RE-ENGINEERING THE DELIVERY OF LABORATORY SERVICES IN THE ASPHALT ROAD SECTOR

Prof Emile Horak
Head of Department of Civil Engineering, University of Pretoria, Pretoria, 0001
Dr Ian van Wijk
Director, Africon Engineering International, PO Box 905, Pretoria, 0001
Paul Olivier
Director, Jeffares and Green Inc., PO Box 1109,Sunninghill, 2157
Prof Stephen Emery
Department of Civil Engineering, University of Witwatersrand, Private Bag 3, Johannesburg, 2050.
Prof. Archie Rohde
Managing Director, Specialised Road Technologies, PO Box 13198, Pretoria, 2028

SYNOPSIS

The transition process in South Africa is associated with institutional changes and paradigm shifts in service delivery in the asphalt roads environment. One of the symptoms of this changed situation is the scarcity of resources, and specialist facilities such as laboratories have to down-size or even close down. There is however an increased need for accredited reference laboratories and road surveillance services. This paper describes how a number of role players in the roads industry came together to re-engineer the delivery of these specialist laboratory services in the fields of asphalt testing and road surveillance services. This re-engineering was linked with the drive for training and education in the roads industry. An academic agreement was reached between the laboratory and two Universities to promote research and education in asphalt technology and road surveillance technology.

1. INTRODUCTION

The emergence of the new democratic South Africa is associated with a paradigm shift in the asphalt roads sector. Institutional changes are the most prominent and with the biggest impact. The Department of Transport (DoT) embarked on a strategic commercialisation drive which culminated in the establishment of the South African National Roads Agency (SANRA). (DoT, 1996). The increase in number of provinces in the new South Africa led to a redistribution and loss of laboratory expertise and resources.

The new realities and priorities forced government departments at all levels to enter into alternative means of service delivery. These include Strategic Development Initiatives (SDIs), build-operate-transfer (BOT), Toll Roads, Public Private Partnerships (PPP) and Municipal Service Partnerships (MSPs). The paradigm shift had a major impact on the functioning of road laboratories at various levels of government.

This impact can be illustrated by the DoT commercialisation process. Once laboratory services were not featured as a core service of SANRA, their main and regional laboratories at Pietermaritzburg, Pretoria and Cape Town were phased out. In other road authorities the same has occurred as a result of the loss of the pool of expertise in the field of road laboratories.

A new delivery method was needed for the provision of quality, accredited specialised asphalt laboratory and surveillance services. This paper describes the rationale and approach followed in the creation of this by re-engineering existing laboratories.

2. INDUSTRY BACKGROUND

2.1. Deflection Survey Needs

Technology developments in the evaluation of pavement structures non-destructively by means of deflection measuring devices were identified in the mid 1980's. The modified Benkelman Beam developed for the Heavy Vehicle Simulator (HVS), the Road Surface Deflectometer (RSD), could measure the whole deflection bowl of a slow rolling wheel load, but was deemed not to be fit for production type operational surveys (Horak et al, 1992). The Falling Weight Deflectometer (FWD) was developed as an apparatus to measure a fast moving wheel load deflection bowl free of the plastic creep effects associated with the slow wheel movement of RSD type measuring devices.

In the later 1980s, a number of role players in the roads industry decided to pool resources to get an FWD for South Africa. A company, Impulse Deflection Measurements (IDM) Pty. Ltd, was formed as a specialised deflection survey service provider. Due to the narrow field of operation in road surveillance, it met with only with modest commercial success. Operational problems experienced were the lack of standardisation and

accreditation regarding FWD deflection surveys in South Africa. This was exacerbated by the lack of facilities to provide accepted international calibration services, and the lack of contractually enforced calibration.

The IDM service ended in 1996 when the equipment was lost, fortunately at the end of its effective service life.

2.2. Asphalt Technology Needs

The need for one or more commercial asphalt and binder laboratories providing advanced commercial services was identified by a number of role players in the industry in the early 1990's. The asphalt laboratory of Transportek, CSIR, was perceived to be a research facility, not a commercially focussed one. This research laboratory needed to be enhanced by such a commercial laboratory to serve the needs of the industry.

A group of consultants and contractors in Kwa-Zulu Natal formed such a commercial asphalt and binder testing laboratory in the early 1990's. Resources such as trained laboratory staff and laboratory equipment were pooled in Durban. The pooling of resources enabled the acquisition of specialist asphalt testing equipment such as the Nottingham Asphalt Tester and the gyratory compactor.

The need was established for such a regionally positioned laboratory in Gauteng. An initial attempt was made in 1993/4 by a local government road authority, contractors, consultants, and existing laboratories to establish such a similar joint venture on the Reef. The momentum of this venture was lost with the emergence of the Transitional Council structures in 1994.

2.3. Academic Parallels for Joint Laboratories

Parallels for jointly operated specialist laboratories exist in civil engineering academia. These have been created as the academic institutions realise that such specialist laboratories provide a valuable research infrastructure, but need industry assistance to allow them to be equipped with advanced equipment. In concrete, research projects into concrete sleepers and then fibre reinforced concrete led to a significant development of the concrete laboratory at University of Pretoria. At the same Institution, a specialist soils and geotechnical laboratory was built up in collaboration with a British university. These initiatives received impetus when various specialist laboratories such as that of Building Technology of the CSIR closed down for reasons similar to those mentioned earlier. Unique equipment was donated by CSIR to help establish these new specialist laboratories as a pooled resource. Other examples of joint laboratories exist at other Universities and Technikons in South Africa.

3. RE-ENGINEERING LABORATORY SERVICES IN THE ASPHALT ROADS INDUSTRY

The need to re-engineer laboratory services in the asphalt roads industry was driven by three factors:

- the paradigm shift in the delivery of road services,
- the closure of many Provincial and National laboratories, and
- the need for contractors to take on responsibility for pavement surveillance in the new type of BOT and PPGS contracts

The existence of the joint specialist laboratories mentioned above in asphalt, concrete and soils showed a way forward in the re-engineering of the delivery of asphalt and road surveillance services in Gauteng. The lessons learnt in the creation and operation of the forerunner laboratories companies were viewed as a valuable resource and were therefore pooled in the re-engineering process.

It was decided to create a commercial service provider company which addressed the need for cutting edge non-destructive road surveillance testing and equipment, coupled with asphalt and binder laboratory services. This unusual coupling allowed a broader base to be created to soften the troughs in the demand associated with single equipment and surveillance service in a "narrow" market. It also had the benefit of providing multi-skilled work opportunities for the career development of operators and laboratory personnel. The specialist nature and natural inter-linking of the two fields supported the coupling.

The experience with the Gauteng joint laboratory exercise showed the great deal of uncertainty and turf protection present when something as radical as physically pooling of resources and collaboration are required. To overcome this psychological resistance to change, it was decided to limit the launching of the concept to only "pioneering" partners and use the reality to demonstrate the concept to other players. It was also decided to restrict initial funding to mainly capital goods contributions. Colas SA therefore contributed its fully operational Coltech asphalt laboratory and associated human resources. Jeffares and Green Inc. contributed a newly acquired Falling Weight Deflectometer (FWD) and Africon Engineering International its new Griptester and the custom built high-speed profilometer to enhance the road surveillance suite of equipment.

Specialised Road Technologies Pty Ltd (SRT) became operational in July 1997. It soon became logical to bring the Durban asphalt laboratory of Bitutek into SRT, thereby broadening the geographical base of SRT. The FWD testing service of IDM became fully merged into SRT as well. Further shareholders were consultants and contractors. The goals of the resultant company were expressed as the following:

- Broad based shareholding to ensure wide representation
- Quality accreditation
- Provision of reference laboratory service

- Act as operator of advanced and specialist equipment
- Academic linkages to be encouraged
- Actively pursue a policy of neutrality which such a laboratory and road surveillance service provider would need for accreditation purposes and for the needed market confidence.

4. LINK WITH THE ACADEMIC SECTOR

The Universities of Pretoria and Witwatersrand, like other higher education institutions, are faced with dwindling government subsidies, increased pressure to promote research and technology development and to make more effective use of expensive laboratory facilities. The latter need for better utilization of facilities is incidentally promoted by the White paper on higher education. It promotes collaboration between educational institutions.

With the need to move from the initial premises at Isando, SRT moved to the South Campus of University of Pretoria. The intention was to link in with education facilitation. At the same time, DoT were looking to dispose of their now-redundant laboratory equipment, and were free to donate equipment to other government departments or to be used by education institutions.

DoT supported the principle of pooling of resources to the benefit of the broader industry. In support of its initiative to support the Northern Center of Development, they donated asphalt testing equipment in 1998 to the University of Pretoria provided the University of the Witwatersrand also had access to it. Such donated laboratory equipment, as well as those of SRT, was to be made available to students from these two universities for research and education purposes. Apart from these specific specialist laboratory items, DoT donations were made to various government departments and to technikons.

The practical spin-off of the linkage between the laboratory and the academic institutions has already been seen in the first year of operating. Student research has included:

- Lateral and longitudinal variation of skid resistance of pavements
- Design of asphalt for use in labour based construction
- Measurement of permeability of asphalt
- Stockpile life of foamed bitumen

At the undergraduate teaching level, students have also made use of the laboratory facilities with practical testing covering:

- <u>Seal design</u>
  ALD, flakiness index, grading
  ball penetration
  sand patch test

- Asphalt design
  Marshall stability
  bulk relative density
  Rice's specific gravity
- Basics of bitumen
  emulsions
  cutback
  penetration grade bitumens
  stone adhesion
  product handling

This laboratory is a truly pooled resource from a broad based group of role players in the roads industry. It is a specialised asphalt and binder laboratory which can fulfil the commercial needs of all role players in the roads industry and still be used fruitfully by both mentioned universities for training, education and research needs. These are facilities which both universities did not previously have. It has also substantially contributed to other subsequent collaborative efforts between these two university departments of Civil Engineering.

5. ACCREDITATION AND QUALITY ASSURANCE

One of the goals of the laboratory is to become a nationally and internationally accredited laboratory. This was identified as of importance in the light of the phasing out of a number of DoT and Provincial laboratories which in the previous dispensation acted as such reference type laboratories by virtue of their position as a client body.

Bitutek was already involved in the SABS MAAP correlation programme, and both Bitutek and the Coltech laboratories were involved in another laboratory correlation programme, and in achieving quality accreditation. The laboratory was able to build on this, and move to become formally accredited to an international system.

The Committee of Land Transport Officials (COLTO), via the Road Materials Committee (RMC) initiated a drive in 1998 to get all road material laboratories to subscribe to a single body. This body had to promote internationally accredited laboratory test procedures, management and it could register as a Standard Generating Body (SGB) for the evaluation of testers as required by SAQA. An working group was established which identified the use of Guide 25 of the ISO 9002 as the preferred system to implement. SRT is involved in this working group, and fully committed to this accreditation.

Similarly, the pavement surveillance equipment had to be calibrated to international requirements. Initially IDM, and now SRT have been instrumental in assisting the South African Bureau of Standards in setting up the Strategic Highway Research Program (SHRP) developed calibration system for FWD's, which became operational in 1998. This calibration centre

was the first to be established outside of the USA. The Griptester has to be sent to the United Kingdom to be calibrated based on their annual calibration of skid resistance testing devices.

6. LIST OF REFERENCES

Department of Transport (1996) **A Future For Roads In South Africa** Department of Transport, Pretoria.

Gautrans (1998) **A Toll Road Strategy for Gauteng** Gauteng Department of Transport and Public Works, Johannesburg

Horak, E, Kleyn, EG, du Plessis, JA, de Villiers, EM and Thomson, AJ (1992) **The impact and management of the Heavy Vehicle Simulator fleet in South Africa** Proc. 7th Int. Conf. on Asphalt Pavements, Nottingham

APPENDIX A SHAREHOLDERS OF SRT

One of the goals of SRT was a broad based industry shareholding to assist in ensuring a neutral policy. In 1998, the following firms were shareholders of SRT (in alphabetical order), and negotiations are in progress which may broaden this representation:

Africon Engineering International
Civilab, representing a number of Consultant's offices in Gauteng including Ninham Shand Inc, Ulmann Witthaus and Prins, Inc, and Anglo American
Colas Southern Africa Pty Ltd
Jeffares and Green Inc
Keeve Steyn Inc
LTA Contractors
Soilco representing a number of Consultants' offices in Kwa-Zulu Natal including Bradford Conning Inc., De Leuw Cather Inc, AA Loudon & Partners, Theron Burke & Isaac, and VKE
Stewart Scott International