

Technical Note TR-99/062

**REPORT ON TOUR OF DUTY
TO THE USA:
14 OCTOBER 1999 to 26
OCTOBER 1999**

WJvdM Steyn

Programme : Transport
Infrastructure
Programme Manager : BMJA Verhaeghe
Technical Reviewer : S Kekwick

Note:

This document is confidential to TRANSPORTEK and may only be distributed with the written permission of the Director or his nominee.

PREPARED BY
TRANSPORTEK, CSIR
PO Box 395
Pretoria 0001
Tel +27 12 841 2905
Fax +27 12 841 3232

DOCUMENT RETRIEVAL PAGE				Technical NoteTR-99/062			
Title: Report on tour of duty to the USA: 14 October 1999 to 26 October 1999.							
Author: WJvdM Steyn							
Client: STEP		Client Ref no:		Date: November 1999		Distribution: November 1999	
Project No: TRC26		OE2: 9476				ISBN:	
<p>Abstract: This report describes a tour of duty undertaken to the USA in October 1999. The objectives of this tour of duty were to attend the 1999 Reno APT Conference, visit two smart material companies and visit the Palmdale HVS site.</p>							
<p>Keywords: APT conference, Reno, HVS</p>							
<p>Proposals for implementation: Recommendations regarding the CSIR Transportek APT programme, the use of smart materials at CSIR and the staff at Palmdale are made for implementation.</p>							
<p>Related documents (eg software, interim or other reports, working drawings, etc): None</p>							
Signatures:							
S Kekwick Language Editor		S Kekwick Technical Reviewer		BMJA Verhaeghe Programme Manager		A vd Merwe Info Centre	
<p>NOTE: This document is confidential to TRANSPORTEK and may only be distributed with the written permission of the Director or his nominee</p>							

TABLE OF CONTENTS

1.	INTRODUCTION	1-1
2.	ACCELERATED PAVEMENT TESTING CONFERENCE	2-1
3.	SMART MATERIALS VISIT	3-1
4.	PALMDALE HVS SITE VISIT	4-1
5.	CONCLUSIONS AND RECOMMENDATIONS	5-1

1. INTRODUCTION

An official tour of duty was undertaken by the author to the United States of America (USA) from 14 October 1999 to 26 October 1999. The purposes of this tour of duty were:

- to attend the International Accelerated Pavement Testing Conference 1999;
- to visit two companies who manufacture Shape Memory Alloys, and
- to visit the HVS site at Palmdale, California.

2. ACCELERATED PAVEMENT TESTING CONFERENCE

2.1 Scope of Conference

The conference was the first conference organized by the Transportation Research Board (TRB) Task Force A2B52 on Full Scale and Accelerated Pavement Testing. The scope of the conference was to provide a forum for exchange of technical information on accelerated pavement testing with an emphasis on approaches to predict pavement performance, pavement materials performance, equipment development, pavement instrumentation and implementation of activities.

2.2 Logistics regarding Conference

The conference was held at the Silver Legacy Hotel in Reno, Nevada.

Papers on the following topics were presented:

- Performance prediction;
- Vehicle-pavement interaction
- Ultra-thin whitetopping;
- Materials base and subgrade;
- Small scale testing;
- Full scale test tracks;
- Instrumentation;
- Materials characterization, and
- Portland cement concrete pavements.

A total of 180 delegates from 23 countries were present at the conference. Three delegates from CSIR Transportek in South Africa, and one from UCB were present.

CSIR Transportek was 1 of the 16 sponsors of the conference, and 1 of 5 organizations that had a display of their work at the conference.

A total of 63 papers were presented, of which 16 were presented in the General Sessions as position papers and the remaining 47 were presented in the various Concurrent Sessions. The influence of CSIR Transportek and the CSIR could be seen in the breakdown of the papers:

- 13 of the 63 papers described work where HVSs were involved, with 7 papers describing work where ALFs were involved, and 5 describing work where MLSs were involved;
- CSIR Transportek delivered 1 of the 16 General Session papers and 4 of the 47 Concurrent Session papers.

During the conference a technical tour to the Westrack facility was also attended.

2.3 Comments on Conference

The conference was a success in terms of its objective of bringing international APT practitioners together. A wide range of topics was discussed, of which most were also relevant to the CSIR delegation. Specific papers are not discussed in this report, but general comments regarding the topics and issues forthcoming from the various papers attended and discussions had by the author, are given.

General consensus exists that APT is alive and well, and that a market exists for the continued use of APT internationally.

A general lack of funding exists for APT, especially for the APT programmes in South Africa and Australia. Major emphasis is put on cooperation between APT programmes in the USA, and funding exists through several avenues for this work. Most of the work is performed through a university, or with a major contribution by a university. It appears as if only the CSIR, LCPC (France) and ARRB are performing their APT without direct university involvement, although work on the APT programmes is generally used in further studies.

In general, funding is received mainly from governmental sources, and in some areas also from private industry.

In some of the discussions it appeared as if a gap exists between the northern hemisphere countries and the southern hemisphere countries' APT programmes. The USA is coordinating their cooperation (or at least attempting to) through the TRB, while Europe is developing a COST programme on APT. Both the USA and Europe have many APT programmes of which the participants are in close contact with each other, due to their close proximity to each other. The APT programmes in South Africa, Australia and South America are perceived to stand apart from most of the work done in the USA and Europe, although some cooperation does exist, mainly through one or two main contracts such as the current UCB/CALTRANS contract running in Palmdale, California.

2.4 Conclusions on Conference

The following conclusions can be drawn regarding the conference:

- The conference was well attended and worth attending.
- There exists a growing interest in APT internationally.
- Funding shortages exist, particularly in southern hemisphere countries.
- The focus on APT needs to be shifted from basic mechanistic type research to specialized or applied product specific research.

2.5 Recommendations on Conference

CSIR Transportek need to define their focus and objectives in terms of APT, and should not attempt to cover all fields equally well. It is proposed that a meeting be held with the concerned parties in the Division to discuss and formalize such an approach.

3. SMART MATERIALS VISITS

3.1 Scope of Smart Materials Visits

During June 1999 the author attended a Smart Materials conference at the University of Pretoria. At the conference the availability and possible use of several smart materials was discussed. The possibility of using Shape Memory Alloys (SMA) as strain sensors were discussed. After further investigations and discussions, it appeared as if SMAs could be used in the place of LVDTs in MDDs, as well as in pavement layers as strain sensors.

Two visits to companies who are actively involved in the field of SMAs were scheduled. The first was to Shape Memory Applications Inc (SMA) in Santa Clara, California, and the second to Dynalloy in Costa Mesa, California.

The objective of both visits was to obtain more information regarding the possible use of SMAs as strain sensors and in other road related applications.

3.2 Visit to SMA Inc

SMA Inc was visited on Thursday 21 October 1999. During the visit one of their application engineers, Carolyn Rice, was present.

Although the use of SMAs in strain measurement was discussed at the conference in June, SMA was not confident that it could be a practical measurement system in the field. Their main concern was that both the strains and the temperature can affect the performance of the SMA, and that it could be possible that measurements may not be caused by one parameter only.

It appeared from the meeting that SMA is not really interested in any new applications of SMA that falls outside their current fields of application, although they indicated in correspondence that these possibilities could be discussed.

The author's perception after the meeting is that SMA does not see immediate possibilities in the application, and that they will not be interested in further work in this field.

3.3 Visit to Dynalloy

Dynalloy was visited on Friday 22 October 1999. During the visit one of their applications engineers, Natalie Joy, was present.

Dynalloy focuses more on the shape memory use of SMAs, and less on superelastic uses. The possibilities of using SMAs as strain sensors, to tilt road signs to decrease glare, to measure vehicle masses and to indicate temperature changes in asphalt were discussed.

They had the same general problems with using SMAs as strain sensors than SMA Inc. It appears as if the use as strain gauges is still very limited, and further work in this regard is still necessary. More contact with Mide Corporation in Boston, who suggested this application, should be made.

The possibility of using SMAs to tilt road signs in early morning and late afternoon to prevent glare was met with a bit of optimism. Although some practical issues regarding the magnitude of temperature change needed to tilt the signs exists, it appears as a feasible idea.

The possibility of measuring vehicle masses using SMAs embedded in the road also appeared theoretically feasible. The amount of pressure (and therefore bending) needed to enable measurement is however unknown.

The use of SMAs as a cheap and robust thermometer in asphalt to indicate when the asphalt is too cold to roll is a strong possibility, depending on the specific temperatures needed.

3.4 Conclusions on Visits

Although the visits did not provide positive answers regarding the use of SMAs as strain sensors, it did indicate that the technology is not available off the shelf, and is also not mature in respect of strain measurements as yet.

3.5 Recommendations on Visits

- It may be advisable to request the Division for Materials and Manufacturing to investigate the use of SMAs in general as part of their STEP drive further, as the possibilities of using this technology are apparently wide.
- Mide Corporation in Boston should be contacted for further information and guidance in using SMAs as strain sensors.
- CSIR should not attempt to use the technology without professional assistance, as this may prove to be an expensive exercise.

4. PALMDALE HVS SITE VISIT

4.1 Scope of Visit

The objectives of this visit were to discuss general issues with the CSIR staff at Palmdale, see how the project was running and to deliver a lateral position sensor to the HVS crew.

4.2 Comments on Visit

The project at Palmdale appears to run smoothly. The crew is in general happy with their working environment, and is doing a good job. Uncertainty exists regarding their deployment at the end of the current project.

4.3 Conclusions on Visit

The Palmdale project is running smoothly

4.4 Recommendations on Visit

Plans for deployment of staff at the end of the current HVS project (locally or abroad) should be initiated in consultation with the relevant staff and management.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 General

Conclusion

- The use of the current dial-up facility to the CSIR for connecting to the e-mail is very expensive and cumbersome.

Recommendation

- An international webserver (i.e. America OnLine) with local numbers should be available for CSIR to link into the e-mail system.

5.2 APT Conference

- The conference was well worth attending and brought together most of the international APT practitioners.
- The papers and presentations were of a relatively high standard.
- The display by CSIR Transportek caused opportunity for much discussion.
- CSIR Transportek is still at the leading edge of APT in terms of contact stress measurements and controlled dynamic simulation of vehicular loads.

Recommendations

- CSIR Transportek has to define where it wants to go with APT internationally.
- We should focus on those areas where we can still be at the leading edge of technology, and ensure that we keep abreast of other developments in the field.
- Additional sources of income need to be identified for the specialized type of research needed to stay at the leading edge.
- The possibility of closer co-operation between the countries / organizations in the southern hemisphere involved in APT should be actively pursued.

5.3 Smart materials visits

Conclusions

- The use of smart materials such as SMAs for strain sensors appears to be very limited in its current application and not necessarily well developed. More work is needed to bring it to maturity.

Recommendations

- The further use of SMAs as strain sensors will have to be investigated with the aid of MIDE Corporation in Boston, who initially indicated the possibility of this technology.

5.4 Palmdale visit

Conclusions

- The HVS crew at Palmdale is still coping well with the project. It appears as if everything is running smoothly without any major problems.

Recommendations

- The possible deployment of staff during 2000 (at the end of the current contract) needs to be planned and discussed. It is proposed that a meeting with the concerned parties be held urgently.