

WCB ENGINEERING BULLETIN

The Institution of Certificated Mechanical and
Electrical Engineers
Western Cape Branch (WCB)
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MISSION STATEMENT : 1. To uphold the image and status of the Certificated Engineer. 2. To represent the Certificated Engineer at ECSA and other decision-making bodies concerning legislation, safety & health standards, the environment and the machinery regulations. 3. To promote continued education and training of its members and future engineers. 4. Promote fellowship in the engineering profession.

Editorial

This branch has been fortunate in the quality of speakers who have brought new information to our attention, especially in the field of computer technology. On 28 August Clive Clifford spoke on Internet as an Engineering Tool. Using the overhead projector controlled by the computer he went into the WWWeb and drew out information on whatever topic was suggested. All at the cost of a telephone call (apart from the service providers nominal fee).

He spoke of advances such as a Zip drive of 100 MB with a capacity 70 times that of the usual stiffy, and a Jazz drive with still 10 times more storage capacity than that. And a CD with 650 MB memory. He said Internet was growing at the rate of 10 - 12% per month.

Then the last speaker at the Seminar on 16 September, Trevor Roberts, astounded us when he said that the availability of information on the WWWeb will really take off in 2010 to 2020. What we have now is only the tip of the iceberg. The address "industry.net" provides access to vast engineering information. There is even a gogga called "Bot" which will search for the item you want. The first speaker of the Seminar was Dr Wichers who lectures in Systems Engineering at the Potchefstroom University. Using transparencies he moved rapidly through probably the whole field of computerised maintenance management. The other contributions were of a more practical nature by speakers sharing their experiences in particular aspects of the subject.

Adrian Wyntje in his article has raised the point that engineers should share their experiences with their fellows. To get an engineer to put pen to paper is like dragging someone to the dentist. There is a wealth of problems and solutions out there which will never see the light of day. Why is this breed so modest? Or don't they want to admit that there were problems — everything in the garden was lovely and everything ran sweetly! The accidents which are regularly described in this bulletin resulted when things went wrong and there is no doubt that they give information which helps to prevent similar incidents.

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Local Branch News

Our Maintenance Management Seminar held on the 16th September was reasonably successful. The reason I refer to it as "reasonably successful" is the poor support/turnout of our members. The primary objective of such events is to fulfil our obligations to members to promote continuous training and keeping members informed of developments.

No midsize to large manufacturing facility will survive in the future unless its management systems are scientifically based to facilitate that, whatever it is we manage, is done in a cost effective manner.

The contents of the seminar was put together to give the Engineer/Maintenance Manager an insight into the processes involved in establishing a scientifically based maintenance management system that would ensure cost effective maintenance.

We as a committee would like to see more members involved in the activities of our local branch. We therefore need to know what a member expects from an institution such as ours.

Firstly we want to invite you as a member to put on paper any suggestions you might have as well as your expectations with reference to our activities locally.

Apart from the expectations you might have insofar as our local activities go, I think we can safely assume you would expect ICMEE to represent your interest at ECSA and other statutory and decision making bodies. It has been said before from more than one source, but it is so important that I have to say it again. It is extremely important for the future well-being of the profession that you urge your colleagues and friends to apply for membership with ICMEE and equally important, register with ECSA if they qualify. ICMEE council members representing us at these bodies are as strong as the members backing them. We certainly don't want to see a repeat of events when the kW rating requirement for a Cert. Eng. was increased from 1200 kW to 3000 kW.

Some of you will remember the number of Engineers that lost their jobs. Decision-making bodies such as these do not know the value and worth of the Cert. Eng., only the numbers backing their representatives.

We had a request from members to look at possibilities to assist unemployed members. We are in the process of talking to reputable employment agencies to utilize this newsletter to advertise. We will in turn invite members who are in the market to forward their CV's to the committee for presentation to agencies. More specific details will be forthcoming shortly.

See you all at our next visit which is to Eskom's power generation facility at Steenbras on the 14th October (provisionally).

Hein Muller ☐

A COSTLY INCIDENT REVEALS INADEQUATE PROVISIONS OF PREVENTIVE MEASURES

The loss of one boiler is bad enough, but losing a second one within a few days of the first one is a total disaster.

Production comes to a grinding halt.

Repairs to first boiler were: replacing collapsed furnace, re-tubing of second gas pass and repair to cracked tube plate.

The second boiler had to have its furnace replaced.

The combined steam capacity was 15 tonne/hour.

Heated vegetable oil had found its way via leaking tubes in the heat exchanger into the condensate return line, and from the condensate feed water tank into the boiler. Unlike mineral oil this oil emulsified with the condensate.

The resultant mixture, settling on heated surfaces, inhibited normal heat transfer. Coagulation also took place, turning part of the mixture into a buttery substance, partially filling the float chambers of the boiler water "level" controls which may have prevented the start up of the feed water pump.

The overheating and subsequent collapse of the boiler parts are a direct result of the prevailing condition at the time.

Several plans have been explored by the user to prevent a repetition of this unfortunate event. Basic requirements are an early detection of oil contaminated condensate and the means to dump contaminated condensate when detected.

A problem is that while water in the boiler evaporates, the oil remains and accumulates. Small oil leaks therefore may go unnoticed for a long time while accumulation takes place.

Turbidity meters are available, but are these sensitive enough to detect small amounts of oil?

The user intends to analyse samples from boiler and feed water tank every shift, but again how accurate will this analysis be where only traces of oil are involved? One suggestion is to discharge condensate into a settling tank before pumping its contents into the feed water tank. However, is there enough time for 10 tonnes of water per hour to settle to detect traces of oil? it would be simpler to divert and collect 40 litres of condensate per shift into a small scale settling or cascade type container. This water could be used for analysis by a suitable method. The presence of oil, having had hours to settle or separate, would most likely also be visible with the naked eye.

As good solutions are seldom easy, would any reader be able to contribute to a satisfactory solution? Please do so by writing to your editor to have your suggestions published in the next WC Bulletin.

In this way a forum could be initiated for questions and answers among our members. We all have something to offer in our special fields of knowledge. By doing so we contribute to our Institution and our fellow members.

Adrian Wyntje

Editor's comment

The water in the boiler is the agent which keeps the metal

plate within safe limits. The water must 'wet' the surfaces, i.e. it must be in full contact with the plate. The condition of the water is critical. Dissolved solids like calcium carbonate which easily precipitate out on a hot surface form the scale which impedes heat transfer. Suspended solids such as oil which stick to hot surfaces where boiling takes place will impede heat transfer. Because of the availability of large amounts of heat at about 1000 degrees Celsius which is trying to get through to a substance whose temperature is not more than about 182 degrees then any impediment will raise the plate temperature to an undesirable extent. When the metal becomes plastic the steam pressure does the deformation.

Plate at 500°C and above in a hostile environment is subject to corrosion.

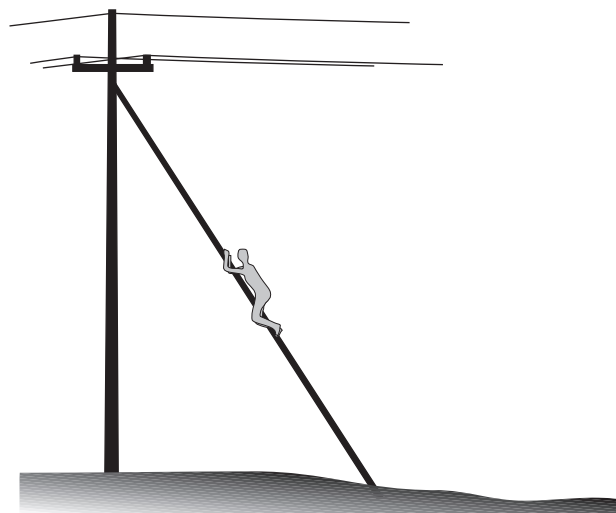
Apart from maintaining boiler water uncontaminated, the formulation of steam bubbles reduce the density of the water in the boiler and its cooling effect is reduced. With the thermal variations inherent in a steaming boiler welded plate which has been overheated will be subject to cracking where plate movement occurs. Cracking usually starts at the toe of a weld and progresses sometimes through the weld and beyond. Metal under stress due to bending is also subject to corrosion and cracking under these raised temperature conditions. □

FATAL CLIMB UP 11 kV STRUT POLE

A 12 Year old boy climbed a steel strut pole and with his right arm made contact with an 11 kV conductor. The pole stood 7.6 m above ground. His right arm and left thigh showed burn marks. Death was due to a fall which caused a head injury. An earth leakage relay tripped as a result of the contact at about 15:00. The circuit breaker was switched in without tripping again. The next day the accident was reported to the Electrical Department.

Three boys had been playing in a field. One climbed up the strut pole but could only get halfway. The other boy, stronger and more daring, climbed to the top and the accident occurred.

The adventurous spirit of the boys is to be commended, but that a life should be lost due to ignorance of the dangers of electricity is the real tragedy. □



LEGAL KNOWLEDGE

November 1996

Question 3

- (a) Every employer who works with asbestos shall take steps to ensure that every employee is systematically and thoroughly trained. Name FIVE aspects which must be included in the training of these employees, as mentioned in the regulations.
- (b) The workplace in your factory has specialised lighting. Name the requirements called for by the regulations in respect of lighting which must be complied with.

ANSWER TO QUESTION 3

- A. Asbestos Regulation (AR) 5 (a to f)
- (a) Employees must be informed of these regulations
 - (b) Employee must be informed of the likely sources of dust which may contain regulated asbestos fibres at his workplace.
 - (c) Informed of the potential dangers to health of exposure to asbestos.
 - (d) Informed of the risks associated with exposure to asbestos coupled with smoking.
 - (e) Must be informed and trained regarding the precautions to be taken to protect himself against the effects of regulated asbestos fibres, including the wearing and use of protective clothing and respiratory protective equipment.
 - (f) Informed and trained regarding the proper use and maintenance and the limitations of all safety equipment and facilities provided.
- B. Environment Regulations (ER) 3(1)
The employer shall ensure that such specialised lighting is available to and is used by such employees.
- ER 3(3) (a to d)
- (a) Average illuminance at any floor level within 5 m of a task must not be less than one fifth of the average illuminance on that task.
 - (b) Glare must be reduced to a level that does not impair vision.
 - (c) Lighting on rotating machinery must eliminate stroboscopic effects.
 - (d) Luminaires and lamps must be kept clean and replaced or repaired forthwith when defective. □

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FATAL SHOCK

Whilst trying to repair a damaged micro-switch a 24 year old fitter was electrocuted. The micro-switch was fitted to the horseshoe bend of a conveyor belt system. The bread pans used to pile up on this bend and the switch was fitted to stop the conveyor as soon as this occurred. The spring loaded arm on the switch would move back as soon as the pans were removed and the conveyor would run again. It was found after the accident that the arm on the switch was bent towards the casing and that the contacts were in the open position. This prevented the conveyor from moving. The now deceased removed the top of the switch (it was found next to his body) and tried to close the contacts without isolating the circuit. A shifting spanner and a screw driver with a plastic handle were found at the scene. The post-mortem report revealed evidence of electric burn marks on the right hand of the deceased.

The fitter had been employed for about two months and was aware of the fact that an electrical handyman was on standby on a 24 hour basis and that he was not allowed to work on electrically charged equipment. The accident occurred at about 18:50. By working on the switch the deceased contravened the regulations which allowed only a competent person to work on electrically charged equipment. After the accident the electrical handyman tested the system for electric leaks but nothing could be found. A circuit breaker was found to have tripped on overload.

As the now deceased was responsible for his own death the prosecution of any other person could not be recommended. A manually operated isolating switch was fitted to the wall in place of the micro-switch.

Comment

General Machinery Regulation (GMR) 5(1) requires the employer/user to permit only competent or trained persons to work on live electrical equipment.

The fitter was not authorised to open the micro-switch and could have called out the authorised persons. He also did not inform the shift foreman of his intention to open the switch. He also did not attempt to isolate the electrical supply. He endangered himself through ignorance or over-confidence in his ability. All that was needed to be done was to bend the arm straight.

Section 8 of the main Act is very relevant to such an incident. S8(2)(e) requires the employer to provide information, instructions, training and supervision for the health and safety of employees.

S8(2)(l) requires the employer to provide trained supervision with authority to implement precautionary measures taken by the employer.

No attempt was made to apply methods of resuscitation to the shocked person and it does not appear that a qualified first aider was on shift at the time. □

PLANT ENGINEERING

November 1989 Question 4

The maintenance control system used in a factory has to control a wide spectrum of activities and has to keep an effective and efficient balance between these functions.

- (a) State the various aspects which the maintenance control system must keep in correct balance. (7)
- (b) State the THREE time bases which must be used to create a maintenance control system. (3)
- (c) A vital feature of any maintenance control system is a priority system. State the essential characteristics of such a priority system. (10) [20]

Answer to Question 4

- (a) In organising, running and managing the maintenance department of a factory or similar undertaking, items such as the following have to be kept in efficient and cost effective balance:
 - Preventive and corrective (i.e. breakdown or crisis) maintenance routine repair work;
 - Spares carried in the company stores and those locally available;
 - Work on downtime and work on breakdowns;
 - Maintenance work and its effects on production runs;
 - Alterations and modifications to plant and minor construction work;
 - Plant and personnel safety and protection of the environment;
 - Sundry and incidental work.
- (b) Maintenance work can be planned and organised on three broad time bases, namely:
 - (i) A short range basis dictated by the job and day, such as adjustment to equipment to correct production run quality deviations, emergency repairs, etc.
 - (ii) A medium term basis (such as annual) so as to balance major project work, schedule planned maintenance, perform statutory inspections, provide for orderly vacations of maintenance staff, set up maintenance budgets, etc.
 - (iii) A long term basis (say from more than one year to ten years) to arrange, organise and ensure the availability of proper skills, space, equipment, capital, replacement plant, etc.
- (c) To be effective and functional a priority system of a maintenance control function must:
 - (i) Be assigned by both production and maintenance departments in the factory;
 - (ii) Give proper recognition to every piece of equipment in the factory;
 - (iii) Consider plant utilities (i.e services such as water, electricity, roads compressed air, steam, etc.) and their transmission lines;
 - (iv) Consider all the various aspects of safety and environmental issues;
 - (v) Be simple enough for all involved parties to understand;
 - (vi) Be rigid enough not to be abused;
 - (vii) Be sufficiently flexible to cover shifting circumstances.

OCCUPATIONAL HEALTH & SAFETY ACT 85 OF 1993

Section 38:

Offences, penalties and special orders of court
The penalty for the offences as itemised in subclause (1) is R5000 or one year's imprisonment or both. These 16 items should be looked at and it will be inferred that the maintenance of health and safety at a workplace is regarded in a very serious light.

Section 38(2)

provides for twice the fine and imprisonment in the following circumstance:

If an act or omission on the part of an employer or user of machinery could have led to the death of an employer, but did not, then that incident would be treated as though it were a case of culpable homicide, and the maximum penalty would be doubled.

Section 43: Regulations

This section enables the Minister of Labour to promulgate regulations in the Government Gazette without reference to Parliament.

Section 44:

Incorporation of health and safety standards in regulations

The purpose of this section is to reduce the writing and updating of detailed regulations which could better be done in Standards and Codes of Practice by institutions such as the SA Bureau of Standards. It must, however, be borne in mind that once a standard is incorporated it has the force of law with the corresponding penalties for contraventions. E.g. if electrical Wiring work as defined is not done as per SABS 0142, as amended, the offender could be charged in a magistrate's court as a criminal offence.

STOP PRESS

18 November 1997

The Talk on Variable Speed Drives will include updated technology. It will be given by Telemechanique which is part of Group Schneider. At Eskom Test and Demo Centre.

SPECIAL NOTICE

Members who are in the market for change of employment are invited to send their CVs to the Committee. Reputable placement agencies will be contacted and arrangements made to consult the Committee when applicants are required. Strict confidentiality will be observed.

It is hoped that in this way a service can be rendered to our members. Personal contact can be made with the Editor or any member of the Committee.

Jokes

When the American comedian George Burns was 90 he went to see his doctor, complaining of a sore knee. The doctor told him, "You must expect such things at your age."

"Why?" asked Burns. "The other knee's fine and it's the same age."