# Managing the process of outsourced contracts and agreements

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## 1. Introduction

Maintenance is a lifetime of sustained effort to ensure that the assets of a company continue to provide a service that will ensure that the organisation can provide its designated service. As a consequence a maintenance contract has very different business goals from the provision of services through construction or a one-off engineering exercise. The key goals for such a contract include:

1. There is no end point to the achievement that can be marked as the completion of the service. The effort must be sustained over the life of the company.
2. The time frame for the services is beyond the life of the contract: while a contractor may be retired at a designated period, the facility owner/user will continue and so must the maintenance of its assets. Hence the engineering decisions taken as part of the contractual services consider much longer time horizons.
3. The effort must be sustained in the sense that the integrity of the facility is only as good as its weakest part. If the outcome of the service is reliability of the assets, then the quality of work must be uniform and sustained to avoid a few weak areas which will undo the good work completed elsewhere.
4. The outcomes of the services should be measured in terms of the productivity of the client's assets. Unlike most other contractor-client relationships, maintenance success is intimately concerned with the business success of the client who uses the assets to achieve the latter.

While these points are self evident, best practice maintenance needs to progress even further in the value of its delivery. Since the services extend over time, there are a number of issues that will lead current effective practices to diminish in value. These include time-based damage mechanisms that deteriorate the equipment and/or facility. Examples include fatigue, wear and corrosion. As a consequence of this, reliance on reactive maintenance with excessive corrective maintenance response will result in deterioration of the assets. Secondly the people who manage and undertake both sides of the relationship, including building supervisors, maintainers, administrators and so, will change in and out of their positions. This leads to forgetfulness where the lessons of the past o not guide the decisions of the future, to incorrect choices being made and to the introduction of damage through lack of skill in operation or repair. A third issue is the transient nature

of business, where the assets may be utilised for services beyond their original design capability, or over a service life greater than their design life.

For all of these reasons, the business of maintenance must also accommodate the following:

1. Sustained introduction of refined or original techniques to improve the surveillance of the equipment or facility to detect life threatening damage mechanisms.
2. Continuously improve the skill in both technical undertakings and organisation/decision making of the maintenance staff. This will reduce the risk of failure introduced by maintenance activity and ensure that resources may be minimised but remain effective.
3. Continuously improve the clarity of communication between client and maintenance staff to ensure that decision making for both task groups is optimised.

This paper covers a number of the key issues that can lead to conflict during the conduct of a contract, and also identifies some means by which contractors and clients have learned to communicate and work with each other. Key issues of scoping the works, mitigating against unwanted business outcomes for both parties, considering capability of the service provider and opportunities for value add are increasingly important in the day to day association within an effective contract.

The spirit with which a good contract may be approached is less of specification of works required, and more request for contributions from the service provider. However to reach such a stage requires the development of mutual trust and maturity on the part of both participants in the contract.

## 2. Reviewing the Asset Base

For commercial office buildings the contractor needs information for long term planning including identification of the most critical items and trend of conditions. He/she then needs checking strategies for taking on the risk of maintaining designs made by other people, who typically have no focus on the full service life. In design checking questions centre on alternative prices, efficiency and controls which differ from the questions relevant to maintenance. Evaluation of design weaknesses allows the contractor to plan ahead for failures rather than just reacting to them.

Key aspects of a building review process are listed below:

- Review capability of Building Management System (BMS) – functionality, data handling, reporting, interface to other systems, efficiency monitoring possibilities.
- Thermomechanical efficiency audit of plant services – plant room, cooling towers, chiller plant room, boiler plant room.

- Review of building operating requirements and matching with availability of services.
- Air conditioning including management of sunny rooms, humidity control and heating requirements (noting ACT weather is cold during winter – what are the efficiency aspects of the seasonal adjustments?), and changing room usage, say to computer rooms.
- Electricity metering – match consumption against budgeted baseline established from past consumption. Reports to include $/month, exceptions to the monthly bill, kW and MJ. Exceptions may take the form of chillers operating incorrectly, incorrect tuning of HVAC, etc.
- Gas metering – same as electricity metering.
- Review of sensor position for BMS – eg air sensors located on ceilings – list for adjustment for people comfort, energy efficiency and so on.
- Water consumption in cooling towers – flooding issues, overflow, matching valves to pumps, adjusting levels, adjust timing of valves.
- Effectiveness of external contracts, eg fire systems, lift systems – performance audits of third party contractors.

These issues are encountered on a daily basis by technical staff from the service providers, particularly with a focus on energy conservation for their client, possibly due to an energy performance guarantee in their contract.

In developing a strategy for the identification of equipment within facilities, some thought has to be given to the inherent similarities across multiple sites with a common purpose. Within the generic structure a hierarchy is evident:

- Functional areas are nominated which have a specific process.
- Within the functional areas distinction is made between those assets that perform the function and those that monitor it.
- Monitoring is typically rolled up into PLC's, SCADA and control circuits. There is an issue as to where sensors, interlocks and other local equipment should be allocated.
- Working assets (those that provide the function) are broken further into mechanical or electrical components with electrical control under the component, and mechanical components otherwise at the same level.

Usually associated with the generic structure is a general purpose area that includes services and other systems providing functional support to the process areas.

Policy on asset management covers three stages: asset creation, asset update and asset retirement. The elements of the policy are briefly examined under each of these headings:

<u>Asset creation</u>

Where is it in the plant?
Logic of the site in the existing number system.
Code for type of equipment.

Unique number to be allocated in the CMMS.
Where are the drawings kept?

Asset update

How can the contractors assist this process? Do they have full responsibility for the process?
The client team owns the assets – is the terminology, numbering, plant association and so on, relevant for their needs?
How are outdated drawings and documents managed?
How are single items updated?

Asset retirement

Decommissioning procedure – CMMS document to be completed
Asset not deleted from database – it is moved to a decommissioning location whereby past history can still be accessed.

## 3. Linking Risk Mitigation Strategies with Maintenance Targets

Risk management is central to effective maintenance improvement, ensuring that the analysis is conducted according to business priorities and that the process is not sunk by the need to handle large volumes of data. A five level risk ranking was established at one client site by the contractor:

1. No problems
2. Cosmetic problems, e.g. needs painting.
3. Requires work but is not process critical, e.g. hoses cracked.
4. Requires maintenance as soon as convenient, e.g. major oil leak.
5. Imminent breakdown, e.g. no oil left in the bearing.

The risk system needs to be utilised by a wide cross section of people. The activities for maintenance and production are tabulated:

| Risk Level | ***Service Provider*** | ***Client*** |
|---|---|---|
| 1 | Do not schedule work | OK for use |
| 2 | Do not schedule work | OK for use |
| 3 | Schedule work into a normal program by bundling together work in that area<br>CYCLIC MAINTENANCE | OK for use |
| 4 | Schedule work as soon as possible<br>OPPORTUNISTIC MAINTENANCE | Provide access<br>Not preferred to operate |
| 5 | Dispatch people now.<br>BREAKDOWN MAINTENANCE | Ensure access to allow BD task<br>Operate only in emergency |

It is necessary that these rankings are agreed upon between the two parties such that the risk level numbers carry the same meaning to both organisation's staff. The above classifications also need to be checked that they correlate well with original corporate definitions such as used with OH&S incident reports, environmental reports and so forth.

Risk is a score which may be employed in the following circumstances:

1. Setting priority for a work order
2. Acting as a qualitative measure from a visual inspection
3. Condition of the plant either as found at the start of a job, or as left when the trades person completes a job

For example, an operator or maintenance person may identify a piece of equipment as in condition 4, resulting from an inspection of the plant. Hence a work order is raised with a risk level of 4. That carries meaning to both the facility user and maintenance as per the table set out above. When the trades person acquits the work, they should sign off that the condition of the plant has been reset to a level 1 or 2.

The status of a plant needs to be reported so that facility operators are continually aware of any threats to use. Levels of reporting which have been suggested included:

| Risk Level | ***Client Management*** | ***Users*** |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | All level 3 jobs tabulated and the summary considered | |
| 4 | All level 4 jobs separately tabulated with some being scrutinised | All level 4 jobs identified |
| 5 | All level 5 jobs described | All level 5 jobs identified |

What this table means is that a log has to be kept with the operators, identifying when an item of plant is subject to a risk condition 4 or 5. When an item is repaired and returned to a level 1,2,3 state the fact must be reported to the operators so that they know that the asset is free for use with no restrictions. A trades person returning an asset from a level 4 or 5 condition should be obliged to complete a visual inspection and report to ensure against secondary damage or other undetected damage.

Client management will need to be aware of the following:

1. The balance of work which is at risk levels 3, 4 and 5. High levels of risk level 4 or 5 is a KPI that maintenance needs to improve its effectiveness. In addition, such high levels would correlate to high expenditure per job which is something we are trying to avoid.

2. Access to a summary of level 4 jobs on request. This is because they may need a please explain as to why the job crept over the level 3 mark and secondly, they may be aware of production circumstances which may raise a level 4 to a level 5.
3. Detailed review of level 5 since these are direct threats to their business performance. Each level 5 needs to be reviewed in detail with the service provider to ascertain how it can be prevented in the future. The number of level 5 tasks is as significant a KPI as the downtime rate.
4. The number of level 5 jobs called in by facility users. The client needs to ensure that their staff do not needlessly call in a level 5 job request which would incur the financial penalty of a call out.

## 4. Incorporating the Budget Process to Risk Management Targets

There is a need for a contractor to guarantee value for money not just minimum cost. The cheapest service may not be the best and hence quality has to be balance with expenditure. Sometime it may be worth the wait for better value goods. Every contractor needs lift their service in order to differentiate themselves from their competitors.

Reliability of service is important in the areas of skills and availability: that the maintenance provider can address the clients' problems in a competent and timely manner. A typical contractor wants to be professional. Therefore they need to keep track of what they did, how they did it, and did they help the client with their budget? A maintenance contractor is a service organisation, processing jobs, confident that they have the control to do the job, and that they can reasonably forecast the future. That means keeping history on the costs, how they invoiced it, reviewing the work, and if there was a fault, what caused it and how could it be prevented it in the future?

If a contractor does not commit to a cost reduction drive he/she will not keep the client. The author was asked once, "Should we increase value rather than reduce cost". The answer:" No, we always focus on reducing costs if we wish to keep clients." How do we define value except in monetary terms, e.g. a OH&S risk can be priced and placed in monetary terms?

As the contractor works with the plant his/her learning about its technical characteristics will allow improvements in the forward costing. This is based on better appreciating its design limitations. If this can be recognised up front then the learning curve can be steeper.

A contractor also needs to factor into a job the capability to manage information. If they are too lean in this area then they cannot improve the quality of their reporting or planning, which will have serious consequences for client relations and effectiveness in keeping the contract. This will be appreciated by an informed client, who will want improvements in informed management.

To establish a useful financial analysis maintenance expenditure records for the past three to four years usually need to be analysed. This avoids any perturbation due to a major equipment problem skewing the trend shown up by the analysis. It is also important to distinguish between expenditure during operation when reliability is the principal focus and during refurbishment when meeting project targets dominates.

The type of financial statistics which an analyst should be seeking include:

1. The percentage of expenditure on maintenance work that is due to individual jobs in excess of a specific cut-off limit in value in combined labour and materials. The cut-off limit varies with application, but may be as much as $10,000. This can range from 40 to 70% depending on the industry.
2. The percentage number of hours these jobs take up. In one study such jobs took up 60% of the booked hours but only represented 9% of the total number logged in the system.

The source of savings may be ranked in accordance with the Pareto distribution of the expenses, differentiated for whether or not they arise during production. The point to the above two questions is whether or not there is an opportunity to seek efficiencies in a small number of jobs (surprisingly small in the example quoted) which will provide the maximum effectiveness in a maintenance improvement program.

Another example of a financial analysis concluded in the following distribution:

| | | % Total Budget |
|---|---|---|
| Overhaul | Materials | 45 |
| Overhaul | Ordinary Hours | 26 |
| Overhaul | Premium Hours | 3 |
| Service | Materials | 13 |
| Service | Ordinary Hours | 10 |
| Service | Premium Hours | 3 |

Table 4.1 Hierarchy for expenditure

It is reasonable to assume that mechanisms were already in place for minimising overtime, and that the current average levels were in keeping with the then current level of manning. The means by which maintenance savings can be achieved within each of the top four categories will differ as indicated below:

| | | |
|---|---|---|
| Overhaul - Materials | Improved protection of assets.<br>Capital investment in new assets.<br>Replacement of PM tasks with predictive | Identification of key causes of materials degradation.<br>Fundamental study of damage mechanisms rather than trial and |

| | | |
|---|---|---|
| | techniques. | error approaches.<br>Capital submissions and tracking reliability of new capital investments. |
| Overhaul - Labour | Optimisation of work. | Improved analysis of downtime causes.<br>Condition monitoring during operation.<br>Extensive data base on plant condition.<br>Planning strategies based on forecast problems and trends in plant history. |
| Operation - Materials | Equipment condition assessment prior to commencement of production. | Extensive and rigorous NDT checks.<br>Recommendations for change-out during subsequent overhauls based on Pareto analysis of materials consumed during operation. |
| Operation - Labour | Avoidance of repetitive work. | Improved commissioning strategies for equipment.<br>Root cause analysis of failure.<br>Condition monitoring during operation. |

Table 4.2 Opportunities for improvement

Maintenance improvement consists of the following aspects:

1. Savings do not mean that a specific job is deferred but rather it is undertaken in such a way that it can be completed quicker (reducing labour hours), with less material where possible, at lower unit costs of material where possible and with an optimised scope of work which ensures that costs are minimised.
2. A job may be deferred if it can be shown that other work would be otherwise deferred and that this other work has a higher criticality. As part of this, the assessment of criticality and hence the selection between work must range outside a specific department and, for large jobs, outside a specific facility.
3. The attempt for about a 12% saving in expenditure on a specific large job will come about largely through improved planning practices associated with improved labour practices. If these cannot be achieved then the 12%

target will not be met, and in that instance at least, the job may well be considered to be optimised.

4. Maintenance improvement has to be demonstrable: say, X% of the past year's budget represents $Y, which is a targeted saving for next year Hence through improved maintenance practices, field engineering will have to demonstrate an increased completion of jobs, which would match the injection of this sum, employing pre-improvement planning and work practices.

## 5. Developing the Procedural and Skill Base

A major area for improvement is how the client communicates a problem during a call out situation. Issues include describing the correct plant that needs to be attended. The operator taking the call out needs to take down specific information, which will be replicated on the work order. This can include an event number by which the job will be tracked.

Part of the communication process for the contractor involves discussion with the client where their operation may be too harsh for the plant. Examples can include the frequency with which filters need to be replaced. Maintenance contractors care for the equipment on the client's behalf - they usually do not have any other input apart from determining whether or not they are getting the performance they want from the equipment.

Staff related damage to the assets can initiate training by the contractors to limit this problem. As a consequence, there is benefit in having a consistent means for tracking downtime and providing a consistent report back to the client. For this to happen the contractor needs to make it simple for staff to record and access the information.

In one case after hour calls were not accurately describing the nature of the job, leading to a blow out in premium time work. Check sheets were introduced to the client to ensure that correct information is relayed to the call out. Event numbers are assigned to each call that assisted in trending the outcomes of each call.

One of the contractor's major problems is that the staff have insufficient information as to how the equipment is supposed to operate. This understanding could provide early warning of problems, particularly those associated with the sequencing of equipment. To determine what equipment is critical, the following information is required:

- Is the failure predictable?
- What is the necessary response time?
- Does the client see value in the work?
- Do a set of standards exist?
- What is the cost of maintenance versus work deferred?
- Is the service life of components known?

It is often a cultural issue to improve people to appreciate the need for this information, rather than a systems improvement or technical issue to achieve improvement. As one contractor wrote to the author:

*Our strengths in the business are our people, the number of people and our knowledge. Our weaknesses are no procedures which can then be customised to suit a particular client. We need quality requirements which are documented.*

Trades people need to see some reports on condition, which may be achieved through tool box meetings where shortfalls in service are identified. Often no hard information is provided to them, but the supervisors/managers talk to them. This is may be due to there being no history from which to report since the job for that particular contractor is so new. Alternatively the reporting focus is skewed to performance indicators to achieve the financial targets.

There is a need for training with people in the work force for 30 years plus newcomers all needing new insight and techniques. It is common experience that when reporting to trade staff, it is better to talk than to provide paper. While the typical sort of people the contracting companies like to employ are good problem solver, there is a need for information literate trades staff able to exercise strategy in actions at the equipment base.

Indicators that skills are lacking include feedback from the clients through project managers on possible lack of knowledge or work skills. Consideration is then given to either training or the employment of subcontractors. The deeper structural problems for contractors are that their otherwise talented trades staff are not appreciating the meaning of work type trends, reliability charts or trends in inspection reports.

## 6. Managing the Ongoing Relationship between Client and Contractor

It is important for the contractor to team with the clients. The relationship builds on mutual trust. There needs to be a general ability to get on with each other. Hence the association needs an open book approach that sets out:

- What is the contractor going to do
- When will he/she do it

To achieve this requires a customer focus where the contractor manages customer problems with their assets. These clients have biases and maintenance contractors well appreciate that they are there to keep clients happy. With respect to this, clients are increasingly under close scrutiny with regard to their budgets.

It is the client's perception of operational liability that is important. This will determine the whether or not they will accept recommendations for repairs. If

the risk is life threatening, then normally they will accept recommendations. Risk assessment assumes a very close relationship with the client in order to be accurate and meaningful.

Characteristics of a successful interface include:

1. Integrity - trust, relationship, ability to get on.
2. How do we communicate - open book.
3. What are we doing for the customer to understand (our value)?

Maintenance improvement is only possible through the collaboration between the maintenance providers and the clients who rely on the availability of the facility for their business to operate. Moving to a single monthly review of accounts can be a sure way to create friction between contractor and client. Sources of friction would be:

- Inaccurate recollection of work requests from three weeks ago.
- Presentation of a single large bill without warning as to the accumulation of tasks.
- Expectation of a confrontational meeting with the incentive of one side to simply reduce expenditure and on the other, to secure fee for service.
- A lack of fitting the evaluation and the joint discussion of costs breakdown into the business of operating a facility: maintenance is seen as an overhead rather than the necessary part of the business that it should be.

In addition to these considerations, there is an opportunity presented by the daily meetings between the client and contractor to include a means for repetitive, constant format reporting on the accumulation of maintenance costs. For example, the Friday meeting may be associated with the hand over of a one page summary of man hour accumulations of maintenance time broken out across the main equipment areas. There are a number of benefits to this proceeding:

1. Facility managers are required to assimilate the details of the maintenance effort on a regular basis. In a sense the contractor reports to them as critical staff providing an essential production service, similar to the key internal staff, who report that everything is running smoothly.
2. The facility managers are assisted to understand the effort associated with the maintenance through simplified reporting which provides an immediate overview of their costs on a weekly basis.
3. When the monthly bill is presented there are no surprises and any issues that occurred during any of the weeks should have been resolved when the weekly report for that period was issued.
4. Facility managers can more confidently sign off maintenance expenditure, as they are more aware of how it accumulated.
5. Weekly data is now available which allows a more immediate reaction to problems such as over servicing a particular area in the

plant. The factory managers plus their support staff need to have maintenance problems associated with equipment type or mode of operation presented to them as swiftly as possible.

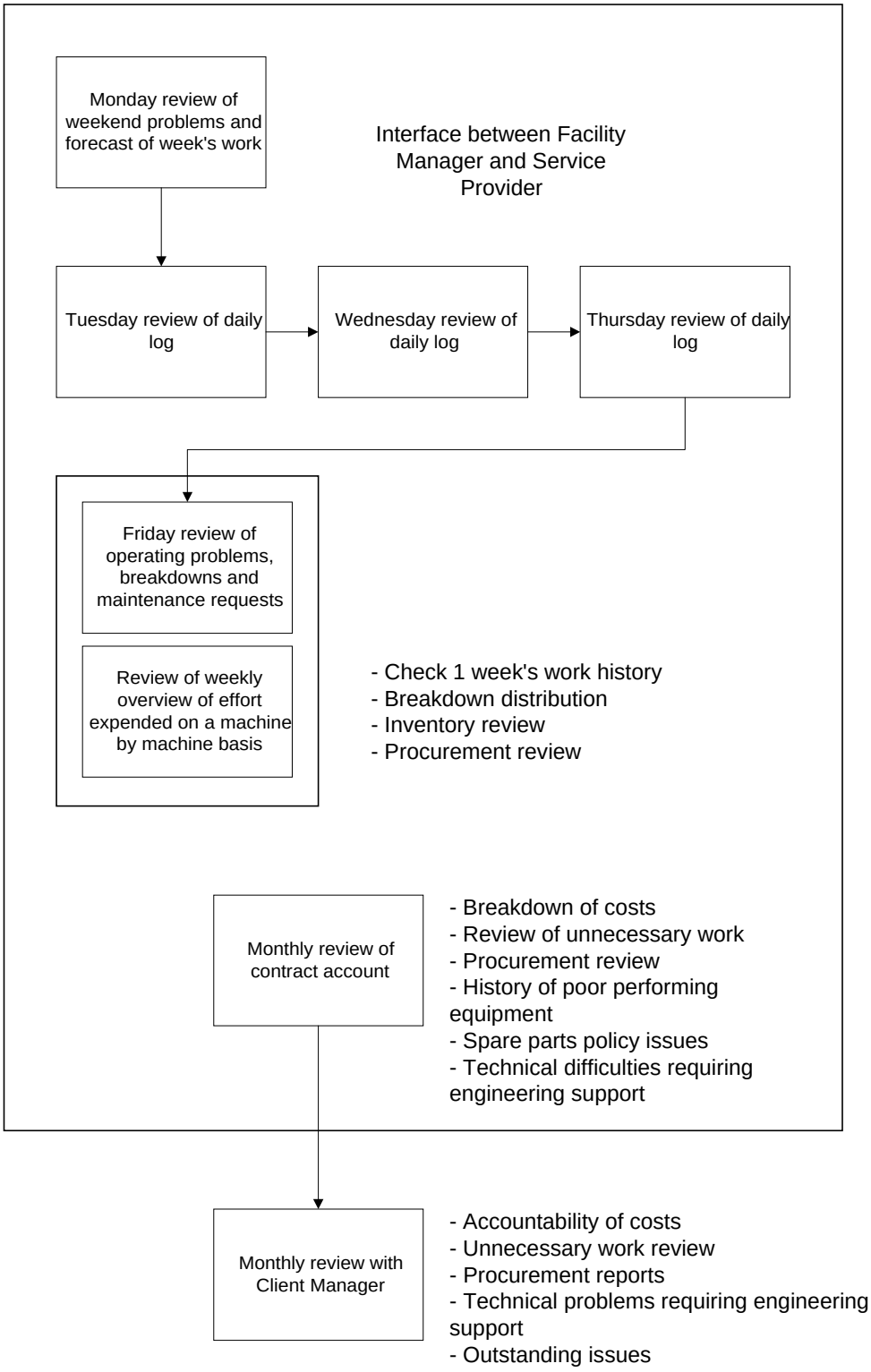


Figure 6.1 Review of interface between client and contractor

Hence the review process may follow the procedure outlined in Figure 6.1. The current meetings are extended to cover the issues nominated. It is important to realise that this is not a new system: it is an extension of the method for liaison that is already in place. It also recognises the following:

1. Maintenance management, irrespective of who carries it out, requires engineering support to counter design-based issues and client complaints to answer operating-based problems.
2. There needs to be specific accountability of the people, irrespective of their organisation, who are responsible for spending maintenance money. The costs in this system are divided between request for labour and procurement.

3. The presentation of reports are a build-up of simpler reports so that no one receives any surprises. Further the reporting is sufficiently frequent to ensure an immediate response to any problems. The reporting is undertaken to ensure efficient assimilation of the knowledge. To achieve this the reporting is simple and normally as concise as possible.
4. There is an expectation that managers responsible for operating decisions will be sufficiently well informed regarding the forward capability of their equipment that their specified targets will not be jeopardised through loss of performance or lack of reliability.

## 7. Opportunities for Value Adding in the Contract

A package for a proposal for value adding is set out by way of a timetable of work. The project would likely target one significant building or part of a building. A preferred choice would be one with a multiplicity of systems.

1. Check asset list of target building
2. Group assets into generic systems, eg air conditioning, lifts, hydraulics, structure and fabric, glazing, misc. light and power, electricity distribution and so on.
3. Review work history and reliability in each of these area. This to include:
   - Past maintenance records
   - Past problem areas
   - Inspection strategies
   - Drawings
   - Energy measures
   - Fault reporting systems
   - Design performance specification for major assets
   - Definition of non-performance for major assets
4. Report on asset base and its management
5. Review and assess the application of an improvement methodology for the planning of asset management.
6. Cross check past project's methodology with application of method to target building.

7. Develop and refine inspection check sheets for manual audit process, necessary to supplement continuous monitoring.
8. Review opportunities for continuous monitoring with existing instrumentation. How is the data to be managed and analysed, plus used to provide early warning of applied stressors to the relevant module?
9. Collect preliminary data and test aspects of data management and reporting.
10. Map the information system that pertains to the building asset management, allocate potential responsibilities for collection, analysis and review.
11. Report on feasibility of improvement including discussion of people-based threats to technical effectiveness.

The improvement methodology for value adding is streamlined into four principles:

- Measure process – either automatic or through manual audit
- Identify process inefficiency or non-compliance with design performance targets
- Diagnose root cause for inefficiency or non-compliance
- Correct root cause

The commencement phase for a value add project includes the following:

- Inspection tour of the target building
- Access to building records as designated above
- Introduction to maintenance staff as well as operational (i.e. inhabitants) staff
- Time once per week for a brief meeting to check progress
- Provision of access to buildings as required by the contractor

## Conclusion

Much of what has been described in this paper is related to simple quality principles. Quality is seen as an overhead but it needs to be introduced in a way that improves the business. This can include:

- Collation of information and reporting - collecting the RIGHT data
- Analysis of control information
- Correspondence to the client, setting out advantages and disadvantages of recommendations
- More understanding and expectations of recommendations

It is important that the work is consistent and using quality control, a contractor should be assured that the level of control is satisfactory and cost justified. Work plans and strategies sometimes need to be reviewed at a corporate level to find deficiencies in the system.

Improvement required in contractor work includes:

- Attention to detail
- All actions covered
- Generation of reporting to customer
- Reporting financials
- Protection control: do the estimated costs meet actuals

It is clear that a contracting company has to distinguish themselves in the market place by assisting clients to raise themselves to new levels of achievement, specifically maintenance excellence. No company in the market place has field staff across the board consistently applying all of the principles contained in this paper. This is due to key personnel not buying into the otherwise good practice techniques, not being aware of what represents good practice or working under a system that does not lend itself to the easy application of the principles.

Inherited weaknesses that are either being addressed or still need to be overcome include:

- Inadequate equipment
- Inadequate trades skills
- Lack of familiarity with equipment
- Incorrect allocation of costs
- Inefficient and often inherited work practices
- Poor communication with the client
- Cumbersome financial system (including billing)
- Employees taking work place risks
- Inaccurate recording of technical details in the field
- Poor leveraging of technical support across the company

However, a maintenance contractor has the right to have expectations of their client if maintenance management is to be optimised. Problems facing the contractor will include:

- Ambiguous contract document
- Demanding additional (and unpaid) services
- Management of the contract in accordance to the superintendent's preference and not as written
- Insufficient time for familiarising the new contractor
- Poor plant records
- Incorrect or limited specification of the plant to be maintained
- Poor lines of communication
- Cultural antagonism to contractors

The benefits of outsourcing maintenance in terms of cost reductions, improved deployment of staff, and the introduction of new technical skills is undeniable. However the drive to distinguish themselves in the market place

plus the needs of the maintenance discipline are taking both contractors and clients into new places of cooperation and technical application that would not have been considered even a few short years ago.

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