



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

The seminar on Gaskets and Total Sealability was well attended by 35 persons. Having a half day seminar seems to suit most people as they are able to get back to their work. It is good to know that the work ethic has not died!

The Committee is planning a seminar on Maintenance for September. This should be helpful to the Plant Engineer who would like to widen his knowledge of other concepts than the one he may be using.

In the newsletter "The Certificate" of April 1997 the proposed route to the new Certificate of Competency for factories is laid out in diagrammatic form. For purposes of this certificate four different levels of qualification are equally acceptable for registration as an Engineer-in-Training viz.

National Technical Diploma

B. Tech

National Higher Diploma

B Sc (Eng)

A school leaver interested in an engineering profession and anxious to get there quickly may decide to go the Technical College route which could gain him registration as Cert Eng in possibly less than five years — a type of instant engineer! There would soon be no shortage of these competent persons to fill the numerous vacant posts in the country. Demand would fall and salaries accordingly. To rectify the drift one can visualize a Union of Disgruntled Cert Eng's being formed, ready to march waving spanners and screwdrivers for their rights.

Should a registered technician, technologist or Professional Engineer decide he would like to be a competent person at a factory requiring a Cert Eng, would he need to register as a CEIT and be monitored?

Would a competent maintenance foreman, old enough in experience but too long in the tooth to study be acceptable under those grandfather clauses? (He probably is literally one.) Dave Sheldon is to be congratulated on editing "The Certificate" and the Council on disseminating it through the "Elektron". This is the type of exposure which our Institution has sorely needed.

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Local Branch News

Since our last Newsletter we have had a half day Seminar on gaskets and total sealability at the Baltimore Restaurant in Bellville. The eyes of those who attended were once again opened to the very significant losses of product and energy at our plants due to leaking interfaces as a result of:

- Poor maintenance practices and the fact that one often does not visually see the leakage.
- Incorrect selection of gasketing material for the application resulting in a much higher leak-rate through the actual gasketing material.

The Plant Engineer, being the person responsible for maintenance can make a major contribution in controlling the spillage of unwelcome substances into the atmosphere. In doing that significant savings in loss of product and wasted energy can be brought about.

By the time you read this we would have had our second General Meeting for the year. If you could not make it, the subject under discussion was the New Labour Relations Act and how it affects the Engineer. A subject which is of extreme importance to everyone in industry.

We did not have an April factory visit due to the seminar on the 17th and some members felt that too much time would be spent out of office.

Our local branch awarded a prize together with a floating trophy to the most promising student studying towards the GCC at the Western Province Technical College. Mr J Geldenhuys, an N6 student achieved one distinction and all other subjects above 70% in his final year, was the worthy recipient at their annual prize-giving on the 26th March 1997.

ICMEE central council also awarded a prize to the best Technikon student taking the Technicians' sandwich course in Mech/Electr (Heavy current) Engineering. Mr Marcello Bartolini, who completed the National Diploma Electrical Engineering (Heavy current) and achieved 14 distinctions out of 21 subjects with a course average of 79.6%, was the recipient. His prize was handed to him on the 23rd May during an in-house ceremony at the Cape Technikon.

"Congratulations to both the above-mentioned achievers".

Dates for our future events for you to diarise are as follows:

- * Second general meeting at the Edgemoed Test and Demo centre - "Labour relations, the new Act and the Engineer" on 27th May 1997 at 17:30 for 18:00.
- * Third general meeting at the same venue. "Internet as an Engineering tool". On the 19th August 1997.
- * Fourth general meeting at the same venue: "Variable speed drives" on the 18th November 1997.

Our future factory visits are planned as follows:

- * 17th June a visit to the "Old Mutual ice plant".

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ELECTRICITY AND THE METAL LADDER

An 11 kV power line supplied a factory and a new line was built by the Electric Supply Company which crossed under the existing line about 4.5 m from the terminal pole. The intention was to connect jumpers between the two lines at the intersection. The new line would supply electricity to a cottage on the site.

Electrician Bill arrived in a truck with seven labourers and proceeded to do some work on the new line. Shortly afterwards Electrician George arrived by station wagon with his two labourers and assisted Bill.

After completion of this work, arrangements were made between Bill and the factory manager for the power supply to be disconnected at 10:55. The labourers sat around having a tea break. Before he left to isolate the line Bill instructed Jack in English to tell the gang to take the ladder, ropes and pins off the truck and place them on the ground at the intersection where the work was to take place, and not to put the ladder against the pole because the power line was alive. He also pointed out which pole was alive and which pole was not alive. Jack repeated the instruction in Xhosa, but apparently some of the labourers were not paying attention. Bill then left in the station wagon and George was left in charge.

After the tea break William and Jackson took the ladder off the truck and placed it at the foot of the live terminal pole where the transformer was mounted and where the bare jumper wires were about 4.5 m from the ground at the transformer bushings. George was standing at the driver's door of the truck waiting for a radio message from Bill. The truck was about 27 m from the transformer pole. William, an elderly and experienced labourer, stood at the foot of the ladder and Jackson and Wellington stood on opposite sides. Jackson assumed that William wanted them to lift the ladder, which they proceeded to do. William assisted by placing his feet against the feet of the ladder. He says he was confused because they had earlier worked on the new line which was dead. As the ladder was raised William did try to prevent it from touching the droppers. No one actually saw the ladder touch the wire. The ladder was of aluminium of length 6,8 m when not extended. The ladder did in fact touch a live jumper and the three men were shocked. They screamed and George saw them collapsing. Another labourer Fred came up to assist and he was slightly shocked.

George, the manager and some labourers all assisted with artificial respiration but Wellington could not be revived. William had slight burns on one hand and both feet. Jackson had slight burns on one hand, was unconscious and not breathing but was revived by artificial respiration, whilst Fred received slight burns on one finger and a slight shock. A Police van took the three injured men to hospital and an ambulance took Wellington away. He appeared to be dead. Cause of death was later established to be electrocution.

Comment

Had George maintained constant personal supervision over the labourers he would have spotted their intention and could have stopped them in time. He had, of course, to stand by the radio to await the all clear from Bill, but he should have placed himself in a position where he could watch the danger area. It is not sufficient to give an instruction to a labourer and expect that it will be carried out to the letter without further supervision.

William was a man of 57 years and had had 9 years' experience with the Electricity Company. He knew the line was alive and he could have prevented the ladder being raised. He was not a satisfactory witness at the inquiry and it is strongly suspected that he initiated the raising of the ladder. Metal ladders are dangerous in the proximity of bare electric wires and their use should be closely supervised.

The height of the jumpers was found to be 4.57 m from the ground when Regulation required 5.1 m. Although this discrepancy would probably not have prevented this accident, the contravention was nevertheless pointed out to the supply company. □

Branch Chairman Hein Muller presented the R250 award for the best results in engineering subjects to J Geldenhuys of the Technical College on 26 March 1997.

This award is from the Western Cape Branch of the ICMEE and is presented annually.



Profile

- Name :** Stephanus (Fanie) Venter
Company : Stephanus Venter & Partners Inc.& others
Position : Consulting Engineer & Director of Companies
Qualifications : Professional Engineer
B Sc B Eng (5 year course, Stellenbosch)
GCC Electrical and Mechanical
Date of Birth : 30 June 1938, Barberton, Mpumalanga
Family : Married to Henriette (27 years)
Best Personal Achievement : Rotary International Paul Harris Fellow Award 1992
Hobbies : Reading – Technical, Financial & Science Fiction, keen Do-it-Yourselfer
Sport : Couch potato (gavr up golf, swimming & skindiving)

Legal Knowledge

Act no 85 of 1993

June 1995 Question No 2

- (a) Where an employer requires any person to enter any place from or into which solid or particulate material is being discharged and where a danger exists of a person being engulfed by such solid or particular material, certain precautionary measures have to be taken. Name ALL these measures. (10)
- (b) With regard to a structure being demolished, every employer who performs building work shall, with respect to such demolition, ensure that certain steps are taken. Name these steps. (12)
- (c) A person working in an elevated position, may only do so from certain positions. Name these positions. (3)
- [25]

Answer to Question 2

(A) General Safety Regulation 7

- (a) A safety belt must be provided and properly used.
- (b) At least one person who has been properly instructed must remain in attendance outside to keep the persons therein under continuous observation in order to render assistance in an emergency.
- (c) The precautions prescribed by GSR 5 must be taken if dangerous gas, fumes, dust or vapour may be present.

(B) GSR 13

- (a) (i) Areas not to be overloaded.
- (ii) Precautions to be taken against collapse when removing frames or cutting concrete.
- (iii) Shoring to be provided to prevent accidental collapse of structures or adjoining structures.
- (d) Ensure the stability of an adjoining building or structure.
- (e) Ensure the safety of persons from services such as electricity, water or gas.

(C) GSR 6

From a ladder or scaffolding or a position as safe as from a scaffold.
□

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- * 22nd July a visit to "John Thompson Africa".
- * 22nd September to be finalised.
- * 14th October a visit to the Steenbras Power generating Plant.
- The above dates are all planned dates and are subject to change. Our annual dinner/dance is being planned for October/November. I trust we will see you all at these events. They are arranged, often with great difficulty, for the benefit of us as members. □

HEIN MULLER

Occupational Health & Safety Act

NO 85 OF 1993 Issue No 6

Section 30: Special Functions of Inspectors

An inspector may:

- (i) Prohibit an employer from performing or allowing an act which threatens the health or safety of a person.
- (ii) Prohibit a user from using plant or machinery which threatens the health or safety of a person.
- (iii) Limit the time an employee is exposed to a hazardous substance.
- (iv) Direct an employer or user to take specified steps to protect the health or safety of persons.
- (v) Specify the period in which these steps must be taken. This period may be extended.

The above notices must be drawn to the attention of the H & S reps and the employees concerned.

Section 31: Investigations

An inspector may investigate any incident which caused injury, illness or death or likely to cause such.

He shall forward his report and documentation to the Attorney-General and the Chief Inspector.

Section 32: Formal Inquiries

The Chief Inspector may direct an inspector to hold a formal inquiry.

An inspector may subpoena any person to give evidence.

The law governing criminal trials in a Magistrate's Court will be applicable mutatis mutandis.

The inquiry will be public to the extent allowed by the inspector.

Interested persons may appear in person or be legally represented.

The inspector shall forward his report and evidence to the Chief Inspector. In the event of a serious incident a copy must go to the A-G

The A-G may deal with the matter under the Inquests Act and or Criminal Procedure Act. □

PLANT ENGINEERING

JUNE 1993 QUESTION No 8

(a) A refrigeration plant uses Freon 12 as a working fluid and operates between pressure limits 270 kPa and 840 kPa. The vapour enters the compressor dry saturated and the liquid at the outlet from the compressor is undercooled by 5°C.

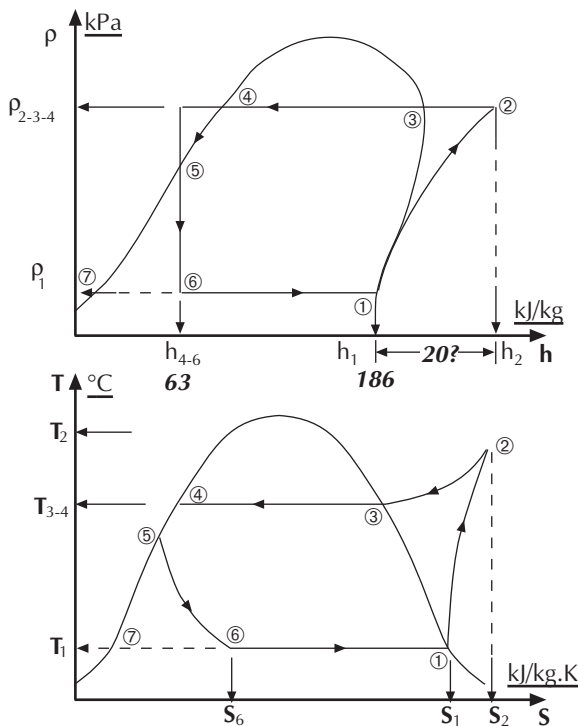
The single-acting single-stage compressor has a piston diameter of 74 mm and a stroke of 80 mm. The volumetric efficiency is 72% at the running speed of 800 r/min.

Determine:

- (i) the actual coefficient of performance
 - (ii) the refrigeration capacity (kJ/s)
 - (iii) the power required to drive the compressor (kW)
- Enthalpy at beginning of compression 185 kJ/kg
 Enthalpy after compression 20 kJ/kg
 Enthalpy after expansion 63 kJ/kg
 Specific volume of refrigerant at 270 kPa 0.068 m³/kg

(b) Describe how you would evacuate the refrigerant from a large refrigeration unit and how you would pressure test the condenser vessel.

ANSWER TO QUESTION 8



Effective volume = swept volume x volumetric efficiency

$$= \frac{\pi \cdot 0.074^2 \cdot 0.08 \cdot 0.72}{4} = 2.4773 \cdot 10^{-3} \text{ m}^3$$

$$\text{Effective swept volume per second} = \frac{800 \cdot 2.4773 \cdot 10^{-3}}{60} = 3.3 \cdot 10^{-3} \text{ m}^3/\text{s}$$

$$\text{Mass flow } \dot{m}_{\text{ref}} = \frac{\text{volumetric flow}}{\text{specific volume}} = \frac{3.3 \cdot 10^{-3}}{0.068} = 48.574 \cdot 10^{-3} \text{ kg}^3/\text{s}$$

$$\text{(i) Coeff. of performance} = \frac{\text{heat energy rejected}}{\text{heat energy applied}} = \frac{h_1 - h_6}{h_2 - h_1} = \frac{186 - 63}{206 - 186} = 6.15$$

which is quite ridiculous.

$$\text{Refrigeration capacity} = \dot{m}_{\text{ref}} \cdot \text{heat captured by evaporator} = 0.048574 \cdot (186 - 63) = 5.975 \text{ kJ/s (i.e. kW)}$$

$$\text{Power supplied to the compressor} = \dot{m}_{\text{ref}} \cdot (h_2 - h_1) = 0.048574 \cdot 20 = 0.9714 \text{ kW}$$

This value is very low. Presumably the examiners had some other value in mind, but, the given values, as adjusted to have some meaning, produce this.

8(b) The inlet to the condenser is closed and the compressor is run so as to evacuate the refrigerant from the lines and pump it into a liquid receiver provided for the purpose. When the plant is evacuated the outlet from the condenser and the inlet to the liquid receiver is closed.

The condenser unit can now be disconnected from the plant. Pressure lines can then be connected to the condenser. Depending on the type of condenser it can be either hydraulically or gas tested, with nitrogen. If it is hydraulically tested the test pressure can be 1.25 times the maximum operating pressure. If it is gas tested the pressure will be 1.1 times the maximum operating pressure and measures have to be taken to contain blast damage in the event of rupture while under pressure.

Before any tests are done the compressor motor must be effectively isolated and locked out. The compressor starts automatically in normal operation and this must be prevented.

Once the test is completed the condenser will be evacuated and at the completion of the this the refrigerant will be bled back into it and the system progressively recharged, prior to recommissioning. □

A FAMOUS SOUTH AFRICAN SCIENTIST

The local branch of the SAIEE hosted a guest speaker from Liverpool University, Mr Brian Austin at their meeting on 16 May. He described the life and work of Sir Basil Schonland, a South African who became famous for his scientific contribution in both World Wars. Schonland investigated the cause of lightening and conducted experiments in South Africa on radar.

This latter interest was sparked by a chance meeting with a New Zealand scientist whom he met on a ship travelling via Cape Town and Durban to N-Z. They discussed the concept of radio echoes as a means of distance measurement. Later in December 1939 while WW2 was being fought Schonland set up an experiment in SA in which gave him an echo from a water tower over a distance of 8 miles.

When Britain approached Commonwealth countries for assistance in the war effort General Smuts, who shared his botanical interest with Schonland's father (also a botanist), recommended Schonland to the British. He engaged in scientific experiments, including radar and the effects of shrapnel on the human body. He also conducted research into nuclear energy at Harwell. At the time of the Normandy landing he was scientific advisor to Field Marshall Montgomery.

He was duly knighted. □

This information verbally reported by a member of the audience - Editor