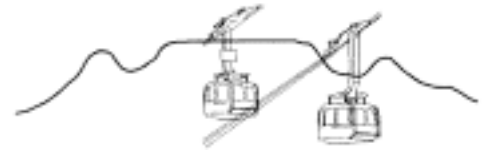




WCB ENGINEERING BULLETIN

The Institution of Certificated Mechanical and Electrical Engineers
Western Cape Branch (WCB)

P O Box 504, Rondebosch, 7700



DECEMBER 2006

- 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 is the last bulletin for this year. My, but time does seem to fly! It was just the other day that we started the year in fine style.

We would like to wish all our readers greetings for the festive season and a Prosperous 2007! May the bird of happiness fly over your head.

In this issue we have our normal items with a contribution from a member on Electrical Safety on Building Sites. Safety is still very much the issue of the day and one just has to read the papers to see just how many incidents take place. As recent as Sunday it was reported of two workers being covered in a trench which collapsed while they were digging it. It was for electrical cables! So, I ask you, why was there no shoring or supervision? Luckily the workers were removed unscathed.

I trust that you will find the contents of this news bulletin interesting enough to pass on to your colleagues and friends.

Chris Schnehage

Editor: Henriette Venter email: vencon@netactive.co.za

LOCAL BRANCH NEWS

During the past few months we have had the following activities put on for members.

Tuesday 03 October – 16 members and guests attended the visit to the Klipheuwel wind power farm. It was a most interesting visit in spite of the fact that the units were not running due to maintenance in the nearby distribution station.

Unfortunately our scheduled visit to the Amalgamated Beverages Canners in Epping did not happen due to a shortage of CO₂. We will try to arrange a visit next year.

Tuesday 21 November – 10 members and guests enjoyed a presentation on large generator set maintenance issues by John Davidson, one of our committee members. The talk was of great interest.

Friday 24 November – a group of us went to the Constantia Nek restaurant where we held a dinner dance in fine fashion! A pity more of you did not manage to attend. It was a most pleasant evening.

The next few months' events planned are:

February 2007 - AGM – Talk on Buildings and the maintenance regime followed by a member of Drake & Scull.

March 2007 – Berg River Dam site visit followed by a wine farm lunch nearby.

April 2007 – Talk on diesel fuels & General lubrication

We look forward to seeing you at one of our functions.

Ciao for now!

Chris Schnehage

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WCB ENGINEERING BULLETIN

FIRES AND EXPLOSIONS IN AIR COMPRESSOR INSTALLATIONS

Internal fires occasionally develop on the pressure side of air compressor installations and, while in many instances they only result in damage to safety valves and pipe-work, in severe cases they may culminate in explosive rupture of the air receiver or associated pipe-work. It is thought that the accompanying notes on the subject, with a consideration of measures which should have been taken to prevent such occurrences, will be of interest.

Although the precise circumstances and causes of fires or explosions have not been accurately defined, all the evidence indicates that these events are associated with a high air discharge temperature and a build-up of carbonaceous deposits within the system. Such deposits are due principally to oxidation, by an abnormally high air temperature, of lubricating oil carried over from the air compressor.

The rate of oxidation of lubrication oil is governed by the temperature attained in service. The oxidation products which first form dissolve in the oil, but become less soluble as oxidation proceeds ultimately giving precipitates which tend to deposit on the hotter parts of the system, such as delivery valves and ports, interconnecting pipe-work and ultimately the intercoolers and air receivers. The quantity of oil which finds its way to the pressure side of the system is related to the mechanical condition of the moving parts – principally the wear sustained by piston rings and bores and by valves. In addition, defective valves which allow hot, compressed air to leak back into the cylinder where it mixes with the new charge and suffers re-compression. This effect, to which the term "double shuffling" is sometimes applied, is cumulative and results in a progressive increase in the temperature of the discharged air which, as indicated previously, facilitates further oxidation.

It is also conceivable that the production of flammable or explosive oil vapour/air mixes on the discharge side could initiate a fire or detonation when ignited by particles of incandescent carbonaceous material and there is a body of opinion that considers the flash-point of the lubricating oil is of primary significance when selecting a suitable oil for an air compressor. It is thought that it is this property which indicates the volatility of the oil and therefore the fire and explosive hazard is increased by the use of oils of low flash-point.

Several cases are reviewed

Case 1

The 3" safety valve on an air receiver working at 690 kPa suddenly disintegrated. When the receiver was opened up a few hours later it was found to be full of smoke and its general condition indicated that an internal fire had occurred adjacent to the inlet pipe from the compressor.

Evidence of burnt oil was evident in the inlet pipe and on the safety valve outlet. A quantity of oil was also present in the vessel. Subsequent examination showed that a discharge valve of one of the compressors serving the receiver had broken and that a splash guard was missing from the crank case features which could have led to an excessive amount of oil carryover. A small 9" diameter vessel which functioned as an oil separator in the discharge pipe from the compressor was also opened for inspection. An internal layer of carbonaceous deposit 20 mm thick was present and it was considered that the fire started in this vessel and spread subsequently to the receiver. The flash point of the compressor lubricating oil was 210° C.

Case 2

The air receiver connected to an installation operating at 690 kPa suddenly ruptured with explosive force. The main body of the vessel was blown through the roof of the compressor-house came to rest 50 m away. The welded-on bottom end plate had been torn away complete with a small portion of the steel shell still attached and its curvature had been reversed.. Internally, a carbonaceous deposit 1,5 mm thick was present, but there was no discolouration of the external paintwork, as may have been expected if the explosion had been preceded by a fire of significant proportions.

Metallurgical examination of samples cut from the receiver did not reveal any evidence of fatigue cracks or other pre-existing defects which may have resulted in failure at the normal working pressure. The safety valve, which was intact and branded "1 000 kPa", was removed and when tested was found to relieve at 1 000 kPa. It was, therefore, unsuitable for the stipulated working pressure of the receiver. A fusible plug was fitted to the replacement receiver in an endeavour to prevent a recurrence.

Reference: British Engine Technical Report.

The G.C.C. is the engineers' passport in the world of industry

*This contribution submitted by
Michael Jaffe*

USE OF LOCK OUT SYSTEMS

A recent article published in the Cape Argus on 22 November 2006 caught my eye, the title of the article was "Man's legs crushed in concrete mixer". This article intrigued me as who would think that a man would have his legs crushed in a concrete mixer! Well, this chap did get it right. It was one of these mobile machines and he wanted to work on the inside of the rotating drum. Well, true to form, he switched off the machine and climbed in! As easy as that. But, he did not make use of a lock out mechanism or regime to ensure that no one started the machine while he was inside! "The machine was switched off but unfortunately it looks like someone came along and switched it on by mistake" said the Chief Fire Services of the Overstrand Municipality in the article.

The man has had his one leg amputated and the other was also on the danger list for amputation.

This is one of those incidents that could have been prevented should a thought have been given to safety.

Makes one think does it not? - Editor

COMMERCIAL MEMBERS

Drake & Scull (PTY) Ltd Tel 021 683-7056

Sappi Cape Kraft (PTY) Ltd Milnerton. Tel 021 552-2127

REGISTERED LIFTING MACHINE INSPECTORS

As you all know by now, entities performing load testing and examinations on lifting machinery must be registered with the Department of Labour and since the end of September 2006, all persons signing off the certificate, must be registered with the Engineering Council of South Africa, as "Registered Lifting Machine Inspectors".

Latest on the subject. The Engineering Council of South Africa has now made specific rules for "Registered Lifting Machine Inspectors" in the Engineering Profession Act, 2000 (Act 46 of 2000). These rules were made in terms of Section 18(1)(c) of the said Act, and is set out in a Schedule, which has come into operation on the date of publication in the Government Gazette. (**Government Gazette No. 29290 of 13 October 2006**).

In essence it makes provision for the registration of a "Registered Lifting Machine Inspectors Registration Committee", which will look after the registration of Lifting Machine Inspectors. It will also make provision for the drawing up of a Code of Professional Conduct, and the investigation into improper conduct of Lifting Machine Inspectors.

VERY IMPORTANT: They also mention that any person who is not registered may not carry out any test/inspection of lifting machinery. This would be constituted as "Improper Conduct" in terms of the Schedule.

This government gazette is available at the Government Printer. "Ensure that your lifting machinery is tested / inspected by the correct people"

OHSA Nov. 99 (3)

State the regulation requirements on guarding of the following machines in terms of the driven machinery regulations:

- (i) slitting machine: DMR 10
- (ii) a mixing machine in respect of the hinged covers of the mixing bowl. Name also the exclusion referred to in the regulation: DMR 11
- (iii) Positive displacement type air compressors which are not provided with automatic means of limiting the operating temperature. State also the exclusion referred to in the regulation. DMR 14
- (iv) When may a user permit the use of an air condition plant? DMR15
- (v) An explosive powered tool which is not provided with an intermediate piston. DMR20(1)

Select the option in brackets that will make the following statements in connection with the driven machinery regulations TRUE.

- (i) the factor of safety of the steel-wire main hoisting rope of a lifting machine where it is not prescribed by the standard is (4,5,10). DMR (18) (3)
- (ii) The time intervals of a performance test on lifting machines is (6,12,36) months. DMR (18) (5)
- (iii) the time intervals of the examination of ropes and safety devices of lifting machines is (6,12,36) months. DMR (18) (6)
- (iv) the factor of safety of non-endless two part or four part steel-wire ropes for lifting tackle is (6,8,10). DMR (18) (10) (c)
- (v) the time intervals for the examination of lifting tackle is (3,6,12) months. DMR (18) (10)(e)
- (vi) a 30 ton overhead shop crane can only be operated by an operator (specially trained/in possession of a certificate of training/with two years experience in lifting machines. DMR (11).

Jorge Pereira (Cert. Eng.)

Plant Eng. Nov. 06 (2.1)

Each of two transformers, A and B, are rated at 40 kVA. The core losses in A and B are 500 W and 250 W and the full-load copper losses are 500 W and 750 W respectively. Tabulate the losses and efficiency at quarter, half and full-load for a power factor of 0,8. For each transformer find the load at which the efficiency is a maximum. (13)

Transformer A:

at quarter full-load:

$$\text{Losses} = 500 + 0,25^2 \times 500 = 531,25 \text{ W}$$

$$\eta = \frac{0,25 \times 32000}{0,25 \times 32000 + 531,25} = 93,77\%$$

at half full-load:

$$\text{Losses} = 500 + 0,5^2 \times 500 = 625 \text{ W}$$

$$\eta = \frac{0,5 \times 32000}{0,5 \times 32000 + 625} = 96,24\%$$

at full-load:

$$\text{Losses} = 500 + 500 = 1000 \text{ W}$$

$$\eta = \frac{32000}{32000 + 1000} = 96,97\%$$

Load at maximum efficiency:

$$n = \sqrt{\frac{500}{500}} = 1$$

$$S_{\text{max}} = 40 \text{ kVA}$$

$$P_{\text{max}} = 40 \times 0,8 = 32 \text{ kW}$$

Transformer B:

at quarter full-load:

$$\text{Losses} = 250 + 0,25^2 \times 750 = 296,88 \text{ W}$$

$$\eta = \frac{0,25 \times 32000}{0,25 \times 32000 + 296,88} = 96,42\%$$

at half full-load:

$$\text{Losses} = 250 + 0,5^2 \times 750 = 437,5 \text{ W}$$

$$\eta = \frac{0,5 \times 32000}{0,5 \times 32000 + 437,5} = 97,34\%$$

at full-load:

$$\text{Losses} = 250 + 750 = 1000 \text{ W}$$

$$\eta = \frac{32000}{32000 + 1000} = 96,97\%$$

Load at maximum efficiency:

$$n = \sqrt{\frac{250}{750}} = 0,577$$

$$S_{\text{max}} = 40 \times 0,577 = 23,08 \text{ kVA}$$

$$P_{\text{max}} = 23,08 \times 0,8 = 18,46 \text{ kW}$$

Jorge Pereira (Cert. Eng.)

VEASEYS ENGINEERING COLLEGE
STUDY FOR THE G.C.C. WITH US.



LAW AND PLANT COURSES
PHONE MAGGIE 011 463 3536

Electrical Safety on Building Sites

With the recent spate of developments taking place, it is sometimes taken for granted that building sites, in terms of services provided, would be unsafe. In relation to electrical installations most contractors, working on such sites, believe that it is standard for installations to be sub-standard to that of a final installation. This is incorrect and to believe that a temporary builders supply should be less safe than the final installation is wrong.

A temporary builder's supply should offer the same protection if not more than that of a completed installation. The same requirements are applicable as per the electrical installation regulations of "The Occupational Health and Safety Act". The safety standard (SANS 10142-1) incorporated into these regulations take cognisance of this environment and section 7.4 requires extra protection for Construction sites, requiring all lighting circuits to be on earth leakage and fixed equipment to at least have an IP32 rating, various other extra requirements are contained in this section. All users or lessors of temporary builders electrical installation should, as per electrical installation regulation 3, be in possession of a certificate of compliance for such builders installation.

Further may the local supplier not connect a temporary supply to a building site without a Certificate of Compliance being produced, even if such installation only consist of a distribution board. The usage and installation of un-armoured cabling (twin and earth etc) sometimes loosely run over a building site, is extremely dangerous due to the nature of such environment. Damage to such cables often occurs and poses a dangerous especially where wet processes are in progress.

A further unfortunate procedure that has resulted in recent fatalities is the process of connecting the final installation when it is partially completed. This result in the electrical contractors working on live sections of an installation and people not related to the electrical work, being exposed to an unsafe installation. Such installation has not been verified safe by means of a certificate of compliance. This is especially true for light circuits where a Client requires access to the building whilst the installation has not yet been completed.

The correct process of course is to complete the installation, ensure that no personnel other than that of the electrical contractor is exposed to the installation and then to connect the installation to the supply for testing purposes. Should any fault be detected the supply should be disconnected, the faults repaired and the test be done in the same manner again. Never expose any electrical staff or other contractors to the installation before it has been certified safe by means of a Certificate of Compliance. The reality unfortunately is that on most building sites, even on some large projects, sites with specialist safety agents, the electrical installations do not comply.

Willem du Toit

Pr Cert Eng, MBA (NMMU), BTech, Hdip Eng, Master Inst Elect (MICMEESA)

For any Health and Safety queries please contact Willem or Leon.

Cape Inspection Services

Approved Inspection Authority
Certificate Nr. CI 011 ER

Leon Boshoff 082 359 5165 e-mail : wdutoit@telkomsa.net
Willem du Toit 0828207619 P.O Box 1880
Fax 044 -8746992 George , 6530

New Members!

The following persons joined the Western Cape branch of the Institution during 2006. Welcome to you all!

<u>First names</u>	<u>Surname</u>	<u>Grade</u>
Willem	Albertyn	Senior
Izak Wolfaardt	Bedeker	Member
Stephen Graeme	Brown	Member
Josua Joubert	Lombaard	Member
Brett Ashley	Potter	Member
Jonathan Anthony	Turner	Student

“Lost” Members!

Anyone know the people listed below?
We would like to get in touch with them as their post returns address unknown

<u>First names</u>	<u>Surname</u>
Christoffel Andries	Botes
David Anthony	Baxter
Donald Ivan	Cason
Hendrik Dirk	Duits
John Lloyd	Houghton
G E	James
Jacobus Christiaan	Janse van Vuuren
B C	Laing
Francis Andrew	Molyneaux
K J	Murphy
Carl Werner Stuber	Oeljeschlager
C	Oldroyd
William Richard	Paverd
Kenneth Michael	Peacocke
William David Loughlin	Poulton
F G	Radcliffe
J M	Reid
C M	Sakko
Gideon Jozua Hugo	Smit
G A	Spence
Frederick L Humphrey	Titely
Gerald John	Toomey
J	Van der Wouden
D P L	Van Ry
Johannes Adrianus	Verheul
Burgett Barry	Viljoen
John Richard Malcolm	Waddington
Johannes Gerhardus	Wiese
Michael George	Wilkie

Annual General Meeting

Please be reminded of our AGM at
Johannesburg
on 6 March 2007
at 18:00.

More details will be available later

PROJECT MANAGEMENT



Top Engineering Terms and Expressions (What engineers say versus what they mean)

1. A number of different approaches are being tried : (We are still guessing at this point.)
2. Close project coordination. : (We sat down and had coffee together.)
3. An extensive report is being prepared on a fresh approach. : (We just hired three punk kids out of school.)
4. Major technological breakthrough! : (It works OK, but looks very hi-tech!)
5. Customer satisfaction is believed assured. : (We are so far behind schedule, that the customer will take anything.)
6. Preliminary operational tests were inconclusive.: (The darn thing blew up when we threw the switch.)
7. Test results were extremely gratifying! : (Unbelievable, it actually worked!)
8. The entire concept will have to be abandoned. : (The only guy who understood the thing quit.)
9. It is in process. : (It is so wrapped in red tape that the situation is completely hopeless.)
10. We will look into it. : (Forget it! We have enough problems already.)
11. Please note and initial. : (Let's spread the responsibility for this.)
12. Give us the benefit of your thinking. : (We'll listen to what you have to say as long as it doesn't interfere with what we have already done or with what we are going to do.)