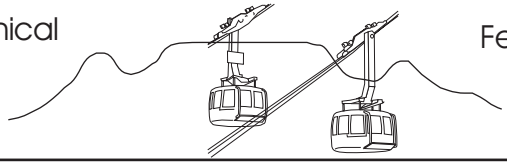
WCB ENGINEERING BULLETIN

The Institution of Certificated Mechanical and Electrical Engineers
Western Cape Branch (WCB)
P.O. Box 504, Rondebosch 7700



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MISSION STATEMENT: 1. To uphold the image & status of the Certified Engineer. 2. To represent the Certified Engineer at ECSA and other decision-making bodies concerning legislation, safety & health standards, the environment and machinery regulations. 3. To promote continued education & training of its members and future engineers. 4. Promote fellowship in the engineering profession

Editorial

The two industrial accidents described in this issue need not have occurred because it is well known in the wine making industry that carbon dioxide is generated in the process. It is also generally known that CO2 is odourless and tasteless. It is perhaps not generally known that it is a heavy gas which builds up in a closed container from the bottom up. For these three reasons and the fact that its presence excludes air it can be fatal. One can drown in a sea of this gas.

The work of cleaning the tanks is unskilled and the workers must be constantly reminded of the dangers. Even experienced workers must be reminded. The cleaning process is routine and the workers move continuously down rows of tanks. After a tank is pumped out the tank is identified to the cleaners and the bottom door must be opened before permission is given for entry. Strictly in terms of the regulations a gas free certificate should be issued by a qualified person before people are allowed to enter. In practice this is not done because of the routine nature of the work and the general awareness of the danger. A responsible supervisor would normally give the approval, but it does occur that the wrong tank is identified by the cleaners and under pressure to get the work done accidents do occur.

The Occupational Health and Safety Act requires the employer to make his employees aware of the dangers of their tasks and the limitations of their duties. Not only training but constant vigilance is required on the part of the employer and those to whom he has delegated authority not only to teach and train but to ensure that the employee understands what is required of him and practises the procedures as instructed. The employee too has the duty to understand the instructions and operations and to carry them out in a responsible manner.

The first incident related in this issue illustrates either an over enthusiastic worker eager to get on with the job without waiting for safe clearance or irresponsibility in risking his safety to take an unlawful advantage from the nature of his work. The second incident seems to indicate a stubbornness on the part of the worker to do his own thing for an unkown reason, possibly a mental aberration.

An employer needs to be aware that he has in his employ not a robot which follows instructions to a tee but a personality with mind, emotions and will.

To prevent recurrences of accidents the Safety Committee should, as best they can, investigate even minor accidents to establish actual causes, taking into consideration all possible contributing factors.

It may even be found that a particular worker should be in a different type of job in a different environment.

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Local Branch News

Hello once again everybody.

The year is well on its way again. We trust that all our members and friends have a successful year.

Please be advised that our AGM will be held on 20 February 2003 at the Western Province Technical College Thornton Campus, corner Poplar and Cedar Streets, Thornton at 18h00. The meeting will be followed by a talk on "The Practical uses of Infrared Inspection Services" by Ian Cromarty of Thermomax. We look forward to seeing a great number of you there!

Further intended programmes for the next few months will be as follows:
March – A talk on registration with ECSA
April – Visit to the NASPERS printing works
[Please note that the programme may change due to unforeseen circumstances]

Best regards to you all!

Chris Schnehage

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Legal Knowledge

Occupational Health & Safety Act 1993 (Act no 85 of 1993)
November 2002

QUESTION 3

(a) Define an 'electrical installation' as given in the Electrical Installation Regulations. (2)

(b) A factory is supplied with electricity from the supplier's substation 800 m away via an 11 kV cable connected to the user's transformer through his 11 kV main switchgear, 50 m inside the boundary of the premises. In terms of the Electrical Installation Regulations:

(i) Where does the electrical installation start?

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Wine tank fatality

Carbon dioxide is generated in the fermentation of wine and being heavier than air it accumulates from the bottom of a tank upwards. In this particular instance the tank contained must i.e. unfermented wine.

After the grapes are pressed the liquid is pumped into a cement tank standing above ground.

At a winery one Saturday morning in March 1982 at about 8:30 am two workmen were busy cleaning a wine press which is used to press the juice out of the grapes. One worker whom we shall call Willie was handling a hose pipe on top of the tank. He was out of sight of his fellow worker Piet on the ground. Piet heard a coughing sound coming from the top of the tank. He surmised that his colleague had fallen into the tank through the top manhole. He immediatly called the farmer whom we shall call Mr Botha. The two men climbed to the top of the tank. The tank was half full of must and skins. They found a ladder in the tank but could not see Willie, who was submerged under the liquid. Using a long hook they fished around inside the tank until they located Willie. With considerable difficulty they lifted his body out of the tank, laid it on the ground below and called a local doctor. The doctor pronounced the unfortunate man dead, and the Police were called.

At the official enquiry the evasive manner of Piet suggested a degree of connivance between the two workers. He expressed surprise that there was a ladder in the tank but he may have guessed that Willie was helping himself to a "dop".

Willie had been working at the winery for 15 years and, according the the farmer, was well aware of the dangers of carbon dioxide gas. He may have decided to take the risk to get a drink, but half the tank would have been filled with the gas and all oxygen would have been excluded. He may have stayed too long in the tank or slipped on the ladder and floundered in the liquid. It seems he did not have a chance to save himself from drowning in the gas or the liquid.

Another wine tank fatality

On 2 July 1983 at about 5 pm routine cleaning of wine tanks was in progress at a winery. Five workers worked moving from tank to tank cleaning and filtering wine dregs. Standing instructions were that no-one must enter a tank until the bottom door had been opened so as to allow the tank to ventilate.

On this occasion one of the workers whom we shall call Alfred fetched a steel ladder, llowered it into a tank. His fellow workers tried to stop him but he went ahead and climbed down and stood at the foot of the ladder until he collapsed. One of the workers went to call the manager while one of them Johnnie climbed down to render assistance.

On arrival the manager immediately opened the bottom door. By this time Johnnie had also collapsed and he was dragged from the tank and recovered once in the fresh air. Alfred was taken to the local hospital but was certified dead on arrival.

The deceased was a man of 54 years and no explanation was forthcoming as to why he deliberately entered a tank which he knew from experience was a potential danger until it was cleared of the carbon dioxide.

The subject Plant Engineering

15th January 2003

As some of you may know, I have been giving lectures on the subject Plant Engineering at the Western Province Technical College in Pinelands.

So far I have given two lectures. The first one was in the first Semester of 2001, and the second was also in the first Semester of 2002. Both classes had 10 students each, which is the minimum quantity to warrant a class in the evenings. For some reason, there are never enough students to warrant a class in the second half of the year. Well, maybe that will change in future.

So, after these two classes, and four exams later, I thought it necessary and interesting to give a summary on who and how many students from my two classes have passed Plant Engineering so far, before this information gets lost in the midst of time and in the archives of the college. I also decided to include the passes on the subject OHSAct, so that we can then see how many students from these two classes have now, at this stage, obtained the "Ticket". Exam June 2001:

Name	*P.Eng.*	*OHSA*
CE Butcher	Pass	Pass
Exam Nov 2001:		
Name	P.Eng.	OHSA
MC Zondi	Pass	Fail
D Gillespie	Pass	Fail
Exam June 2002:		
Name	P.Eng.	OHSA
OME Onelli	Pass	Pass
MC Zondi	Pass 2001	Pass
Exam Nov 2002:		
Name	P.Eng.	OHSA
G de Klerk	Pass	Pass
D Gillespie	Pass 2001	Pass

So, looking at the above summary, we can see that since Jan 2001 up to Nov. 2002, and out of two classes of 20 students in total, 5 have obtained their GCC, Factories and their names are:

CE Butcher	Class First Sem. 2001
MC Zondi	Class First Sem. 2001
D Gillespie	Class First Sem. 2001
OME Onelli	Class First Sem. 2002
G De Klerk	Class First Sem. 2002

Well done guys. Congratulations.

I wish you all the best of luck and success in your future endeavours and I have no doubt that each one of you will do well in whatever you are destined to do.

If all goes well I will give another summary by January 2004.

Until then I wish everyone a healthy and prosperous 2003.

Jorge Pereira
Cert. Eng.

Plant Engineering (factories)

Nov. 2002 (6) (b) Exam Question

A sinusoidal alternating current supply has a maximum voltage of 311 V and a periodic time of 25 milliseconds. Calculate:

(i) the root mean square value of the voltage
(ii) the average value of the voltage
(iii) the frequency
(iv) the instantaneous value of the voltage 5 milliseconds after the commencement of the cycle. (7)

I chose this particular question because it is such a basic elementary Alternating Current theory question that I thought it would be interesting to both the younger engineer in training and also to the more greyish engineer, where it would bring back memories of their Principles of Electricity days.

I wonder how many candidates managed to get this one right, since one would have to remember the basics to solve it.

Some of us would say; "how on earth a question like this will test the skills of the future maintenance engineer"; but on the other hand, some of us would also say that, in order for the candidate to answer complicated questions, the candidate will have to know basics like this one. Be as it may, the truth is the question is here and whether we like it or not, the serious candidate will have to know it in order to answer it correctly.

I must confess I had to consult my Principles of Electricity text book to answer this one, and I decided to answer this question with a bit of basics. Hope you guys enjoy it.

First, let's represent the e.m.f. with a sine wave as shown. Referring to the above figure:

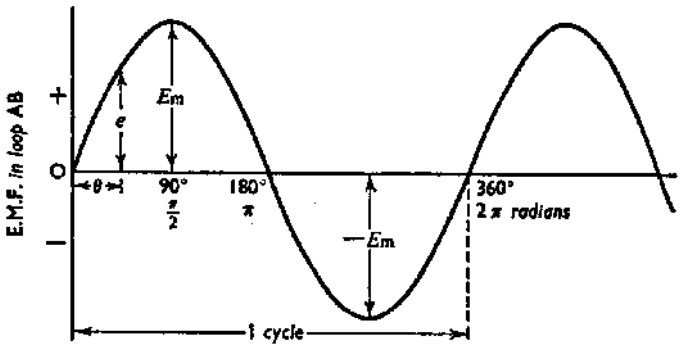

Fig. 10.3 Sine wave of e.m.f.

Em = maximum value of e.m.f. generated in a coil.
e = instantaneous value of e.m.f. generated in a coil which is = Em Sin u, and
u = angular velocity x time = wt = 2pft where (p) is in degrees.

The duration or time of 1 cycle is termed (period) or (periodic time). The number of such cycles that occur in one second is termed the (frequency) (f) of that quantity measured in (Hz).

And frequency (f), is the inverse of the periodic time. r.m.s. value of a sinusoidal current or voltage is = 0.707 x maximum value.

Average value of a sinusoidal current or voltage is = 0.637 x maximum value.

Armed with this information we can now try to solve this problem.

Possible Answer:

(i) E (r.m.s.) = 0.707 x 311 = 219.88 V
(ii) E (ave.) = 0.637 x 311 = 198.11 V
(iii) f = 1/periodic time = 1/ 0.025 = 40 Hz
(iv) e = 311x Sin 2.px40x 0.005=295.78V

This is it for (7) marks, which I think is reasonable.

The very next question of this paper refers to a 3-phase induction motor which requires a fair amount of knowledge regarding the way the induction motor works, and has been given a value of (6) marks only. Comparing the marks with the above question I think it is not fair, but as I said before, the question is here and we have to live with it.

Well, the answer to this one is for another time and place.

Jorge Pereira
Cert. Eng.

Continued from Page 1 col. 2

(ii) Who is responsible for the safety of the 11 kV cable? (4)

(c) Define 'earthed' as given in the Electrical Machinery Regulations. (3)

(d) Who shall carry out the inspections and tests of electrical machinery in hazardous locations and at what intervals? (2)

(e) List THREE options for a source of electrical energy for portable tools with an operating voltage above 50 V to earth. (3)

(f) List TWO requirements for the use of portable electrical tools. (2)

(g) What measures shall the user take where bare conductors, which cannot be completely insulated (other than conductors of power lines), are installed in a workshop? (4)

(20)

ANSWERS to QUESTION 3

(a) EIR 1 - On a premises, equipment from point of control to point of consumption
Excludes: supplier's material, voltage 50 V and less, electricity for telecommunication, television or radio, electrical equipment on vehicle, vessel, train or aircraft.

(b) (i) At the incoming terminals of the user's switchgear.

(ii) The supplier.

(c) EMR 1 - connected to general mass of earth to ensure at all times immediate safe discharge of electricity.

(d) EMR 8(7) A person who is competent to express an opinion -such as a master installation electrician.

(e) EMR 9(1) (i) Earth leakage protection
(ii) Double wound isolating transformer
(iii) Double or reinforced insulation

(f) EMR 9(3&4) (i) Easy and safe starting and stopping switch.
(ii) Tool, cord and plug maintained in serviceable condition.

(g) EMR 21 - So placed as to prevent accidental contact, and warning notices displayed.

A bi-monthly column on Project Management

Caesar Alexandre

Part 4

DEMAND DRIVEN AND NEEDS-BASED APPROACH

The sponsors and clients in the community development field have to learn a whole new set of skills on how to manage their projects, facilitate large scale public involvement programmes that bring a larger number of stakeholders into agreement and full commitment about a project design, train people in how to maintain involvement of stakeholders and teach project management skills.

The demand driven, customer focused project mindset means that development agencies must pay closer attention to the technical, social and environmental forces that will affect a project's sustainability after completion. Resources are limited and the impacts can sometimes mean the difference between life and death.

A social development project involves large numbers of stakeholders and the impacts are of great interest to many parties.

This necessitates large-scale collaborative implementation of project technologies and so project scope by necessity becomes a social process.

The development agencies must see the beneficiary/end users as customers with a valid point of view about their project designs.

Community development can teach Project Management insights that are useful in the development point of view, such as the importance of classifying the impact in order to sharpen the definition of deliverable, the introduction of participative methods and the impact of external factors.

If the critical problems of mass poverty and deprivation in the third world are to be dealt with, concerted action by the state will be needed. Local people do not have the resources to solve these problems through their own efforts alone … Participation is highly desirable but the poor cannot survive on rhetoric and idealism.

In the final analysis, development is a process of collective action that involves co-operation between diverse actors in the pursuit of common goals.

Most projects are mainly designed around what the poor need, but attention should be also focused on "what the poor have, rather than only what they do not have".

The needs driven approach starts out by focusing on the needs deficiencies and problems of poor communities, and devises projects to address these needs and problems.

These needs-based only approach creates mental maps of communities that encouraged its members to think about themselves as fundamentally deficient and as powerless victims of their circumstances.

The development of a victim image encourages a culture of entitlement, and the use of tradition as a resource can lead to its misuse by powerful groups.

• It focuses on problems and deficiencies of communities rather than their strengths, and thus creates a negative image of the community.
• As the needs and deficiencies of poor communities are often overwhelming, the needs-based approach serves to discourage and disempower communities rather than encourage and empower them.

• Community leaders and members are encouraged by the needs-based approach to dwell upon and even exaggerate their needs and deficiencies because qualifying for aid often depends upon showing that one's needs and problems are greater than those of others. This created dependence on outside agencies to which communities look for assistance and helps to perpetuate perceptions of disempowerment.

• Powerlessness and dependency in turn create attitudes of hopelessness and entitlement that act as a drain on the limited resources of service-delivery and development agencies. Communities are therefore encouraged to become consumers of services rather than producers.

• The needs-based approach also tends to fragment efforts to find solutions to the interrelated problems of poor communities.

• Finally, as research and research funding agencies are predominantly needs and problem-oriented, our knowledge of poor communities is skewed towards their problems and weaknesses rather than their capacities and strengths.