

Asset Management Implementation

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Summary: This paper presents various methodologies and issues associated with a total asset management process that embraces the use of capital and maintenance expenditure to ensure assets meet the full spectrum of operational requirements, including safety, performance and return on investment. Pervading the entire process is a risk management process that is a function of the condition of the asset base and the responsiveness to identified needs.

Output from the asset management plan described in the paper includes distribution of costs across systems and areas, efficiency of the expenditure (including reactive versus proactive maintenance plus anecdotal notes on known problems), and effectiveness of the expenditure – management of the reliability and capability of the systems, where capability represents ability of an asset to provide its intended function with expected levels of flexibility, efficiency and quality.

1.0 INTRODUCTION

The Asset Management Plan for an organisation links the business requirements of the asset base with various necessary business functions associated with the management of risk and cost. These include capital management, a register of risk issues, long range maintenance strategy and budget management.

A facility should be analysed wherever possible (pending data, time and access for interview constraints) for the following:

1. Top cost areas (i.e. opportunities for savings subject to further detailed analysis in these areas)
2. Work types and possible work efficiency
3. Reliability data in the form of defect trends
4. Responsiveness to backlog and rectification of defects
5. Risk management – as indicated by integrity considerations and responsiveness of maintenance providers
6. Budget analysis
7. Anecdotal notes of relevance regarding asset management of the facility

Essentially the Asset Management Plan is the means by which we identify the intended future performance of the equipment base as well as the engineering means by which we will achieve this performance, [4]. The Asset Management Plan is more than maintenance engineering, although maintenance is a very important component. The Plan is an agreement between operations,

Production engineering, principal engineering and maintenance providers and covers:

1. Equipment operational requirements – opportunities for improvement, limitations to be addressed, operational considerations such as access for maintenance
2. Risk management – issues to be addressed, priorities for work to be done
3. Sustainment Plan – solution strategy to achieve operational goals, improve the state of the equipment base
4. Capital plan – stay-in-business capital projects, prioritisation of projects, impact analysis of budget reduction
5. Maintenance plan – major maintenance or Non-routine work, prioritisation of projects, impact analysis of budget reduction, routine maintenance budgeting
6. Equipment analysis – maintenance and equipment condition improvement opportunities, investigations
7. Performance analysis – backlog analysis, work efficiency and maintenance strategy analysis, budget analysis

This paper considers aspects of a strategic asset management approach, the exploration of maintenance improvement and concepts in effective measurement of maintenance work performance.

2.0 ASSET MANAGEMENT PLAN

The simple framework of the Asset Management Plan is shown in Figure 1. The Framework describes all of the elements that make up the Plan. An element is a business process or set of tasks that a group of people are expected to undertake as part of their normal duties.

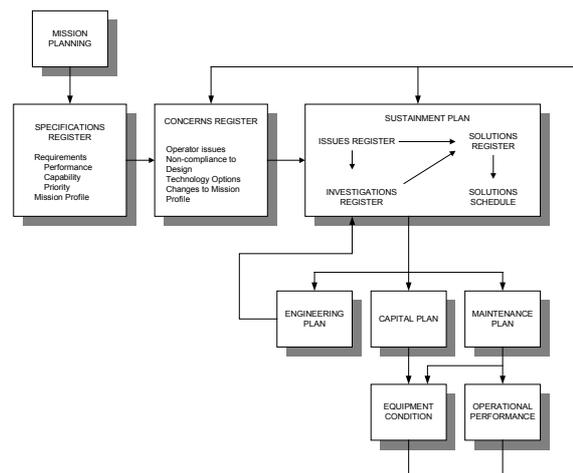


Figure 1 Asset management framework

The Asset Management Plan is a system of documents, databases and other types of information that are organised in a planned manner to assist various organisations make decisions about the care of assets associated with the facility. The tangibles

of the Asset Management Plan are physical documents and systems that make up the individual elements within the framework. In this case, they are the outward signs of a business process, which is comprised of many business rules. The business rules are defined in policy and then enforced through the information system, work procedures and the responsibilities listed in position descriptions.

The Specifications Register is a Register of both library (or source) information on the design performance requirements of the specific items within the asset base, updated with consequent operational experience, and new operational requirements.

A Concerns Register is a means by which non-validated concerns and nominated problems with the assets may be collated, ready for technical validation. Concerns must be initially checked for the following before they may be registered in the Sustainment Plan as valid Issues:

- They are technically credible – a true issue does exist and can be analysed as to size of potential impact
- The concern is not a duplicate of a registered issue and nor can it be chunked with other related concerns to form a single, significant issue

The Sustainment Plan is a business process by which all of the issues concerning the effective use, condition and support of the assets are logged. These issues are driven by three sources:

- Feed input from changing operational requirements for the assets as recorded in the Concerns Register – these would include shortfalls in operational performance, changing mission requirements and perceived technological opportunities for improvement
- Continuous improvement feedback from reports on Equipment Condition or Maintenance Effectiveness – these would cover reliability and downtime, deteriorating asset condition, risk associated with excessive backlog of work and deficiencies introduced by excessive rework
- Issues contained in a Issues Register, which is a business element related to and within the Sustainment Plan, and refers to a formalised process of identifying risk issues, recording them and allocating them a specific risk score

The expenditure on the asset base is divided into three broad areas:

- Engineering Support – a mix of routine support activities such as documentation and drawing updates, and non-routine or one-off investigations and analyses

- Capital Plan – the allocation of capital projects to improve the capability of the asset base – the Asset Management Plan may except special large projects that are treated as major configuration changes in its day-to-day administration and concentrate on minor capital changes and smaller projects
- Maintenance Plan – the combined budget formed from the addition of non-routine or ad hoc maintenance activities with the routine maintenance program established in the Facility Planned Master Maintenance Plan (PMMP)

The outcomes of the expenditure associated with the three cost areas may be measured by two classes of reports:

- Equipment Condition – the assessment of work types (preventative versus corrective, etc), condition assessment reports and reliability analyses
- Maintenance Effectiveness – the assessment of the degree to which the work conducted by maintenance support is effective and well planned, reducing the risk associated with the assets' capability to support mission requirements

Cost optimisation is expected to be undertaken within the administration of the three expenditure areas nominated above, using the systems and internal reporting processes described as part of the Asset Management Plan.

3.0 FUNCTIONAL SPECIFICATION OF THE ASSETS

The purpose of the Specification Register is essentially to document the operational requirements of the asset base in terms of performance and capability, conscious of the need to meet operational durability and performance targets. The basis of the operational requirements is the as-design specification for all of the systems that make up the facility, but clearly there is a need to cope with changes over time.

The suggestion of improvements in operational capability of assets by respecifying their requirements operates outside the continuous improvement loop whereby issues are generated in the Sustainment Plan due to deficiencies in reliability or emergent risk associated with less than optimum maintenance effectiveness. Hence this element is a place concerned with improvement of the assets rather than maintaining them to a known baseline.

The Specification Register describes what the assets are meant to do, which is a major driver in the strategy concerned with how they should be cared for and improved. Key items that are covered include:

- Criticality for the business outcomes

- Mission capability limitation – risk that the mission or required operation will be prematurely aborted
- Mission effectiveness and robustness impact – risk that even though the mission can be undertaken, the effectiveness of the facility is reduced
- Risk of operation – incurred risk to facility operations, people or the environment
- Cost impact – likely reduction in value from expenditure or risk of high cost (budgeted or unbudgeted)
- Long term considerations for the system
- Integrity
- People and environment
- Technology opportunities

4.0 STREAMLINING CONCERNS AND ISSUES MANAGEMENT PROCESS

The purpose of the Sustainment Plan is to manage technical solutions to improve the state of the equipment base and to address issues raised from a number of areas, including the Specification Register, risk management systems, technical analyses and so forth. The Sustainment Plan is the starting point where the engineering and management groups decide what engineering support, capital and maintenance tasks are necessary to achieve objectives for the relevant systems and equipment.

The content of the Sustainment Plan includes:

1. Equipment identification – not only does this cover CMMS registered assets but also infrastructure (eg piping, cables) which comes under each system
2. Issues of concern associated with the equipment – this includes uptake from internal audits, surveys of plant, defects notification, docking reports, and the impact of comprehensive programs such as corrosion management.
3. Current major projects associated with the equipment
4. Priorities of identified issues
5. Recommendations of likely issues to proceed to investigation, capital or maintenance work with estimated budget guidance
6. Timing of expenditure – to be approved by senior management

The process by which the Sustainment Plan operates is shown in Figure 2. The steps are essentially:

1. Concerns may be raised by any competent person who may be uninformed as to any current work in hand which is relevant to the matter
2. A concern is evaluated by an approved person and either archived as being either of little significance or addressed by other work, or upgraded to an issue registered in the

3. Sustainment Plan, which warrants further investigation and ultimately work to be funded
4. An issue may also be raised in response to the content of an approved or regulatory form which is submitted and advises of a deficiency to be addressed
5. Once an issue is registered either a solution or number of related solutions may be specified. Alternatively before proceeding to a solution, it may be necessary to raise an investigation which may or may not be funded. The investigation is then expected to raise solution(s) to address the underlying issue. It should be noted that neither investigations nor solutions exist without an underlying registered issue.
6. Registered solutions may also be applied to other issues registered in the asset management plan.

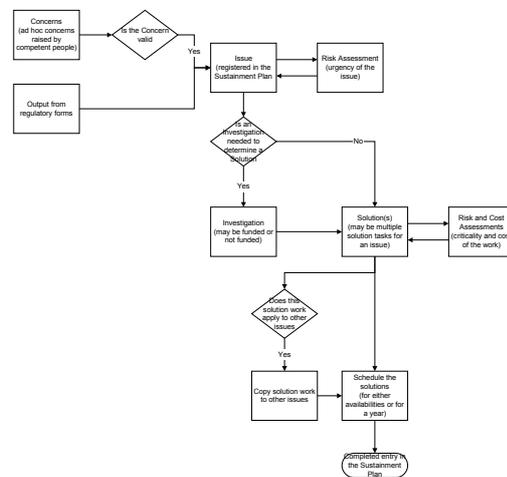


Figure 2 Use of the Sustainment Plan

Once a solution has been costed and risk ranked, then it is ready to be scheduled for implementation in the future. It may be scheduled to occur within an availability within the Useage and Upkeep Cycle (UUC) which is loaded within the Asset Management Plan, or may be budgeted for a specified year.

Based on the content of the Sustainment Plan, decisions on engineering support, capital and maintenance work will be made, including:

- Nature of the work – what is the issue or problem being addressed
- Whether the work is engineering, capital, maintenance or can be conducted as part of routine maintenance
- The likely range of costs of the work, noting that further investigation will be warranted to develop to the stage of say a proposal for expenditure, which will be entered into a capital or maintenance plan
- The initial understanding of the priority of the work, noting that further investigation

may increase or decrease the urgency of the work

- Alignment of the work with existing larger programs so that maximum leveraging of investment and knowledge can be achieved
- A submission to senior management that provides them with an understanding of the overall engineering needs of the plant, and assists them with strategic guidance on long range budgeting

5.0 FINANCIAL, TECHNICAL AND RISK INFORMATION

The Capital Plan and the non-routine section of the Maintenance Plan are treated in an identical manner, using a risk-focused issue management and cost estimation process for project-type work. The Maintenance Plan is augmented by a routine maintenance section whereby such work is treated in a simplified, lump-sum type process.

The purpose of the Capital Plan and the Maintenance Plan is to achieve the following:

- Register all work packages, their timing and notional expenditure
- Provide a means by which work can be staggered in time according to both resource/access capabilities and budget limitations
- Present a strategy for the care of systems, sub-systems and major equipment that integrates all work in a single budget process

Best practice is that the cycle of the budget plans contained in the Capital Plan and the Maintenance Plan will be a rolling multi-year cycle. The system may be established on a calendar year basis but can be moved to a financial year basis. An annual budget for capital work and maintenance work may be extracted from the full cycle, zero-based budgets contained in the Plans. A full cycle represents a campaign of a number of years, eg 10 years for a power station, 6 years for a ship, 4 years for a production line and so on.

The concept of a zero-based budget is that budget prices for all work are developed in a bottom-up process on an equipment-by-equipment basis. There is no concept of setting budget estimates based on historical funding. The development of the budget estimates are achieved as follows:

- Capital work and non-routine maintenance work – specific work packages are recorded in the Plans and individually priced
- Routine maintenance work – the budgeted cost of a procedure is compiled with the costs of all other procedures for a given system, according to the projected time when that procedure is planned to commence. This is based on the Useage and Upkeep Cycle (UUC)

Non-routine maintenance work is defined as all maintenance work for which a programmed work order procedure is not available in advance, and is not scheduled in advance according to the scheduled PM maintenance plan. Routine maintenance work is all maintenance work so scheduled in advance in the scheduled PM maintenance plan and for which individual PM procedures exist.

All work is controlled and managed by business processes external to the Asset Management Plan, such as corporate procedures and work management procedures required by the various planning departments (eg maintenance planners). Hence this section is concerned with how the approaches and information within the Asset Management Plan can be used to efficiently plan, raise and manage capital and maintenance works in compliance with these external business processes.

6.0 CONCLUSION

The challenge for asset management is to provide a credible statement on a strategy that will ensure the organisation can sustain their asset base and its business mission in a long term cost effective manner. An imperative for this issue is the need to reduce overall expenditure to meet gaps between the sum of individual budget submissions from all areas across a facility and the total organisation maintenance and logistics budget guidance figures.

To achieve this the conduct of the asset management plan has to be guided with feedback on the distribution of costs across systems and areas, efficiency of the expenditure (reactive versus proactive maintenance plus anecdotal notes on known problems), and effectiveness of the expenditure. Effectiveness refers to management of the reliability and capability of the systems, where capability represents ability of an asset to provide its intended function with expected levels of flexibility, efficiency and quality.