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MIDAS AT A GLANCE

Midas Engineering Group (Midas) is a dynamic and innovative consultancy group offering an extensive suite of engineering capabilities. Midas provides engineering disciplines across the group with offices in Perth, Newcastle and Melbourne, where our teams are focussed on delivering value adding engineering solutions. We are committed to providing an extremely high level of personalised service undertaken with the highest integrity and confidentiality. This is reflected in the growth of our brands and their client bases, which have been built over 28 years through referrals and excellence in client focus.

Midas brings a mix of skills and expertise within multiple sectors such as mineral processing, electrical, civil, structural, environmental and building services. The group has served a wide variety of clients including mining, oil and gas companies, the Australian Defence Force, developers, architects, financial service companies, local governments and councils, school districts, hospitals, and medical centers. This wide range of experience developed across many industries, demonstrates the wealth of knowledge and specialised skills that allows the Midas group to consider no engineering project too large or small to consult upon.

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DIRECTOR'S NOTE

Welcome to the 49th edition of the Midas Gazette,

Welcome to our first edition for 2016 and Happy New Year! I hope you had time to relax over the festive season and enjoy precious time spent with family and friends. I believe 2016 is shaping up to be a year of greater visions, greater aspirations and greater achievements as January kicked off on a high note with the first step taken to expand Sanderson Consultants into the Perth market. While this will present a new set of challenges for the Midas Group, we are in the process of setting our goals and will work towards their implementation and achievement. As the saying goes "The establishment of a clear, central goal is the starting point of all success".

On that note, I hope you enjoy this quarter's edition of the Midas Gazette. In this issue we take a look at sensible cost cutting, biomechanics, Who came first – The Architect or Civil Engineer and review the hazards of an arc flash, among other interesting topics.

If you would like any information about the contents of this newsletter or any details about the services the Midas Group can offer, I would be delighted to speak with you personally. I can be contacted on 08 9421 9000 or feel free to drop in for a coffee at any one of our offices located in Perth, Melbourne or Belmont.

And once again, Happy New Year.

Kind Regards,

DAMIAN CONNELLY

Damian Connelly
Director / Principal Consulting Engineer

SENSIBLE COST CUTTING

FOCUS DURING TOUGH TIMES

As the resources sector toughens with rising costs and cyclical metal prices, mining companies need to continue to reduce their costs and do 'more' with 'less'. However, I would question some of the ruthless "race to the bottom" behaviour that is occurring in order to cut costs.

Many new resource projects fail to come in under or on budget. Particularly, capital expenditure (CAPEX) proves difficult to achieve for resource projects. A number of resource projects have failed because of aggressive plant CAPEX cost cutting, resulting in projects with no surge capacity and the inability to achieve design throughput. In addition, the plants are not operable because of the omissions. Current operations are doing similar things such as reducing maintenance and cutting R&D which is making highly skilled technical people redundant. People make it happen, in particular technical people, and they are being undervalued and trashed in the pursuit of cost cutting. This is cutting the opportunity for future technical innovation and improvement.

I had one accountant say to me recently, "We got rid of all you technical people and saved a heap of money" and "We also saved the money you used to spend on testwork and studies". So yes, they have saved money no doubt about it but they also have no technical people left. My personal prediction is that the business will not exist in five years because any further savings will be minimal and there will be no technical innovation where the big savings are actually made.

In recent times, many businesses have also experienced the "costs" of simply implementing aggressive operating "cost cutting" measures as a strategy for solving business performance problems. Money spent on technology and innovation can be a game changer for new projects and operations. I have seen huge project transformations spending money on innovation but unfortunately for a lot of companies this is not their focus. Instead, many organisations focus on the past using an incremental approach based on the use of past budget information. This unfortunately is used as an integral part of the budget construction process going forward. The use of performance reports and Management Information Systems (MIS) are used in the role of continuous improvement in achieving cost cutting. This has small incremental benefits but from my experience this is where most effort is currently expended.

NEWS

Sanderson Consultants are expanding to Perth

We are excited to announce that Sanderson Consultants are expanding their building services division in Perth. Sanderson Consultants is part of the Midas Engineering Group (based in Perth) and is one of Melbourne's leading building service engineering consultancies. We have worked on projects that have earned us a reputation for technical excellence, commercial viability and ecologically sustainable developments.

Due to the ever increasing building services market in Perth, Sanderson has decided to expand their operations in Perth, utilising the skills and experience of the Midas Engineering Group.

Sanderson has the experience in delivering high quality, innovative and sustainable design solutions. Conscious of providing cost effective solutions to our clients, we offer a comprehensive range of expertise spanning the entire building's life cycle. Our success is attributed to our ability to be flexible, highly responsive and adaptable to the different challenges and regulations which influence the delivery of a project.

Sanderson, together with the Midas Engineering Group, can provide the resources, industry expectations and sustainability all of which make us an ideal choice for taking your buildings into the future. For more information, please visit our website: www.e-sanderson.com.au

SAFETY IN DESIGN

EMBEDDING SAFETY AS A FUNDAMENTAL PLANK IN ALL DESIGNS

History shows us that Process Plants contain many risks for personnel who operate them. These risks include moving equipment, electrical, dust, noise and chemical exposure, along with many others. Workplace Health & Safety statistics have shown a significant reduction in LTI's (lost time injuries) following the introduction of regulations for safe working places. These regulations include a requirement for Safety in Design (SiD). Understanding and complying with these regulations and the principles in Safety in Design includes working towards eliminating hazards and controlling risks. One such way of doing this is completing HAZOP and HAZID reviews. The role of HAZOP and HAZID reviews is discussed, along with the role of Materials Safety Data Sheets.

This paper looks at the purpose of Safety in Design, what designers must do to comply with the SiD regulations and the hazards to consider when conducting a risk analysis during the design phase; including risk prevention and protection.

A number of case studies are cited and the duty of care and harmonisation across the jurisdictions are discussed as well as the role of Safe Work Australia.

Introduction
As stated above, Process Plants are hazardous areas where humans are exposed to numerous risks. To reduce the potential or severity of the risks involved in working at a process plant, a legal requirement to provide a safe work place has been incorporated into process plant designs and procedures. Safety in Design is now an accepted principle in designing process plants.

Duty of Care
Under the Health and Safety Act, every person involved in the design and production of a process plant, has a Duty of Care to eliminate hazards and minimise the risk as much as possible to people operating process plants. Standards specified by the Work Health & Safety (WHS) Act outline the duties designers are required to follow to identify and locate risks or hazards involved with the design structure. Failure to comply with these regulations, by individuals and/or corporations is considered an offence under the WHS Act.

HAZOP/HAZID
Formalised hazard assessment techniques such as the Hazard and Operability Study (HAZOP) and the Hazard Identification Study (HAZID) help to systematically identify and analyse hazardous events, respectively. As part of these assessments, mandatory safety signs and emergency situation considerations are established and included as part of the design. This includes but is not limited to noise, fire, electrical shock, radiation safety and exposure to chemicals (Dangerous Goods Act 204).

Safety in Design
Safety in Design is best conducted during the earlier stages of plant design; including the conceptual and detailed engineering phases, as these stages are where there is the greatest ability to influence safety. One of the main objectives of health hazard control is to limit the chemical dosage of a chemical by minimizing or preventing exposure.

The potential health hazard to an individual by a material used in any chemical or biochemical process is a function of the inherent toxicity of the material and the frequency and duration of the exposure. Thus an understanding of the materials and their sources to which workers may be exposed to is important for the recognition, evaluation and control of occupational health hazards.

Continued on next page...

SAFETY IN DESIGN

CONTINUED

For example, potentially hazardous small particles that can form an airborne dust cloud or solid aerosol can arise from mechanical abrasions of solid material by cutting, grinding or drilling, such as a high pressure grinding circuit.

To help identify and remedy potential hazards, various codes of ethics adopted by the various engineering societies have been established. These societies include:

- Engineers Australia, AusIMM, SME, CIM
- American Institute of Chemical Engineers Code of Ethics
- National Society of Professional Engineers (NSPE) Code of Ethics

Environmental
Each process plant is required to determine what environmental standards require compliance by the project. In order to establish the applicable standards, baseline data of the various environmental safety elements is established and examined. This baseline data includes:

- Air quality
- Water quality
- Ambient noise levels
- Ecological studies and social surveys
- Emissions and effluents

The examination of this existing data will aid in determining the environmental safety aspects of the project.
To meet acceptable standards, the preparation of an effluent and emissions summary, with possible alternatives, is required as part of the project environmental analysis.

Risk Analysis
A risk analysis is mandatory for all studies and detailed design projects. This analysis incorporates the fundamental concept of eliminating or minimising hazards and risks. The risk assessment used in Australia follows the Australian Standard, along-side the Australian Standard Risk Matrix and must be documented.

Australia Standards
SAI Global provides downloadable Australian Standards that can be applied for purposes such as plant design and operation safety analyses.

The table below is a guide to the minimum standards when designing process plants. Depending on the specific industry, other standards may also apply i.e. minerals, chemicals, oil & gas etc.

Examples
Cranes and hoists, pressure vessels, heat exchangers and boilers are some examples of registrable classified plant or mining operation groups. Operating plants also need to account for plant layout requirements; for activities such as maintenance and installation space requirements, where crane or large vehicle access may be required.

Code	Title
WH&SA	Workplace Health and Safety Act 1995
WH&SR	Workplace Health and Safety Regulations 1997
QDC	Queensland Development Code
BCA	Building Code of Australia
AS/NZS	4360 Risk Management
HB 205	OHS Risk Management Handbook
HB 436	Risk Management Guidelines
	Code of Practice for the Construction and Building Industry
	Noise Code of Practice
	Manual Tasks Code of Practice
	Risk management Code of Practice
	Hazardous Substances Code of Practice
	First Aid Code of Practice
QBA	QBA Queensland Building Act
MIDAS QA	MIDAS Safety in Design Procedure

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The variety of topics offers an excellent opportunity to broaden one's knowledge of the resource sector in general and individual disciplines in specific.

For more information please head to our website:
www.midasengineering.com.au

BIOMECHANICS

CAN AN ENGINEER DIAGNOSE A BROKEN HEART?

Computer assisted modelling of complex or otherwise ethically or practically unfeasible mechanical systems is a very desirable tool in the analysis of engineering problems. It allows for the engineer to efficiently compute an output for a given input; whether that is electrical, structural, dynamic or building energy modelling. The quick computation of various engineering problems are allowing for applications in non-traditional fields such as medicine, where the modelling of complex biological systems are breaking new ground in surgery, brain injury mechanisms and heart disease risks.

When modelling soft-tissue, deformation is very high and the materials are non-linear in their reaction to force and displacement. Therefore so-called meshless modelling is used in the three cases below. This was originally developed to model the formation of stars in the universe but has more recently been used in the field of biomechanics.

If you're squeamish maybe skip this paragraph. Traditional surgery methods for removal of tumours make use of pre-operative imaging and visual feedback during surgery. However, the pre-operative images indicate only the position in-vivo (in the normal biological context) and during surgery these positions can vary. This does not have a large impact in most cases, however due to the removal of the skull for brain tumour elimination, the tumour can move by 3mm. This is a large distance considering that the surgeon must remove as little excess material as possible. Researchers at UWA's Intelligent Systems for Medicine Lab have developed modelling techniques which allow for the computation of this displacement, and therefore give a more accurate picture to the surgery team. The vision is that further into the future surgery could be performed robotically, simply following instructions computed by modelling software that is un-intrusive, faster and with a much higher precision.

Head traumas have a huge cost on society. The study of the brain's response to contact however is basically impossible on ethical grounds. Some questionable research was done relating dynamic forces on the head to brain injury half a century ago; however this was stopped for obvious reasons. Still however, through sport, driving or a simple fall, many people are living with brain injury. Using a similar modelling technique as above, it is possible to build a detailed model of the brain and skull allowing for study into the underlying causes of Traumatic Brain Injury. For example, using meshless modelling it is possible to compute the dynamic response of the brain due to a rotation or acceleration to the skull, which allows for the simulation of such scenarios and identifying which situations can cause high degrees of injury and which methods of prevention are most effective. This could lead to breakthroughs in helmet design for sports as well as airbag design and crumple zone formation in cars as it allows for realistic simulation of such scenarios which we wouldn't want to undertake on our own bodies.

Aortic aneurysms occur due to the weakening of the blood vessel structure which is caused by a number of conditions. Previously, there has been a one-size-fits-all solution, which might be okay for a hat size, but means many people who do not need surgical intervention receive it and others who do need it miss out. This is because the geometry and material structure vary from person to person. 3D scanning using an MRI can be used to define the geometry of a patient's aorta as well as regions of differing material structure (original blood vessel, calcination, other weakening mechanisms) being visually identified. Then the forces due to the flow of pumping blood are applied and regions of high stress analysed for possible rupture points. Through the modelling of the aorta, the integrity of the structure can be deduced and therefore a definitive answer can be given to a specific patient.

Building Information Modelling is becoming more prevalent in the building services industry and is being driven by the need for increased energy performance. The use of BIM enables the engineer to test different building services solutions before they are built and work to an optimal solution. Midas Sanderson Consultants are currently developing capabilities to perform energy modelling for projects still in the architectural stages of development to build in sustainability in this early phase. While this all seems very far removed from biomechanics, the central pillars between are much the same; geometry is produced, material properties and boundary conditions are defined, and an analysis is performed. And both are currently in stages of rapid improvement and adoption within industry.

Therefore the answer to the question - Yes, using similar modelling techniques to those used frequently by engineers on a daily basis, such as Finite Element Analysis, it is possible to state whether someone has a broken heart.

If you would like further information contact me on l.bartlett@e-sanderson.com.au.

ARC FLASH HAZARD

AS A PCBU, WHAT PRECAUTIONS SHOULD YOU BE TAKING?

Qualified electrical personnel are often requested to operate and /or maintain electrical equipment that is at the end of its serviceable life, inadequately maintained or faulty. To manage the associated risks, access to electrical equipment should follow prescribed Switching Plans and a Job Safety Analysis (JSA).

When things go wrong, electrocution is not the only cause of death or injury. Burns or flash impacts due to Arc Flashes can be life threatening. This has been recognised for decades in Europe and the US. In Australia, Australian Standards AS4836:2011 and AS3007:2013 make reference to Arc Flash for general installations and equipment in mining environments respectively.

What is an Arc Flash?

An Arc Flash typically occurs through inadvertent contact with live conductors, or due to failure of equipment or due to incorrect operation of equipment. A short circuit caused by these events can produce an explosion of molten material that expands 40,000 times the volume of the solid material. A resulting pressure wave directs the vaporised metal to the operator resulting in severe burns or impact injury.

The energy contained in the Arc Flash is dependent on the arc current magnitude, its duration, and the distance between the arc and operator. The energy can be estimated by calculation (refer to IEE 1584:2002). In addition, the operators clothing has a significant influence on potential injury, a high degree of PPE (Personal Protective Equipment) can greatly reduce the extent of injury. Best practice calls for operators to wear PPE when working in potential Arc Flash environments, the amount or rating of the PPE depends on the potential energy of the potential Arc Flash.

The guide at the bottom of the page relates the upstream transformer rating (which governs maximum potential fault current) to the minimum level of PPE required. Increasing both the kVA rating and the protection tripping times requires a significant upgrade in PPE. For all electrical activity a minimum level of PPE must be worn.

The following should be considered when managing Arc Flash hazards in the workplace;

- Obtain up-to-date single line diagrams (SLD's) and protection setting information to understand the fault level and trip delay at each point in the electrical network.
- Engage a suitably qualified electrical engineer to review the (SLD's) and protection co-ordination to ascertain areas of optimisation. Re-grading and the inclusion of fault limiting devices are examples of how to minimise the Arc Flash hazard to ALARP (As low as reasonably practical).
- For new and existing installations Arc Flash calculations should be undertaken prior to switchboard energisation. Arc Flash warning labels should be provided on equipment to advise the minimum level of PPE to be worn while operating or working around electrical apparatus.

UpstreamTransformer Rating (kVa)	Protection Trip Time (secs)	Est. Arc Fault Current (Amps)	Typical Minimum Level of PPE
500 or 1000	All at 0.2s	8200, 13600	Arc rated long sleeve shirt and trousers, Arc rated face shield and Arc rated balaclava (or Arc Flash suit hood)
1500, 2000 or 2500	All at 0.2s	16700, 18900, 21800	All kVA ratings: Arc rated long sleeve shirt and trousers, Arc rated coverall, Arc rated suit jacket, Arc rated suit pants, Arc Flash suit hood and Arc rated gloves. Rated min. 25cal/sq cm
1500 or 2000	All at 0.5s	16700, 18900	Arc rated long sleeve shirt and trousers, Arc rated coverall, Arc rated suit jacket, Arc rated suit pants, Arc Flash suit hood and Arc rated gloves. Rated min. 40cal/sq cm

WHO CAME FIRST?

THE ARCHITECT OR THE CIVIL ENGINEER?

The term “civil engineer” came into existence long after the term “architect”, however, what a “civil engineer” does originated long before architecture. Civil engineering began between 4000 and 2000 BC during the creation of the pyramids in Egypt and was a result of the increased need for transportation of goods, materials, and supplies for people and construction. Major structures like the Great Wall of China and the Pyramids were constructed on the basis of ancient civil engineering techniques that form the basis of what we use today. They started creating aqueducts, dams, and vast empires for protection of their people and commodities.

It wasn’t until the early to mid-19th century that civil engineering was named a separate study from architecture. In 1819, the University of Norwich established a separate civil engineering class delineating the difference between architecture and civil engineering. From that point on, many civil engineering societies like the Institute of Civil Engineers were formed in Australia and the UK as the popularity and importance of the study greatly increased.

Originally, the design and construction of buildings and places were done by artisans, stone masons and carpenters. There was no clear distinction between an architect and engineer until modern times. In many places, including Europe, architects and engineers are often used interchangeably and regarded as the same.
Today most people know that architecture and civil engineering are two different fields of study and profession. Architects are associated with buildings while civil engineers are associated with computers and software. This is actually just a small part of the profession. Although this is correct, it is only a small part of what makes up the whole definition. Architects are often regarded as designers while civil engineers are considered as builders.

Being part of a civil engineering design consulting team, I can confirm this to be an accurate view. Wilkie Civil Engineering delivers civil and structural design services within Australia, servicing both commercial and residential sectors. Wilkie has specialised expertise and capabilities built on 30 years’ of experience across a wide range of diverse and challenging projects. Our company focuses on land development projects and residential/commercial, civil/structural engineering solutions. Wilkie works closely with their clients to turn their design into a reality.

So who did come first? From an old civil engineers point of view, the engineer did of course.

DON'T TALK AND DRIVE

AN EMPLOYER'S CELL PHONE LIABILITY

In today's world of instantaneous connectivity it is increasingly common to see a person on their mobile while driving. While the driver may view themselves to be multi-tasking, research suggests they will experience trouble placing a concentrated focus on the actual task of driving. A driver's speed may fluctuate; they may drift into other lanes or make abrupt stops. In some instances these drivers are the cause of accidents.

It is becoming more common place that business owners are finding themselves in a precarious situation. If their employees must drive to a job to do a site survey or meet with a client and that employee is the cause of an accident while talking on their mobile, it may be the business owner who is found liable.

In a recent article by the Occupational Safety and Health Association (OSHA), they presented a true story from the USA. The results speak for themselves.

Clients anticipated the arrival of Ms. Walker who used her car as a mobile office most days. It didn't take Ms. Walker long to discover she could get more work accomplished if she used her cell phone while she drove from one client's location to the next. Walker entered the onramp of the regional Interstate and set her cruise while using the company supplied cell phone to make an appointment with a client. She didn't notice the traffic snarl until it was too late. Walker hit the vehicle in front of her causing it to overturn. The driver's arm was lodged between the door and the pavement. In the end this victim, a single mother of four, lost her arm to amputation.

You can probably tell what direction this story takes next and you'd be right. The victim sued both Walker and her company due to what she perceived as an unreasonable hazard associated with the cell phone use. Millions of dollars in damages were asked for and millions of dollars were given to the victim.

Now you may think this is an isolated case but employers are increasingly finding themselves liable for accidents involving employees who use company supplied cell phones while driving. While this example highlights the use of a cell phone provided by an employer, similar scenarios exist where an employee is using their personal mobile for business purposes. Therefore it is recommended that businesses develop a plan to deal with employees and their use of cell phones for business purposes.

A clearly written company policy addressing mobile phone use while at work may limit or even negate a business's potential liability should such a situation arise. Addressing this problem could save your business from the loss of millions in insurance claims and the potential loss of innocent life.

COFFEE CUP CORNER

GET TO KNOW US

MIKE CARTER

TCT MANAGER

What divison of Midas Engineering Group do you work for?

TCT Electrical Engineering.

What drove you to choose your career path?

My father, brother and sister are all Electrical Engineers. It runs in the family.

How did you go about getting your job? What kind of education and experience did you need?

I applied to the Department of Defence (Navy) for an Electrical Engineering cadetship and was lucky enough to get the job out of school.

What do you do differently from your co-workers or peers in the same profession? What do they do instead?

I like to meet with the customers face-to-face as this is the only way to build a meaningful relationship. Some managers sit behind a desk or PC and hope for the best.

What misconceptions do people often have about your job?

Some people think work comes into a business purely because you have an office, signage and a website. It's all about being in front of the customer and following up opportunities.

How is the future looking for young Engineers?

In Electrical Engineering there are many IT and software specialists but not many power systems engineers. If you want an in-demand qualifaction, consider power systems engineering.

What do you enjoy most about working at TCT?

Our staff are very diligent, honest and customer focussed. It's great receiving positive feedback on a weekly basis.

MIDAS ENGINEERING GROUP

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