

**REPORT ON STUDY TOUR - THIN BITUMINOUS SURFACING  
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## **1.0 EXECUTIVE SUMMARY**

This report was written on the basis of a study tour to Europe generously sponsored by the IPWEA – West Australian Branch.

The report covers a range of topics relating to thin surfacing or bitumen slurry technology used in Europe. The process and technology was discussed with contracting companies in Denmark and France.

The report further deals with contract management and tendering process as conducted by a council in Denmark and gives the reader the opportunity to draw comparisons.

The report concludes that paving processes in relation to thin surfacing can be successfully transferred to Australian conditions following due trial. The report further gives an insight into the tendering and contract management process at a local government authority in Denmark.

International relations have been established for continuous exchange of information and know how.

## **2.0 INTRODUCTION**

The IPWEA and its committee members are thanked for giving me this excellent opportunity to undertake this tour and I sincerely hope value can be gained from this report amongst IPWEA members and other interested parties.

The study tour was conducted with the objective of:

- A. Gather and present information on thin pavement surfacing methods, products and applications.
- B. Investigate pavement surfacing options suitable to outback community.
- C. Develop international relations.

## **3.0 BACKGROUND**

The relative limited variety of paving applications used by the rural community in Australia was the main driver behind this study tour. In most cases the rural community is using sprayed bitumen applications for resurfacing works.

When offering the rural community pavement surfacing solutions there are a number of significant constraints such as extreme weather conditions, funding relative to kilometres of road network within council and distance from fixed bitumen installations. Also termed industrial projects such as logging and mining projects are controlling level of funding and expected life of pavement.

These factors all have a bearing on which pavement solution is chosen and furthermore one always tend to recall which solution has previously provided good results in terms of life and durability. This then becomes a very strong basis for the choice of future applications and methods.

The following is an introduction into thin surfacing options as applied overseas. In particular it will cover slurry and microsurfacing and it is the intention to spark further discussion on thin surfacing applications.

## **4.0 VISIT TO DANSK OVERFLADEBEHANDLING (DOB) I/S, DENMARK**

The first stop of the tour was at Dansk Overfladebehandling I/S in Denmark. Here a meeting was arranged with the national manager Finn Jensen for a discussion on slurry/micro surfacing used in rural districts. It also was an opportunity to view some specialised bitumen spray equipment in action. DOB is a company specialising in thin surfacing such as slurry and microsurfacing as well as spray sealing. They employ approx. 25 people and have an annual turn-over of approx. 50 million AUD.

An interesting aspect of bitumen surfacing in general in Denmark is the fact that all aggregate used has to be imported due to a lack of quarry sources within Denmark's own borders. Aggregate is typically imported from Sweden or Scotland.

#### Slurry Sealing

Slurry surfacing is used for a multitude of different projects ranging from street resurfacing, road widening or delineation as well as rut repairs.

Coloured products are achieved by adding oxides in smaller percentages are chose red coloured aggregates. The colours range from blue to red to brown and in some cases yellow.

The specification used is based on a national standard as issued by the Federal Road Authority. Their specification is then based on that of the International Slurry Surfacing Association (ISSA).

Image 001 – Slurry of shoulder on rural road.



Otherwise slurry surfacing is used for shape correction on rural roads as well as resurfacing of residential streets.

Image 002 – Slurry used for rut correction on rural road.



The company had recently developed a fibre re-inforced slurry. After gaining approval from Vejdirektoratet (Federal Road Authority) the company now applied this product as a final wearing surface on a major freeway near Copenhagen. Test on the product had proven very good performance characteristics in the area of wear resistance and skid resistance.

Image 003 – Fibre reinforced slurry applied on freeway in Denmark.



Product KA 6 Plus ®, Cold slurry – nominal size 6 mm aggregate with fibre added.

The process of application included the following steps:

1. Sweeping of pavement
2. Application of 50% emulsion to host surface for improved adhesion
3. Application of 1. Layer of KA 6 at appr. 13 kg/m<sup>2</sup>
4. Application of 2. layer KA 6 at appr. 11 kg/m<sup>2</sup>
5. Static weight compaction

Image 004 (next page) – Loading of emulsion and fibre to slurry machine.



Spray Sealing

A visit was also arranged to a site where a rural road was resurfaced using sprayed seal application method.

Image 005a, b, c and d – Progress of sprayed bituminous surfacing on rural road.



The process involved spraying of bitumen Class 200 with 3% cutter, application of 10mm aggregate followed by compaction using static weight multi tyred rollers.  
As it can be seen from the photos both the sprayer and the spreader trucks are specialised equipment.

The sprayer vehicle comprised of a semi trailer tanker with a control cabin mounted at the back of the tanker. An operator would control the positioning of the bitumen spraybar transversely and enter the relevant bitumen application rates relative to road speed. The spray width would be set by positioning the main bar as well as the independently mounted spray bar extensions in the correct position. This was all controlled from the rear cabin.

Image 006 – View of spraybar



Image 007 – View of sprayer control cabin



## 5.0 VISIT TO FREDERICIA KOMMUNE, DENMARK

The following day a meeting had been arranged with Ivan Toftgaard of the technical committee at Fredericia Kommune (City Council). The meeting was to gain an insight into how the council approaches the process of tendering and managing bitumen surfacing works.

The council has a population of 50,000 and some 1200 km of road network ranging from paths, residential streets, distributor roads, highways and freeways. The council has a three-year plan to invest 66 million DKK or AUD 16 million in new infrastructure and improvements. It has an annual road maintenance budget of appr. \$9M AUD.

The principal city Fredericia is situated on the coast with a large base of heavy industry including oil refinery and fertiliser processing factories.

The council is responsible for some of the most significant road transport routes within Denmark . With freeway junctions distributing traffic in all directions of the country as well as traffic coming from Germany and the remaining continental Europe. Hence the relative high level of funding.

The council calls tenders annually for bitumen spraying surfacing and asphalt surfacing. Cold asphalt works was completed on a quote by quote basis and plans to integrate this product into the tendering process were scheduled for the following financial year. Local contractors are preferred used although international involvement has been required on major projects. The bulk of the surfacing work is undertaken in asphalt due to the traffic volumes and the movement in base layers.

Thin surfacing is used widely for resurfacing, noise reduction and skid resistance improvement projects. Both bitumen sprayed seal as well as cold asphalt (slurry) is used for these purposes.

The engineering section largely relied upon guidelines issued by “Vejdirektatet” the Danish federal Road Authority for calling tenders and executing works.

The Danish road authority has issued guidelines for tendering, conditions of contract and guidelines for procedure documentation, basis of tender and invoicing as well as recommended schedule of rates items.

As an example the schedule of rates items for asphalt works would include:

- a. Establishment and removal of plant and equipment – lump sum
- b. Lights, barriers inclusive of installation, maintenance and removal – daily rate.
- c. Provisional sum for establishment – lump sum.
- d. Corrector work including tack coat using asphalt paver – rate per tonne.
- e. Corrector work including tack coat by hand rate per tonne.
- f. Asphalt overlay using asphalt paver – rate per tonne.
- g. Asphalt overlay by hand – rate per tonne.

As can be gathered from above the council as well as the state road authority is rewarding separately processes, that involves a higher level of manual labour.

In general the tender process follows simple steps similar to those used in Australia.

Initially an advertisement is placed in relevant newspaper. The invitation to tender will typically provide a brief description of the services required, the term of the services (time) and reference to relevant specifications and guidelines. In some cases it will also stipulate the preferred timing for executing the works. Typical contract period from 1 to 3 years although some councils are moving towards termed maintenance and will ask for a 5 year contract term.

It is also common practice to award panel contracts where more suppliers are listed for providing the same service.

Due the climatic conditions of the country the surfacing season typically commences in April and finishes in October/November. This is impacting greatly on the resource availability during peak season and the council of Fredericia is developing a system of plan A and B.

This includes nominating minimum two surfacing alternatives on critical projects. This will minimise the risk of leaving projects incomplete before the onset of winter snow and frost.

## **6.0 ISAP CONFERENCE**

The itinerary also included attendance of the ninth international conference on asphalt pavements in Copenhagen, Denmark. The conference covered a broad range of topics with the presentation of several papers.

With the focus on thin surfacing the presentation of a paper, by Jim Carswell of BP Bitumen UK, had particular relevance.

The following is an extract of the paper “The Design and Performance of Thin Surfacing Layers”, as presented by Jim;

“Thin surfacings are materials that fit between the ‘traditional wearing courses (40 mm to 50 mm of asphaltic concrete, rolled asphalt, dense macadam, stone mastic asphalt or porous asphalt) and the chip seal treatments (6 mm to 14 mm of surface dressing or slurry seal).”

“Over the years, many researchers have sought to design and develop durable thin surfacing materials, for a much wider application to the road network, which are fatigue and rut resistant and economic”

“With the many varied types of thin surfacing available, the road engineer can select the most appropriate thin surfacing design to meet the requirements of the contract. Thin surfacing has increased in popularity for at least four principal reasons:

- Environmental: saving on new aggregate extraction (hence, conservation of quarrying resources) and noise reduction.
- Durability: through the increasing use of PMBs a longer life than with conventional bituminous surface layer is possible.
- Serviceability: maintaining specified performance properties.
- Operational: thin surface treatments can be laid quicker than conventional surface layers causing less traffic disruption and delays. Many can be opened to traffic within 30 minutes of being laid.”

The paper include a description of the role of the binder and how the addition of polymers have proven to significantly improve the performance of thin and ultra thin surfacing and helped make them rut resistant.

Further the paper evaluates the design and benefits of thin layer surfacing as well describing a range of case studies from UK and Sweden.

Further information and papers will be posted on the web site of International Society of Asphalt pavements (ISAP) - [www.asphalt.org](http://www.asphalt.org)

## 7.0 VISIT TO EUROVIA, PARIS

As a further objective of the tour, a visit to Eurovia's office in Paris was part of the schedule. Eurovia's engineer Jerome Fachon hosted a discussion on the application and use of microsurfacing (polymer modified slurry) with added fibre.

The company has developed it's own product called Gripfibre. This product is according to Jerome widely used in France and Europe as well as overseas for its improved durability and skid resistance characteristics.

The basis of the product is similar to conventional microsurfacing (slurry)-using aggregate ranging in grading from below 75 µm to 6.75 mm, using cationic polymer modified emulsions and adding cement to aid product curing. In addition to this synthetic fibre with a length of over 4mm is added to the mixture resulting in a 'reinforced' product.

Image 008 – Fibre as used in Gripfibre® Product



According to Eurovia the application of the fibre slurry can be applied in high-speed heavy traffic environment and as an example the ring road around Paris as well as several national highways have been treated with Gripfibre.

The product is typically applied in a single layer of 10mm thickness.

Image 009 – Application of Gripfibre on rural road



The application of the fibre is taking place via a separately designed and installed device mounted at the back of the slurry machine.

Image 010 – Fibre hopper mounted at rear of slurry machine



The company is offering this product internationally under a licence agreement.

## 8.0 CONCLUSION

The tour established that technology is at a more advanced level in some markets (i.e. spray operation visited in Denmark) but the end result appear similar to that achieved in Australia.

It was further determined that thin surfacing is used in the rural areas of Europe for reasons of lower cost more so due to lack of other surfacing options. There also seems to have been developed a market for more specialised products such as fibre reinforced slurry and that this process has proven to be successful.

The fibre re-inforced product will be suitable to Australian conditions and preliminary work is under way to trial the product. The trials are currently being discussed with state road authorities. The coloured slurry will achieve a similar high level of success as coloured asphalt and concrete at very competitive rates. Trials are now also in the planning stage.

The aim of this report was to spark some interest and discussion on thin surfacing. Although the topic covered in the report is relative broad the report it is hoped useful information has been conveyed to both engineers, planners ,works overseers/supervisors and other interest groups.

Should you require further information on any of the products or processes mentioned in the report or on the topics of contract management in Denmark (Fredericia City Council) or otherwise, please do not hesitate to contact undersigned.

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