

Lifetime Reliability Solutions

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A Letter to Tom on Best-Practice Mobile Plant Maintenance

Hi Mike,

I am putting together a feature on mobile plant maintenance and have read your website with some interest and thought you might be willing to contribute some thoughts. I am not sure whether your expertise is on fixed plant or can be carried over to mobile plant as well - let me know if so.

The sort of questions I am after response for are designed to get contractors thinking about better ways to manage their mobile plant maintenance requirements. Whether it is shrewd to outsource entirely, managed internally and if so, can it be managed productively and efficiently.

The questions are broad and designed to allow wide ranging response.

1. How can contractors achieve maintenance success with mobile plant?
2. How can they work out which program or method is best - outsourcing, internal, mix etc.
3. Are rigid, planned maintenance programs less impacting on production, productivity etc than less formal.
4. With contractors without planned maintenance programs in place, where can they start?
5. Are there simple or initial steps contractors can take to begin to manage maintenance better?
6. Is maintenance always red ink on a P&L?
7. Does your philosophy of equipment "wellness" also work on mobile plant?
8. What are the features of a 'good' equipment maintenance program?

Regards,

Tom

Hi Tom,

There is always opportunity to do things differently. The challenge for mobile plant contractors is to determine what changes are good for the business, and to put them into place effectively.

1. How can contractors achieve maintenance success with mobile plant?

What does maintenance success mean? Is it top quality maintenance for a low cost, or is it maintenance done so well that it extends the time between maintenance, or is it top quality maintenance done fast to get you back into operation quickly? All three are measures of maintenance success.

The very first thing contractors can do to improve their maintenance is to start measuring each of those three success indicators for each of their mobile plant and equipment items.

Start by creating a trend graph for each item of mobile plant that shows the total maintenance cost for each maintenance outage. Mark each outage on the graph. For each outage make it clear whether it was a service or a failure repair. Use colours to show the reason for the maintenance.

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Create a second trend graph for each plant item that shows the operating hours between each type of maintenance. Track both operating hours between service and operating hours between failures. It needs to be operating hours that you track. Using calendar dates between services is unsuitable for mobile plant.

Thirdly, create a trend graph that measures the time from the instance the plant stopped for its maintenance, to the instance it was operating properly and available for service. The counted time starts the second the plant is turned-off, no matter where it is; through to the time it is parked-up ready for use. Indicate on the graph how much income was lost during the time it was having maintenance.

These graphs will tell you the truth of what is happening with maintenance in your operation. They are also the beginning of your maintenance improvement program.

2. How can contractor work out which maintenance program or method - outsourcing, internal, mix etc - is best

Before you can make maintenance program choices with confidence, you need the historic facts on the effects of past maintenance program choices. Whether to do your maintenance in-house or outsource it, or mix it up, depends on which choice makes the most profit over the plant's working life. There are two useful methods to decide whether to do maintenance in-house, outsourced or a mix.

First, collect your past operating and maintenance costs together for each item of plant. Separate them into service and failure maintenance costs, because the costs for each are totally different. For both service maintenance, and failure maintenance, calculate the cost of each maintenance program type per hour of operation. For example, if you have plant maintained in-house, and plant maintained by others, calculate the cost per hour of operation for servicing and for repairs by each provider. The results of the analysis will give you new insight.

It is best if you can bring the costs of your maintenance program down to cost per unit of production from each item of plant. An example would be, the maintenance cost per tonne of dirt excavated, or for a trucking fleet, the cost per tonne or volume per kilometre carried. This is a more accurate reflection of payback to the business from using the plant. But if all you have is the hours of operation, use that. It is important to use a consistent measure for comparison.

The second method is to run an experiment for a good length of time. In this case you intentionally change your maintenance program mix on a few select items in your fleet and watch how the costs per unit of production, or hours of operation, change. With true historic data on which to base a decision, you will not need to guess.

3. Are rigid, planned maintenance programs less impacting on production, productivity etc. than less formal?

This is always a challenging question for plant owners because it is not often practical to take equipment out-of-service at a set date. We now know that most machine parts do not need planned maintenance. The only parts and materials that need planned maintenance are those that wear-out or degrade with use. If you are replacing parts on planned maintenance based on hours of operation, or at regular calendar dates, you are most likely wasting a lot of money. Many of the parts you replaced could have had years of life left in them.

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You only need to replace parts when their condition indicates they need replacing. Base your maintenance on a part's condition. Instead of automatically replacing parts on a schedule, institute the inspection and testing of their condition. Let their condition tell you when to replace them. Prove you need to do the maintenance.

Other factors affect whether you do planned maintenance. Warranty requirements may demand it. Another is the business risk in a situation may reduce by replacing old parts on planned maintenance. For example, before sending equipment to remote locations it could be justifiable to do substantial parts' replacement in order to have equipment in prime condition.

There are two other important issues to understand about the life of parts. If you reduce the stress and fatigue that parts experience, you will increase the time between maintenance. Often you can extend time between planned maintenance 5 to 10 times longer.

The other factor you always have to consider is that maintenance causes failures. People doing maintenance make mistakes. They can replace the wrong part, they may not replace a worn part, they may replace a part with a lower quality part, or they may assemble things incorrectly. There are many reasons why maintenance jobs go wrong to cause premature failure.

The message to take-away from this question is do not do maintenance if it is not necessary. And when you do the maintenance, it must be with strict work quality controls in place. Prove that the maintenance work is correct and proper.

4. With contractors without planned maintenance programs in place, where can they start?

Start a 'see and touch' inspection program and a lubricant condition and wear particle program.

Develop a checklist that thoroughly examines the external condition of the working parts on the equipment. Look for tell-tale evidence of problems. You can even use hand-help measuring devices like laser temperature guns and touch-on thermometers. Write the checklist so that for each check and inspection it is clear what condition is acceptable and what is not. When the inspection highlights problems take the time to investigate what was/is being done to the equipment.

The lubricant analysis and wear particle analysis will tell you what is happening inside the machine to its lubricated parts. Set the sampling period so that you pick-up problems well before they cause failure. The inspection period should be set to allow the next inspection to confirm the evidence found in the previous inspection and still leave you time to program the equipment for necessary maintenance before failure. Follow correct procedures when taking samples so the results of the analysis truly reflect the parts' condition.

5. Are there simple or initial steps contractors can take to begin to manage maintenance better?

If you want to have less maintenance, you need to lower the stresses put on the parts. Parts that have low stress last longer, usually much, much longer.

Start by instituting control over the quality of the maintenance work. This needs procedures that make the maintainers test and prove what they do is to the manufacturer's specification. Unless there is a written record showing the maintainer's work truly met the manufacture's spec, you

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have not got the quality control you need if you want top maintenance results. That is the simplest place to start if you want to lower maintenance costs quickly.

The next simple thing to do is to train plant operators in the least stressful ways to use the machinery they work with. Teach operators to handle their machines as lovingly and caringly as they would a baby. Show them how to run equipment in low-stress ways and get them to prove that they can do it right. Get them to think ahead to identify the risks to their equipment during operation and actively control the situations that cause them.

The last 'simple' thing to do is to have a database of all the facts about the condition, costs and history your machinery. Start a database for each item of equipment and record its operating costs, maintenance costs and historical evidence from the inspections, servicing and repairs. Record the replacement of every part so you can find the problem ones. With a full and thorough equipment history, you will spot problems and know what to do to fix them.

6. Is maintenance always red ink on a P&L?

I hope that you are stating to sense that Maintenance is not about working on your machines and fleet vehicles. Maintenance is all about good business decision making that turns a profit for the operation. Maintenance is not about putting tools and men to work to service and repair machinery. Maintenance is about making the most profit by making choices that minimise business costs. World-class Maintenance today has only a little to do with fixing and replacing things on machines. The top people in the mobile plant and equipment maintenance game make serious profits for their companies.

7. Does your philosophy of equipment "wellness" also work on mobile plant?

'Wellness' is a cumulative outcome. You do all the little things right, and the collective result is to have a well and healthy life. It is the same for machines as it is for people. Look after your equipment's parts, treat them well, keep them at low stress, keep their local environment clean and at the right temperature, keep them aligned straight, be highly accurate when operating and maintaining them, watch their condition and replace them when their time is up; doing all that will accumulate into endless mobile 'plant wellness'.

8. What are the features of a 'good' equipment maintenance program?

Good equipment maintenance programs deliver the six functions of maintenance –

1. Risk reduction
2. Equipment reliability
3. Failure avoidance
4. Defect elimination
5. Least operating cost
6. Maximum production

The features to look for are:

- An active and on-going operational risk management process that identifies every operating risk beforehand and significantly reduces the chance of it happening.
- The profitability of each machine is measured and poor performance is addressed
- Obvious plant operator ownership of equipment condition.
- A work quality system for operators, maintainers and managers that controls work accuracy and feeds learning back for continuous improvement.

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- Persons who are competent in using the skills, equipment and practices that keep equipment parts at low-stress and prevent degradation of the part's local environment do the maintenance.
- There are full records of every machine's parts history regularly used to analyse and identify the causes of reliability and profitability problems.
- There is an active and aggressive equipment improvement program that solves equipment operating and profitability problems fast.

My best regards to you,

Mike Sodalini

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