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Experienced but not competent?

It would be nice to say that the incidence of equipment overturns was falling. However, in spite of the efforts to convince operators to always use mats under outriggers, the number of incidents seems to be as prevalent as ever. Looking at last month's news stories on Vertikal.net, there were five overturning reports of which three - two cranes and one truck mounted platform - were directly related to outrigger set up or ground conditions.

The 'Crane to the rescue' story on September 9th was interesting in that it showed what can happen when an operator 'doesn't put his brain in gear', but also how a company can deal with the situation. See 'Crane to the rescue' www.vertikal.net/en/news/story/26384/

In a nutshell a trained operator with an 'exemplary safety record' set-up the 45 metre truck mounted platform on an estate in London, and placed his nearside outriggers on the pavement without mats. While working over the side, the rear jack punched through the footpath surface, causing the truck to tilt and the boom to drop onto the roof of a building. Fortunately, no-one was injured. An immediate investigation by the platform company, Blade Access, revealed a 'lack of suitable ground protection' (outrigger mats). The operator said that on the day he 'thought it would be ok without mats' in spite of this going against all his professional training and experience. This scenario is not uncommon,

however the statement from Blade is: "Whilst it is disappointing that such an incident has occurred it is crucial that any lessons or improvements which can be learned are not only communicated within our own business but the industry. As such we have decided that further Specific Point Loading Education on why additional ground protection is required would be beneficial to professional platform operators. Blade will now write this additional training module and include it within our 'Platform Operator Training Programme' in addition to the existing training all our platform operators receive, relating to ground protection and platform stabilisation. The new module will be communicated every six months to all employees. And although it was out of character for the operator not to deploy outrigger pads, as a precautionary measure, he has been removed from platform operation until further training has been completed."

If accidents such as these are to be eradicated the reasons why experienced trained operators seemingly ignore common sense, needs to be established. Is it laziness, complacency or immunity to the dangers when working every day with the same equipment?

This problem applies worldwide. At the end of last year WorkCover Queensland, Australia issued a safety alert highlighting the risks associated with inadequate outrigger support,



Improper outrigger set-up can be devastating



Chris Powell, 41, died when this platform overturned. His 17 year old son was badly injured but survived. Lack of appropriate mats on soft ground caused the overturn.

particularly on poor ground. This followed the fatal overturn of a 70 metre truck mounted lift in Brisbane which killed photographer Chris Powell, 41, and seriously injured his son Brendan, 17.

The main points in the alert included:

- The equipment manufacturer/supplier should always provide information on the loads imposed on the ground by outriggers and wheels. If this is not available a competent person should be used to determine the loads.
- Employers should provide operators with sufficient training instruction and supervision for them to make an informed decision as to what ground support is required.
- Where there are any doubts or obvious signs that the ground may be suspect (i.e. soft ground, underground services, etc.), the operator should seek direction from their employer which may use a competent person such as a geotechnical engineer, assess the ground and specify suitable

control measures, such as ground preparation with crushed rock or the use of bog mats under the outrigger feet.

- Where the ground is fill, the operator should not assume that just because there are no obvious signs that the ground is soft, it is able to safely support the machine.
- Continual monitoring of outriggers during operation is needed so that the unit can be stopped if the outriggers or mats show any signs of sinking

It is all obvious stuff but until experienced and novice operators start to take serious note of the ground conditions, and always spread the load with mats regardless - we will continue to see frequent overturning incidents, with their resulting fatalities.



Short rigging outriggers requires experience and caution

A lapse of judgement by an experienced operator caused this overturn



Hard or tropical?

If you are a regular user of heavy timber mats - bog mats or crane mats if you prefer - you will know that they are available not only in differing sizes, but also in a surprisingly wide range of wood types, with prices to match!

Many in the industry assume that as long as the mats are made from a decent hardwood - ideally from a sustainable source - there is little to choose between them. Paul Koolmees of mat supplier Welex and an expert in this field outlines the differences between them and why you might choose one over the other.

Most people in the business know about bog or crane mats. There are however lots of differences in the quality of a mat depending on the wood species and how it is constructed. These can mainly be divided into two groups, namely hardwood and tropical hardwood. The following uses readily available information to highlight the difference between the two types of hardwood used as mats.

Hardwood

The most commonly used wood species for 'hardwood mats' are oak and beech. These two species are the mostly widely used in

the UK and are good to use in the construction of crane mats in that they have an average strength and flexibility as shown in the table below. The wood is mainly sourced in Europe, although oak from American and Canadian sources are also widely used. As you might expect, each species has its advantages and disadvantages and apart from a difference in elasticity perform very similarly, as can be seen from the chart.

Pros and cons of hardwood mats

Positive points:

- They are relative cheap, being around half the price of tropical hardwood mats.
- They perform well for most crane support jobs.
- They are often used for longer term projects where the cost is amortised over the project, as they are cost efficient on a project basis.



Oak beams with natural cracks and early signs of fungus/mold



A large stacked pile of used Ekki tropical hardwood rental mats



Oak beams with natural cracks in a mat



Ekki is used on this wind turbine installation

- In an uncertain market these mats are a relatively cheap and sensible solution in that the mats will do the job and at the same time the investment is modest

Negative points:

- Due to their high moisture content they are relative heavy compared with other wood species such as tropical hardwood.
- The high moisture content and a straight wood fibres can also mean that they have lots of cracks in the wood which do not affect the performance. However in colder climates this can lead to premature damage from freeze-thaw action.
- Due to the straight wood fibres the mats will be damaged more easily.

- The high moisture content means that the wood will start to rot and decay faster. The average life expectancy of beech is approximately one to two years under normal usage. The average life expectancy of oak is between two to three years under the same circumstances.
- The mats are not as strong as tropical hardwood, so for weight distribution applications they not always the best choice.

Tropical hardwood

Under the general heading of 'tropical hardwood mats' a far wider variation of timber types can be found including Ekki, Okan, Dabema, Greenheart, Basralocus, Mora and many others. These wood species are very good as crane mats and have an above average strength and flexibility as can be seen in the below table. The biggest differences between the different tropical wood species - apart from the allowable pressure strengths and durability etc - are



Used tropical hardwood mat being used by a large crawler crane

Name	Botanic name	Volume mass in Kg/m ³	Volume mass in mats Kg/m ³	Elasticity module in N/mm ²	Flexibility strength in N/mm ²	Pressure strength in N/mm ²	Slide strength in N/mm ²	Durability class	Fibre
European Oak	Quercus petraea Lieblein	700	1,000	9,900	96	48	9.9	2	Straight
Beech	Fagus sylvatica L.	700	1,000	12,300	113	54	10	5	Straight

Source: Houtvademeccum.

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three different types of wood fibre, straight, wavy and interlocked.

With a straight fibre the wood tends to crack and split open and due to the fibre the mats are more easily damaged and can even become unusable. A wavy fibre looks similar to the straight fibre, but is however slightly better when it comes to resistance to damage. The interlocked fibre is the best choice of all for crane mat applications.

The interlocked fibres are difficult to split and therefore not easily damaged making it by far the best choice for heavy duty mats. An example of how important a role the fibre type plays is the wood species Demerara Greenheart which appears on paper to be one of the strongest of all the wood species. However in everyday use this wood species gets damaged really easily and as a result is not as good to use in crane mats as first thought.

The tropical hardwood species are sourced from many countries mainly Africa and South America. Here some pros and cons of tropical hardwood for use as bog mats:

Positive points:

- They are good for all jobs
- Tropical hardwood is very durable

and therefore has a very long life expectancy, approximately seven to nine years under normal usage.

- Due to the interlocking fibres the wood is not easily damaged, providing a far longer usable life.
- Due to its low moisture content and interlocked fibre the wood tends not to suffer from heavy cracks.
- It can withstand higher pressure than hardwood mats - therefore you can use a thinner mat to do the same job.

Negative points:

- The mats will cost more than hardwood mats, although a calculation that takes their durability into consideration will show that they are a better investment because they last longer.
- The mats are slightly heavier than hardwood mats, so fewer mats can be loaded onto each truck.

In summary this is just a brief introduction to the variations in what at first glance looks like a relatively generic product. There are of course many more things that can be said or considered about the various wood and mat types, but we will cover that another time.



Not using any mats!



Rot and decay can affect mats - this is oak



The used Ekki tropical hardwood top mat has almost no damage however the Demerara Greenheart mat below has cracked open

Name	Botanic name	Volume Mass in Kg/m3	Volume mass in mats Kg/m3	Elasticity module in N/mm2	Flexibility strength in N/mm2	Pressure strength in N/mm2	Slide strength in N/mm2	Durability class	Fibre
Ekki	Lophira alata Banks	1,010	1,200	18,600	157	72	17,1	1	Interlocked
Okan	Cylicodiscus gabunensis Harms	930	1,150	17,200	133	82	20.0	1	Interlocked
Dabema	Piptadeniastrum africanum Brenan	688	1,000	12,000	104	56	15.5	1 / 2	Interlocked
Demerara Greenheart	Chlorocardium rodiei Rohwer	1,030	1,225	22,600	180	95	18.0	1	Straight
Basralocus	Discorynia guianensis amsh	760	1,050	16,000	126	66	7.8	2	Straight
Mora	Mora excels Benth	990		21,400	152	83	14.0	1 / 2	Straight

Source: Houtvademecum.



A new tropical hardwood mat (Mora) with a straight fibre but cracked



A used tropical hardwood mat (Demerara Greenheart) which has cracked open due to its straight fibre



An Ekki mat that has been used on a bridge demolition project being lifted without damage



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