

# The education, training, and employment of engineers\*

by Colin M. Spence†

If one is to discuss sensibly and beneficially the whole spectrum of education, training, and employment of engineers, it is not possible to confine oneself to Professional Engineers because the profession of engineering embraces also technologists, technicians, and those people known in South Africa as certificated engineers. It would therefore be imprudent if this seminar were to be limited to certain sectors of the profession and industry. I hope that it will review the full situation from top to bottom and from side to side.

## Formal and Informal Education

I am grateful to Dr P.C. Pretorius of Bruinette, Kruger, Stoffberg for the observation that the De Lange Report on Education laid emphasis on the fact that *total* education consists of both 'formal' and 'informal' education. It is surely everyone's experience that the success of any professional man is dependent not only upon his formal academic education but also on his own personality, his diligence, his initiative, and his motivation, which are usually developed subsequent to his formal education. These attributes, in fact, ultimately determine how successful his formal education and later training have been in producing a 'whole' person who can make a worthwhile contribution to the development of his country and to society in general.

I would agree with Dr Pretorius when he says that it is ironic that, in the engineering profession (as well as elsewhere), the 'classification' of persons is essentially based upon formal education. For example, someone who only just obtains his engineering degree and subsequently (for the rest of his professional life) only makes marginal progress is, under the present system, privileged over the brilliant and highly motivated technologist or technician. This is surely absurd when one realizes that a person's formal education is usually based on studies done 20 to 30 years before, and may well be far removed from the requirements of modern-day technology.

A system that is not based on real merit is discriminating and can lead only to frustration. A merit system would judge a man by his present achievements and contributions, and not on a basic education obtained many years before. We must therefore find a way to reward people on merit; and to bridge the gaps between the various forms of formal engineering education.

The very nature of much engineering design and construction work is such that the conceptual element is relatively small, and much of the work is mechanical, repetitive, and based on standardized procedures, codes of practice, and regulations. I am grateful to Mr H.M. van Rooyen of Van Niekerk, Kleyn & Edwards for the comment that the 'bread and butter' work of many consulting engineering practices is not 'consulting' or 'advisory' in the true sense of those words, but rather an

extension of the 'technical arm' of the Client and that this fact implies, in turn, that much of the consultant's work can be done effectively by 'practical engineers', such as technologists and technicians, without the need for engineers with higher academic qualifications.

It is well known that, in comparison with other countries, South Africa suffers from a real shortage of engineers and technically trained personnel. Yet we are surely guilty of setting up a classified system that serves to discourage scholars from entering the technical field. In addition, our attitude towards practical training—so essential to supplement and complete what is learnt during formal education—leaves a great deal to be desired.

I believe that it is most important that the technologist and technician, as well as the professional engineer, should be provided with an unrestricted career path that will ensure his continuing motivation and enrichment. There must be no 'artificial' ceilings placed on his ultimate advancement, which should depend only on merit and personal achievement. If this dispensation is not provided, the ablest individuals will continue to leave the profession in their most-productive years and take up other occupations, which will then receive the benefit of their abilities.

## Education of Engineers

While the academic education of professional engineers, technologists, and technicians appears to be well catered for by the existing institutions such as the universities and technikons, there appear to be some aspects of technical education that require attention. Some of these have been pointed out by Mr C.H. Glick of Ninham Shand, who has observed the following shortcomings:

- an unwillingness to apply first principles,
- a lack of appreciation of basic finance and economics,
- an inability to express ideas clearly in one of the official languages, and
- an absence of any understanding of the engineer's role in society.

Many of these shortcomings can, of course, be overcome by subsequent training, but a conscious effort on the part of the educational authorities and employers is necessary to ensure that this is achieved.

No matter how adequate the basic academic education may be, the subsequent continuing or so-called 'mid-career' education of technical personnel is a vital ingredient of sustained and improving effectiveness. An engineer, technologist, or technician cannot consider his education complete when he has achieved registration: he must continue to learn and study for the rest of his working life. This requires a strong motivation on his part, as well as a cooperative and understanding attitude on the part of his employer.

## Sponsorship by Employers

I would agree with Mr Dudley Clinkscales (a well-known consulting mechanical and electrical engineer and Past President of the Association of Consulting Engineers) when he says that 'It is essential for the industry to develop a positive commitment to take care of its future—and the future of the country, be it noted—

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ried out this year among members of the S.A. Association of Consulting Engineers.

1. The percentage of staff receiving financial assistance and the percentage being trained appear to be roughly the same and in the order of 11 to 12 per cent. This is a change from the previous survey, 5 years ago, which showed that financial assistance was then being extended to just over 10 per cent of staff while at least 20 per cent were being trained. The fall-off in the proportion in training can probably be ascribed to the economic situation, and is a serious matter for the future well-being of the country and of consulting engineering firms.
2. The shortage of technical staff revealed in the previous survey does not seem to be apparent now, but this is almost certainly due to the economic recession. When the next upturn comes, the situation is likely to change rapidly, and complaints about the inability of firms to attract adequately trained staff
- creasing the present numbers being educated and trained. In particular, this requirement must apply to the non-White category, from which sector the future supply of technicians must come.
4. It is therefore clear that consulting firms should now be reviewing their education and training programmes with a view to expanding these as much as possible whenever the financial situation will permit it.
5. Firms that are already making substantial contributions in this field are to be commended for their efforts and for setting a good example to others, but this does not mean that we can be complacent about the situation. Unless there is a greater effort on the part of employers of technical staff in connection with the sponsorship of education and the provision of practical training and mid-career education facilities, the industry will find itself in a serious situation when the next upturn in the economy takes place.

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## New President of FAPA

Mr Douglas H. Mills took office as President of the Federation of Societies of Professional Engineers on 1st July, 1985.

Douglas Hazelton Mills was born in Johannesburg in 1926, and was educated at Marist Brothers College in Observatory, Johannesburg, and at the University of the Witwatersrand. He holds a B.Sc. degree in electrical engineering.

In 1950 he joined the SABC as a workshop mechanic and is currently Deputy Director General: Technical in the same organization. He has served on the Council of the South African Institute of Electrical Engineers since 1969, and was President of that Institute in 1980. He has also served on the Board of The Federation of Societies of Professional Engineers, on the South African Council for Professional Engineers, and on advisory committees of the Council for Scientific and Industrial Research.

He has represented the SABC and been a South African delegate at various international conferences, and presented papers at international conventions in Hamburg, Brussels, Montreux, London, and Sydney. He has chaired sessions at the International Broadcasting Convention in London on several occasions. His influence both internationally and within the Republic has been of inestimable value to the engineering profession.

