

Can you become World Best Practice in Asset Management?

World Best Practice (WBP) is often mentioned in relation to asset management. What does WBP mean and how could you achieve it?

What is World Best Practice?

I generally describe the main aims of any business and any level within the business as 'optimising output/capability at minimum cost and risk'. If you achieve that, in the most effective and efficient way, you may be at WBP level.

To investigate WBP further, you need to look at the various activities in the needs, requirements, acquisition, in-service and disposal stages in the life of material. To become WBP, you must be the best in the world in all five areas.

Many years ago, I published the following asset management model that represents these various activities in slightly modified format:

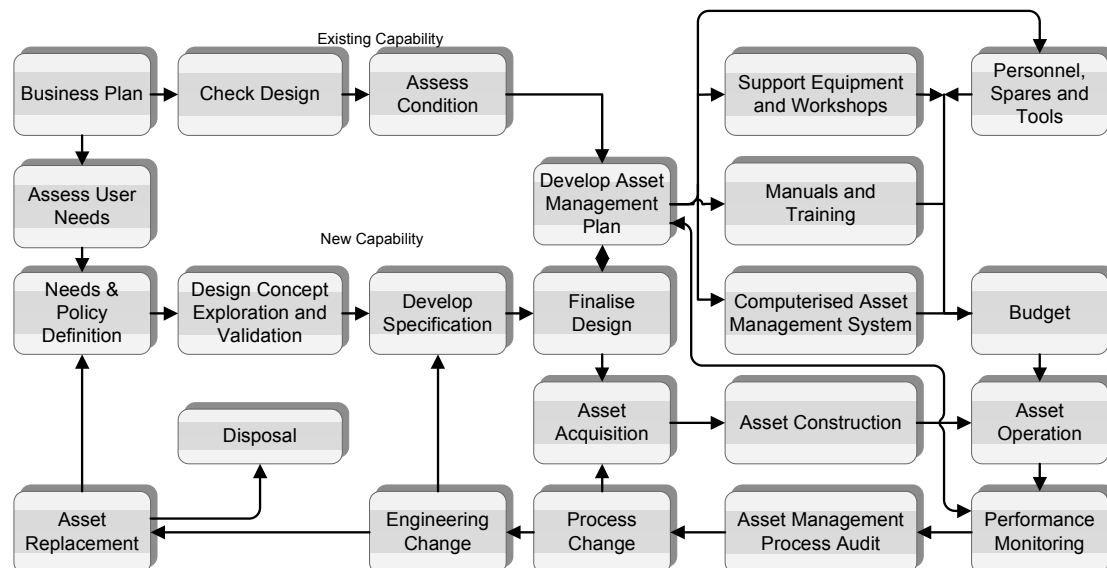


Figure 1. Asset Life Cycle Activities.

(I described the 'what', 'why', 'how', 'when' and 'where' of all the tasks in this model in my Business Driven Asset Management book (see <http://www.sympac.com.au/eercons/amfmmm.htm>). This figure shows that each of these five areas consists of several sub-areas or activities and, to be WBP, you must become the world's best in all of those. This means that every task you specify must be correct and you must perform it in the most effective and efficient way. The outcome of each task must be the best possible in quantity and quality, in the shortest possible time, at the lowest LCC (Life Cycle Costs) and introduce the minimal amount of risk to health, safety, environment and other areas. This needs to continue throughout the life of asset that can be anything up to 50 years.

Prerequisites to becoming WBP

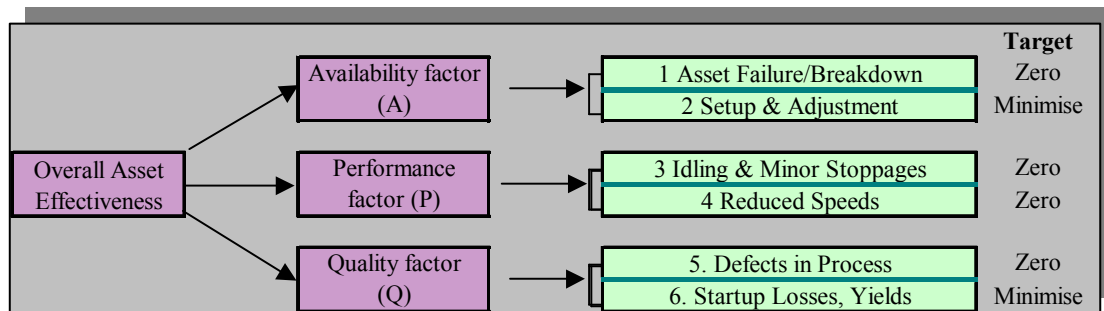
To be able to claim WBP status, you need to measure performance indicators and be able to compare yourselves against at least one other.

If asset performance was best expressed in operational availability (Ao) and you were the only organisation measuring it, you would already be WBP.

What can you Measure?

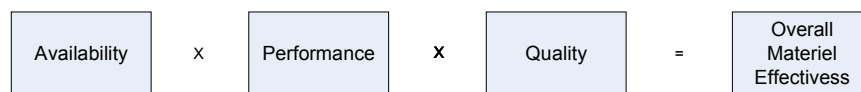
You measure the Ao (Operational Availability). Of course it is good if asset is available, but it would be better if that meant that it could perform its intended function at the required performance levels.

There is an overall asset effectiveness factor (Overall Equipment Effectiveness factor from TPM), made up of six contributing factors. You can express each factor as a percentage and they combine two by two as shown below.



and

$$\text{Overall Materiel Effectiveness} = A \times P \times Q$$



Example; $OME = 81.25\% \times 87.5\% \times 94.17\% = 66.9\%$

Figure 2. Overall Asset Effectiveness Factor

Compare to Others

To compare your performance you need to have other organisations for comparison. It is no good to compare against a vehicle manufacturer or oil refinery when your activities are different. This is another reason why you cannot, by definition, become WBP, as your organisation cannot compare against any other industry. You cannot even compare against just any other similar organisation, as there will still be differences between the equipment, geographic circumstances and resources. You need to compare the same benchmarks and will find that few organisations measure them.

The Cost of achieving WBP and Improvement

If you wanted to measure your current standing in one particular asset management function, you can look at the much used operational availability. For a particular fleet you may find that, due to various reasons, the Ao may be 27%. You need to investigate all the reasons why this figure is low. You then need to spend a large amount of money to remove some main causes and may be able to increase Ao to 50%. To go from 50 to 70% will cost more money again, to go from 70 to 80% may cost an excessive amount and you are still not WBP. Generally, cost increases at least exponentially for every performance improvement increment.

WBP may actually be between 90 to 95%. To better these figures could unsettle your survival. If you were to become WBP in one area, there are still other areas to go.... You must ask, whether the benefits of becoming WBP outweigh the cost (most likely not) or even what the benefits are.

You should aim for Most Appropriate Practice.

If you cannot achieve WBP in all areas of your asset management, you can still improve your current practices, analyse these and see what you should adopt as MAP (Most Appropriate Practice) to optimise your capability at the lowest life cycle cost and risk levels. You must approach every activity from first principles and determine what you must achieve, then find a way of achieving it. There are many techniques available.

From Maintenance to Asset Management

There is a lot of emphasis on maintenance, totally concentrating on those that maintain. It is important to widen this view and include the operator.

A recent visit to mobile water treatment plants showed that the lack of proper operator knowledge is the main reason for repairs and overhauls. Reasons are unfamiliarity with the plant, connection to dirty fire hydrant water when running the plant as part of maintenance, connecting plant to unintended sources (salt water) without the correct pump (attempting to cover 50m height difference when plant can only handle 2.5m) and not cleaning plant after use. We found that one plant required 413 hours of repairs at a cost of \$72,418 after only 3 hours of use from new.

There is often a clear mismatch between the level of asset sophistication and personnel capability.

The operations manual for new mobile reverse osmosis water treatment plants contained 337 pages with many tables explaining steps for operating the asset. Several of these steps require the operator to make a decision. According to a main table, an operator, who may also operate a chain saw, bobcat or excavator, 'only' has to remember 134 master tasks, 969 process steps, 157 alarm set points and 130 process set points. The manual further contained four intrinsic process diagrams, forty-four pages of process diagrams, twenty-two intrinsic electrical diagrams, followed by 32 switchboard pictures that will also provide a puzzle to the mechanics who has to maintain or repair this asset. In addition, there is a 25 page calibration manual, a 123 page light grade repair manual, a 73 page technical description, a 14 page data summary and 41 page servicing instructions. All this only covers the treatment module that sits on the back of a truck.

I am afraid that the high level of sophistication of the new asset may result in an even faster demise in the hands of operators and maintainers than the old asset. I also believe that any mistake or error in the operation of this asset may result in greater and more costly damage. However, most organisations do not deal with the matching of asset sophistication to personnel skills.

Being Effective and Efficient

When working towards a goal, you need to ensure that you are effective and efficient. The sequence is important. You need to become effective first, which implies that you are doing the right things. There is little benefit from being very efficient in doing the

wrong things. Then you need to ensure that you become efficient, which means that you do the right things right.

When discussing maintenance, you should first define what it is that you should maintain; should you maintain a truck or should you maintain the functions of the truck at the various performance levels, such as speed, load, fuel consumption, stability angles etc.?

WBP indicates that you should only perform maintenance to avoid unacceptable consequences of failures against a combination of a function and a performance level. This means doing maintenance when the asset needs it. The reason that the asset needs it is 'why' you do it. This is not the same as doing maintenance every three months, based on conservative estimates, regardless of whether the asset has been used or not, and disregarding where it was used and what it was used for. This is maintaining 'because you can', which is what most organisations do.

A mine used bucket wheel dredgers, designed and delivered by German companies and invited inspectors from those companies to perform an independent inspection of the status of the machines. In one dredger, they found rust in a major structural connection point. The Germans provided a recipe of de-rusting, first undercoat, second undercoat and two more top coats. After each step they wanted to inspect the quality of the work and measure coat thickness, to ensure that the problem was adequately addressed and that the machine would survive for many more years. The 'locals' weren't happy with the fact that this would leave their machine with an area showing a different 'battleship grey' than the rest of the machine. They ignored the recipe and spray painted the whole of the machine in the next shutdown. They did not bother to remove layers of coal dust; they spray painted over toolboxes and even maintenance workers' shoes. The outcome was that the machine looked good but needed emergency work to keep the structure up a few years later at excessive costs. The Germans wanted to maintain the structure's function at the required performance levels, the 'locals' thought that they were doing 'maintenance' of the machine.

Time-based maintenance is very often not the most efficient, but many organisations do the majority of their maintenance based on time, rather than condition, which would indicate actual need. Not only is this less efficient, it can also be less effective when maintenance results in problems that were not there before the maintenance. Everybody believes that 'maintenance is goodness', but maintenance can be truly bad if not performed well, at the wrong times, too often, or when using replacement items that show wear-in failures.

Figure 3 shows an asset population and failure distribution over time. To minimise the risk of failure all population members need to receive maintenance (or replacement) at a conservative time. For many members this will mean wasting large parts of remaining life. So, time-based maintenance, by definition, can be fairly wasteful.

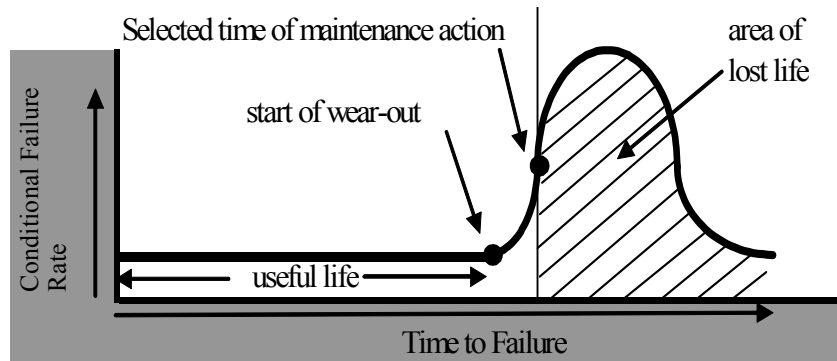


Figure 3. Fleet Failure Performance

On the other hand, if you were to monitor the condition of the assets, you could elect to replace them when they reach a certain minimum acceptable condition, to get the longest possible life out of each asset. The point where deterioration starts and the linked point of performing maintenance to address this deterioration will be different for each asset, depending on their stress exposure.

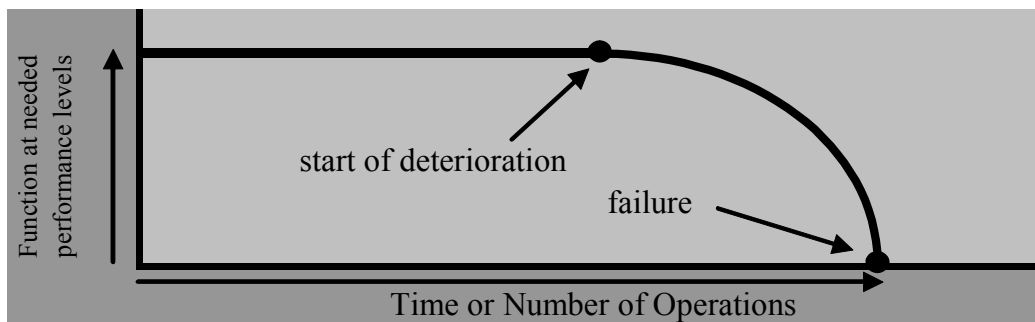


Figure 4. Monitoring Deterioration for each Individual Fleet member

Questioning 'what you've always done'

When I arrive in a new organisation, I normally have many ideas and suggestions but regularly meet with arguments about why 'this cannot be done here'. Many of these arguments were based on 'what we have always done'. There is nothing wrong with 'what you have always done', if what you did was most effective and efficient. As many things you do have a historic heritage, it may be based on outdated techniques. Many things you have always done are based on manufacturer's recommendations that often prescribe using their spares, consumables and services. It is fair to generalise that many such recommendations have a conservative basis again. Some organisations have achieved amazing improvements once they started questioning what they always did. Without a willingness to question and deviate from 'what you have always done', your asset management approach is doomed to fail.

To be able to question 'what you have always done' may not be easy in certain industries, when licences or authorities may prescribe it. The need to challenging the authority may be a major deterrent.

Knowing what to do

There are many techniques that assist you in improving your effectiveness and efficiency in the acquisition and sustainment phases of your assets' life cycles. Figure 5 shows how available techniques (in square boxes) cover the life cycle activities.

With RCM (Reliability Centered Maintenance) or the author's RDM (Reliability Driven Asset Management) version, you assist in the development of the maintenance plan, consisting of risk and root cause-based tasks, frequencies, duration, needed resources and responsible group (www.sympac.com.au/eercons/rdm.htm)

With TPM or the author's AOO (Asset Output Optimisation) version, you can analyse your processes and assets for effectiveness losses and waste and eliminate these. It also deals with the introduction of operator maintenance (www.sympac.com.au/eercons/tpm.htm).

You can also analyse maintenance procedures with the Breiby Maintainability Index. A HazOps analysis aims at identifying all possible operational problems and hazards through the disciplined use of guidewords

(www.sympac.com.au/eercons/opsmaint.htm). Value Engineering is a method of identifying other means of delivering a function at a required performance level at lower cost and risk (www.sympac.com.au/eercons/value.htm). This can mean that the new way of delivering is different from the existing way. Think of a zipper or Velcro instead of buttons. RCA (Root Cause Analysis) is an essential activity when solving problems (www.sympac.com.au/eercons/rca.htm).

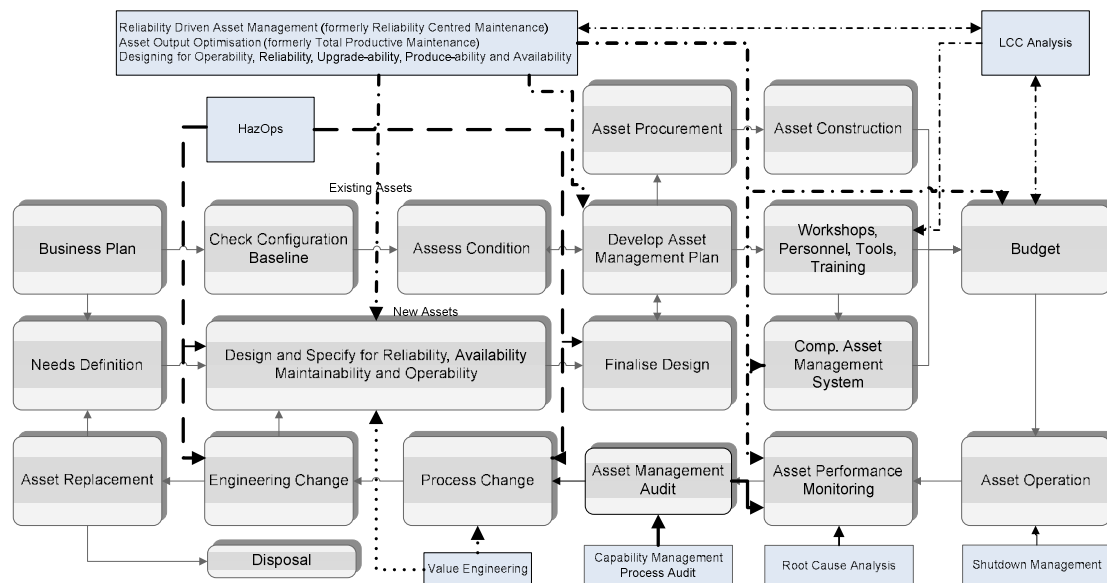


Figure 5. Available Maintenance Engineering techniques for the Asset Life Cycle Activities

Now You know what to do, do You do what You know?

Using one of my techniques, a RAAF student of mine claimed in his final project report that he could save \$500 million in F18 engine maintenance and overhauls. With on average 45 students per year, since 1991, the potential savings from all their assignments in my subjects (about 9 each) may total several billion dollars. However, the actual savings would be nil, if their suggested improvement were not implemented.

Despite the claim of potentially remarkable results, I always contemplate why these students only did this analysis because I set it as an assignment and equally wonder whether they will apply the same analysis again to achieve further savings.

As all activities towards achieving MAP require effort and time, you must make the people and other resources available. If nobody can be made available to step back from 'fire-fighting' or from their all-consuming workload, little will be achieved. One reason given for the failure of many projects in industry is the lack of resources.

Another contractor tried to sign a manager up for an RCM analysis, after proving that this had resulted in a saving of \$1 million in a competitor of similar size. All went well until the manager said that he could not spare anybody to save \$1 million.

The Sequence of Activities

When engineers or other non-decision makers suggest improvement projects, managers often respond by saying that there are no resources available, whether personnel or finances. Quite often management reduces resources first, followed by the request to improve output. In fact, it is more likely that you need to allocate extra resources in personnel training or asset modification. After this, you will be able to make savings that, because they will be ongoing, are likely to exceed the initial resource increase. The sequence of spending to improve first and reaping the benefits, has a much better chance of success than restricting resources first and then expecting miracles.