AMQ International

Strategic Asset Management

Issue 82, Feb 22, 2002

IMPROVING MAINTAINABILITY

In the last issue

we looked at what maintainability was, whether we had it, and did it matter? In this issue, we concentrate on improving maintainability – for new *and existing* assets.

The scope for improvement is wide. After all, maintainability is the provision of the desired service, when needed, at lowest possible cost -- in other words, asset management itself!

In this issue,

Greg Williams looks at **maintainability and contracts** with the clear message that, while you may be outsourcing the work, the responsibility for maintainability is all yours.

Ami Sudjiman-Spinks says while options are greater at the design stage, **maintainability can be improved at any stage in the life cycle.**

Malcolm Winterburn recognises that growing complexity and specialisation of assets presents problems of **organisational structure** and suggests that it is worth investing energy in devising incentives that ensure that all of your business units are working towards the corporate good, rather than their own betterment.

And I suggest **some actions** that you can take **now** to improve your own maintainability.

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Published fortnightly. $200 plus GST. Subscribe on line at www.amqi.com or, f
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MAINTAINABILITY AND CONTRACTING

GREG WILLIAMS, TRANSFIELD WORLEY SOLUTIONS

In Issue 81, Greg Williams considered "Maintainability – what is it?" Much of what he said in that issue can be applied 'post-design'.

Greg provides a set of "What not to do" checkpoints which are worth noting:

- Don't assume the designer has considered maintainability issues. Designers normally do what is contracted, not what is ideally required.
- Don't assume the construction company will build in maintainability. Concrete is cheaper than steel and shovels are easier to use than arc welders*. (see below)
- Don't discretely avoid maintainability issues: if you are the owner of the asset, the life cycle costs attributable to redesign or rework will be yours to account for, not the designers of constructors.
- Don't avoid documenting your maintainability observations; be conscious of the potential for litigation issues to arise over the life cycle of the asset.
- However, don't over-specify for maintainability. A degree of pragmatism must be included in the Asset Manager's approach to reducing the life cycle costs.
- Don't avoid trade-offs, in design or support, if the total costs of ownership can be minimised whilst optimising the maintainability of the asset.

Summarised, I would say **"the responsibility for maintainability is yours"**

***Greg may have had in mind the new City Link tunnel in Melbourne where a number of major items of equipment such as pumps or compressors have been enclosed underground in inaccessible pits, because the equipment reliability is considered to be high and thus the likelihood of failure very low. However, while the system is in its infancy, the random failure of just one such item would require the maintainer to gain access by breaking in, possibly limiting the use of part of the road and tunnel, directly contributing to an increase in life cycle costs and probably a loss of revenues.

It has also been common practice to concrete in the floor of the lift well requiring maintenance crews to dig up the concrete in order to access some of the lift systems.

Greg writes:

If asset management is generally agreed to be the practice of optimising service delivery from physical assets, then maintainability—or lack of it—must be recognised as a contributing factor to poor service delivery.

Some industries have developed approaches to maintainability that result in the inclusion of targets in conceptual design.

Still others, such as aerospace, specify uniquely for maintainability, linking the requirement to availability and reliability.

Generally, however, the practice of asset management has not been inclusive of the design for maintainability approaches.

Perhaps the time is right for a standard maintainability clause to be included in government contracts for physical and infrastructure assets?

(also see research program on the back page)

APPLYING EINSTEIN

Actions you can take to improve maintainability

Maintenance v. Maintainability

One is an action, the other a capability

How much time do you spend on developing your organisation's maintenance capability (maintainability) - as distinct from the actual doing?

Be honest!

Einstein's Three Rules of Work

1.Out of clutter, find simplicity
2.From discord, find harmony
3.In the middle of difficulty lies opportunity

How do Einstein's "Three Rules of Work" apply to maintainability?

1. *Standardise wherever possible, organise, de-clutter!*

This particularly applies to your spare parts inventory. Do you know what you have got? Is everything easily accessible? Still current? Are your process manuals old and convoluted? When were they last reviewed?

Listen to your trades people—their 'whinges' can tell you what is working and not working in your systems.

2. *Systematise, develop maintenance, response, procedures*

But don't just write them down in a manual—teach them!

Check your lines of responsibility (financial and legal). YOU may think HE is responsible, but what does HE think? Check! (This applies to both out-sourced and in-house staff resources.)
(also see Malcolm's paper on common incentives)

3. *Review maintenance performance*

NOT with an eye to proving that everything is OK, but deliberately looking for those things that are NOT OK, so you can fix them. In this respect see Ami's examples in the last issue (#81) and her paper in this issue.

Also spend some time to develop probable problem scenarios and then script your responses to them - then test the script! So you think that you will use the back up generator if the power fails? Do you know if the generator actually works? (Many only find out it doesn't when they need to use it.)

MAINTAINABILITY DOESN'T STOP AT DESIGN STAGE

AMI SUDJIMAN-SPINKS, STRATEGIC FACILITY SERVICES PL

Ami also writes for "Strategy" a quarterly newsletter published on the Strategic Facility Services website

www.stratfac.com.au

In the current February issue you will find interesting comment on

"Maintenance of Essential Services"— How will the changes recently introduced by the NSW Government affect your maintenance contracts?

"Long Term Costs vs Capital Costs" describing the ANAO Better Practice Guide to Life Cycle Costing

And "Getting your facility ready for 2002- and beyond"

Sure, designing in maintainability should start when the need for a new asset is first thought of, but that doesn't mean that quite a lot can't be done to improve the situation later in the asset's life cycle.

In fact, it is often only by 'living with an asset" for a while – particularly if it is a new type of asset - that owners and users may appreciate the real maintainability requirements. It is much like living in a house before designing your own, or trying out a number of motor vehicles before deciding what features (including risk, reliability and availability) are important to you. The trick is to ensure that these 'learnings" are built into your next contract.

Review user requirements

Review your user requirements – the higher your stated user requirements, the higher the level of maintainability (not to mention actual maintenance) that is usually required, so by re-assessing your requirements and avoiding over-specification, you can greatly simplify the problems facing you.

Follow through

Many organisations prioritise maintenance actions – but fail to follow through on them. For example, one housing organisation recognised that the weather wall of its houses needed more frequent painting, but when it came time to paint, the maintenance supervisor would generally decide to do the whole lot anyway! While this is not an issue of individual asset maintainability it does affect the ability of the organisation to maintain the portfolio as a whole; wasting resources always does.

Link downstream outcomes to upstream decisions

But the biggest breakthrough in maintainability is finding ways to link the downstream savings back to the upstream decision. Theoretically, this is what a fully integrated organisation should do, but generally doesn't because of its organisation into separate business units, each with their own partial objectives.

For example,

- Designers can be required to demonstrate how their design minimises energy use and leads to lower ongoing maintenance costs.
- Builders can be rewarded for making suggestions that will enable the original design to be constructed in a way that lowers future costs.

If these requirements and rewards were built into the system, practitioners would look for ways to demonstrate and prove their life cycle improvements. They would then pay more attention to the deficiencies of existing designs and construction methods.

MAINTAINABILITY—MAKING IT HAPPEN

MALCOLM WINTERBURN, INFRACO SSL

Malcolm discusses how the use of an organisation-wide performance measure is helping to generate a common approach by different business units, thus improving maintainability in the London Underground

Why aren't assets *more* maintainable ?

If maintainability is built into the design, whole life costs can be dramatically reduced. Why should it be that relatively little thought has apparently been given to the maintainability of many assets in Railway Infrastructure ? What are some of the blockers and how do we overcome them ?

Integrating maintainability into design

Railways, having grown up in the 19th Century, used to epitomise the vertically integrated Company. In theory this integration should mean that maintainability is designed in from the start, and for a time this may have been the case.

A vertically integrated Company however is difficult to manage without splitting it up into divisions of some sort, a natural one being between design and operations. The designer becomes remote from operational concerns and this becomes a barrier to good maintainability. In a state owned organisations this effect is compounded by annual budgets which force short-term thinking. The design department no longer takes into account whole-life costs, for it is only constrained by short-term needs and to do so increases the project costs. There is a loss of concern about maintainability and the long-term efficiency of the enterprise suffers.

Malcolm writes:

"I have a friend who is an expert in Gallium Arsenide semi-conductor technology—no Chief Signal Engineer, let alone an Engineering Director could understand the value of this technology to increasing infrastructure maintainability—yet one day, it might!"

Change in technology

Massive change in technology in the late 20th Century has added further barriers. One man could master steam train technology and justify the balance of first and overall costs of ownership to the Client. Or, taking another example, until quite recently electro-mechanical, highly reliable and easily maintained signalling equipment on London Underground was understood and specified by staff who rose to the top. That is no longer possible.

Technology now requires specialists and integrators. All new signal equipment has solid state technology, the engineer carrying out safety analysis of the circuits requires specialist expertise. She (quite likely) uses a foreign language to the mechanical engineer overcoming problems of leaves on the line that threaten a train stopping within its safety envelope.

At the same time commercial pressures lead senior managers to appreciate that sub-systems can be delivered better and more cheaply by relying on others. This all leads to further division, now through contracts, putting maintainability at risk. However in the face of all these forces for change comes an opportunity for re-integration.

Performance Indicators

Many organisations have a plethora of performance indicators that refer to each individual business unit and some time to sections within it—but few have a main performance indicator that refers to the customer outcomes of their business.

By forcing units to focus on their own outcome performance—rather than their contribution to the organisations' overall success, these organisations are detracting from maintainability

- and profitability.

Editor

Focus for the team

When a team builds a system new methods are required to enable individuals to understand how their efforts contribute to the whole enterprise - for example to enable the designer to understand the particular importance of the maintainability of their sub-system. One such technique is the use of performance measures.

Measuring what matters

London Underground has recently introduced a measure to focus the efforts of all its staff and supply chain on the aspects of design that matter. Loss is measured in Nachs - an acronym for Notional Accumulated Customer Hours. The concept is borrowed from the Dutch Railways to measure the impact of system failures on the travelling customer. A formula is used that calculates the impact of failures and thus the commercial loss, based on the location and duration of the delay, the time of the day and of the week.

Consideration of the Nachs losses instead of plain failure count has recently driven planning to focus renewals on areas of track in the central area where there is the greatest impact. This may be obvious, but under the Nachs system the value can be quantified and commercially justified

This measure drives the supplier to consider the cost of failure and ensure it is factored into the design. Comparison can also be made by the manager of the whole network of the impact of the reliability of different types of asset or different parts of the system. Where in-service repairs are required, the criticality of sub-systems can be measured, and a firm basis for the analysis for sub-system "unit change" designs is achieved.

In most organisations, the asset manager may need to play the role of a "systems integrator".

Engineering in the Supply Chain

Connecting the various elements in the supply chain presents particular challenges to maintainability.

In theory, a perfect market for Design, Build & Maintain drives suppliers to consider whole-life costing, and thus maintainability, in order to remain competitive. In practice, however, there are often other dominant short term, commercial or political considerations, which allow the supplier to take a more relaxed approach to post delivery costs.

Any gain in up front costs from the scale of the supplier of say, escalators, may in practice be more than offset by the difficulty of maintaining standard machines in the cramped environment underground.—a distinctly non-standard location.

Under these circumstances, various forms of partnership, and in the final analysis, intervention by the systems integrator, may be necessary to maintain the Client's requirements for the whole of the infrastructure system.

Specifying maintainability, or at least access, is critical to success of the whole system. Managing the transfer of risk under these circumstances is both a financial and a technical activity and it should not be left solely to commercial managers because they won't understand the technical and system implications. This raises new needs for support from Engineers across departmental boundaries.

The London Underground PPP (Public Private Partnership) contract considers information to be an asset in its own right. The contract requires the suppliers to establish an asset management regime to demonstrate its effective management. (see research program call over the page)

Information

To discuss anything raised in this issue of SAM, take advantage of our discussion site on the web

www.amqi.com

Information is a key requirement for the successful management of these modern complex systems and web of commercial, technical and personal relationships. LUL have learnt from the National Rail privatisation and have a special section in the PPP to define rights to access to information. In this way they can, if necessary, understand and adjust their requirements to ensure that the arrangement still provides value for money. They could if they wanted to examine the maintainability of parts of the system - if that became an issue.

Bi-stable state

London Underground has been making the transition in the past decades from a low technology, low cost, and in the modern world, only just tolerably reliable system. It is moving to a knowledge based, capital-intensive state, meeting public demand for very high standards and facilities. For this to be affordable, whole-life cost management is a necessity. Measurement and obtaining maintainability are key to this success.

STRATEGIC ASSET MANAGEMENT - NEW RESEARCH PROGRAM
Participants Wanted

SAM is researching
"Maintainability in Contracts"

- What has been done?
- What has been the experience to date?
- What works? What hasn't worked so well?
- What have we learnt?

What do you get for your involvement?

A full copy of the research report and the opportunity to move forward the asset management agenda. Citation if you wish it; discrete anonymity if that be your choice.

What do I want from you?

Just the opportunity to talk with you over the phone.

Guarantee! No organisation or consultant will be identified unless they wish to be. So, if you are incorporation maintainability or asset management plans, or similar, in your contracting and would like to find out what others are doing and what success they have had, or perhaps what to avoid, then please ring me on **08 8281 5795**. Or you can email me at **editor@amqi.com**

Coming in the next issue

You know that collecting data for models is expensive and ongoing - but have you taken full account of the real killer - **Asset Data Maintenance is Boring!** In Issue 83 we look at data and data modelling – and how to make it work well for you.