TECHNEWS

ATTAR
Advanced Technology Testing and Research
A division of Engineering Materials Evaluation Pty Ltd

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Engineering skill shortage at 20%, despite what Minchin says...

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Federal Finance Minister, Senator Nick Minchin might not think there is a skills shortage in Australia, but major engineering organisations in the NSW Hunter region say employers are desperate for skilled workers, with the shortage level at about 20%.

Minchin said on a TV interview last week: 'There are labour shortages. There are not skill shortages per se. There are labour shortages as a function of having a very strong economy.'

However, the urgent need for workers with engineering and technical skills and qualifications to undertake the current backlog of work and future planned programs, has been confirmed by research conducted with major engineering organisations in the Hunter region.

Engineers Australia's Newcastle Division commissioned the research to identify where the main engineering shortages existed and the short and long-term implications of the situation.

'Engineers Australia felt that the nature of the skills shortage was anecdotal and not sufficiently detailed to define the nature of the shortage in terms of engineering discipline and also engineering qualification,' said the organisation's President, David Stewart.

Vacancy rates at 10%

Research found that vacancy rates remain at around 10% and it can then take up to three months to fill a vacancy. The highest level of demand was for engineers with five-to-10 years of experience.

The research also highlighted that the existing skills shortage has actually masked the severity of the problem, as the amount of work that businesses and engineering organisations can tender for and/or undertake has been limited.

The real skills shortage is estimated to be around 20%.

Engineers Australia said effort spent on keeping existing staffing levels consistent reduces the ability for growth by organisations and, on top of local competition for filling demand, the Hunter region firms needed to also compete globally for engineers.

It said an option to address the issue involves establishing collaborative and strategic partnerships with like-minded organisations that have complementary skills and resources.

'The research in the Hunter is a sound benchmark for the impacts of the overall skills shortage across Australia,' Stewart said.

Need national strategies

'What's needed nationally and locally are strategies and funding to repair, and then maintain, the diverse skills base that we must have to remain competitive.

'The Hunter research is another serious pointer to the need for collective action to address the failure to keep up with demand for professional engineering, science and technology skills capability.'

Contact ATTAR to find out how we can help up-skill your NDT Technicians to meet skill shortages in your company.

IN THIS ISSUE

Hands On NDT in Perth

Our popular Introduction to NDT Hands On Course has been scheduled for 26 to 28 March, 2008 at our new premises in Morley, Western Australia.

Engineers, Managers, Supervisors and Technicians seeking to obtain a better understanding of NDT and its role in industry would benefit from attending An Introduction to NDT Methods!

NDT is a cost effective and reliable technique in a wide range of applications and it aids in the delivery of quality products and cost effective plant maintenance. Selecting the appropriate technique for a particular application requires care and understanding since all NDT techniques have limitations that must be well understood to ensure the desired reliability of inspections.

Managers, Supervisors, Engineers and Technicians often have a requirement for the use of Non-Destructive Testing (NDT) techniques to maintain their plant & equipment.

To assist non NDT experts in understanding NDT, this Training course covers the basic theory of each technique, some of the many applications, relevant limitations and provides basic practical exercises to support the theory.

More information and an enrolment form is available from our website: www.attar.com.au.

Monitoring of FRP booms on EWPs.

EWPs are designed to permit operator access to live wires at distances greater than 10 metres above ground. They are easily manoeuvred into tight places and hence are used for other operations such as tree lopping, particularly around power lines. In the normal course of operations, EWPs have been used as rests for tree limbs, to lift power poles or transformers in place, to lift cross arms and to support cables, none of which the EWP was designed to do. These types of application have the potential for high dynamic loads and have been known to damage FRP booms. Of course, lifting the boom without undoing restraining straps doesn't do the boom any good either! These practices can result in cracks in the boom, either at the external surface or internally.

Poor quality boom manufacturing can result in significant internal discontinuities that may also propagate externally or internally under normal service loading. See figure 1, a defective boom picked up in a regular Acoustic Eemission (AE) test program. More details on this test are available on request.

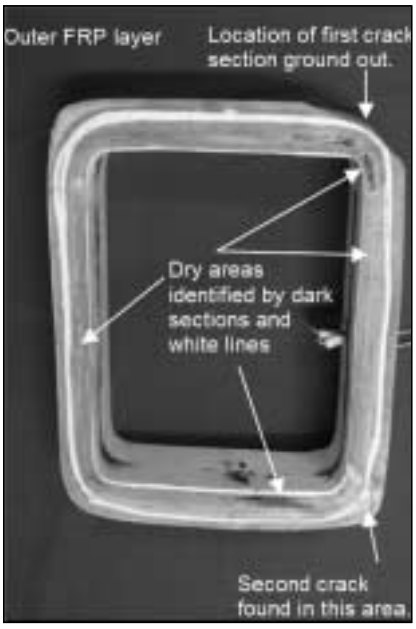

Figure 1 Showing cross section of boom with resin depleted or dry glass areas and location of cracks.

External cracks may be detected visually and this process may be assisted by the collection of dirt in the crack. Often cracking occurs only in the external resin flow coat and may not penetrate into the underlying fibre composite material. If it penetrates into the fibre composite then the integrity of the structure is affected. The amount of reduction in integrity depends upon the depth of cracking. If detected, repairs should be undertaken to prevent further cracking and possible boom failure. How can you determine if the cracking is only in the flow coat? The best way is to conduct an Acoustic Emission (AE) test of the boom.

Internal cracking can not be detected visually and is best found by conducting an acoustic emission test on the boom.

To assist in conducting AE tests on FRP booms an Australian Standard has been developed, AS 4748 Acoustic Emission Testing of Fiberglass Insulated Booms on Elevating Work Platforms.

In the past the recommended procedure for ensuring structural integrity of EWP's has been the application of 1.5 times the SWL in the most critical position, more recently that load has been reduced to 1.25 times Rated Load.

Of course, if the UTS of a boom has been reduced to about 3 times SWL by undetected in-service damage, application of a load of 1.5. times SWL will cause further damage to the boom. Under these test conditions the boom may not fail catastrophically but be further undetectably weakened so that it is more likely to fail in service!

Mechanical tests without AE may cause more problems than they prevent.

ATTAR has been carrying out Acoustic Emission (AE) monitoring of the fibreglass reinforced plastic (FRP) section of elevating platform vehicles (EWPs) for more than 20 years. The results of these tests have been collated and are summarised in Table 1. It is clear that some booms are defective; 1% contained defects that gave a significant reduction in strength as indicated by AE. Most, but not all defective booms were repairable and re-testing showed the boom to be satisfactory, thus costly replacement was avoided.

Booms Tested	3502
Unsatisfactory Booms	35
Satisfactory (a)	380
Defects Reported Hydraulic	656
Defects Reported Other Damage	619

The AE test has also indicated areas of minor damage, reported as OTHER DAMAGE, such as gouges, cracks in flow-coat, cracks in leveling rod support bar holes and at inspection holes, as well as looseness between the FRP and steel sections. These defects and any leakage in the hydraulic system are always reported.

The suggested re-testing intervals for satisfactory booms, based on our current level of knowledge and experience, are as follows:-

1. Booms involved in accidents - retest immediately after accident to determine feasibility of repairs as indicated in AS 2550.10.
2. Booms giving no AE or very high AE, Satisfactory (a), - retest after 12 months.
3. Booms with high damage potential, i.e. booms used for tree lopping, replacement of poles, transformers, cross arms or cables, and demonstration of abseiling techniques - retest after 12 months to 24 months. In this case the test interval should be set by the owner, after taking into consideration the local work techniques.
4. Booms dedicated to light globe replacement - retest every 4 to 5 years.

AE from fibre composites

The sources of AE are directly related to the damage mechanisms that occur in fibre composites.

Deformation mechanisms in fibre composites

These may be broken down into three groups as follows:

A. Crack breaking matrix only
   1. Transverse cracking
   2. Splitting
   3. Delamination

B. Fibres breaking
   4. Fibre break (single)
   5. Fibre breaks (multiple)

C. Complex/combination mechanisms
   6. Fibre breakage (multiple) with resin cracking, Fibre pull out and potential friction sources.

Each mechanism is illustrated in the figure below.

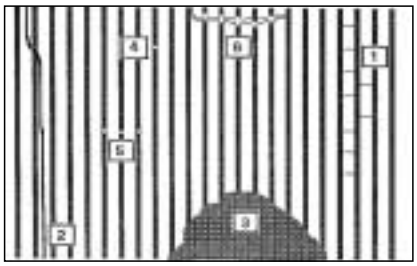

Figure 2 Deformation mechanisms in fibre composites

Monitoring of FRP booms on EWPs. (Cont.)

The AE characteristics of composites are:

1. Large amounts of AE
2. Large increase in activity (AE rate) before failure
3. At higher stress levels, emission continues during load holds
4. Felicity effect is a good indicator of prior damage
5. Rich, informative amplitude distributions
6. Friction at damaged surfaces is a major AE source, as well as new damage

As a result of these characteristics, AE is widely considered "the most" effective NDT method for assuring the structural integrity of composite material fabrications, particularly the glass fibre booms on elevating work platform vehicles. Its main advantage over conventional non-destructive testing techniques is that it is not necessary for the detecting transducer to be near the source of AE. The elastic waves generated as the material fractures or deforms under stress can be detected at a distance from their point of origin, although their amplitude is reduced. The other advantage of AE is that it offers the opportunity for continuous surveillance under a variety of environmental conditions.

AE does have its disadvantages. The energy of stress waves detected is very low, requiring expensive electronics for signal processing. Background noise, in the frequency range of 20kHz -100kHz must be removed to obtain satisfactory results. This is achieved electronically by a band pass filter within the AE system.

An AE event is a pulse of energy generated when a material is stressed. This pulse of mechanical energy passes through the material and is detected by sensors mounted on the surface. Within the sensor a piezoelectric crystal converts the mechanical pulse to an electrical signal which is amplified and filtered for processing by other equipment. For FRP materials, low frequency sensors that detect events with a frequency of about 60kHz are generally used, although 150kHz sensors may also be used.

FRP is a copious emitter of AE, the three sources being cracking of the resin matrix, debonding between the matrix and fracture of the fibres, and fibre failure. Each type of failure has been characterised by the amplitude of the AE associated with it. Those emissions for fibre failure (the most critical in terms of strength) have the highest amplitude. Like most materials FRP exhibits the Kaiser Effect, wherein no AE occurs until the applied stress exceeds the previous highest stress. However, the Kaiser Effect is only observed for stresses less than a critical value, known as the K-point. The K-point is not a sharply defined value but, rather, a band which is approximately related to the ultimate tensile strength (UTS). The relationship depends primarily upon the manner in which the FRP is laid up. For chopped strand mat the K-point occurs at about 50% of UTS. AE on the second load indicates that the K-point has been exceeded and fibre failure is on the increase. The longer the load is held above the K-point, the greater the irreversible damage to the material. The Felicity effect or ratio is determined by dividing the second load at which AE reaches a set rate by the first load it reached the same rate. If it is less than 0.9 then it is cause for rejection of the structure.

For these reasons an AE test always requires a minimum of two load applications to the same load level.

For further information on Acoustic Emission testing contact Dr. Gary Martin or visit our website www.attar.com.au

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NATA
ACCREDITED FOR TECHNICAL COMPETENCE

Slip Resistance Testing With ATTAR!

Regular Slip Resistance Testing at 3, 6 or 12 month intervals can ensure that your floor surfaces meet the relevant Australian/New Zealand Standards:

- AS/NZS 3661.1: 1993 Slip Resistance of Pedestrian Surfaces Part 1 Requirements:
- AS/NZS 4455: 1997 Masonry Units & Segmented Pavers;
- AS/NZS 4586: 2004 Slip Resistance Classification of New Pedestrian Surface Materials;
- AS/NZS 4663: 2004 Slip Resistance Measurements of Existing Pedestrian Surfaces;
- AS/NZS 4586: 2004 - Appendix D

Some other benefits of an ATTAR Expert providing you with a tailored slip resistance testing program include:

- Lowering the risk of slip, trip and fall incidents;
- Confirmation that a tile or flooring surface is slip resistant in accordance with the relevant standard before it is installed on-site, or provided for purchase as an individual product;
- Independent check on the quality of your floor surface cleaning;
- Assist compliance with OH&S 'duty of care' requirements;
- Small sample area required;
- 'After trading hours' testing available;
- Contributes to PR, as testing can visible on-site and demonstrates to clients you are ensuring their safety; and
- Confirms the in-service performance of your floor surface

Tortus 3 Floor Friction Tester

ATTAR can help you mitigate your risk of a slip, trip or fall as the only NATA Accredited Laboratory in all three Slip Testing methods; Wet, Dry & Ramp Testing.

As the only NATA Accredited Laboratory in all three Slip Testing methods; Wet, Dry & Ramp Testing, ATTAR has recently acquired the Tortus III, the most advanced equipment for conducting dry slip resistance testing!

Level 3 Services

As a Senior NDT Trainer and Consultant, one of the major roles other than training is the provision of Level 3 Services to other NDT facilities. One of our key clients for Level 3 Services is Rosebank Engineering PTY LTD.

Currently, Level 3 Services for NDT carried out at Rosebank Engineering in Bayswater are provided by Malcolm Oakey. Malcolm is the nominated NDT Level 3 in Magnetic Particle (MT), Liquid Penetrant (PT) and Eddy Current (ET).

Responsibilities to this facility are quite extensive. In brief they include the following:

- Carrying out proficiency tests on Level 1 and 2 Technicians;
- Carrying out periodic audits to ensure both reporting and equipment meet the appropriate standards;
- Signing off on specific work instructions, which potentially involves the refining and streamlining of the work instruction;
- Writing the main control procedures for NDT disciplines;
- Liaising with NADCAP to ensure that all systems are in place to comply with;
- Auditing of the NDT testing facility; and
- Maintaining and updating visual acuity records for all technicians

The Rosebank NDT Inspection Department carries out NDT on a variety of aircraft components, each of which is required to have its own specific work instruction. There are currently in excess of 350 work instructions written explicitly for individual components tested on site. These work instructions include details of the NDT discipline that will be used, the acceptance criteria and many other factors that will ensure an efficient, thorough and reliable inspection of the component. For any given NDT work instruction it will reference the procedure which acts as an umbrella for all relevant work instructions. Currently Malcolm Oakey is approved by Rosebank Engineering, (in accordance with their procedures which are written to comply with EN4179 and NAS410), to carry out these duties which involves regular site visits and liaison with Rosebank's Quality Department and Materials & Processing Engineer to deal with all on site NDT Quality systems and checks.

Should you require any information on how ATTAR's Level 3 Services could assist your Company, please contact Paul Grosser, Technical Director - NDT.

Success For Simon!

Big Congratulations to Simon Langdon, who successfully completed his last two exams for the year.

Simon achieved High Distinction pass marks again! Simon works as an Engineering Technician and is being sponsored by ATTAR to complete his Materials Engineering Degree at Monash University – Clayton Campus. We are all very proud of Simon, and wish him all the very best as he heads into his 3rd year of University in 2008! Well Done Simon!

ATTAR Festive Season Party!

On the 8th December 2007 - ATTAR's Festive Season Party was held at Paul Grosser's home in Rowville, Victoria. With the sun shining, scrumptious food and drinks, a fantastic time was had by all employees, their families and friends.

With about 40 people attending; the mood was buzzing with excitement, laughter and sometimes bad jokes. The celebrations continued on through the night with a few staying into the late hours of the evening.

What a way to wind down the end of the year festivities with great food and a few beverages amongst friends!

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