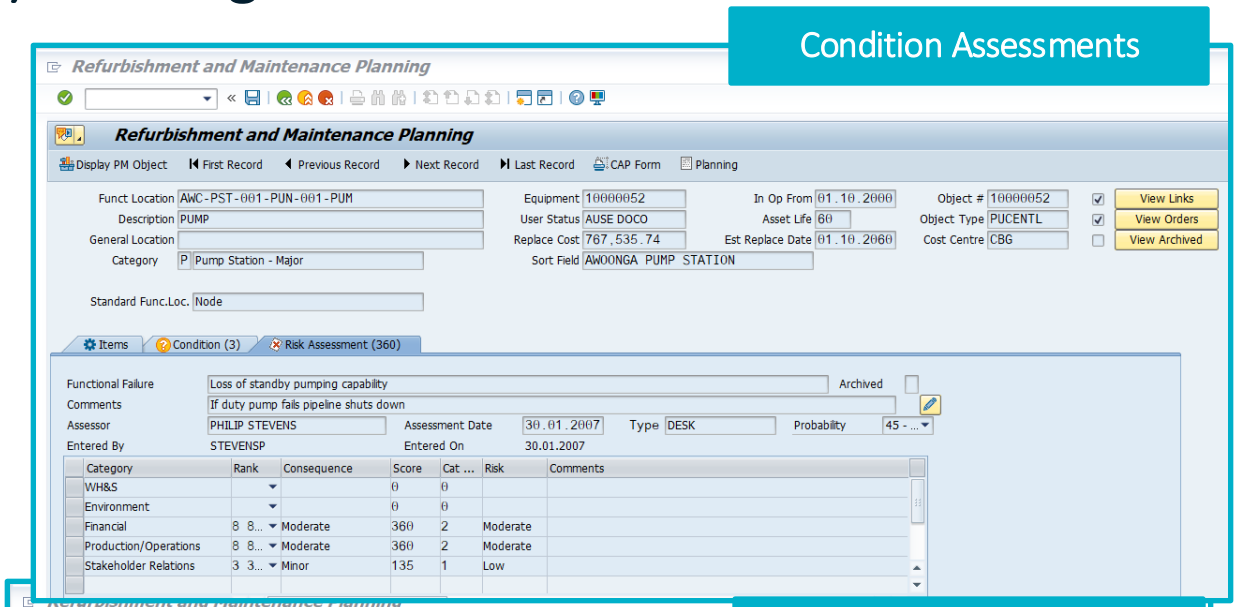
Background on APM

Legacy ECC Work Management System (WMS) for Long Term Planning

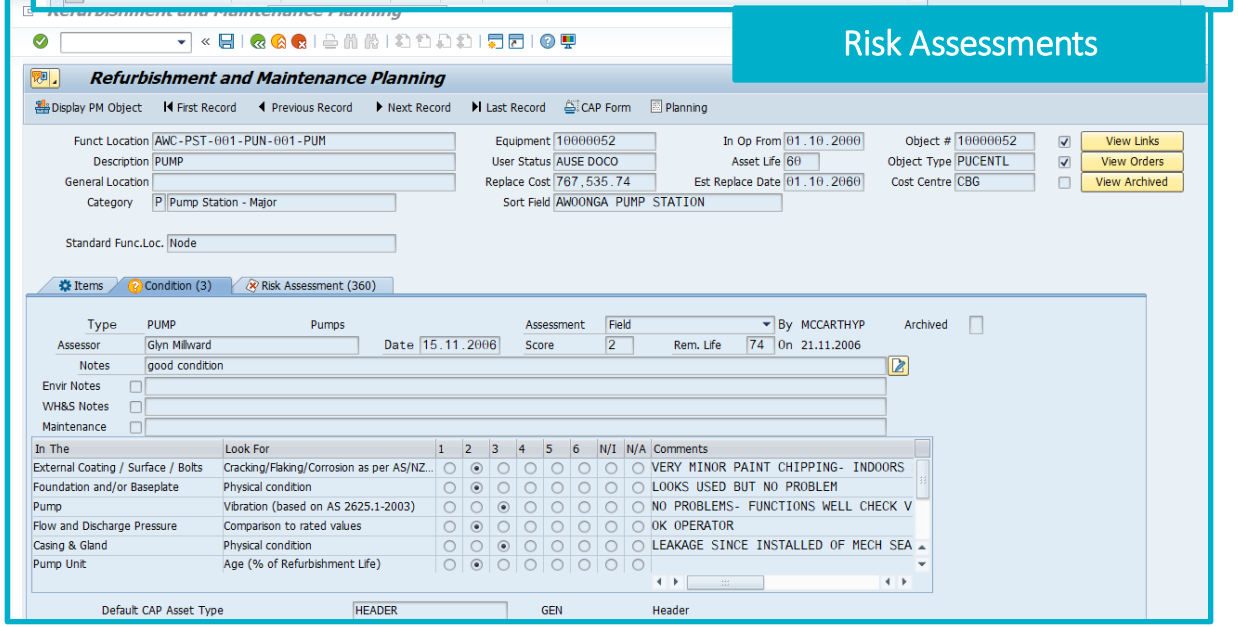
- Implemented S/4HANA in September 2020 including Asset Strategy & Performance Management (ASPM)
- Custom built legacy ECC Work Management System (WMS) replaced with standard S/4 objects:

ECC WMS Object	S/4 Object
Long Term Planning Item	Maintenance Items & Task Lists
Condition Assessments	Measuring Points & Documents
Risk Assessments	Criticality & Risk Assessment in ASPM

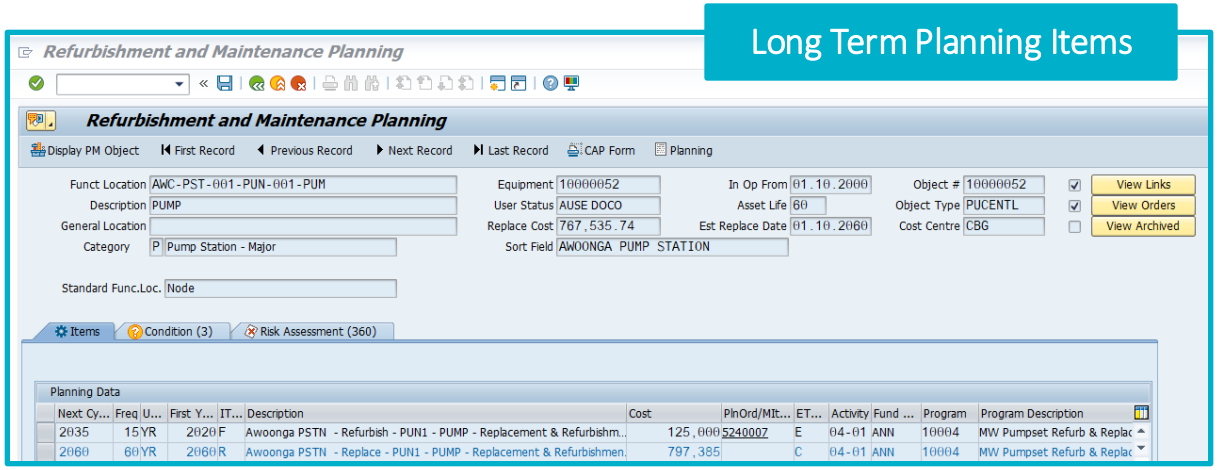
Condition Assessments



Risk Assessments



Long Term Planning Items



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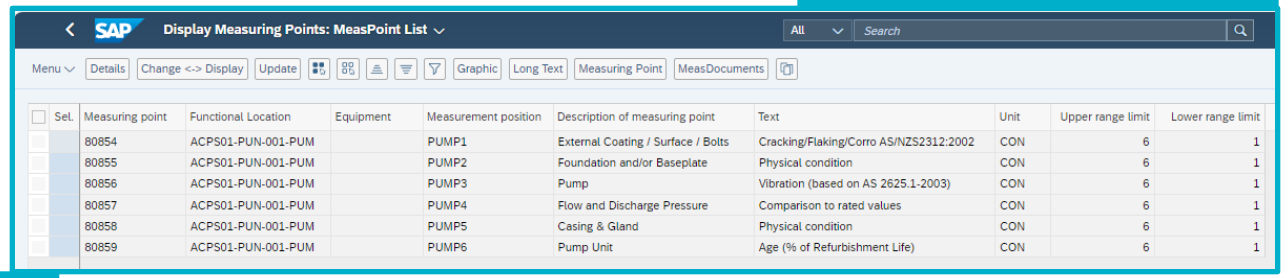
Standard S/4 Solution for Long Term Planning, Condition & Risk

- Implemented S/4HANA in September 2020
- Attempted to set up ASPM but SAP advised it wouldn't be developed any further and was to be replaced by APM in 2021
- Current S/4 Standard objects to replace Legacy WMS:

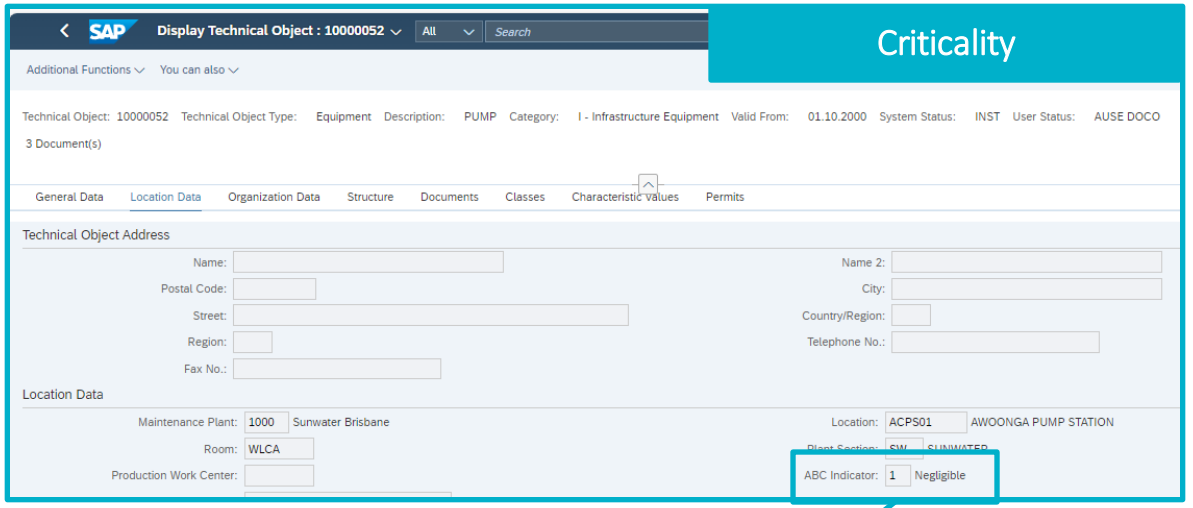
ECC WMS Object	S/4 Object	
Long Term Planning Item	Maintenance Items & Task Lists	✓
Condition Assessments	Measuring Points & Documents	✓
Risk Assessments	Criticality & Risk Assessment in ASPM	✗

Condition Assessments



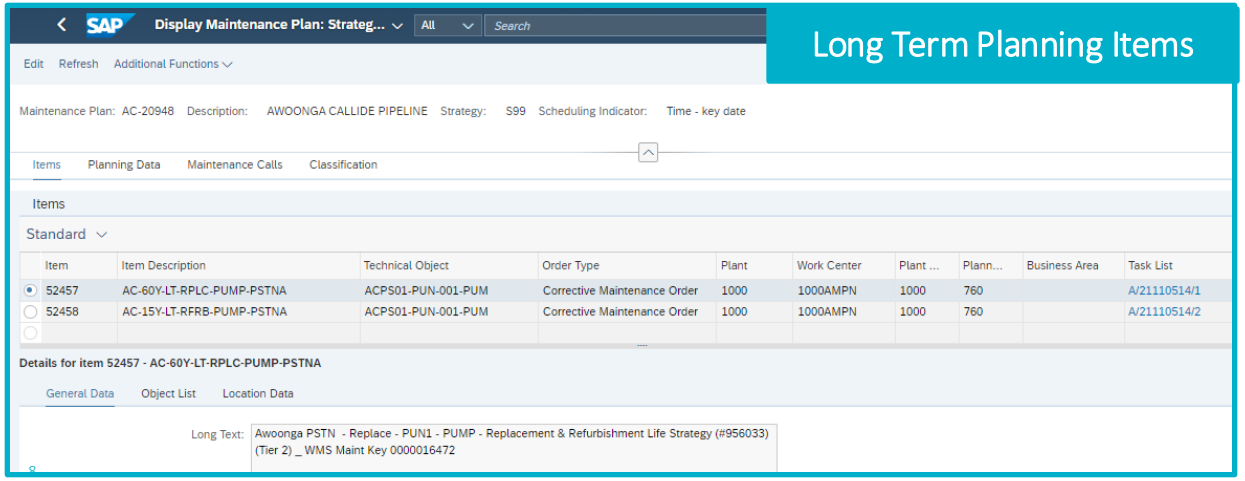
Sel.	Measuring point	Functional Location	Equipment	Measurement position	Description of measuring point	Text	Unit	Upper range limit	Lower range limit
	80854	ACPS01-PUN-001-PUM		PUMP1	External Coating / Surface / Bolts	Cracking/Flaking/Corro AS/NZS2312:2002	CON	6	1
	80855	ACPS01-PUN-001-PUM		PUMP2	Foundation and/or Baseplate	Physical condition	CON	6	1
	80856	ACPS01-PUN-001-PUM		PUMP3	Pump	Vibration (based on AS 2625.1-2003)	CON	6	1
	80857	ACPS01-PUN-001-PUM		PUMP4	Flow and Discharge Pressure	Comparison to rated values	CON	6	1
	80858	ACPS01-PUN-001-PUM		PUMP5	Casing & Gland	Physical condition	CON	6	1
	80859	ACPS01-PUN-001-PUM		PUMP6	Pump Unit	Age (% of Refurbishment Life)	CON	6	1

Criticality



ABC Indic.	ABC IndicText
1	Negligible
2	Minor
3	Moderate
4	Major
5	Catastrophic
N	Not Assessed

Long Term Planning Items



Item	Item Description	Technical Object	Order Type	Plant	Work Center	Plant ...	Plann...	Business Area	Task List
52457	AC-60Y-LT-RPLC-PUMP-PSTNA	ACPS01-PUN-001-PUM	Corrective Maintenance Order	1000	1000AMPN	1000	760		A/21110514/1
52458	AC-15Y-LT-RFRB-PUMP-PSTNA	ACPS01-PUN-001-PUM	Corrective Maintenance Order	1000	1000AMPN	1000	760		A/21110514/2

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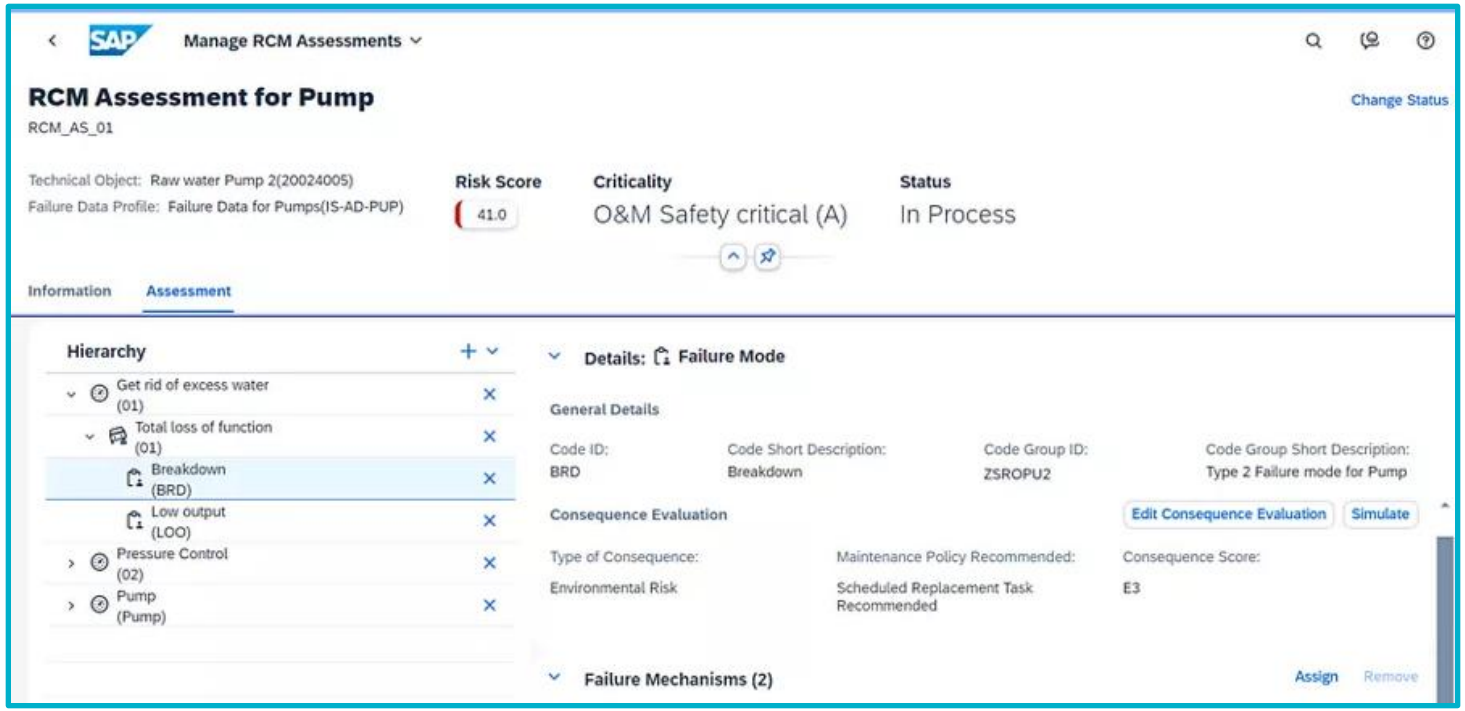
Proof of Concept – Asset Performance Management (APM)

- Kicked off in September 2024
- Proof of Concept in Sandpit
- Limited number of assets (max 5,000)
- Measurable Objectives for PoC include:
  - Data model
  - Fields ingested by APM from Technical Objects
  - Catalog Codes – Mandatory vs Optional
  - Assessment types – Criticality, FMEA, RCM
  - Rules
  - Alerts
  - Data cleansing/creation effort



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Data ingested from S/4 to APM

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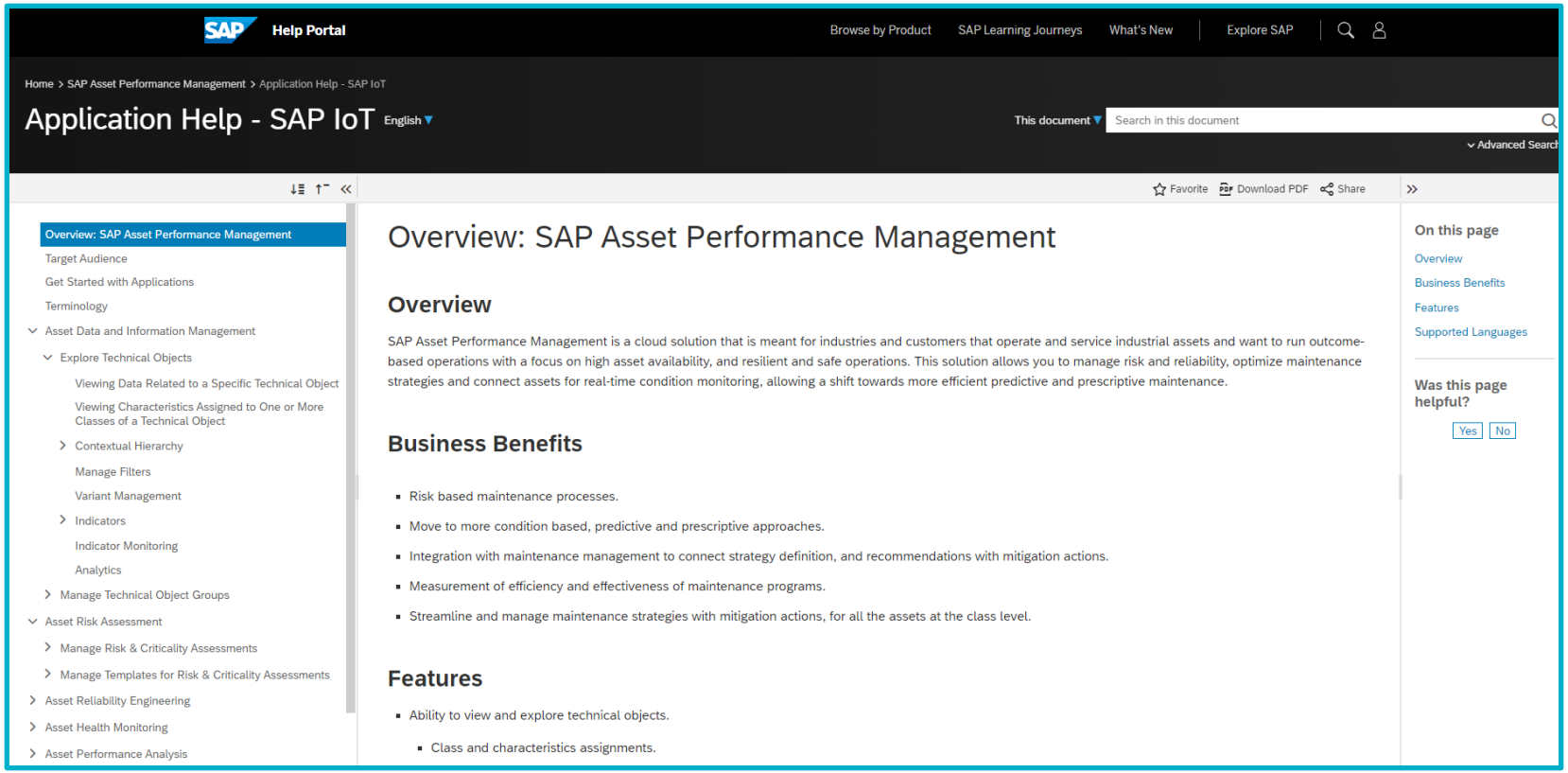
SAP Help Portal – APM Documentation

- SAP Asset Performance Management | SAP Help Portal
- Feature Scope Design
- Getting Started Guide
- Application Help
- Security Guide
- Integration Guide
- Overview of API Services
- Extensibility Guide
- What's New

- Information overload!!!



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Technical Object Fields Visible in APM

Critical Data Mapping Field

Tab	Field
General Data	Category
	Object Type
	Serial Number
	Equipment/Functional Location
	Material
Structure	Superior Functional Location
	Technical Identification Number
	Superordinate Equipment
	Construction Type
Location Data	Maintenance Plant
	Sort Field
Account Assignment	Company Code
	Cost Centre
	Controlling Area

Tab	Field
Manufacturer Data	Manufacturer
	Model Number
	Manufacturer Part Number
	Manufacturer Serial Number
	Construction Month
	Construction Year
Responsibilities	Planner Group
	Maintenance Planning Plant
	Main Work Centre
	Catalog Profile
Administrative Data	Created On
	Changed On
	System ID

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Classification & Characteristics Visible in APM

- View the following Class/Characteristic attributes:

Field	Description
Characteristic	Refers to the name that uniquely identifies a characteristic. For example, Torque (TORQUE), Switching Location (CONTROL).
Characteristic Group	The characteristic group is used to group together similar characteristics. For example: “Corrosion, Output, Rating”.
Value	Refers to the Unit of Measurement.
Data Type	Refers to the type of data of the characteristic. For example: “Numeric”, and “Character”.
Value Description	Refers to the characteristic value description from SAP ERP.

- Filter Technical Object based on Class attributes:

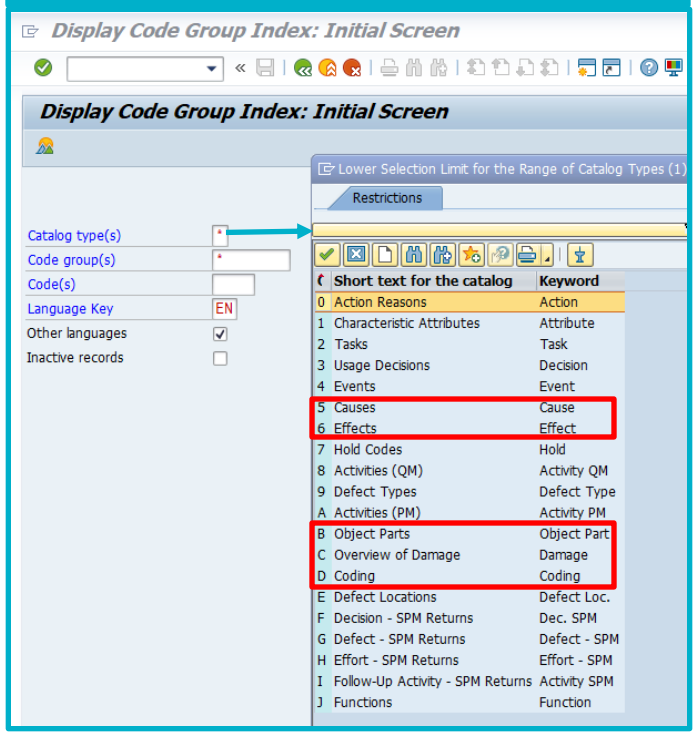
Field	Description
Class Name	Refers to the unique name to identify a class within a class type. For example, Transformer, Pump, etc.
Class Description	Refers to the description of the class. For example, “Centrifugal Pump”.
Class Group	Refers to the group that a specific class belongs to. For example, “Machinery, Rotating, Stationary”.
Class Type	Refers to the unique key, which identifies the class type. The standard class type used for equipment is “002” (equipment class) and for the functional location is “003” (Functional Location class).

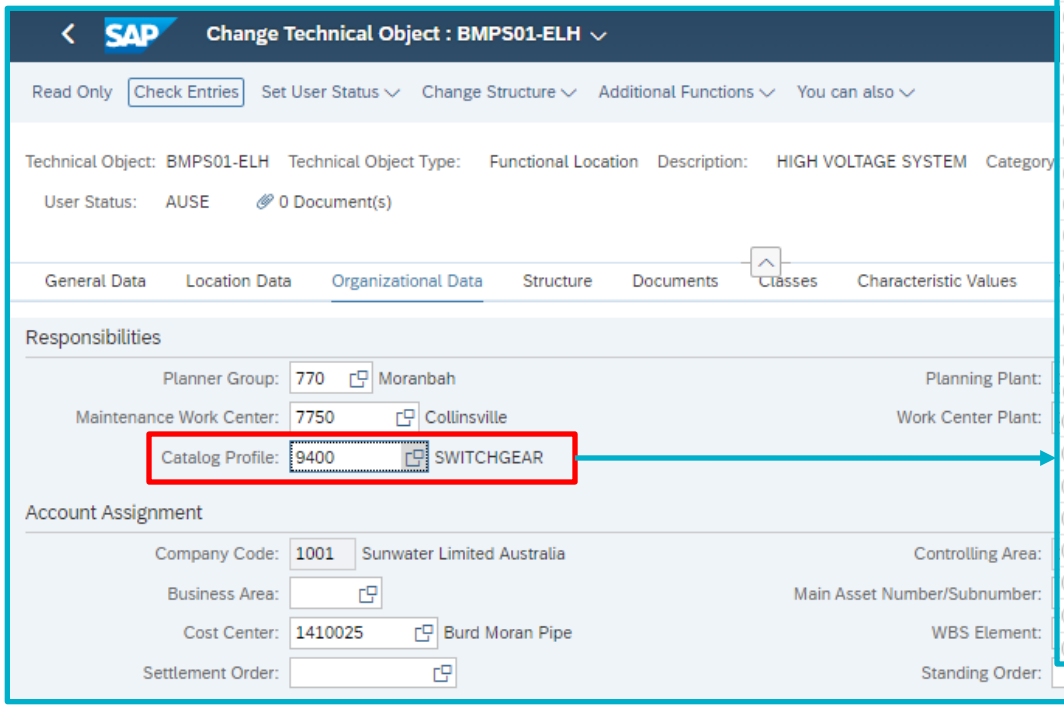
Catalog Codes – Catalog Profile

Critical Data Mapping Field

- Stored on FLOC or EQ on Organization Data tab
- All other Catalog Codes are linked to Catalog Profile
- Catalog Codes used on Malfunction Data tab on Notifications for Damage, Object Part, etc

T-code QS49 – Display Code Group Index





Catalog Prof...	Catalog profile
1000	CIVIL GENERAL
1100	CHANNEL STRUCTURES
1200	FENCING
1300	CHANNELS
1400	BUILDINGS/LAND
1500	DRAINS
1600	ROADS
1700	EARTHWORKS
1800	EMBANKMENTS
1900	WEIRS AND BARRAGES
2000	STORAGES(RESERVOIRS,BALANCING)
2100	TOWNSHIP FACILITIES
2200	RECREATIONAL FACILITIES
2300	DAMS
4000	POWER POLES
6000	VALVES
6100	PIPES AND FITTINGS
6200	MECHANICAL EQUIPMENT
6300	GATES (FLOOD,REGULATING)
6400	PUMPS
6500	LIFTING EQUIPMENT
6600	MOTORS
6700	PUMP STATIONS
6800	BORES
6900	MOBILE PLANT EQUIPMENT
7000	CRANE
7100	TANK
7200	CATHODIC PROTECTION
9000	FLOW METERS
9100	ELECTRICAL EQUIPMENT
9200	ELECTRICAL CONTROL SYSTEMS
9300	SUBSTATION
9400	SWITCHGEAR
9500	TRANSFORMER
9600	UPS
9700	CITECT / SCADA
9750	INSTRUMENTATION
9999	SWP GENERAL CATALOG PROFILE

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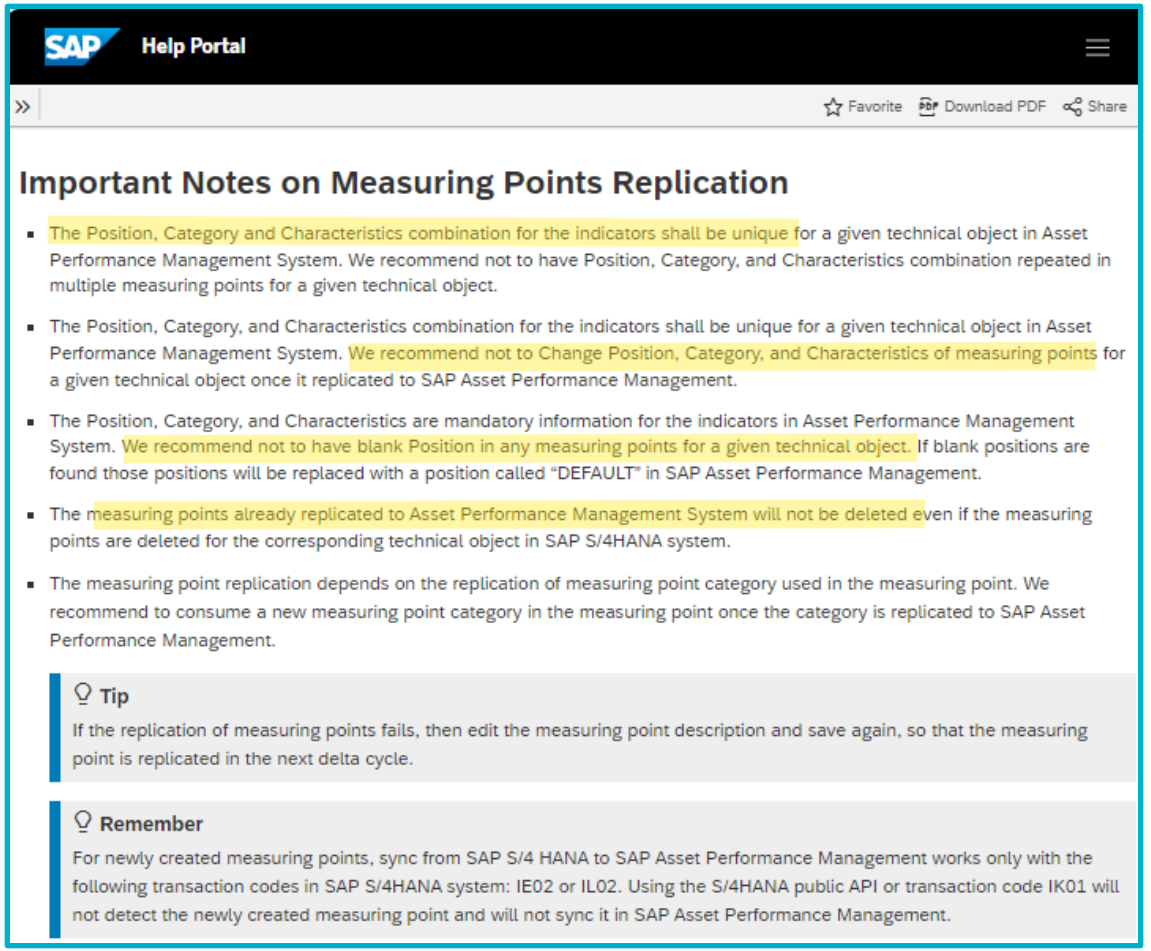
Indicators (Measuring Points) Visible in APM

Critical Data Mapping Field

- The following fields from Measuring Points and Measurement Documents are visible in APM

Field	Description
Characteristic	Characteristic of Measuring Point
Description	Description of Measuring Point
Position	Measurement Position of Measuring Point
Maximum Value	Upper limit of Measuring Point
Minimum Value	Lower limit of Measuring Point
Category	Measuring Point Category
UoM	Unit of Measure for Measuring Point
Indicator Latest value	Last Measurement Document reading value
Number of Decimal places to display	Number of decimal places on Measuring Point
Last Updated	Last Measurement Document date
Data Type	Data type of the characteristics on Measuring Point
Source	Refers the source of indicator - Created locally in SAP Asset Performance Management or originating from SAP S/4HANA Cloud System.



SAP Help Portal

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Important Notes on Measuring Points Replication

- The Position, Category and Characteristics combination for the indicators shall be unique for a given technical object in Asset Performance Management System. We recommend not to have Position, Category, and Characteristics combination repeated in multiple measuring points for a given technical object.
- The Position, Category, and Characteristics combination for the indicators shall be unique for a given technical object in Asset Performance Management System. We recommend not to Change Position, Category, and Characteristics of measuring points for a given technical object once it replicated to SAP Asset Performance Management.
- The Position, Category, and Characteristics are mandatory information for the indicators in Asset Performance Management System. We recommend not to have blank Position in any measuring points for a given technical object. If blank positions are found those positions will be replaced with a position called "DEFAULT" in SAP Asset Performance Management.
- The measuring points already replicated to Asset Performance Management System will not be deleted even if the measuring points are deleted for the corresponding technical object in SAP S/4HANA system.
- The measuring point replication depends on the replication of measuring point category used in the measuring point. We recommend to consume a new measuring point category in the measuring point once the category is replicated to SAP Asset Performance Management.

Tip

If the replication of measuring points fails, then edit the measuring point description and save again, so that the measuring point is replicated in the next delta cycle.

Remember

For newly created measuring points, sync from SAP S/4 HANA to SAP Asset Performance Management works only with the following transaction codes in SAP S/4HANA system: IE02 or IL02. Using the S/4HANA public API or transaction code IK01 will not detect the newly created measuring point and will not sync it in SAP Asset Performance Management.

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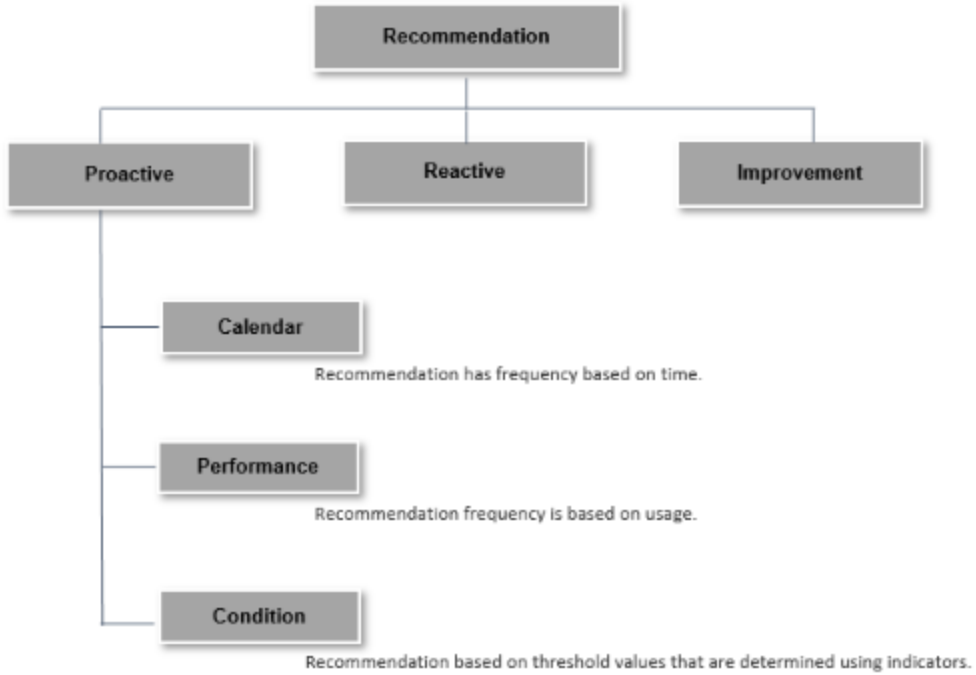
Recommendations

- Used to manage failure mitigating Recommendations
- Maintenance Activity Category:
  - Proactive (Calendar, Performance or Condition)
  - Reactive (Corrective)
- Improvement Activity Category (e.g. design/process change)
- Assigned to Technical Objects (FLOC/EQ)
- Can be linked to Indicators (Measuring Points) on Technical Objects
- Can be linked to Task List and Maintenance Plan

Illustration



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Data Requirements for Criticality & Risk Assessments in APM

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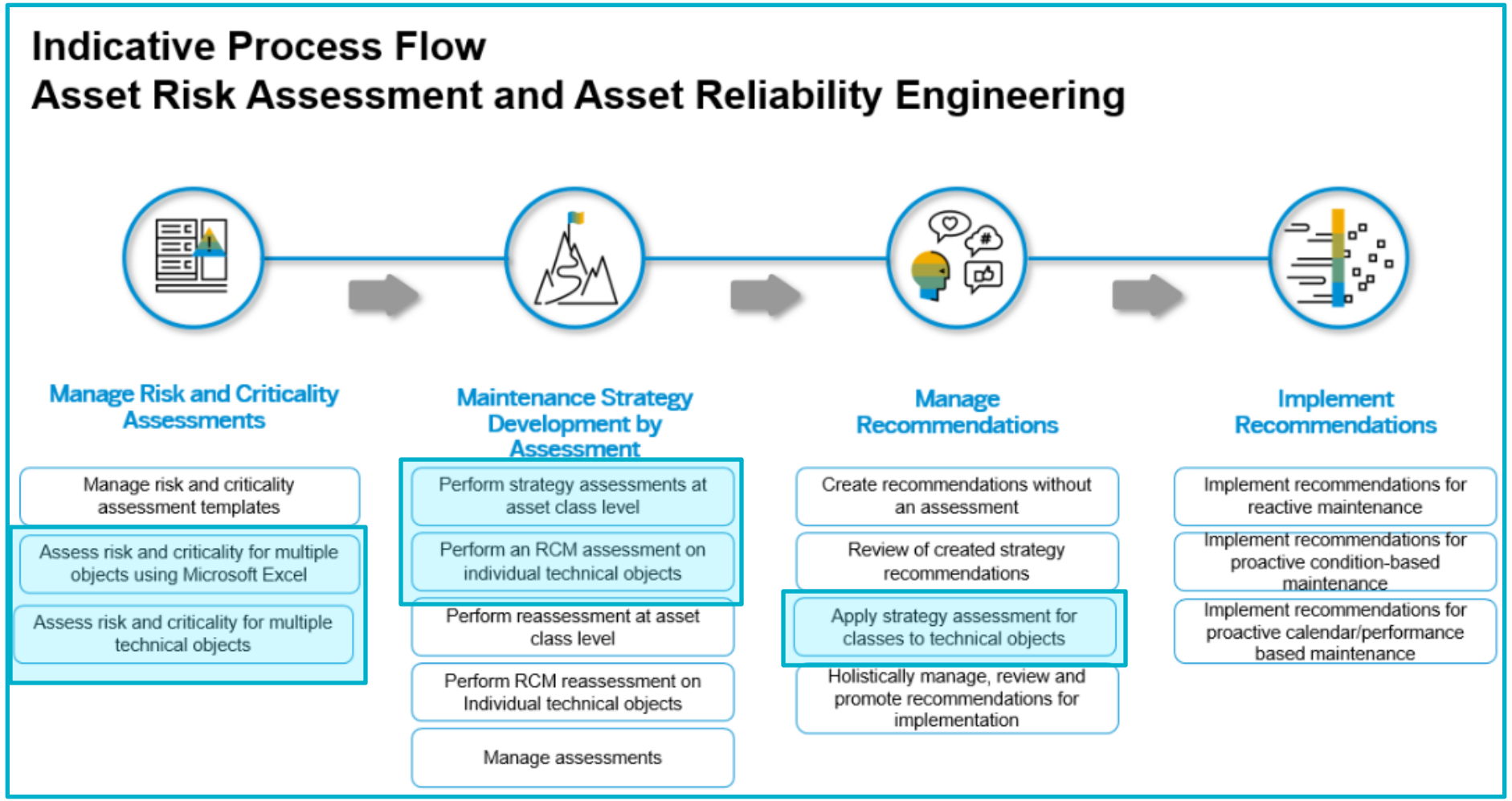
Criticality & Risk Assessment Types in APM

- Multiple Assessment Types – which one do I use?

Assessment in APM



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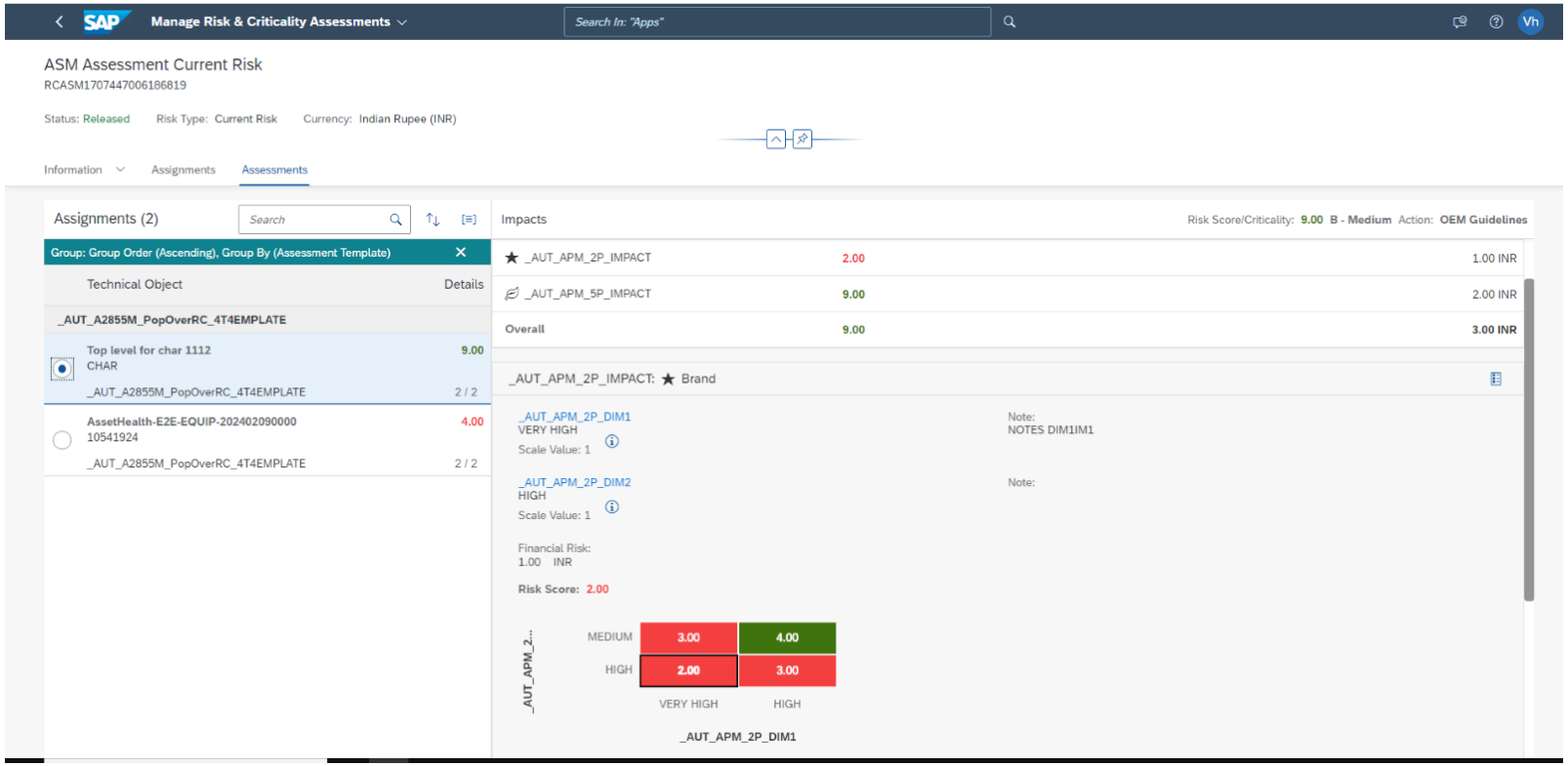
Risk & Criticality Assessment

- Risk & Criticality Assessment is used to identify critical assets and determine risk score
- Suggest appropriate risk-based methodologies as defined in template such as:
  - Reliability Centered Maintenance (RCM)
  - Failure Model Effects Analysis (FMEA)
  - Preventive Maintenance Review
  - Run to Fail
  - OEM Guidelines



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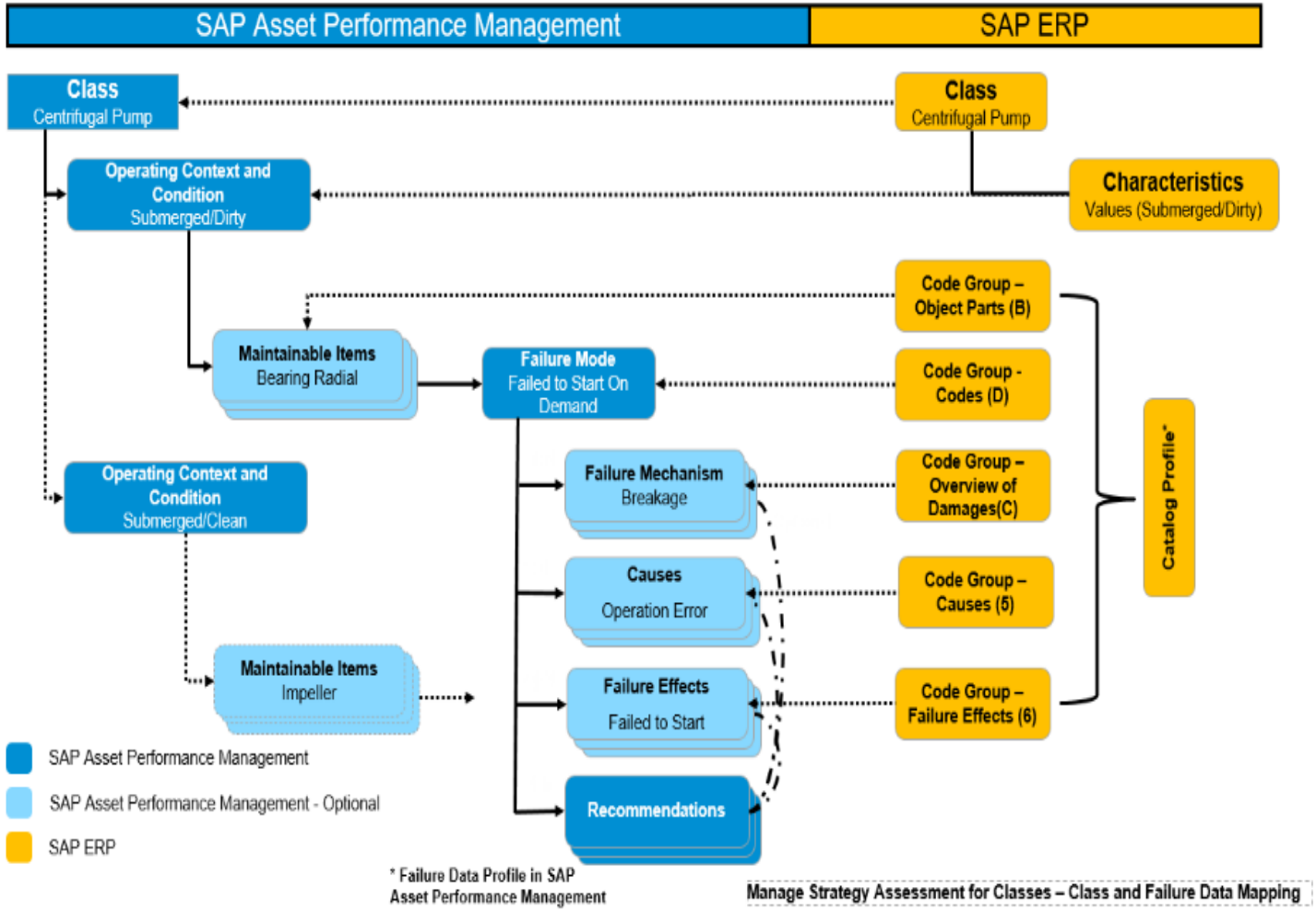
Strategy Assessment for Classes

Manage maintenance strategies with mitigation actions at the Class level



Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP
Class	Mandatory	Class
Operating Context and Condition	Optional#	Characteristic
Maintainable Items	Optional	Object Parts (B)*
Failure Modes	Mandatory	Coding (D)*
Failure Mechanisms	Optional	Overview of Damage (C)*
Causes	Optional	Causes (5)*
Failure Effects	Optional	Effects (6)*

Mandatory if Operating Context set to “yes”
* Catalog codes defined in SAP ERP & visible in GUI T-code QS49

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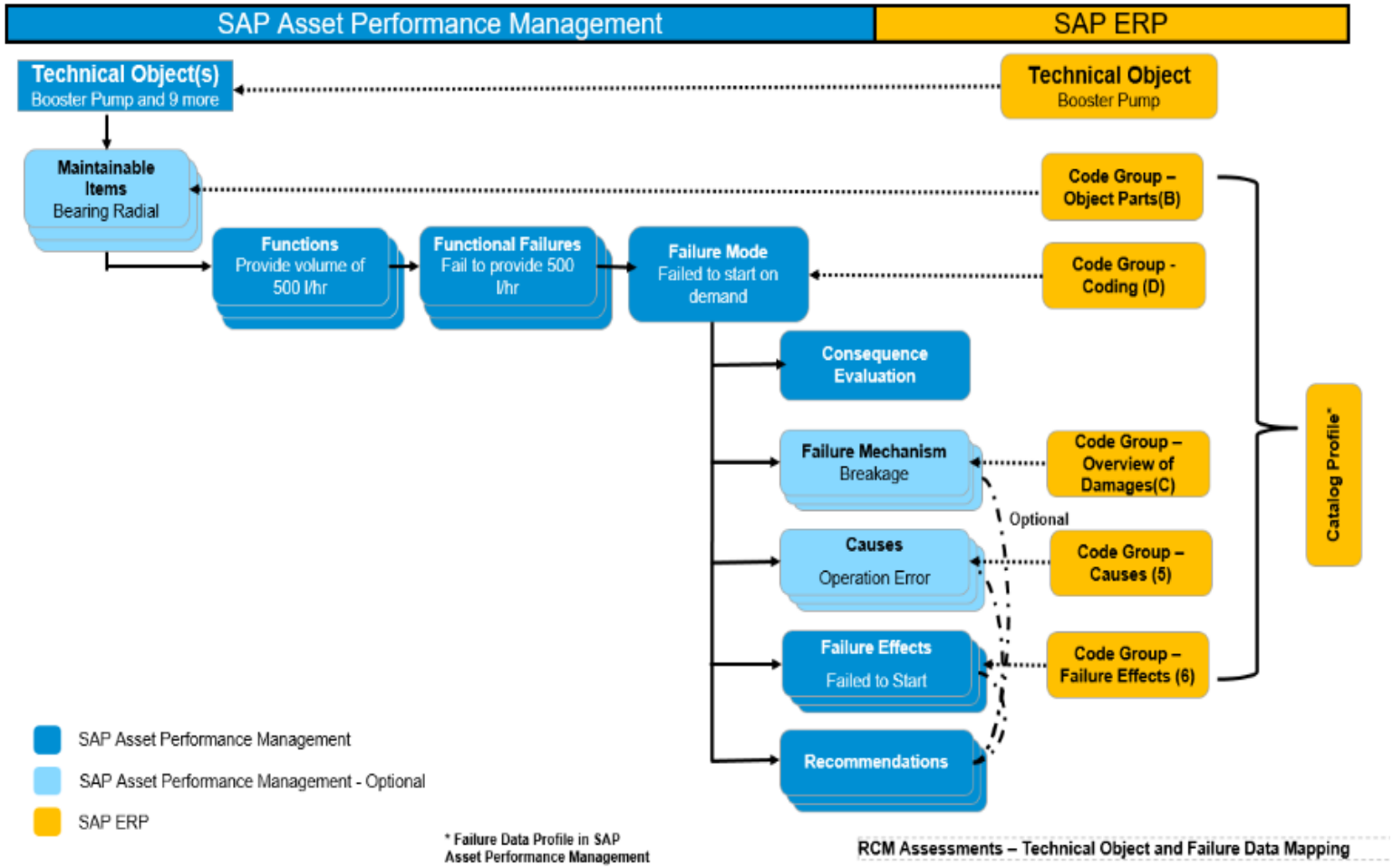
Reliability Centred Maintenance (RCM) Assessment

- Assess Technical Objects and assign failure data

Critical Data Mapping Field



RCM Assessments – Technical Object and Failure Data Mapping

Component	Mandatory / Optional	SAP ERP (Type)
Function #	Mandatory	
Maintainable Item	Optional	Object Parts (B)*
Functional Failure #	Mandatory	
Failure Modes	Mandatory	Coding (D)*
Failure Mechanisms	Optional	Overview of Damage (C)*
Causes	Optional	Causes (5)*
Failure Effects	Mandatory	Effects (6)*

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
# Created & maintained in APM

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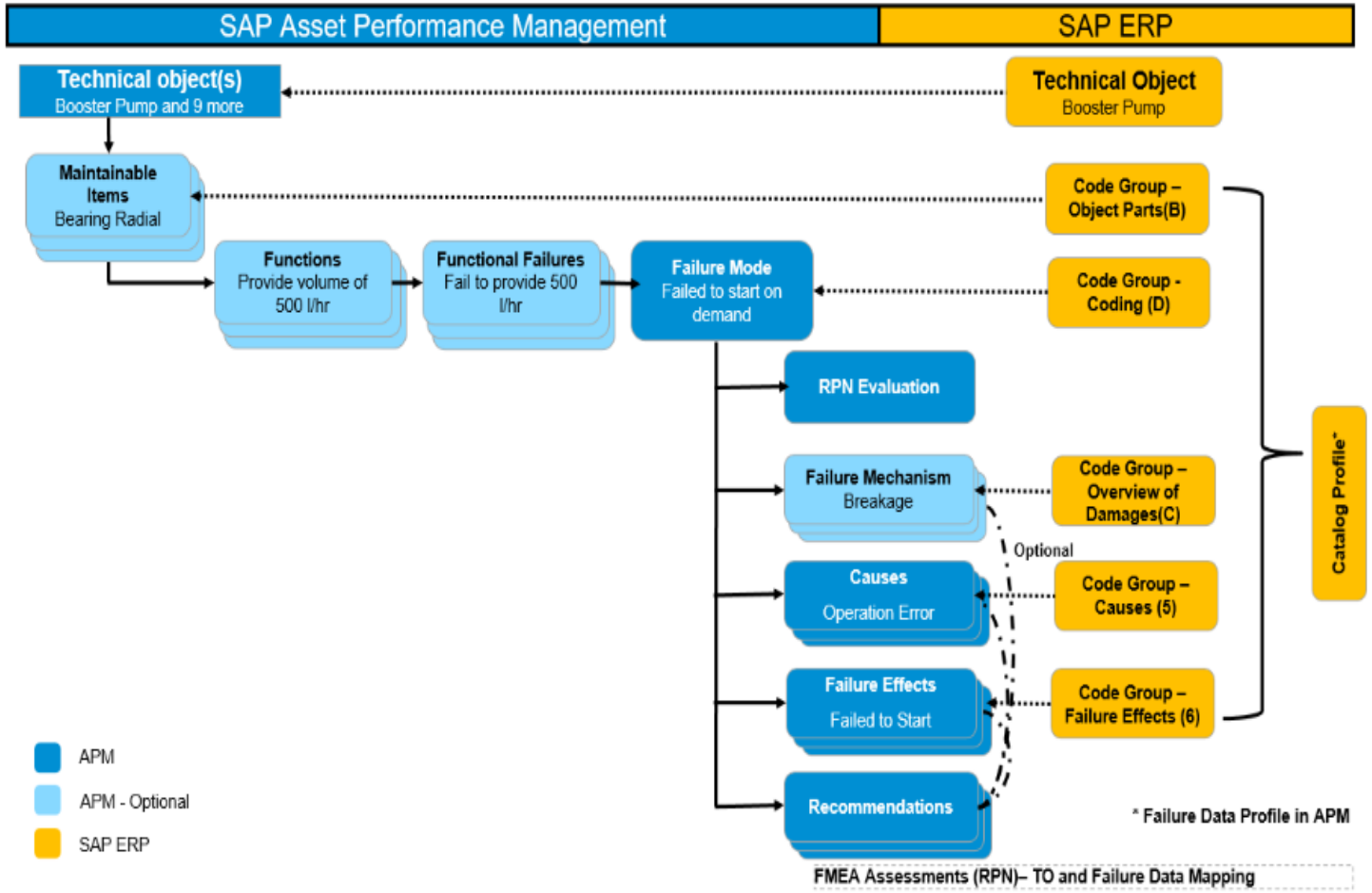
FMEA - Risk Priority Number (RPN) Evaluation

- Identify Failure Modes, their causes and effects on an asset



Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP (Type)
Maintainable Item	Optional	Object Parts (B)*
Functions #	Optional	
Functional Failures #	Optional	
Failure Modes	Mandatory	Coding (D)*
Causes	Mandatory	Causes (5)*
Failure Effects	Mandatory	Effects (6)*
Failure Mechanisms	Optional	Overview of Damage (C)*
RPN Evaluation #	Optional	
Recommendation #	Mandatory	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
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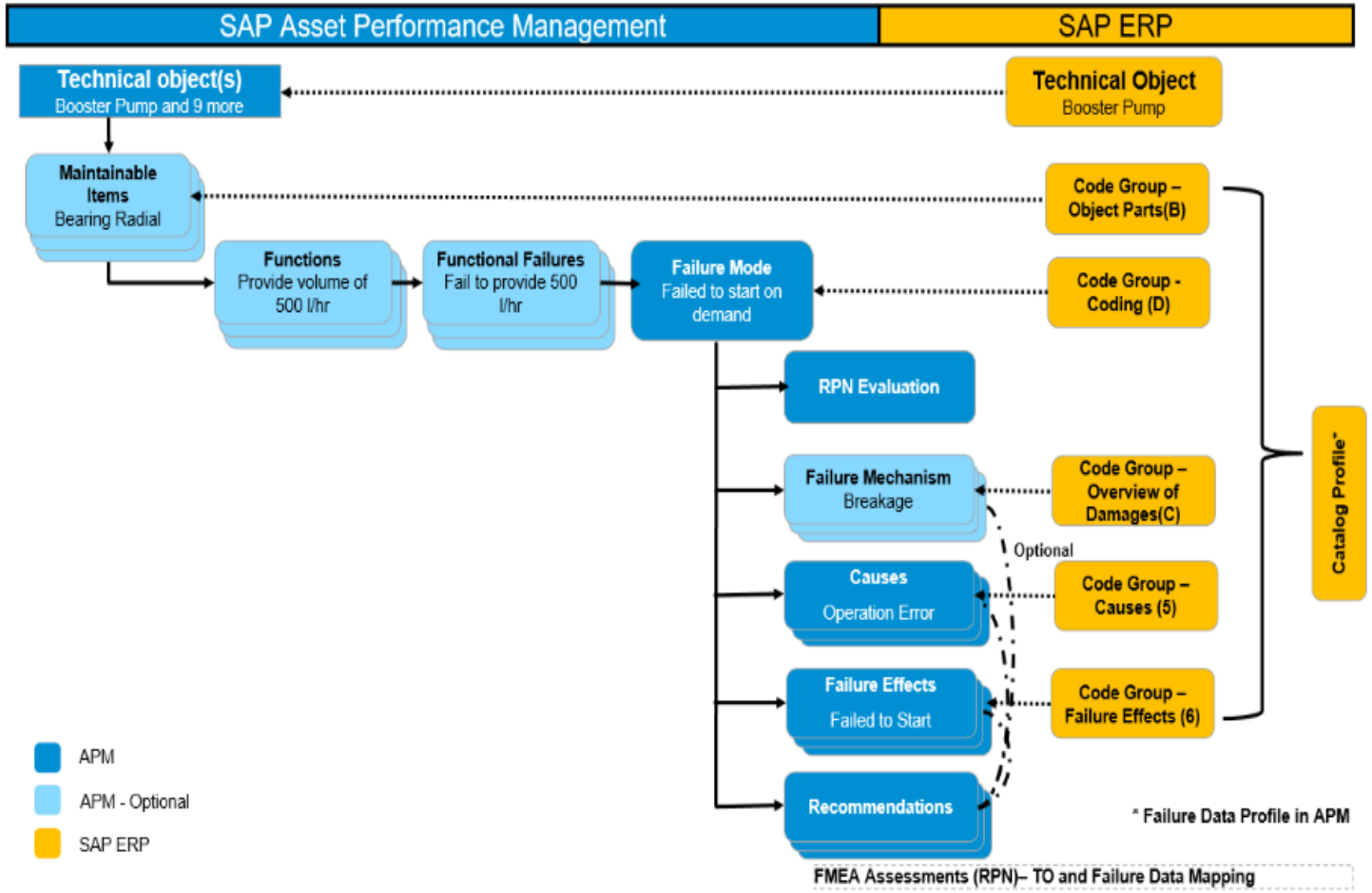
FMEA – Failure Mode Criticality Score (FMCS)

- Perform Criticality Analysis at the Failure Mode level



Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP (Type)
Maintainable Item	Optional	Object Parts (B)*
Functions #	Optional	
Functional Failures #	Optional	
Failure Modes	Mandatory	Coding (D)*
Causes	Optional	Causes (5)*
Failure Effects	Mandatory	Effects (6)*
Failure Mechanisms	Optional	Overview of Damage (C)*
FMCS Evaluation #	Optional	
Recommendation #	Mandatory	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
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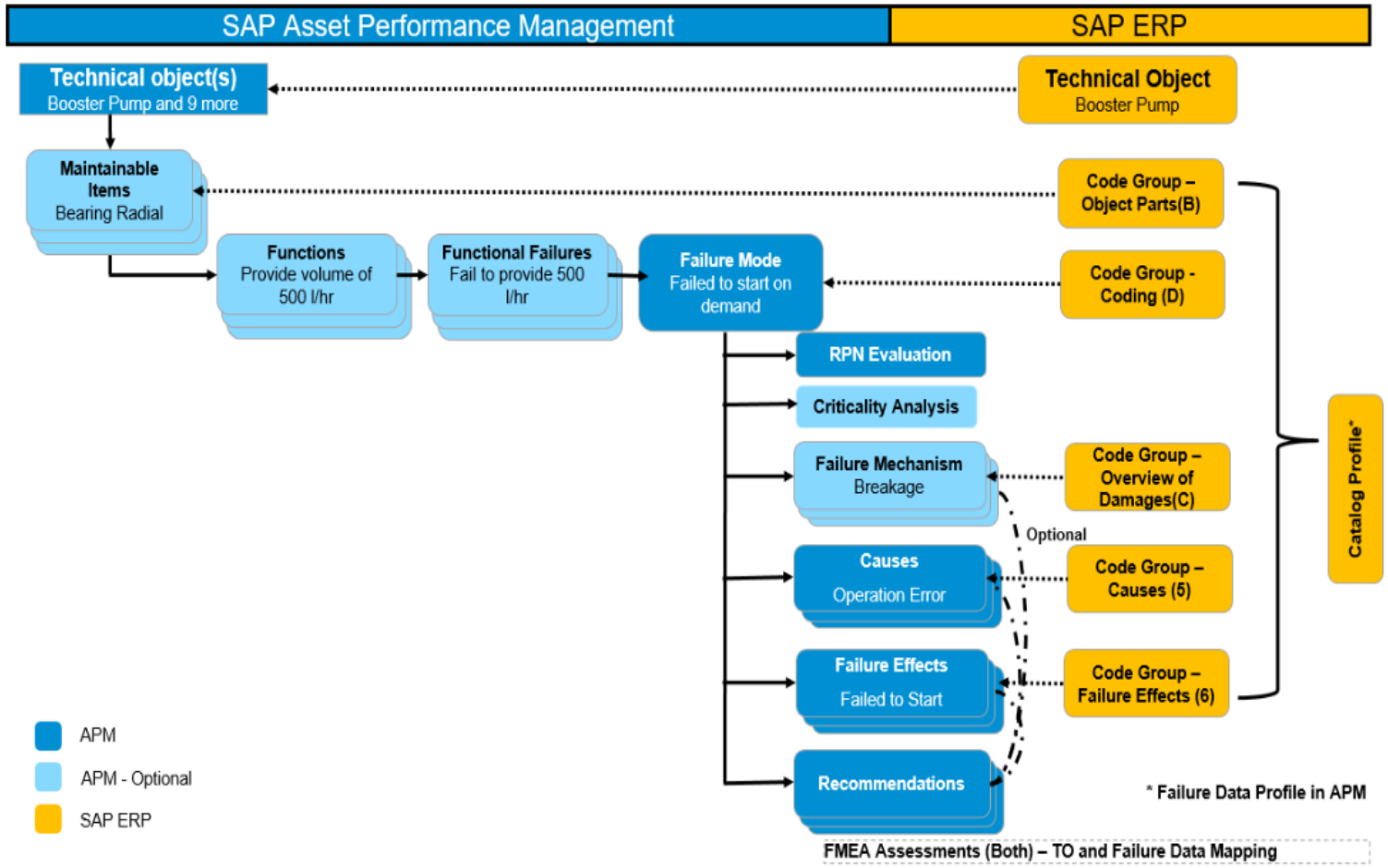
FMEA – Both RPN & FMCS

- Perform Criticality Analysis at the Failure Mode level and Identify Failure Modes, their causes and effects on an asset



Critical Data Mapping Field

Component	Mandatory / Optional	SAP ERP (Type)
Maintainable Item	Optional	Object Parts (B)*
Functions #	Optional	
Functional Failures #	Optional	
Failure Modes	Mandatory	Coding (D)*
Causes	Mandatory	Causes (5)*
Failure Effects	Mandatory	Effects (6)*
Failure Mechanisms	Optional	Overview of Damage (C)*
RPN Evaluation #	Mandatory	
FMCS Evaluation #	Optional	
Recommendation #	Mandatory	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
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So… what data do I need to build for Risk & Criticality in APM?

Component	SAP ERP	Strategy Assessment for Classes	Reliability Centered Maintenance (RCM)	FMEA - Risk Priority Number (RPN)	FMEA – Failure Mode Criticality Score (FMCS)	FMEA – Both RPN & FMCS
Class	Class	Mandatory	N/A	N/A	N/A	N/A
Operating Context & Condition	Characteristic	Optional	N/A	N/A	N/A	N/A
Maintainable Item	Object Parts (B)*	Optional	Optional	Optional	Optional	Optional
Functions #		N/A	Mandatory	Optional	Optional	Optional
Functional Failures #		N/A	Mandatory	Optional	Optional	Optional
Failure Modes	Coding (D)*	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory
Causes	Causes (5)*	Optional	Optional	Mandatory	Optional	Mandatory
Failure Effects	Effects (6)*	Optional	Mandatory	Mandatory	Mandatory	Mandatory
Failure Mechanisms	Overview of Damage (C)*	Optional	Optional	Optional	Optional	Optional
RPN Evaluation #		N/A	N/A	Mandatory	N/A	Mandatory
FMCS Evaluation #		N/A	N/A	N/A	Optional	Optional
Recommendation #		N/A	N/A	N/A	Mandatory	Mandatory

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
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What data do I already have for Risk & Criticality?

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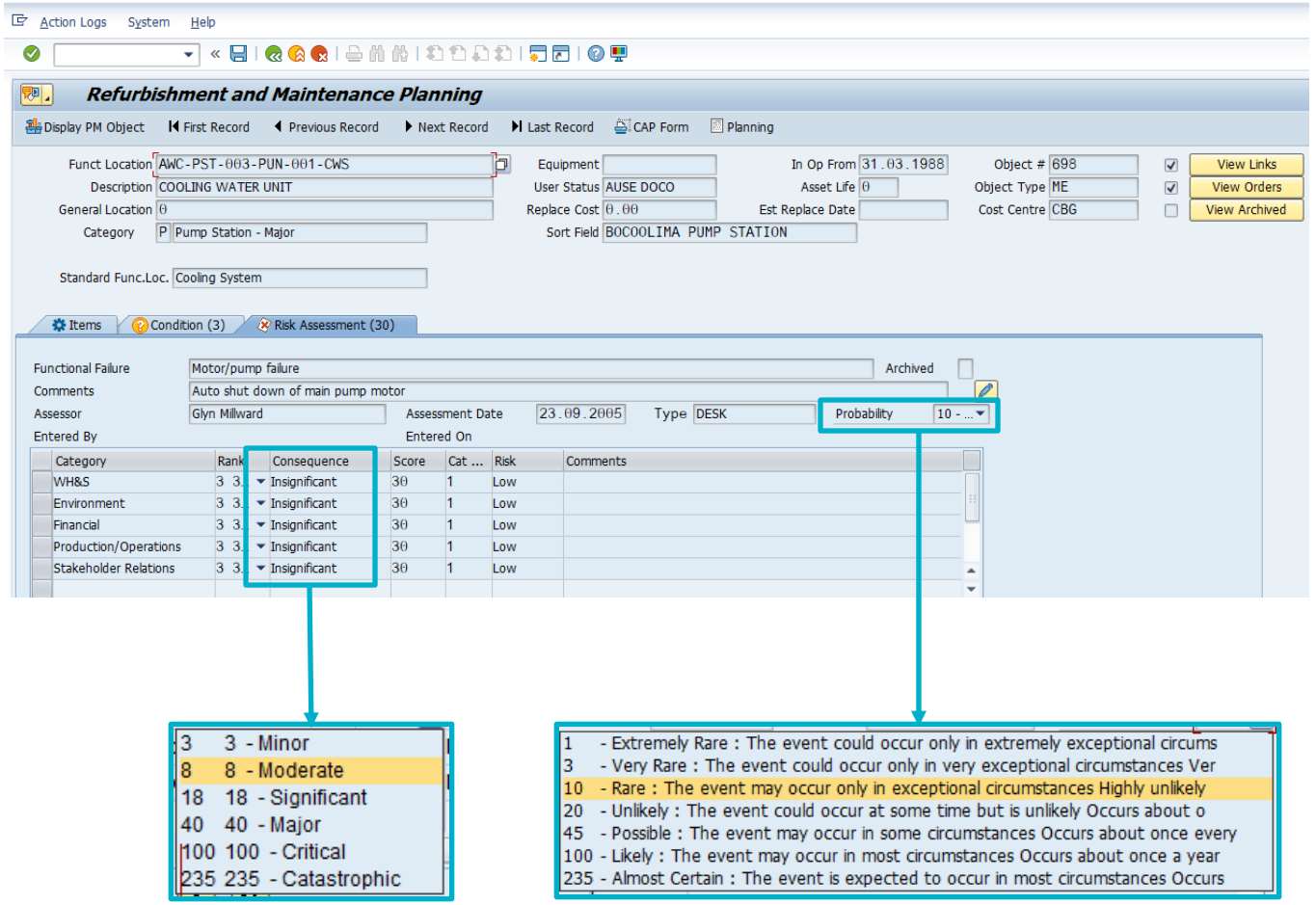
Legacy WMS Risk Assessments

- Free text Functional Failures:
  - No list of Failure Modes to select from
  - Not consistent across asset types
  - Not linked to Object Part, Damage, Effect, Cause, etc
- Risk Matrix changed from 6 x 7 in ECC to 5 x 5 in S/4:
  - No way to map scores to new matrix
  - Risk Categories are different
- Inconsistencies in what level in the hierarchy Risk Assessment is done (e.g. Header or lower level)
- Not linked to mitigation strategies
- Data is difficult to mine and has to be dumped from tables
- Maximum Risk Score is not weighted by Category



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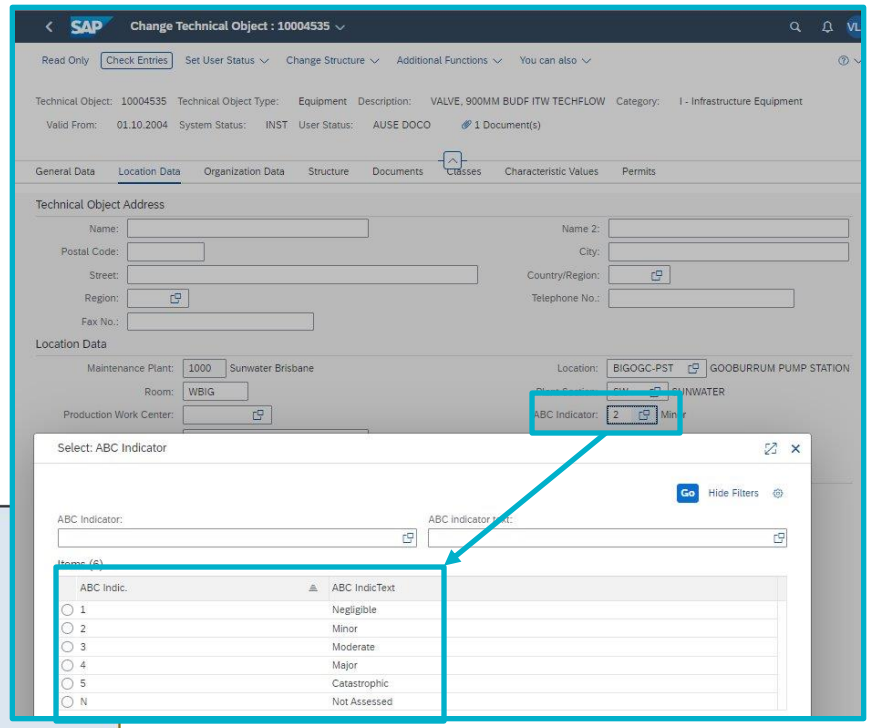
Criticality Assessment for Critical Spares

- Only looked at water producing assets where holding a spare would reduce risk
- Data stored in Excel on Sharepoint
- Failure Modes concatenated in one cell and not assessed separately
- Max Consequence Score loaded in ABC Indicator field in SAP



Asset Description	Object Type	Parent	Dominant Failure	Consequence	Safety	Environment	Customer Supply	Stakeholder Relations	Financial	Legal, Regulatory	Max	Consequence Description
TRANSFORMER ISOLATOR STAT/SERV	ISOLATOR		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure / Fails to operate due to mechanical damage	Potential electrical injuries/death to personal. Supply disruptions to customers. <$10k to replace item, <$200k to replace any damaged equipment	5	1	3	3	1	2	5	Catastrophic
LOW VOLTAGE	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
CABLES	LV CABLE-ABOVE GRND		Insulation failure due to mechanical damage / Short circuit due to loose connections	Crane fails to operate	3	1	2	3	1	1	3	Moderate
SWITCHBOARDS	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
SWITCH BOARD OPERATOR CONSOLE	CONTROL CONSOLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Potential personnel injury - electrical burns. Control gear damage. Loss of customer	3	1	1	2	1	1	3	Moderate
SWITCHBOARD 48V DC TRIP SUPPLY	ELECTRICAL EQUIPMENT		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Potential personnel injury - minor electrical burns	3	1	2	2	1	1	3	Moderate
CABINET, BATTERY CHARGER	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate
SWITCHBOARD STAT/SERV 415V	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
CUBICLES	ELECTRICAL EQUIPMENT	x	Parent - see below		5	1	4	3	3	1	5	Catastrophic
AUX SUPPLY ISOLATING CUBICLE	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate
COMPRESSOR NO1 ISOL CUBICLE	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to	Incorrect control. Potential personnel injury -	3	1	1	1	1	1	3	Moderate
COMPRESSOR NO2 ISOL CUBICLE	CUBICLE		Fails to switch due to burnt contacts / Fails to operate due to electrical component failure	Incorrect control. Potential personnel injury - low voltage	3	1	1	1	1	1	3	Moderate

Note that Data Origin defaults to “Inherit from Superior” which is not ideal. Had to load data twice to force ABC Indicator Data Origin to set to “Individually Maintain”

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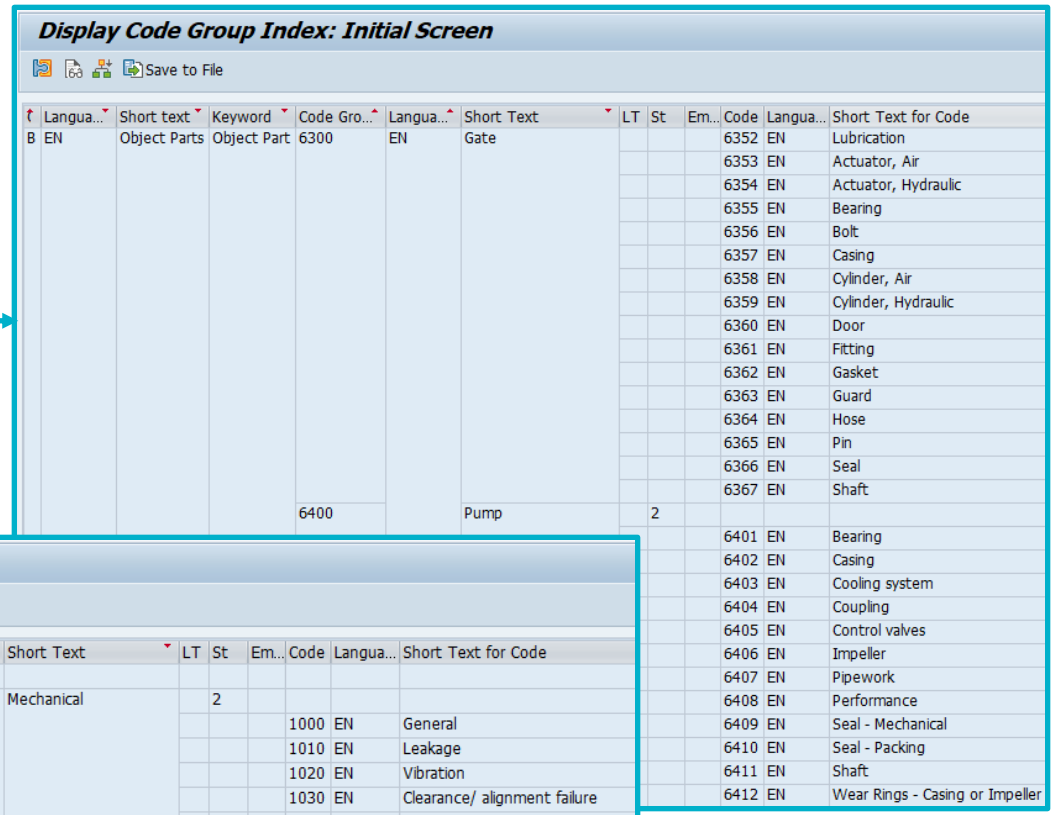
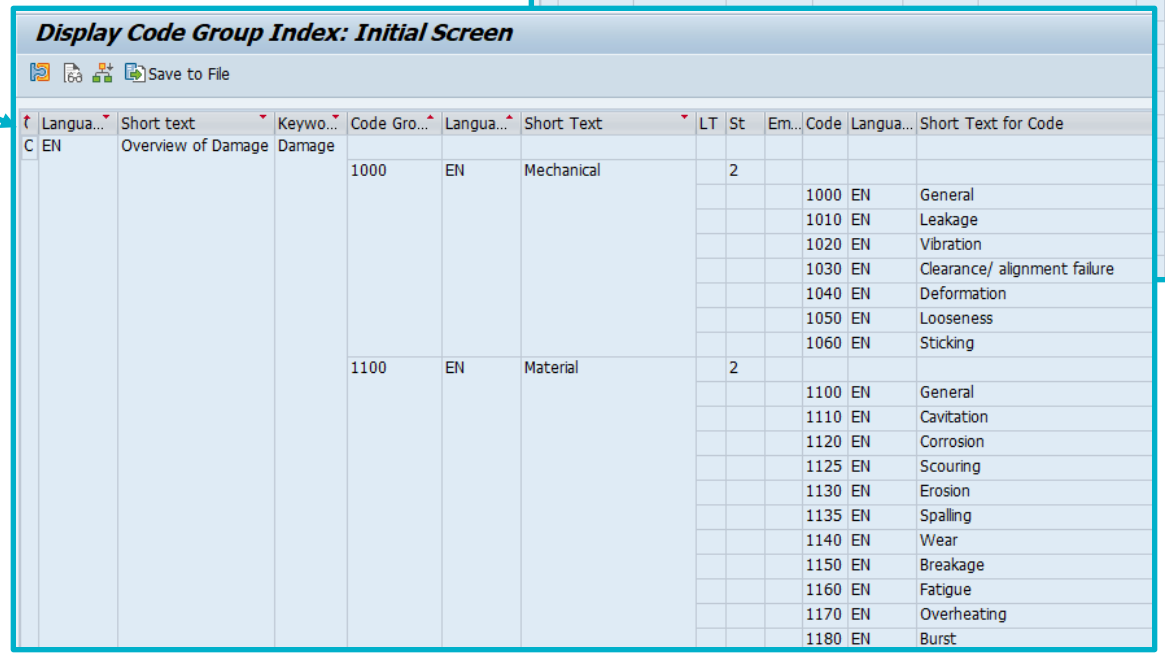
Catalog Codes – Object Part & Damage

Component	SAP ERP
Class	Class
Operating Context & Condition	Characteristic
Maintainable Item	Object Parts (B)*
Functions #	
Functional Failures #	
Failure Modes	Coding (D)*
Causes	Causes (5)*
Failure Effects	Effects (6)*
Failure Mechanisms	Overview of Damage (C)*
RPN Evaluation #	
FMCS Evaluation #	
Recommendation #	





* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
# Created & maintained in APM

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Catalog Codes – Coding Code

Component	SAP ERP
Class	Class
Operating Context & Condition	Characteristic
Maintainable Item	Object Parts (B)*
Functions #	
Functional Failures #	
Failure Modes	Coding (D)*
Causes	Causes (5)*
Failure Effects	Effects (6)*
Failure Mechanisms	Overview of Damage (C)*
RPN Evaluation #	
FMCS Evaluation #	
Recommendation #	

* Catalog codes defined in SAP ERP & visible in GUI T-code QS49
# Created & maintained in APM

Already used Coding Code D for Valuation Code on Measuring Points!!

Display Code Group Index: Initial Screen

Save to File

	Langua...	Short te...	Keywo...	Code Gro...	Langua...	Short Text	LT	St	Em...	Code	Langua...	Short Text for Code
D	EN	Coding	Coding	10000003	EN	WTP Comment Codes				BWN	EN	Backwash cycle not run
										BWY	EN	Backwash cycle run
				10000004	EN	Laboratories for Samples		2				
										ALS	EN	ALS
										CAIR	EN	Cairns RCLS
										DES	EN	DESPL
										ECOS	EN	Ecoscope EL
										MACK	EN	Mackay RCLS
										OTHR	EN	Other
										SYMB	EN	Symbio
										TOOW	EN	Toowoomba RCLS
										VERI	EN	BureauVeritas
				10000005		Comment codes SDL Group		2				
										NINF	EN	No Water/Low Water - No Sample Collected
										NR01	EN	Not Required Seasonal - No Sample
										NREL	EN	No Release - No Sample Collected
										NSNA	EN	Access/Safety Issues - No Sample
										NSXB	EN	Christmas Shutdown - No Sample Collected
										OTOP	EN	Overtopping - No Sample Collected
										SDLI	EN	SDL sensor issue - data not available
				10000006		Comment codes LAB Group		2				
										NINF	EN	No Water/Low Water - No Sample Collected
										NR01	EN	Not Required Seasonal - No Sample
										NREL	EN	No Release - No Sample Collected
										NSNA	EN	Access/Safety Issues - No Sample
										NSXB	EN	Christmas Shutdown - No Sample Collected
										OTOP	EN	Overtopping - No Sample Collected

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Data Model
(What data is where?)

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Asset Data Working Group

- Established Asset Data Working Group with representatives from:
  - Reliability
  - Long Term Planning
  - BAU Master Data team
  - Contractor Master Data Specialists
  - Asset Management Improvement Program team

- Purpose of the group is to have input on:
  - All decisions relating to master data
  - Ensure any cross over with other initiatives are identified and utilized
  - Ensure all documentation is up to date (e.g. Asset Management Plans, Standards, Procedures)
  - Ensure any regulatory or compliance issues are covered

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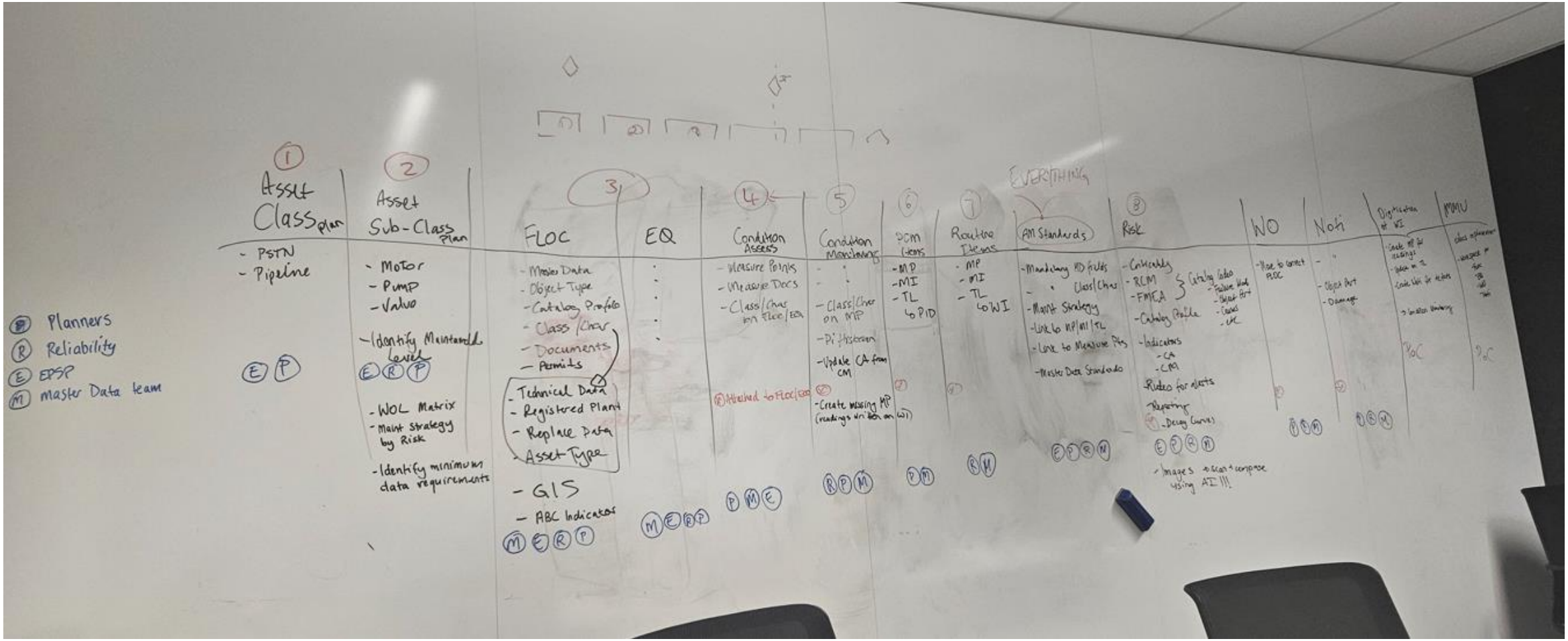
Whiteboard Brain Dump



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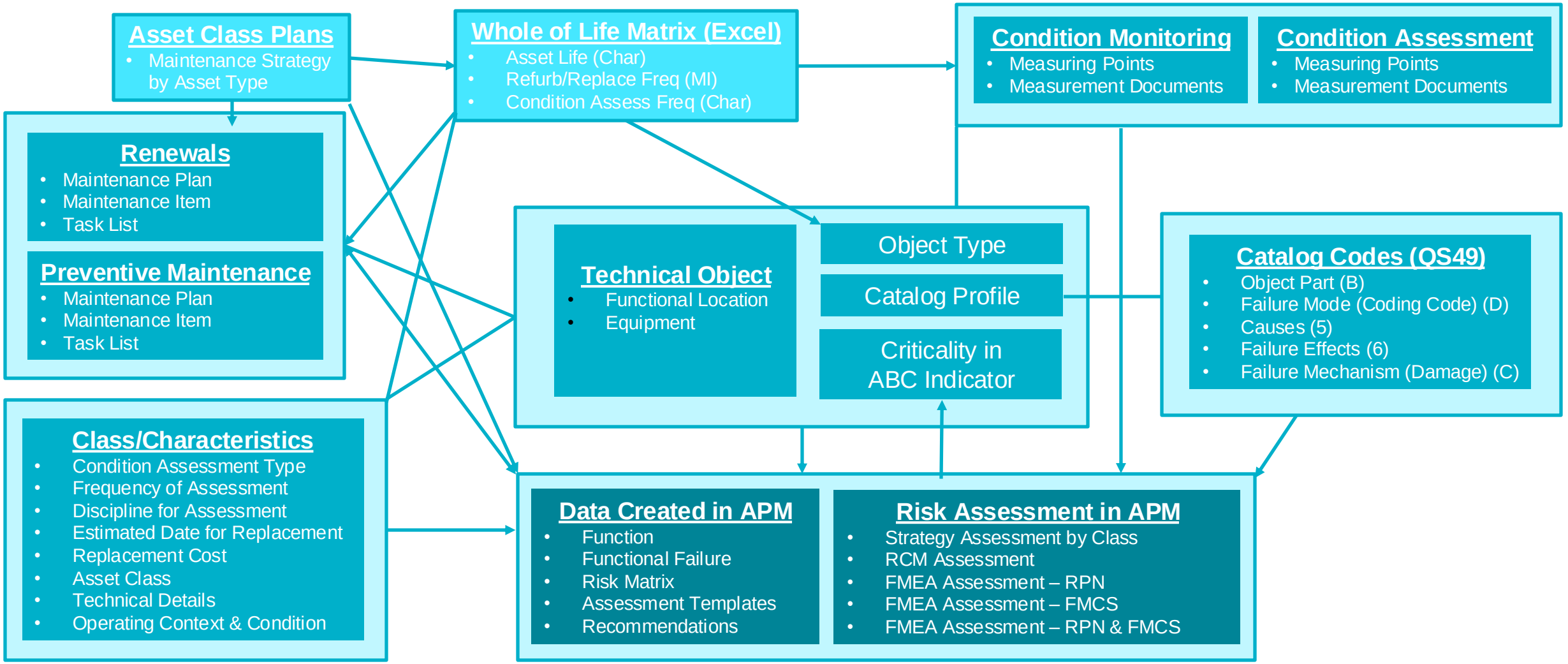
S/4 Data Objects used in APM

SAP S/4 | APM | Excel



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S/4 Data Objects used in APM

SAP S/4 | APM | Excel

Asset Class Plans
- Maintenance Strategy by Asset Type

Renewals
- Maintenance Plan
- Maintenance Item
- Task List

Preventive Maintenance
- Maintenance Plan
- Maintenance Item
- Task List

Class/Characteristics
- Condition Assessment Type
- Frequency of Assessment
- Discipline for Assessment
- Estimated Date for Replacement
- Replacement Cost
- Asset Class
- Technical Details
- Operating Context & Condition

Whole of Life Matrix (Excel)

Condition Monitoring

Condition Assessment
- Measuring Points
- Measurement Documents

Catalog Codes (QS49)
- Object Part (B)
- Failure Mode (Coding Code) (D)
- Causes (5)
- Failure Effects (6)
- Failure Mechanism (Damage) (C)

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A High-Level Approach – what data is where?

Need to identify Maintainable Asset in asset hierarchy and ensure all below data objects are on the same level where possible.

- Technical Objects (Functional Locations & Equipment)
  - Object Type – linked to asset life, refurb/replace frequency, Condition Assessment frequency
  - Catalog Profile – linked to Catalog Codes for Object Part, Damage, Cause, Effect, etc
- Maintenance Plans, Items and Task Lists
  - Renewals (major refurb/replace, major inspections, enhancements, etc.)
  - Preventive Maintenance (minor servicing, minor inspections, etc.)
- Measuring Points & Measurement Documents
  - Condition Assessment (physical inspection assessed against up to six criteria on a scale 1-6)
  - Condition Monitoring (manual and/or SCADA readings for temperature, hours run, vibration, etc)
- Risk Assessments
  - Criticality Consequence Score in ABC Indicator field (from Criticality Assessment for Critical Spares)
  - Future APM Risk Assessments

Spot the Maintainable Asset – Surge Tanks

Blackwater Pipeline

Object	Object ID	Description
◉	BLPIP2-SRG-001	SURGE TANK 4T 4861.56M
○	BLPIP2-SRG-001-PIP	PIPE
○	BLPIP2-SRG-001-STR	STRUCTURE
○	BLPIP2-SRG-001-TKS	TANK
○	BLPIP2-SRG-001-VLN	400D REFLUX VALVE

Eungella Eastern Pipeline

Object	Object ID	Description
	EWEEPI-P02-SRG	P2 SURGE TANKS
	EWEEPI-P02-SRG-001	SURGE TANK AT 11545M
	EWEEPI-P02-SRG-001-BYP	BYPASS LINE
	EWEEPI-P02-SRG-001-BYP-PIP	PIPEWORK
	10009892	PIPEWORK
	EWEEPI-P02-SRG-001-BYP-SCT	25MM STRAINER
	EWEEPI-P02-SRG-001-BYP-VLI	ISOLATION VALVE
	EWEEPI-P02-SRG-001-BYP-VLI-001	100MM ISOLATION VALVE (UPSTREAM)
	10009890	VALVE, 100MM SLUICE
	EWEEPI-P02-SRG-001-BYP-VLI-002	100MM ISOLATION VALVE (DOWNSTREAM)
	10009891	VALVE, 100MM SLUICE
	EWEEPI-P02-SRG-001-BYP-VLI-003	25MM ISOLATION VALVE
	EWEEPI-P02-SRG-001-BYP-VLL	100MM ALTITUDE VALVE
	10009893	VALVE,100MM ALTITUDE VALVE
	EWEEPI-P02-SRG-001-BYP-VLP	25MM PRESSURE REDUCING VALVE
	EWEEPI-P02-SRG-001-CVR	TANK ACCESS HATCH
	EWEEPI-P02-SRG-001-FNC	FENCING AND GATE
	EWEEPI-P02-SRG-001-INN	INSTRUMENTATION
	10009894	LEVEL TRANSMITTER
	10009895	VALVE, 50MM GATE
	EWEEPI-P02-SRG-001-OVF	OVERFLOW PIPE
	EWEEPI-P02-SRG-001-PIP	PIPEWORK
	EWEEPI-P02-SRG-001-SCA	SCADA AT SURGE TANK 11545M
	10009896	240V DISTRIBUTION PANEL
	10010133	CONTROL CUBICLE
	10010134	DATA RADIO
	10010135	RTU
	EWEEPI-P02-SRG-001-SCO	TANK SCOUR OUTLET
	10009897	VALVE, 100MM SLUICE
	EWEEPI-P02-SRG-001-STR	CONCRETE STRUCTURE
	EWEEPI-P02-SRG-001-TKS	TANK 6.2M
	EWEEPI-P02-SRG-001-VLV	VALVE ARRANGEMENT
	EWEEPI-P02-SRG-001-VLV-VLI	300MM ISOLATION VALVE
	10009898	VALVE, 300MM BUTTERFLY
	EWEEPI-P02-SRG-001-VLV-VLN	300MM NON RETURN VALVE
	10009899	VALVE, REFLUX 300MM

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Proposed Ideal Data Model for Surge Tank

Data in S/4 matches Ideal Data Model

Data in S/4 does NOT match Ideal Data Model

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
BLPIP2-SRG-001	SURGE TANK 4T 4861.56M	TK03	CIVIL GENERAL	NO	NO	NO	NO	NO	NO
BLPIP2-SRG-001-PIP	PIPE	PI01	PIPES	60Y REPLACE	12M INSPECT	YES	NO	YES	YES
BLPIP2-SRG-001-STR	STRUCTURE	CW01	CIVIL GENERAL	80Y REPLACE	12M INSPECT	YES	NO	YES	YES
BLPIP2-SRG-001-TKS	TANK	MT01	TANK	60Y REPLACE	12M INSPECT	YES	NO	YES	YES
BLPIP2-SRG-001-STR	400D REFLUX VALVE	VL14	VALVES	30Y REPLACE	12M INSPECT	YES	NO	YES	YES

Existing Data for Surge Tank

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
BLPIP2-SRG-001	SURGE TANK 4T 4861.56M	TK03	CIVIL GENERAL	NO ✓	NO ✓	NO ✓	NO ✓	NO ✓	NO
BLPIP2-SRG-001-PIP	PIPE	PI01	PIPES	60Y REPLA ✓	12M INSPEC ✗	YES ✗	NO ✓	YES ✓	YES
BLPIP2-SRG-001-STR	STRUCTURE	CW01	CIVIL GENERAL	80Y REPLA ✓	12M INSPEC ✗	YES ✗	NO ✓	YES ✗	YES
BLPIP2-SRG-001-TKS	TANK	MT01	TANK	60Y REPLA ✓	12M INSPEC ✗	YES ✗	NO ✓	YES ✓	YES
BLPIP2-SRG-001-STR	400D REFLUX VALVE	VL14	VALVES	30Y REPLA ✓	12M INSPEC ✗	YES ✓	NO ✓	YES ✓	YES

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Proposed Ideal Data Model for Pump Unit

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
ACPS01-PUN-001	PUMP UNIT 1	PU01	HEADER	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-MOE	MOTOR 1	MO02	MOTORS	15Y REFURB 45Y REPLACE	600HR INSPECT 1800HR INSPECT 12M SERVICE	YES	YES	YES	YES
EQ.10000044	MOTOR, 11KV	MO02	MOTORS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-PUM	PUMP 1	PU03	PUMPS	15Y REFURB 60Y REPLACE	3M INSPECT 6M INSPECT 12M SERVICE	YES	YES	YES	YES
EQ. 10000052	PUMP, TKL	PU03	PUMPS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV	VALVES	VL01	HEADER	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX	SUCTION VALVE & ACTUATOR	VL06	HEADER	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-ACT	ACTUATOR	EL02	ELEC EQUIP	15Y REPLACE	12M INSPECT	YES	YES	YES	YES
EQ. 10039597	ACTUATOR, ELEC	EL02	ELEC EQUIP	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-VLX	SUCTION VALVE	VL06	VALVES	15Y REFURB 45Y REPLACE	12M INSPECT	YES	YES	YES	YES
EQ. 10000054	VALVE, 600M BUTF	VL06	VALVES	NO	NO	NO	NO	NO	NO

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Example of Existing Data in S/4


Data in S/4 matches Ideal Data Model


Data in S/4 does NOT match Ideal Data Model

Technical Object (FLOC/EQ)	Description	Object Type	Catalog Profile	Renewal Maint Items	PM Maint Items	Condition Assessment	Condition Monitoring	Criticality	Risk Assessment
ACPS01-PUN-001	PUMP UNIT 1	PU01	PUMPS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-MOE	MOTOR 1	MO02	MOTORS	15Y REFUR 45Y REPLA	600HR INSP 1800HR INS 12M SERVICE	YES	YES	YES	YES
EQ.10000044	MOTOR, 11KV	MO02	MOTORS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-PUM	PUMP 1	PU03	PUMPS	15Y REFUR 60Y REPLA	3M INSPECT 6M INSPECT 12M SERVICE	YES	YES	YES	YES
EQ. 10000052	PUMP, TKL	PU03	PUMPS	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV	VALVES	VL01	VALVES	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX	SUCTION VALVE & ACTUATOR	VL06	VALVES	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-ACT	ACTUATOR	EL02	ELEC EQUIP	15Y REPLA	12M INSPEC	YES	YES	YES	YES
EQ. 10039597	ACTUATOR, ELEC	EL02	ELEC EQUIP	NO	NO	NO	NO	NO	NO
ACPS01-PUN-001-VLV-VLX-VLX	SUCTION VALVE	VL06	VALVES	15Y REFUR 45Y REPLA	12M INSPEC	YES	YES	YES	YES
EQ. 10000054	VALVE, 600M BUTF	VL06	VALVES	NO	NO	NO	NO	NO	NO

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What next?

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Preparing Data for APM

- APM Proof of Concept in Sandpit for:
  - Multiple types of facilities (e.g. dam, pump station, pipeline, channel)
  - Asset Types – pumps, motors, valves, pipes, switchboards
- Develop **Asset Class Plans** to define maintenance strategies by Asset Type
- Develop **Asset Data Information Standard** to:
  - Define business rules for maintainable asset
  - Define naming convention, field relationships, etc.
- Develop **Asset Data Strategy & Plan to**:
  - Move S/4 data objects to maintainable asset where possible
  - Create Functions and Functional Failures in APM
  - Review and update existing Catalog Profile, Object Part and Damage codes
  - Create Catalog Codes for Failure Modes, Causes and Failure Effects

Delivering water for prosperity

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