Lunar-verse

June 2008

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Welcome

Welcome to this edition of Lunar-verse. This month we challenge the value of using the Risk Management tool for assisting projects, discuss the term 'Refractory', highlight some of the advantages of recycling, and discuss a non destructive testing technology.

Project Risk Assessment Value

When was the last time you were asked to participate in a Risk Assessment? If like many, your thoughts went straight to Safety, and you participated in a Safety Risk Assessment, then the frequency response would have been daily, weekly and at most monthly.

Many people have generally not been involved in a project risk assessment, but for those who have will attest to their long term value for the project.

What is a Project Risk Assessment then? In a nutshell, it is an activity undertaken that identifies the outcomes desired by the project (and I'll come to why 'desired'), and then an identification of the projects environment to recognise threats and opportunities. The threat and opportunities are then weighted for relevance to the projects desired outcomes, and finally, actions can be documented and assigned so that the threats and opportunities have a greater chance of mitigation or fruition.

Why desired? We all know that projects are to deliver the scope – on time, on budget, and to scope. Whilst this is true, what about capturing the hard and soft results of any activities we undertake, and in essence start to introduce sustainability principals into our projects. Every project will change something – either the built environment, work flow systems, service delivery etc, and hence the project interacts with many stakeholders; people, companies, government bodies, the natural environment (air, water, land), the built environment (roads, ports, office space, buildings, processing facilities) to effect this change. So whilst the scope is well defined typically around the 'thing' to be built', the projects environment it is in, will either hinder (threat) or enhance (opportunity) the project.

How well this 'project environment' is understood at the start of the project can have a dramatic impact on the projects initial direction and momentum achieved, with the added bonus of the right project team then on board with the right alignment of their project goals. Have fun..... David Glover.

What is Refractory?

Would you agree that Refractory material is an advanced thermo-mechanical thermo chemical engineering material? Or are they just bricks!

According to Lunar Engineering Co-founder, Roger Turney, they are the former. With Facilities now operating at record production to meet market demand the service conditions and demand being placed upon the refractory material is the greatest it has even been. Like all systems, the weakest link will break first, one just hopes that it's not the most expensive part of the system. DG.

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Asset Management & Refractories

The Asset Management Council of Australia defines asset management as '*Life cycle management of physical assets to achieve the stated outputs of the enterprise'*
Asset management is a systematic process which starts with sound business practice and economic rationale as the key input into the process. This input is the driver for the engineering, maintaining, upgrading and operation of the asset in which the refractory material is used. An asset management approach provides the tools to facilitate a more organized and flexible approach to making decisions on the use of expensive engineering materials – refractories.
Life cycle costs are all costs associated with the acquisition of refractory materials, the installation of refractory materials, and the ongoing 'ownership' of these materials (operation & maintenance) over their full life and disposal of these materials at the end of their life.
In this 'life cycle approach' an Australian Refractory manufacturer Darley Refractories offers a unique service in recycling of refractory materials. Recycling from a life cycle perspective changes the way life cycle costs are perceived. Costs of disposal in landfill are foregone; these costs may include long term environmental site remediation. Recycling is a proven way of reusing expensive materials and is the basis of a sustainable future.
For further information on recycling of refractory materials contact: Darley Refractories Australia Pty Ltd, phone 03 53672300 or visit www.darleyrefractories.com.au

Why the Name

Lunar Engineering proudly takes its name and underlying philosophies and principles from the Lunar Society of Birmingham.

Between 1765 and 1813 a group of industrialists, natural philosophers and intellectuals met regularly in Birmingham, UK at the time of a full moon. They called themselves 'The Lunar Society of Birmingham'. It was common practice in those days for gatherings of people to occur at or close to the full moon to make the journey home easier and safer as there was no street lighting.

This society was interested not merely in science, but in the application of science to manufacturing, mining, transportation, education, medicine and much else. They and the work they did during this time had great influence upon the Industrial Revolution. Some of the influential members of the Lunar Society were Matthew Boulton, Erasmus Darwin, Samuel Galton Junior, James Keir, Joseph Priestley, Josiah Wedgwood, James Watt, John Whitehurst and William Withering. Interestingly Benjamin Franklin attended some meetings and was a regular correspondent to the society.

Lunar Engineering Pty Ltd proudly links itself to the Lunar Society of Birmingham through our name and ethos of the Lunar Society in influencing change through stimulating ideas, broadening debate and catalyzing action.

REF: Uglow, Jenny The Lunar Men: Five Friends Whose Curiosity Changed the World Faber & Faber (2002) ISBN 0374194408.

Nondestructive Testing using Impulse Excitation

The impulse excitation technique (IET) or *Ping* test has been receiving some attention recently as a precise and repeatable technique for measuring the dynamic elastic properties of materials[i]. IET is described in detail in ASTM standards E1867 and C1259 and other international standards. The test involves tapping a sample with a small, flexible hammer (impulse tool) or projectile in such a way that the sample will freely vibrate in one of several possible modes of vibration. The fundamental frequency of vibration is then measured and the elastic properties - Young's modulus (E), shear modulus (G), and Poisson's ratio (μ) – are calculated[1]. IET can be used to detect defects and is often used as a QC/QA tool. This latter aspect is discussed with respect to a commercial instrument, *Buzz-o-sonic*[2].

Quality Control/Assurance

Although precise and absolute measurements of the elastic constants may be desired, there is usually more interest in comparing the elastic or damping properties of one part or batch to another. So, rather than using ideal test pieces, real parts are tested and compared directly. In some cases, the elastic properties are not calculated at all, but rather a characteristic frequency is used as quality indicator. For example, on testing square tiles, the difference in longitudinal frequencies generated along the width and length should be small if the part is isotropic and homogeneous: a defective part might be expected to have a larger difference than normal. An example of some real test results on square tiles using Buzz-o-sonic is shown in figure 1.

Speed of sound (*sonic velocity*) is also used as a quality indicator and is derived simply from the longitudinal frequency and length[3]. Several refractory companies are using the sonic velocity to compare parts being fired at different locations on a tunnel kiln car.

Buzz-o-sonic also measures internal friction (Q^{-1}) as derived from the decay in the vibrations and from the width of the resonant frequency peaks. In general, Q^{-1} increases with the number or severity of defects, such as porosity or cracks. In fact, IET is derived from the original technique used by wheel tappers to test locomotive wheels: a defective wheel would ring for less time and less strongly than a good wheel when struck with a sledge hammer (ring Vs clang).

The largest amplitude of vibration can be used as a quality indicator provided that a controlled impulse is used to excite the sample. Consequently, computer controlled impulse tools are available for Buzz-o-sonic. These tools can also be used in high temperature and in-line automatic testing applications.

The frequency spectrum obtained on the part being tested can be compared to that obtained on a control sample. A defective part will not only have weaker peaks, as described above, but quite frequently has a much noisier spectrum containing additional peaks.

Dr Paul Bosomworth, BuzzMac International. www.buzzmac.com

[i] M. Radovic, E. Lara-Curzio and L. Riester, "Comparison of Different Experimental Techniques for Determination of Elastic Properties of Solids," *Materials Science and Engineering*, **A368** 56-70 (2004)

[1] E and G are proportional to the square of the fundamental frequency multiplied by the bulk density. μ = (E/2G)-1
[2] Available from BuzzMac International, LLC
[3] Sonic velocity = square root of Young's modulus over density or 2 x length x longitudinal frequency (rod velocity)