Business Focused Maintenance

Business-focused maintenance

- a framework for betterment

Enterprises with vision know that asset care and maintenance is a complex, enormously valuable activity that assuredly delivers competitive advantage. It is easy to identify these organisations - they are the best in the world at what they do, whether manufacturing cars or consumer goods, processing chemicals or food. In all these organisations the asset maintenance process is carried out to the book so as to achieve the business expectation of faultless delivery of agreed performance targets - no breakdowns, no accidents, no quality violations and operating costs that continually decrease.

So what is it that they do in asset maintenance terms that makes them the best? How do they do maintenance? What thinking underpins their extraordinary business performance?

The core guiding concepts

The most effective maintenance is underpinned by some inviolable, core concepts:

- The purpose of the maintenance process is to achieve high levels of asset availability at affordable levels of cost and in compliance with safety, health and environmental (SHE) standards.
- Performance targets in terms of asset availability, affordable cost and SHE are set by direct reference to the business goals.
- Affordable budgets are established and the organisation is motivated to achieve the necessary work within these agreed budgets.
- Actual work requirements are determined on the basis of pre-established standards and criteria for equipment condition or performance.
- An effective work screening process is in place to ensure all executed work is justified, necessary and legal.
- A systematic decision process is used to evaluate and manage the risks where pre-determined work is deferred or cancelled.
- Planned work is maximised. Unplanned and emergency work is the exception and limited to situations that can have an immediate adverse business impact - safety, health, environmental and profitability threat.
- Work is always executed by the most cost-effective method.

- Performance parameters are established, monitored and used as a basis for continuous performance improvement. A pro-active, information-driven performance improvement process provides analysis of repetitive and costly repairs in order to develop and implement solutions with lower asset total life cycle costs.

Any demands, including changes in maintenance performance, follow directly from the specific requirements of the business as a whole.

Deciding the rational maintenance program – the steps

There are three cascading decision stages to arrive at the most appropriate, business-focused maintenance schedule for a facility so as to assure needed business performance. The following are defined in order:

- The asset strategy
- The maintenance strategy and its enabling maintenance plan
- The time-based maintenance schedule to achieve the plan

1. Asset strategy

The asset strategy ensures that the maintenance organisation is aligned with the goals of the business. It provides the essential correlating interface between the business strategy and maintenance management/asset performance.

To develop a business-aligned asset strategy, carry out the following stepwise process:

1.1 Understand the enterprise's mission in the marketplace, the enterprise's goals and operational strategy to achieve them. Consider the contribution physical assets make to this mission and strategy. Understand and accept the capabilities and constraints demanded by the business needs

1.2 Prepare a block flow diagram of the value chain of the enterprise's primary, value adding operational activities underpinning its competitive advantage.

1.3 Identify the support activities on which the performance of the primary activities depend. Understand the nature of their required contribution.

1.4 Identify the asset 'systems' within both primary and support activities. Understand the operations policy and the service levels demanded of the asset systems to fulfil this policy. Understand the financial budget constraints placed on the organisation - what can be afforded at the present time.

1.5 Prepare a listing of all asset systems. Analyse the systems into hierarchies of assemblies and sub-assemblies. Develop an Asset Register of significant assets – those individually important from a cost, technical or management viewpoint. Complete the listing of the remaining non-significant assets later, as time allows.

***Note**: The structure of the asset register should be considered carefully as a well defined structure can make it a much more simple task to carry out any Failure Modes and Effects analysis required to develop its maintenance strategy.*

1.6 Carry out criticality assessment of each asset system. (What is the potential for significant failure and loss - financial, environmental, safety and other adverse impact for the enterprise). Study the asset systems and determine the seriousness of the consequences of failure to fulfil each of their individual missions – that is, complete or partial failure to function as needed. By engineering reference to the assembly hierarchy, assess the general likelihood (probability) of each failure occurring. Rank the separate asset systems in order of their criticality to the enterprise.

1.7 In consideration of the nature and imperatives of enterprise operations, determine the asset maintenance scheduling characteristics that will limit or allow maintenance access to operational assets. That is, the production loading cycle and seasonal influences, production cleaning, production consumable changes, product type changes, etc.

2. Maintenance Strategy/Plan

An overall long-term policy and realisation plan must be defined for *each asset 'system'* on the basis of risk/criticality analysis. This process will set the most cost-effective maintenance approach for each asset in order to meet financial, quality, SHE and timing targets. The overall approach is shown diagrammatically in the Attachment – *'Establishing the maintenance plan'.*

2.1 Identify the 'maintenance demanding' items from information from 1.5.

2.2 Identify any 'rogue assets' – those assets having frequent disruptive failures/high cumulative cost of maintenance – use Pareto analysis of historical failure and cost information. Apply root cause analysis to identify and then carry out corrective action to bring the rogue assets to the required state of reliability and economical performance.

2.3 For ***critical*** asset systems:

(i) Identify the failure prone components of each asset from failure history and engineering analysis. (As appropriate, use FTA, Fault Tree Analysis, and FMECA, Failure Modes and Effect Criticality Analysis. But, use these techniques sparingly, as they are resource hungry – the value gained must exceed the cost of the analysis by a margin and cost must be within affordability constraints).

Note: *Manufacture's/supplier's maintenance recommendations are insufficient for critical assets. Engineering analysis should always be carried out.*

(ii) Select the best failure-countering maintenance approach (strategy) for each asset, i.e. condition based tasks, calendar based tasks (or metered, counted, other 'usage' criteria), corrective tasks (run to failure) or redesign to obviate maintenance (minor modification or extraordinary capital maintenance). Strive to minimise off-line work.

Note*: The temptation is to adopt a blanket decision approach for identical or generically similar assets. However, caution must be exercised, as an asset's maintenance needs are a function of the total environment in which it operates and this varies not only from facility to facility but also within a facility.* ***Identical items of equipment may have different maintenance needs because of their differing contexts of use.***

2.4 For ***non-critical*** assets refer initially to the manufacturer's/supplier's information to identify the periodic inspections and jobs 'required'. Modify manufacturer's recommendations in the light of operating experience. Resist the temptation to 'over-maintain' and strive to follow a hands-off approach, limiting maintenance to essential cleaning, lubrication and checking (TLC). Favour the run to failure option. Prepare High Frequency and Low Frequency Checklists. Group tasks into logical groups to ease their administration (chunking).

Note: *To protect rights in terms of manufacturer's warranties for new equipment, it may be necessary to carry out otherwise needless maintenance interventions in the warranty period that can be discontinued afterwards.*

2.5 Determine the organisation and logistics necessary to support the maintenance approaches decided upon. (Spares, tools, test equipment, services, training, special needs, Work Permits - also fully consider 'contract out' options, especially for major shutdown work, major refurbishment and modifications – and also for non-critical general assets, like portable equipment. When contracting out maintenance work, strive to reduce reimbursable (timesheet) work to the minimum. Award contracts on a fixed price or measured work basis. Ensure there is an effective programme for the reconditioning of used, refurbishable spare parts.)

2.6 Determine the most appropriate maintenance routines for each asset dividing the interventions into on-line (energised) and off-line (denergised).

2.7 Establish an off-line plan for each asset 'system' in terms of individual jobs defined by craft (including special skill or technical requirements) and frequency.

Note: On-line interventions proceed directly to scheduling.

3. Maintenance Schedule

Define the time-scaled maintenance plan for the *Plant/Facilities*

3.1 Establish a preliminary on-line schedule for the facilities in terms of maintenance routines defined by trade/craft team and frequency. Agree the schedule with equipment user groups. Jointly consider the productivity and value-adding benefits of autonomous maintenance by equipment users and multi-skilling initiatives for trade/craftsmen, etc. for basic care tasks and 'first-fix' maintenance.

3.2 Establish a preliminary off-line opportunity outage schedule for the facilities using information from 2.7 and any relevant outcome from 3.1.

3.3 Establish a preliminary off-line general shutdown schedule for the facilities using information from 2.7 and any relevant outcome from 3.1. Agree the shutdown calendar with the user group management. (In general, use *utmost endeavours* to minimise the shutdown workload and length of outage. Jointly plan for the *contingent measures* that are invariably necessary to cover for the non-availability of 'essential' systems and utilities during the shutdown.)

3.4 Estimate from 3.1, 3.2 and 3.3 the planned workload profile.

3.5 Forecast the unplanned workload demand using past experience and history.

3.6 Forecast the facilities modification and major refurbishment workload for the period - include any substantial work-in-progress that straddles the planning period.

3.7 Consider the resource requirements for the total forecast workload. Carry out 'resource levelling' by changing the schedule as necessary and allowable, in consultation with the equipment user group.

Note: Although the process proceeds in a rational sequence, much ***judgement*** is required because of ***value trade-offs*** and ***planning iterations*** that occur throughout.

A final thought

In the UK, maintenance has suffered from a legacy of misunderstanding, prejudice and low esteem. This has been a serious restraint to progress. The most visionary enterprises have thrown off this legacy. These enterprises have an expectation of ultimate perfection that drives their extraordinary world-class performance.

Establishing the maintenance plan

NOTE

Implicit in good maintenance strategy is proper:

- cleaning
- lubrication
- operation