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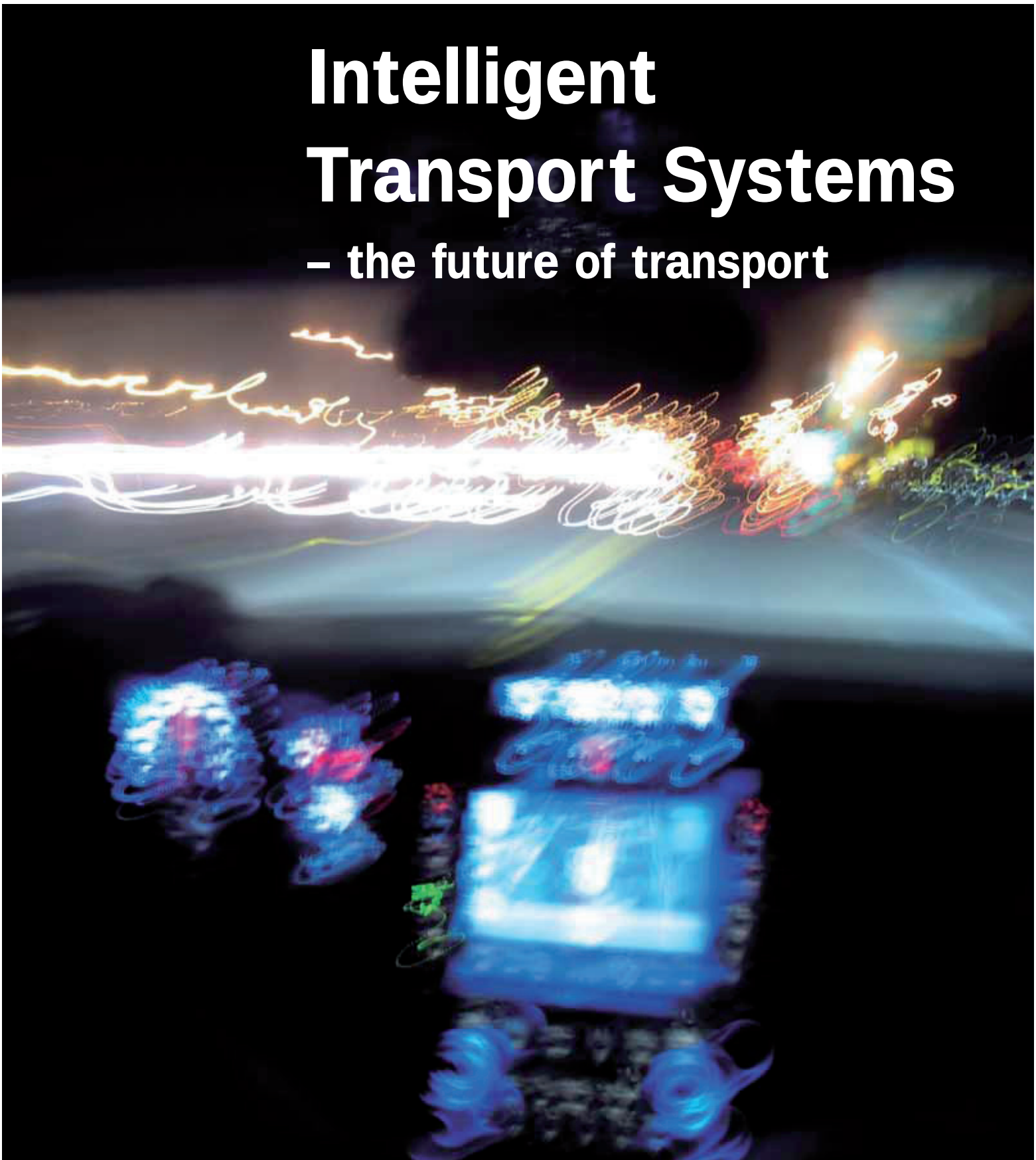
Intelligent Transport Systems

– the future of transport



News from

Swedish National Road and Transport Research Institute (VTI)

VTI is an independent, internationally established research institute which is engaged in the transport sector. Our work covers all modes, and our core competence is in the fields of safety, economy, environment, traffic and transport analysis, public transport, behaviour and the man-vehicle-transport system interaction, and in road design, operation and maintenance. VTI is a world leader in several areas, for instance in simulator technology.

Danish Road Directorate (DRD) Danish Road Institute (DRI)

The Road Directorate, which is a part of The Ministry of Transport, Denmark, is responsible for development and management of the national highways and for servicing and facilitating traffic on the network. As part of this responsibility, the Directorate conducts R&D, the aim of which is to contribute to efficient road management and to the safe use of the network. The materials research component is carried out by the Danish Road Institute.

Technical Research Centre of Finland (VTT)

VTT Technical Research Centre of Finland is a contract research organisation with a staff of 2,800. In this joint publication, the VTT expertise areas cover research and development of transportation, logistics and road structures. The work is carried out in five research groups employing a staff of 60.

Icelandic Road Administration (ICERA)

The ICERA's mission is to provide the Icelandic society with a road system in accordance with its needs and to provide a service with the aim of smooth and safe traffic. The number of employees is about 340. Applied research and development and to some extent also basic research concerning road construction, maintenance, traffic and safety is performed or directed by the ICERA. Development division is responsible for road research in Iceland.

Norwegian Public Roads Administration (NPRA)

The Norwegian Public Roads Administration is one of the administrative agencies under the Ministry of Transport and Communications in Norway. The NPRA is responsible for the development and management of public roads and road traffic, as well as the Vehicle Department. This responsibility includes research and development of all areas related to road transport and the implementation of R&D results.

Institute of Transport Economics (TØI), Norway

The Institute of Transport Economics is the national institution for transport research and development in Norway. The main objectives of the Institute are to carry out applied research and promote the application and use of results through consultative assistance to public authorities, the transport industry and others. The Institute is an independent research foundation employing about one hundred persons.

Editorial notes

Nordic Road & Transport Research is a joint publication of six public road and transport research organisations in the Nordic countries, Denmark, Finland, Iceland, Norway, and Sweden. The main objective of the publication is to disseminate research results and news from the institutions, especially to researchers and decision makers. Each institution is responsible for the selection and presentation of the material from its own scope of activities.

Nordic Road & Transport Research is published three times a year. It is regularly sent out, free of charge, to recipients selected by the six joint publishers. Free sample copies are also sent out on special request.

Correspondence about the contents of the publication:

Please write to the author or to the respective publishing organisation.

Requests for back issues, and notification of address changes:

Readers outside the Nordic countries: please write to the Editor-in-chief at the VTI in Sweden.

Readers in the Nordic countries: please contact the publishing institution of your country.

Addresses: see back cover.

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VTI Builds an Advanced Driving Simulator in Göteborg

The VTI Board of Directors have taken the decision to establish an advanced driving simulator in Göteborg. The investment cost will be 20 million Swedish crowns. The Region Västra Götaland and the Swedish Governmental Agency for Innovation Systems, Vinnova, are among the main financers.

The investment involves an advanced, high-tech simulator being built up which is expected to become an important and central part in the open research environment in Göteborg.

– It is extremely positive to be able to start to build the new simulator in Göteborg, says the Director General of VTI, Jonas Bjelfvenstam. This gives us the opportunity to offer an open, world class research environment in western Sweden which is the center of the Swedish vehicle industry. I hope this will inspire and motivate other long-term investments for research and development, too.

VTI already has research cooperation with parties in the Göteborg area.

– Now we hope that this cooperation will grow so that VTI's work within vehicle technology and human-machine-interaction will expand.

It is expected that the investment will promote the development of Swedish vehicle technology and research activities, it now being possible to offer the simulator for virtual product development and prototyping.

The establishment of the simulator in Göteborg also means that research teams, inside as well as outside VTI, now are able to apply for EU research programmes while they have this unique equipment to promote their competitiveness.

PHOTO: VTI/HEJDLÖSA BILDER

A distinctive feature of the new driving simulator is its motion system that enables linear motion both in x and y directions, as well as its system to visualize a view wider than 180 degrees. It is possible to change the cabin design, too, from a passenger car cabin to a driver cabin of a lorry.

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VTI Sums up 2008

In January, VTI submitted its annual report for 2008 to the Ministry of Enterprise, Energy and Communications.

A summary of the report canw be found in the brochure "VTI in words and figures for 2008" which can be downloaded from the web site www.vti.se/english. The brochure describes the work of VTI in the past year, and presents the institute's accounts.

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Conference of the Swedish Transport Sector

PHOTO: VTI/HEJDLÖSA BILDER

The New Year of the Swedish transport sector traditionally begins with the large annual conference, Transportforum, organised by VTI. Over 1 600 delegates met at Linköping on 8–9 January this year. The well-filled programme offered as many as 69 sessions with more than 500 presentations.

The conference has become the largest event in its field in the Nordic countries. It is a place where researchers and the many players of the transport sector meet to share knowledge and make contacts. The conference this year was the 26th.

The keynote speakers this year were Jonas Bjelfvenstam, Director General of VTI, and Åsa Torstensson, Minister for Communications. Both spoke of the importance of development and infrastructure in the present economic crisis. The conference introduction continued with a discussion of how intelligent transport systems, ITS, can make our transport sector more efficient. The reason that ITS was the main theme is that the world congress on ITS will be arranged in Sweden in September this year.

Next year's Transportforum will be held on 13–14 January.

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Read more: www.vti.se/transportforum

ViP – Virtual Prototyping and Assessment by Simulation

The Swedish centre of excellence, ViP, Virtual Prototyping and Assessment by Simulation, has opened a website to inform of transport related real time simulation of vehicles and traffic.

The centre of excellence was established in the spring of 2008. The centre shall coordinate Swedish resources relating to real time simulation of vehicles and traffic with focus on HMI, Human Machine Interaction. The centre is expected to contribute to the strengthening of competitiveness the Swedish transport industry.

The centre is developed and coordinated by VTI but involves cooperation with a number of actors in the transport sector in Sweden.

ViP
Virtual Prototyping and Assessment by Simulation

Contact: Lena Nilsson, VTI, lena.nilsson@vti.se
Read more: www.vipsimulation.se

Visit by the Namibian Minister of Transport

Since the end of the 1980s, Sweden has given extensive aid to Namibia, inter alia to the country's transport sector. This aid is will now be replaced by collaboration within the framework of the Swedish Government's policy for stakeholder driven collaboration, i.e. direct collaboration between two parties in a certain area. Namibia is one of the countries chosen by the Government for the development of this type of collaboration.

With a view to promote these new relations, a delegation comprising representatives of organisations engaged in trafic safety in Sweden, among them VTI, visited Namibia in October 2007. Now, in November 2008, a Namibian delegation, with the minister of transport Helmut Angula, paid a return visit to VTI.

The aim of the delegation was to explore the possibilities of some kind of collaboration in the field of traffic safety and to have a look at VTI's staff and laboratory resources in this area. The delegation was very impressed by the breadth of VTI's activities, especially during a visit to the crash track and the driving simulator.

PHOTO: VTI/MAGDALENA GREEN

Contact: Kent Gustafson, VTI, kent.gustafson@vti.se

A project for environmentally friendly transport:

Transnova in Trondheim

– The city of Trondheim is a centre of scientific and technical competence in Norway. This specialist environment will now receive a new contribution. The Norwegian Minister of Transport and Communications, Liv Signe Navarsete, made this statement early October 2008 when the government budget for 2009 was published.

The new project Transnova will be placed at the NPRA's Technology Department in Trondheim and the Road Directorate will manage the project. The objective of the project Transnova is to develop policy instruments and measures to reduce greenhouse gases and other environmental pollution caused by the transport sector.

– The intension of Transnova is to give financial benefit to good environmental projects which will speed up the increased use of alternative fuel such as second generation bio fuel, electricity and hydrogen.

PHOTO: VTIHEDLOSA BILDER

Transnova will advance better solutions to the environmental problems within the transport sector, stated the Minister of Transport and Communications.

The Norwegian Government has emphasized that it is of vital importance to reduce the greenhouse gases from the transport sector. The emissions from road transport 1990–2005 showed a 25 per cent increase, which brings the amount of emissions from this sector up to a quarter of the total national emissions. Transport is necessary for people, industry and commerce and in that sense it is very important that fuel used by the vehicles give low or no emissions. Advancing this objective will be the main task for Transnova.

The budget allocated for 2009–2011 was 6 million euros per year which was in accordance with the Climate compromise made by the political parties represented in the Norwegian Parliament (Stortinget). In February 2009, as part of a financial package, the government made an additional grant of 6 million euros this year to intensify the effort on environmentaly friendly transport.

Author: Thorbjørn Chr. Risan, NPRA

Award for Traffic Safety Work

PHOTO: JAN WIDHALL, VTI

Previous VTI staff member Thomas Turbell has received this year's Kenneth A Stonex Roadside Safety Award. The award, which comprises a plaque and 1,000 US dollars, is made by The Roadside Safety Committee. Part of the citation read "In recognition of his achievements in advancing the state-of-the-art and promoting international cooperation in the field of roadside safety technology, Mr Turbell is foremost among European safety experts in fostering international harmonization of performance standards for roadside safety hardware".

– It feels great. The prize has been awarded for 17 years, and I am the third from outside the US. All the others, apart from an Italian, an Englishman and I, have been Americans, says Thomas.

The researcher the award is named after, Kenneth A Stonex, worked at General Motors Proving Ground for 37 years, and was one of the pioneers in developing the traffic safety of the roadside environment. Many of his designs are still used along the US motorways.

Read more about VTI's crash test tracks:
www.vti.se/crashtest

Re-road – End of Life Strategies of Asphalt Pavements

PHOTO: BJÖRN KALMAN, VTI

The Re-road project started in January 2009 with a well-attended and productive kick-off meeting in Sweden. 35 project participants gathered to set the groundwork for the project.

The 3,2 million euro project has 14 parties. The project addresses the technical and environmental aspects of all steps in the recycling procedures of asphalt material. The objectives are to develop knowledge and innovative technologies for enhanced end of life strategies for asphalt road infrastructures, improving the sustainability of the materials used.

A great deal of the first day meeting was devoted to laying the administrative foundation of the project but at the end of the first day and throughout the second day the time was committed to planning actions for the coming years in the technical work packages and for the scientific coordination between the work packages.

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Read more about Re-road: http://re-road.fehrl.org/

WHAT'S UP IN THE NORDIC COUNTRIES?

PHOTO: HEJDLÖSA BILDER/VTI

SWEDEN

Digital Human Modeling A Design and Engineering Conference, DHMC
9–11 July 2009, Göteborg, Sweden

SAE International is holding the 12th international conference for companies and university researchers who are engaged on human modelling. The conference relates, inter alia, to biomechanics, crash simulation and cognition. Around 200 delegates from all over the world are expected.

The arrangements are made by VTI together with Chalmers University of Technology.

Read more: www.sae.org/dhmc
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ITS WORLD CONGRESS
21–25 September, Stockholm, Sweden

It is the 16th time that the annual international congress on intelligent transport systems and services is held. The arrangement alternates between different parts of the world, and this year it is taking place in Sweden, with ITS Sweden, Vinnova, The Swedish Road Administration and Stockholm City as the hosts.

VTI will take part with a stand and also arrange a technical visit to VTI at Linköping on 20 September.

Read more: www.itsworldcongress.com
Contact at VTI: Helena Sederström, helena.sederstrom@vti.se

Human Factors and Ergonomics Society Europe Chapter, HFSE
14-16 October 2009, Linköping, Sweden

The key theme for this conference is Human Factors: A system view of human factors, technology and organisation.

Abstracts can now be submitted through the conference website. The length of the abstract is maximum 200 words, and the last date for submission is 15 June 2009.

Hosts for the arrangement are VTI, Linköping University and HFN, the Swedish Network for Human Factors.

Read more: http://conference.hfes-europe.org/
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Road Safety on Four Continents, RS4C
Spring 2010, Abu Dhabi

The international road safety conference Road Safety on Four Continents is arranged by VTI for the fifteenth time. In previous years, the conference has attracted almost three hundred delegates from all corners of the world. The conference will again be a meeting place, for the sharing of experiences and new findings, for road safety experts from the whole global arena.

Work on the arrangement and the programme is well under way. Call for papers will be made shortly.

Read more: www.vti.se/rs4c
Contact at VTI: Kent Gustafson, kent.gustafson@vti.se

PHOTO: PHOTOS.COM

Ranking System for Active Safety Functions

Magdalena Green,
VTI, Sweden

Passive safety systems have for many years been ranked through various systems such as EuroNCAP. To make things easier for the buyers of cars and heavy vehicles, methods are now being developed for the objective ranking of preventive (often referred to as active) safety systems. Examples of such systems are stability control to keep a vehicle in its lane and support systems to avoid collision with the vehicle in front.

Vehicles are increasingly fitted with active safety systems to reduce accident risks in traffic and thus lower the number of accidents on the roads. Today it is however difficult to demonstrate the effect of various types of active safety systems and the way the systems help enhance safety in traffic. The objective of the project eVALUE is to create a procedure for the objective elucidation, ranking and evaluation of active safety functions.

It is also desirable to test active safety functions and to present the results in a clear manner, and research is now in progress to develop criteria and principles of evaluation, as well as test methods for these systems in road vehicles. Evaluation may be performed in different ways, but it will be most realistic if the tests are made in different traffic situations to see how these active safety systems alleviate risks.

The aim of this project is to develop a completely new system, and it has therefore been decided to employ a system that is slightly different from the usual.

– What is normal for this type of work is to base it on specific functions, i.e. to use a system based approach, says Fredrik Bruzelius, project leader for the part VTI is engaged on. In eVALUE we have decided to adopt a holistic perspective of the car and its capacity to deal with situations which may give rise to danger in traffic, i.e. a scenario based approach. We want to consider the whole entity.

It is hoped for that this type of ranking system will also enhance understanding of the benefits of this type of functions on a broader front.

The project is financed through EU funds.

Read more: www.evalue-project.eu
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Traffic Simulation at VTI

PHOTO: PHOTOS.COM

VTI has developed simulation tools that can be used for the analysis and evaluation of changes in the road traffic system. The tools can be used to investigate what effects the use of ITS (Intelligent Transport Systems and Services) and other changes in the traffic system will have on traffic performance, safety and the environment.

Johanna Malm, VTI, Sweden

Effect analyses by ITS often take place in two stages. A study is made first of all of the effect ITS or driver support systems will have on the driver behaviour. These behavioural studies can, for instance, be made through tests in a driving simulator. In the next stage, an analysis is made of the effects which the changed driver behaviour will have on the entire traffic system. Traffic simulation is an important tool for this kind of traffic system analysis.

In the present project, "Simulation tools for evaluating ITS and driver support systems", simulation tools have been developed for the two evaluation stages. The project consisted of two parts.

In the first subproject, models have been developed for simulating surrounding traffic in a driving simulator. The surrounding traffic should be realistically modelled so as to create the necessary illusion of real driving.

In the second part, models have been developed for simulating traffic which also include vehicles fitted with driver support systems. The developed model can be used to find out how changes, that occur in driver behaviour when driver support systems are used, influence the traffic system as a whole. The model also makes it possible to study the effects if different percentages of the vehicles in the traffic stream are equipped with driver support systems.

The project is a collaborative project between VTI and Linköping University which has been in progress since 2006 and is expected to finish during this year. It is also a part of the doctoral theses of Andreas Tapani and Johan Olstam.

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Norwegian ISA-study

A recent study in Norway on an informative ISA-system showed that the ISA-system could significantly reduce the drivers' mean speed, speed variance, time that drivers drove over the speed limit and the maximum speed. The drivers did not report any change in subjective mental workload when the system was introduced in the driving environment.

Bjørn A. Lund, NPRA
Norway

Speeding represents a significant traffic safety problem in Norway, and internationally. Each year, about 300 persons are killed and about 12 000 injured in road traffic in Norway. Several studies have shown that there is a clear statistical relationship between speed level and traffic accidents. Relatively small speed level changes result in significant changes in the number of accidents. Traditional measures to counteract speed-related accidents, has been increased and enhanced traffic control, reduced speed limits, engineering measures (e.g. road humps) and attitude- and information campaigns. These measures has documented effects, but it may be discussed whether these would be sufficient to pursue the goals of the vision zero – to work towards a traffic society were no one will be sustained injured or killed in the road traffic.

ITS (Intelligent transportation systems and services) is technology, systems and services that promote safe and efficient transportation of persons and goods. ITS technologies may be able to resolve the various transport issues, and has been designed and developed to improve the transport handling- and mobility, increase road safety, help energy conservation and to reduce the environmental impact of road traffic. In recent years, however, a number of ITS technologies for use in the vehicle have also been developed to reduce the speed level and the high speed violations among the drivers. Of the various ITS technologies that can have a great potential to reduce the number of accidents and seriousness of the accidents through the reduction of e.g. speed, the ISA systems stand out.

There has recently been carried out a study in Norway, as a part of a master thesis in psychology at the Norwegian University of Science and Technology (NTNU), and the scope of the study was to look at the extent to which an informative ISA-system can lead to different behavioural effects as e.g. traffic safety effects with regard to the reduction of vehicle speed. It is in this study focused on doing an evaluation of a Norwegian developed, informative ISA-system that exists as a prototype. The study was carried out as a simulator study in the SINTEF / NTNU driving simulator, which speed data at various conditions were analyzed.

The results showed that the informative ISA-system can help to reduce the mean speed, speed variance, time that drivers spent over the speed limit and the maximum speed. These effects were especially noticeable in the 80 - and 90 km/h speed limit. It seems that this ISA system helps to reduce the differences between women and men when the ISA- system is active. Men have generally higher scores than women, but the differences are smaller when the ISA system is in use. Age and driving experience seems generally not to have any effect on the efficiency of the ISA-system.

It was, as expected, a correlation between attitudes to road safety and self-reported behaviour in traffic, but it appears that one can conclude that the ISA-system has no systematic effect on the relationship between attitude, behaviour and the speed variables. There was no evidence that the ISA system led to increased, subjective perceived mental workload of drivers when the system was introduced in the driving

PHOTO: PHOTOS.COM

environment. Drivers' positive attitude and acceptance towards the ISA system was however somewhat reduced after having gained experience with the system. It appears that there is no particular willingness to acquire such an ISA system today, although the majority believed that the ISA-system will be a very important contribution to road safety work in Norway.

Implications of this study will be that earlier research results has been confirmed in large extent, where several studies showed evidence that an ISA-system will be a positive contributor to road safety in the way that we can achieve significant speed reductions. There must however be awareness about how the driver perceives the alerts that are provided by the ISA-system. Further studies related to the HMI-perspective should be done, particularly in relation to the ISA device that was subject to evaluation in this study.

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The article is based on a master thesis,
Department of Psychology, NTNU, Trondheim

PHOTO: TORBJØRN CHR. RISAN, NPRA

Lane Departure Warning by Use of RfID Communication

The Norwegian Public Roads Administration is completing a R&D project on Lane Departure Warning. In contrast to traditional Lane Departure Warning systems based on optic reading of lines, this project uses RfID technology. A five kilometre test site has been established as well as a vehicle fitted with necessary equipment. The technology is showing potential, and the ongoing evaluation will provide exhaustive results.

Terje Reitaas, NPRA, Norway

The majority of the severe traffic accidents on Norwegian roads are head-on accidents or single accidents – driving off the road. One of the traditional measures to prevent these accidents has been the use of central barriers. Norway has a demanding topology when it comes to road construction, which has lead to building of narrow roads with a lot of curves. The majority of roads have a minimum lane width and no or very narrow shoulders. It is therefore very expensive to build central barriers on a lot of locations, this due to the need to expand the road width. These circumstances have made the Norwegian Public Roads Administration (NPRA) investigate if technology can be a measure to ease the situation.

After completing a state of the art analysis the NPRA realised that there are few suppliers of lane departure warning systems. The vast majority of suppliers have an optic solution using video with picture analysis. This technology is not suitable in Nordic conditions where the lines are covered in snow several months a year. Besides ploughing and use of studded tires will quickly wear down the lines. The result is faint lines in the summer, which is not easily read by an optic solution. On this bases a different approach was needed.

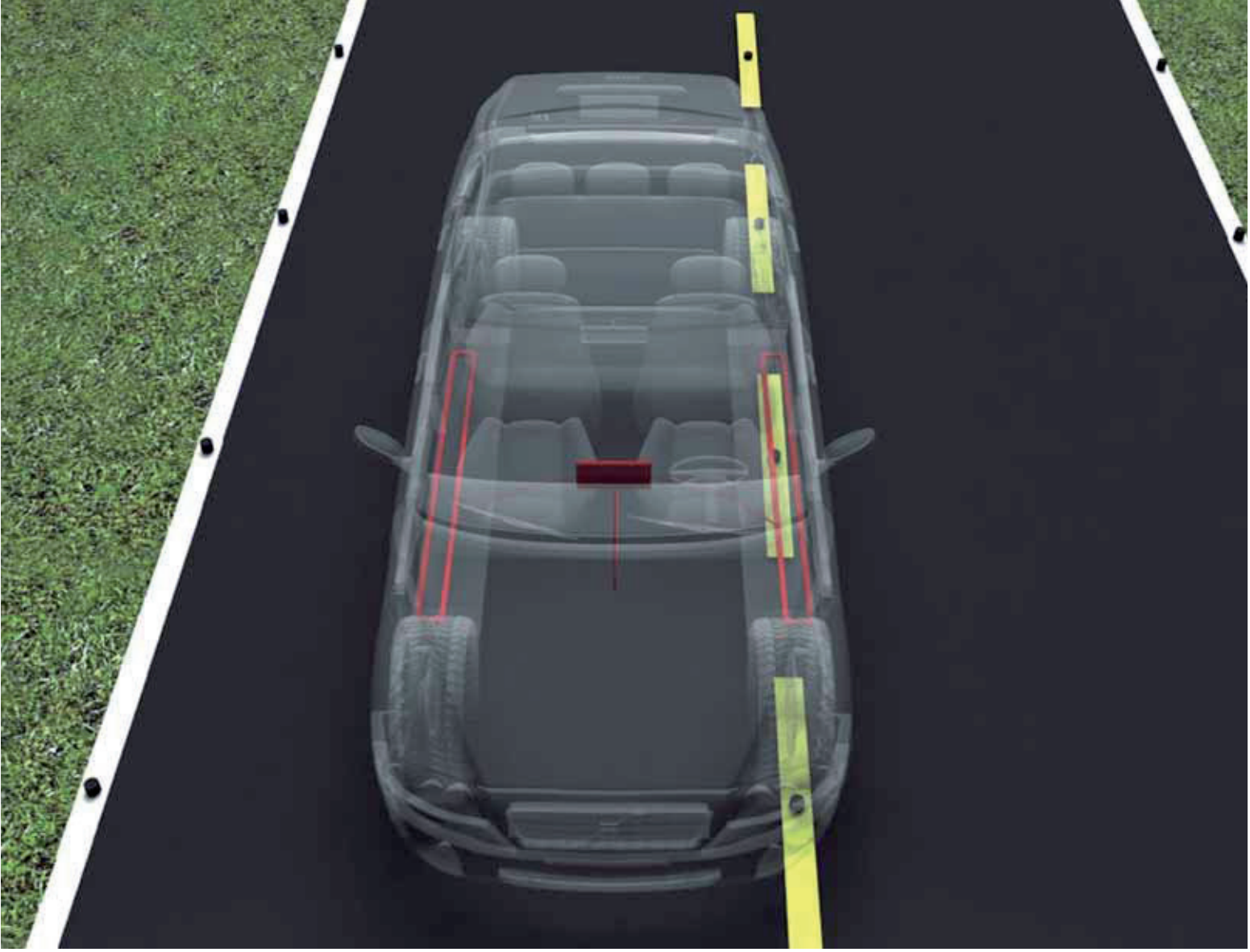
A small company in Tvedestrand, Southern Norway, had developed a technology with some potential. This resulted in an OFU project which is a way of helping small companies with the development. The basis of the arrangement is a three way funding between a public authority, a private company and Innovation Norway. The project was planned and implemented between April and October 2008, with a budget of 130 000 euros. The first activity was to establish a 5 km test site south of Trondheim.

Technology

The main task of this solution is to detect whether a vehicle unintentionally are about to cross the edge line or the centre line. The technology is based on RfID communication with a digital transfer between vehicle and road. The complete equipment consists of the following:

Transponders – contain a data unit and a coil. The transponder is drilled about 15 cm into the road surface. By incoming radio waves, the coil will induce power to the data unit. The data unit will send an echo back trough the coil, tagged with unique pre-programmed information. This information is detected by an antenna.

The antenna – is strapped underneath



the vehicle. It can be made in a variety of sizes and shapes dependent on operate frequency range. Antennas send and detect radio waves and communicate the information to the data unit.

The data unit – analyze the incoming radio signals and translate to readable language consisting of a number series. To utilize this, an application is needed.

Application – tells which function is to be executed when the system get a given transponderID, e.g. activate an alarm, showing an object or reducing the speed of a vehicle.

It is possible to store other relevant information such as danger ahead, signs or warn about a pedestrian crossing ahead on the transponder.

Evaluation

The evaluation process is to be carried out during 2009. By large the effort will be put in the HMI (Human Machine Interface). But there will also be some evaluation of the technical part of the project.

A part of the HMI discussion will consider the need of an onboard unit with a visual interface. Maybe an extra interface will induce increased mental workload for the driver. What is the optimal way of alerting the driver? Although we already know a lot about how additional interfaces affect the driver, there will be conducted simulator studies to answer these questions through 2009.

There will also be conducted an evaluation on transponders and how they are placed in the road, as well as finding the optimal distance between them. Both the antenna and the data unit will be subjects to scrutiny.

Conclusion

The NPRA entered this project knowing it had a large aspect of R&D. The aim was to learn about the technology and its possibilities. A goal was also to help the supplier developing their idea.

We have learned that the technology, being in a pilot stage of development, is quite robust, and that the implementation of the test site went smoothly.

At this stage it is too early to draw any final conclusions. The evaluating process has just started, but the technology has a lot of potential. A natural continuance of the project might be to detect other areas of use.

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Removing Barriers from Intelligent Transport

The deployment of Intelligent Transport Systems (ITS) faces many barriers. These were explored in Finland and solutions to overcome them have been presented. The public sector should provide strategic leadership to the development and create prerequisites for ITS markets.

Risto Kulmala, VTT, Finland

European and overarching Finnish transport policies put much more emphasis on ITS than what is in use now. Based on this, the Ministry of Transport and Communications (MTC) de-cided to nominate the author as a one-man committee to investigate the status of ITS deploy-ment in Finland, identify the major implementation issues and the appropriate roles and tasks of the public sector, and recommend actions to accelerate the implementation of ITS solutions. This paper summarises the content of the report [1] of this one-man committee.

Finland has been at the leading edge of ITS development in e.g. public transport payment, demand responsive transport, road surface friction monitoring, and weather-related traffic management. Even today, Finland is very advanced in maritime transport management, mobile ITS solutions for public transport, demand responsive transport, road surface friction monitoring and modelling, national information base interface libraries, and the assessment of services and their impacts. As a whole, Finland is today on a good average European level of ITS development and deployment, but seems to be falling further and further behind Japan, the USA and leading European countries.

Barriers

The implementation issues slowing down or hindering the development and deployment of ITS solutions were investigated via interviews of major stakeholders in Finland. The most important issues were:

- Lack of a champion for ITS
- Lack of a national master plan
- Planning and decision making is infrastructure oriented
- Small budgets for implementation and R&D
- Lack of personal resources and expertise in the public sector
- Lack of awareness and information, conservative attitudes
- Lack of customer orientation
- Poor quality in 1st deployments bad for reputation
- ITS does not bring publicity and thereby votes
- Inadequate business models in a small market
- Aversion to risk
- Varying roles and operational models in the public sector
- Inadequate information infrastructures
- Issues related to protection of privacy and data security
- Lacking standards and legal frameworks
- Heaviness of European solutions
- Difficulty of use
- Difficulty of payment

Overcoming barriers

There is a need to develop and agree on a

national ITS master plan together will all stakeholders, with specific financial commitment from the public sector. Innovations should be actively sought via focused R&D programmes with sufficient "seed funding". Large-scale test environments and field operational tests in cooperation with ”brother countries” should be set up to verify benefits, raise awareness and build markets. There is an imminent need to renew the transport administrations’ planning systems to also enable ITS as a true alternative and to set network operations as the key mission of the transport administrations.

Society is becoming increasingly networked, where public-private and private-private part-nerships play an essential role. The public sector should develop its purchasing processes to promote innovation and business opportunities, and to provide affordable information infra-structure with long-term quality guarantee to any ITS service providers. The public sector should also implement ITS where and when it is effective and profitable. Currently, this means the large scale deployment of incident management, network operation in large urban areas, intelligent road use charging, electronic payment, new public transport solutions, eLo-gistics, GNSS solutions in all modes as well as full utilisation of VTS and train control.

For full utilisation of ITS, MTC and its administrations should immediately 1) adapt the me-dium and short term goals of the administrations to also consider use of ITS, 2) obtain suffi-cient personnel and expertise in the domain and agree on share of work, 3) start up active goal oriented national and international cooperation, 4) commence actions to deploy the most effi-cient and effective ITS solutions and to start up large-scale field operational tests, 5) main-stream ITS and renew the planning system for network operation, 6) agree on a national vision programme for ITS and get the political and national commitment for it, and 7) agree on a national ITS strategy with the support of the Intelligent Transport Forum.

References

Kulmala, Risto (2009). Towards Intelligent Transport - Case Finland. Paper to be presented at the 16th ITS World Congress, Stockholm 21–24 September, 2009.

Contact: risto.kulmala@vtt.fi
Read more (in Finnish): http://www.vtt.fi/inf/julkaisut/muut/2008/get_file[1].pdf

ITS towards 2020

"ITS towards 2020" is a project initiated by the Norwegian Public Roads Administration, Technology Department in Trondheim. A main objective is to establish a test site for new technology and ITS in the city of Trondheim. Two other important objectives are to get knowledge about the HMI (Human Machine Interaction) due to the use of ITS and to search for and communicate knowledge and effects about ITS.

Anders Godal Holt, NPRA, Norway

University, science institutions and private companies are participating in "ITS towards 2020" and are also invited to generate new activities. The budget for "ITS towards 2020" is 2.5 million euros. The project contents following core activities:

- Establishment of a test site
- ITS and driver behaviour / HMI
- Collecting documentation about and communicating ITS
- Cooperating and interactions

Establishment of a test site

Measures and solutions to improve traffic safety, to reduce environmental impacts made by road transport and to provide more efficient use of the road network will be in focus. Measures that address the entire traffic system, including the road, the vehicle and the road user will be implemented.

The project includes the use of a driving simulator with simulation models of the road network in Trondheim and instrumented vehicles for use in project activities and for demonstrations.

The test site developed by "ITS towards 2020" is quite unique, based on the main road network in the city which offers the possibility to do tests both in a simulated road environment in the driving simulator and in a real road network environment equipped with data communication, road traffic monitoring etc.

The measures chosen are based on the ITS strategy for the NPRA which is closely linked with "ITS towards 2020".Among more well known measures present in the project there are queue warning system and WIM (Weighing In Motion) system. RTTI (Real Time Travel Information) based on Autopass technology (a toll fee collection system) is examples of measures combining traditional and more experimental technology. The most experimental measure is named "Electronic departure warning system". This system is based on RFID technology and a pilot was established in 2008.

The project period is over by 2010, but the test site will continue as a permanent arena for tests and demonstrations.

ITS and driver behaviour / HMI

"ITS towards 2020" has at least two focus on the topic driver behaviour and HMI. The first one is connecting knowledge from international activities and projects by searching for literature and participating at conferences. Secondly it is of importance for the road authorities to build up experience based on activities included in the project.

The driving simulator and the simulation models of the road network in Trondheim will be an important element. The first step in building up competence was taken in 2008 by doing a speed alert study of test persons using PDA equipped with speed alert in the driving simulator. In 2009 the main activities will be tests focusing the measure "Electronic departure warning system".

Collecting documentation about and communicating ITS

A main pillar in the project is to collect and communicate information about ITS to motivate for ITS-measures as an alternative to more traditional measures. It is of greatest interest that decision makers and planners learn about the potential of using ITS as alternatives to more traditional and physical measures.

The test site in Trondheim is geographically quite compact and suitable for excursions combined with conferences, meetings, visits etc. In this way one can learn both theoretically and a practically about ITS.

Cooperation and interaction

Cooperation and interaction with both education and science institutions and private companies is of great importance in "ITS towards 2020". Measures and infrastructure financed by one part should be at disposal for use for others to create synergies. Individual budgets for single activities could be quite moderate but together with other activities the total result could be "respectable".

Examples of activities with the potential to create synergies:

Infrastructure for wireless communication in Trondheim: The Norwegian University of

A street in the city centre modelled in the driving simulator.

PHOTO: NPRA

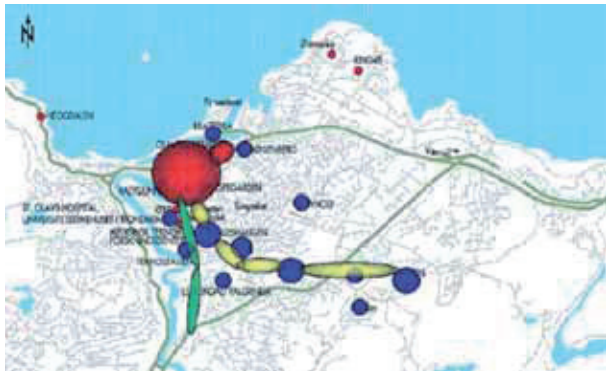

ILLUSTRATION BY NTNU

Wireless communication in Trondheim.

PHOTO: NPRA

A street in Trondheim included in the test site.

Technology and Science in Trondheim is establishing a laboratory along some parts of the road network. These roads are equipped with infrastructure for wireless communication. The activity focuses on research and development and is named "Wireless Trondheim" (www.wirelesstrondheim.no).

CVIS, Cooperative Vehicle-Infrastructure Systems: QFree ASA, a Trondheim based company is central positioned in a major European research and development project named CVIS. CVIS is aiming to design, develop and test technology needed to allow cars to communicate with each other and with the nearby roadside infrastructure. In "ITS towards 2020" together with "Wireless Trondheim" it is possible to do some preliminary tests and activities based on the CVIS concept (www.cvisproject.org).

Smartfreight: "ITS towards 2020" / NPRA, is a partner in Smartfreight, a European research and development project. The research organisation SINTEF is managing the project. The main aim of Smartfreight is to specify, implement and evaluate Information and Communication Technology (ICT) solutions which integrate urban traffic management systems with the management of freight and logistics in urban areas (www.smartfreight.info).

Wisecar, Intelligent driver support systems: SINTEF is managing this project funded by the Norwegian Research Council. "ITS towards 2020" / NPRA is a project partner together with several companies in the Trondheim region. Wisecar develops intelligent driving support systems for improved safety and efficiency in transport.

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The Research and Development Project:

Spontaneous Rideshare

In the earlier days of motorization, people were passengers because the vehicles were few and the public transport inadequate. Today nearly all drive alone in their private cars, even adequate public transport service exists. In the larger cities we see that nearly all traffic capacity is in use especially during the rush hours. The only place where we now have ample space is in the private cars–roughly four seats per car! We should use this spare capacity to solve the rush hour problems.

Arild O. Eggen, NPRA, Norway

In Norway long time has passed since the authorities constructed road capacity in response to demand. There is no indication that the trend will change. The city areas are also developing in a public transport "unfriendly" direction - living and working areas are still spreading in an inefficient way for transport. Population increase is higher in the surrounding areas than in the central city. The public transport system is adding in a negative sense to keep its market share (modal split is moving in the wrong direction).

We expect that each one of us is not going to walk more in the future, or cycle many more trips, and at the same time it will prove very costly to expand conventional public transport to take a higher share of the total transport, with an increasing population outside of the central city areas. We have in theory, three other possibilities

PHOTO: PHOTOS.COM

PHOTO: PHOTOS.COM

to avoid large environment and congestion problems:

A. Considerable strengthening the expansion of the transport network, i.e. roads and/or public transport
B. Considerable increase in the cost of using the transport system, so that people will travel less due to economic reasons
C. Develop systems that lead us to share car rides and as such improve the utilization of the present transport capacity.

It is in this respect interesting to see that by expanding the use of the private car with 0.2 (17%) passengers in the present day Bergen-private car, i.e. from 1.17 to 1.37, the resulting increase in transport capacity, is as large as the present total public transport system in Bergen. Talking about the potential and a 5 seated private car can still accommodate an extra 3.63 passengers.

These considerations made the mandate for the research and development project "Spontaneous Ridesharing", initiated, funded and carried out by the Norwegian Public Roads Administration.

The idea of this project was presented in 2002 and with the following basis: Is it possible to connect a driver and a potential passenger by mobile phone and GPS positioning system - spontaneously. The passenger is also a driver but has left his/her car in the garage. The aim of the project is to get one of the two (or three,..) drivers to park the car at home, use the Rideshare system to get to work or other activities. It is obvious that the system "knows" that the two are going in the same direction. The idea is further to create a set of positive incentives for the participants so that Spontaneous Rideshare will develop into an important part of the public transport system in the future. Especially in the city areas where the total transport capacity is a limiting factor for new traffic. Incentives may be: free passage of the toll system, free and convenient parking, use of bus lane, taxation benefits - and also the good feeling from the participants that they are making their contribution to ease the traffic congestion and the negative impact from traffic on the environment.

The research and development project Spontaneous Rideshare got off in 2006, and delivered its report late 2008. The project is clear about and know it is working on a long term basis. It will take some years before the full potential of spontaneous rideshare is reached. It is an important side effect that the cost of this service is very low, even when you include reduced income from tolling and parking, in comparison to other measures to increase the transport capacity. Effects on the environment are indeed positive.

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The Attitudes of Young People to Alcohol and Traffic

Drivers in the 18–24 age group figure most prominently in Swedish accident statistics. This is a situation that is about the same all over Europe. The number of young people who are injured in traffic is a serious problem on our roads increases. Alcohol use among young people is also increasing year by year. These problems are well known, but how does one establish contact with young people and change their attitudes to alcohol and traffic?

PHOTO: PHOTOS.COM

Magdalena Green
VTI, Sweden

The aim of the project "Emotion or reason" is to devise an effective way of modifying the attitudes and behaviour of young people regarding alcohol in traffic. An information and training package about the consequences of alcohol and traffic was presented in different ways to five test groups. Different combinations of emotional messages and factual information were given to sixth form students during special topic days and follow-up exercises. The aim was to see what effects the programme has on the attitudes and preconceptions of the young people and on their self-reported behaviour.

– Just now we have only preliminary results from one school. Studies of these have shown, inter alia, that fewer would travel with someone who was not sober, and that more would ring their parents instead of travelling with somebody who had been drinking, says Gunilla Sörensen from VTI, which is exactly what we wanted to achieve. Even before the age when people can obtain a driving license there are serious problems in traffic; it is often a matter of careless riding on mopeds. The number of mopeds, and thus accidents, has hugely increased in recent years.

– Here also it is a matter of attitudes and risk taking, says Jessica Berg at VTI who has studied the problems regarding youngsters on mopeds. Our studies show that those who own or have ridden souped-up mopeds are more inclined to take risks than others. They ride at higher speeds and have a longer history of traffic regulation infringements, continues Jessica Berg. We find that it has a lot to do with the attitudes of parents; many parents are aware that their children soup up their mopeds and there is high acceptance of modifications and high speeds.

– I wish we could raise the age for mopeds from 15 to 16, and also that we could find good methods for altering the attitudes of youngsters, and adults, and that we could reduce risk taking in traffic.

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Jessica Berg, VTI, jessica.berg@vti.se

New book, a result of European co-operation

A book covering almost any aspect of water in road structures is now ready for purchase. It passes on European knowledge on improving highway performance and minimising leaching of contaminants from roads and traffic.

Susanne Baltzer, DRD, Denmark

"Water in Road Structures" is the title of a book recently published by Springer Science.

The book is the outcome of a research project - named WATMOVE - under the COST-programme (European Co-Operation in the field of Scientific and Technical Research). Over a period of 3_ years, experts from 18 European countries shared their knowledge, research and experience, and structured everything into a book that contains chapters on both theory and practical aspects with recommendations for specifiers and practicing design and maintenance engineers.

The book is well timed, as climatic changes put pressure on finding solutions to lead water quickly away from the road. Rain falls more intensely in northern Europe than it used to. Heavy rain usually has a negative influence on the durability of the road structure, so it is important to know what are the effects of that water and what can be done to modify the behaviour of the road so as to resist any deterioration. The book provides information that leads to a better understanding of the issues of water in and on roads, and gives examples of solutions.

Contents of the book

The book aims at covering all aspects of water and water movement in roads and their immediate surroundings. It looks at the effects of moisture on performance, how water moves in the pavement and its surroundings, how it can be measured and controlled, sub-pavement drainage design and the environmental issues associated with the protection of ground and surface water due to seepage of water from run-off or from leaching construction material.

The Nordic countries have been strongly represented in the WATMOVE project. This shows in the book, where special northern climatic challenges such as frost heave and spring thaw are dealt with thoroughly.

Nordic representatives in the project

WATMOVE was chaired very dynamically by Andrew Dawson from University of Nottingham, UK, who also put a huge effort into editing the book. The strong Nordic flavour is the result of the input of the members listed in the box.

WATMOVE Representatives from Nordic Countries:
Jostein Aksnes, Norwegian Road Administration
Torleif Bækken, Norwegian Institute for Water Research
Susanne Baltzer, Danish Road Institute,
Gunnar Bjarnason, Icelandic Road Administration
Sigurdur Erlingsson, University of Iceland
Lennart Folkeson, Swedish National Road and Transport Research Institute
Åke Hermansson, Swedish National Road and Transport Research Institute
Rainer Laaksonen, Technical Research Centre of Finland
Michael Larsen, Danish Road Institute
Antero, Nousiainen, Destia Ltd, Finland

Contact: Susanne Baltzer, sub@vd.dk.
Read more: www.watmove.org

Europa Project to Reduce Damage to Roads by Storm Water

PHOTO: PHOTOS.COM

ERA-NET ROAD embraces a number of European countries under the slogan "road authorities getting to grips with climate change". VTI is participating in ERA-NET ROAD with the project SWAMP, Storm Water Prevention – Methods to predict damage from the water stream in and near road pavements in lowland areas.

Tarja Magnusson,
VTI, Sweden

The aim of the project is to study drainage and drainage systems on or near roads in lowland areas, chiefly in The Netherlands, Denmark, Norway, Ireland and Sweden. The project is to produce two guidelines: first of all, on a general level, places are to be identified where flooding often occurs, with disruption to existing infrastructure of great importance, and which can be maintained within the existing limited economic resources. In the second place, the project group will, through a questionnaire survey and interviews, collect information on what guidelines there are available in each country or region, what the drainage systems are like, how they are maintained, and so on. Attempts will also be made to find out more about the places where flooding has occurred and how these have been dealt with. What is of particular interest is to find whether it has been possible to identify the main cause of the problems (under-dimensioned drainage ponds, road culverts, lack of proper maintenance or similar), whether, if this is the case, anything has been done to prevent a recurrence, and what action has been taken in such a case.

- The first part of the project is to result in a method for identifying "blue spots", i.e. the places where most problems will occur in conjunction with heavy, extreme, rainfall, says Klas Hansson who is one of the researchers from VTI who is engaged in Swamp.
- The results of the second part will be a step by step guidance for inspection, maintenance, reinstatement and possibly upgrading of the drainage systems at the places identified as "blue spots".

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Read more about ERA-NET: www.road-era.net

Development of Expertise for Road Maintenance

PHOTO: PHOTOS.COM

The purpose of the project Development of expertise for road maintenance is to raise professional skills and the status of road maintenance in the Norwegian Public Roads Administration and in the industry as a whole. The project includes establishment of future systems and routines for enhancement of professional skills.

Øysten Larsen,
NPRA, Norway

Norwegian Public Roads Administration (NPRA) fears a loss of professional skills from the agency as well as from other parts of the industry, for various reasons:

- The NPRA lost a significant amount of competence related to road maintenance following the separation of the production section (now Mesta) from the agency in 2003.
- As a consequence of the introduction of competitive tendering for road maintenance from 2003 onwards, the NPRA's main focus has changed from professional issues to contractual obligations.
- A large number of staff in pre-retirement age implies that a significant loss of experience-based skills will follow in the years to come.

Experience from Sweden and Norway indicates that the construction industry needs stimulation as an inducement to undertake research and development efforts that do not result in immediate profits or competitive advantages.

An old road network with neglected maintenance and increasing traffic loads, in combination with rising demands from society, represents challenges for the NPRA that call for a high level of professional skills.

Focus areas

The project is divided into four focus areas. Separate project groups have been established for each of these.

- Visibility:
  The purpose is to enhance the status of, and interest in, road maintenance as a professional field, and to improve recruitment.
- Training:
  Improved training aims to enhance skills at all levels among actors who are engaged in road maintenance.
- Specialization, research and development:
  The purpose is to recruit more specialists and PhD graduates, aiming to increase the pace of development of the professional field and to strengthen future research and development (R&D) and education. The project will focus on new technology and future-oriented R&D, and on introducing R&D as an element in contracts for road maintenance.
- Transfer of experience:
  The purpose is to collect, systematize and disseminate experience-based skills from experienced staff to new colleagues, as well as among various industry actors, so they may mutually benefit from each other.

Progress and organization

Development of expertise for road maintenance is a four-year research and development project, which will be undertaken in cooperation with construction enterprises, suppliers, consultants, R&D institutions and seats of learning, as well as other institutions with road-related responsibilities, especially municipalities.

The project was initiated in 2007. Its initial phase included surveying and planning, where the project content was discussed at seminars and in meetings with the industry. Specific plans for further undertakings will be elaborated by the project groups during 2008. The groups are composed of representatives for the NPRA and various parts of the industry.

An advisory board with a broad representation has been established to provide advice and input to the project work. The project is organizationally located in the Technology Department of the NPRA.

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Competitive Tendering Improves Efficiency

The introduction of competitive tendering in local bus transport in Norway has led to a reduction in both costs and subsidies, with limited effects on labor income and welfare. The service level in general is not reduced, but a higher priority of patronage in counties using competitive tendering is observed.


Frode Longva and Oddgeir Osland, TØI, Norway

The Institute of Transport Economics has analysed the effects of competitive tendering and increased operational independence on public companies in local public transport, rail and regional aviation. The main emphasis is on local bus transport.

Half of Norwegian counties have made use of competitive tendering in local bus transport, in most cases also establishing a procurement body responsible for planning and marketing, and the use of gross cost contracts.

The increase in administrative costs is small, and mainly attributable to transfers of administrative costs from the operators to authorities. Such an improvement of competencies among public authorities, are likely to lead to improved conditions for prioritizing between public transport and other modes. Hence, neither a hypothesis that competitive tendering lead to increased transaction costs that outweigh savings, nor that it will lead to increased fragmentation, has support in the case of local bus transport.

The drivers

As to the effects for bus drivers, no negative effect of competitive tendering on wages can be observed. One effect is increased uncertainty about getting a job at the winning operator, but empirical research show that this in most cases is not a problem.

Competitive tendering leads to increased work intensity. Evidence on the effects of these changes on work absenteeism is, however, scarce and inconclusive. In other words, the effects of competitive tendering on wages and working conditions are marginal, mainly because the use of nationwide collective agreements is made statutory. Also the centralized tariff structure and a high membership rate in the trade unions work in the same direction.

Improved efficiency

The general conclusion is that the introduction of competitive tendering in local bus transport does not hamper any of the key goals for public transport. It has improved efficiency and reduced public costs, with limited redistributional side effects. Our main explanation is that these effects are a result of the traditional Norwegian model of employment relations.

Also, when analyzing operative personnel in other sectors, such as engine drivers, conductors, pilots, stewards/stewardesses on planes, we find little evidence that their working conditions have been weakened due to increased operational independence or competitive tendering. On the contrary, for engine drivers, we can observe a relative improvement in wages in the last decade, due to a change of tariff agreement and not least that more and more operators compete for a scarce number of drivers.

Regional aviation

When it comes to effects of competitive tendering in regional aviation, where they make use of three-year net cost contracts and a high degree of specification of services, we find that there has been larger problems establishing a well functioning

The general conclusion is that the introduction of competitive tendering in local bus transport does not hamper any of the key goals for public transport.

competition. Hence, the evidence on reduced costs for public authorities are inconclusive, whereas it is clear that the services in general have been at the least at the same level as before competitive tendering was introduced.

Rail sector

Also in the rail sector, the level of services for customers has been maintained after increased operational independence for NSB and at the Gjøvikbanen, where tendering was introduced. As for the development of costs, evidence is inconclusive.

In this area, however, the report concludes that a thorough analysis of the effects of new regulations and competition in this sector should include the general changes in relation between freight and passenger transport, as well as the relation between infrastructure and operations. Such an analysis should include changes in transaction costs in the general system as well as changed performance in terms of services and costs in the rail freight market.

Report: "Competition the Norwegian way". The effects of public transport tendering on service levels, costs and working conditions. TØI report 982/2008. Language: Norwegian with english summary.

Author(s): Frode Longva and Oddgeir Osland, E-mail: oddgeir.osland@toi.no

The Road Surface Influences Fuel Consumption

The state of the road surface has an effect on the rolling resistance of the vehicle, which, in turn, influences fuel consumption. This has been known for a long time, but VTI has now been studying the models and methods for the measurement and control of this.

Magdalena Green
VTI, Sweden

The aim of the EU project ECRPD, Integration of the Measurement of Energy Conservation in Road Pavement Design, Maintenance and Utilisation, is to develop models and methods for the minimisation of energy use in road construction, for road surfacings and for traffic.

To estimate the energy use of traffic, we need data on the influence of the road surface on driving resistance. This part of the driving resistance is called rolling resistance, and it is one part of the ECRPD project that VTI is engaged on. The task is to develop a model for the way the state of the road surface influences rolling resistance for a normal road vehicle.

Accuracy is essential

There are many variables that affect rolling resistance, such as speed, *macro* texture, *roughness*, wind and temperature. The way rolling resistance is influenced by these has been studied many times before, but it is difficult to judge the accuracy of these studies. This is evident from the large variation in effects per change in road surface that is found in the literature. VTI has therefore devoted great attention to accuracy, expecially with regard to road gradient, meteorological conditions and tyre pressure, and is using variables that can be measured.

The literature shows that it is also necessary to demonstrate effects that may be small. This poses stringent demands for great accuracy in recording measurement conditions or for modifications to suit different conditions.

Tests on roads and by simulation

In order to estimate driving resistance, VTI has carried out coastdown measurements, a method which makes it possible to record deceleration over a distance of about 500 m. Some of the advantages of this method are that deceleration gives a true description of driving resistance under real conditions, costs are relatively low, and uncertainties due to the engine and fuel quality are avoided. For coastdown measurements three vehicles are used, a car, a light lorry and a heavy lorry.

PHOTO: PHOTOS.COM

In the VTI tests, measurements were made on a total of 34 road sections; the main variables were *macro* texture and surface *roughness* for Swedish conditions. The state of the road surface was measured with the VTI Road Surface Tester which produces several indexes of importance in addition to surface *roughness* and macro texture.

Computer simulation was also employed in the test. The results from the simulations, the influence of surface *roughness*, were compared with the coastdown measurements. The simulations produced considerable underestimates, but also high correlation with the measured data. After calibration, it should be possible to use simulation for the description of surface *roughness* effects.

Work in this study is an important contribution to a description of the effect of road surface on rolling resistance, both with regard to method and the results obtained. Based on measurement results and a survey of the literature, a general model for all vehicle types has been proposed. This model has finally been implemented in a computer program for calculating fuel consumption.

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High Accident Risk among Immigrants in Norway

The accident risk in Norway is twice as high among immigrants from non-western countries as for Norwegians. The accident risk is highest among drivers from the Middle East and Africa.

Susanne Nordbakke,
TØI, Norway

PHOTO: PHOTOS.COM

The Institute of Transport Economics has studied the accident risk among non-western immigrants in Norway. The purpose of the project has been to increase the knowledge about accident risk of immigrants and their relation to traffic safety in terms of knowledge, attitudes and behaviour.

Men from the Middle East and Africa have an accidents risk twice as high as Norwegian men. The accidents risk for women from the Middle East is twice as high as for Norwegian women.

The project was based on three different studies that are built upon each other: 1) Analysis of accident statistics where the purpose was to have knowledge about accidents risk among car drivers born abroad, 2) A focus group interview study with car drivers born in a non-western country with a Norwegian driver licence, 3) A survey among car drivers, both Norwegians and immigrants from non-western countries.

The survey did not find any simple explanations for the differences in accidents risk among immigrants from non-western countries and Norwegians, and it did not reveal any differences in self-reported behaviour. However, the survey did reveal differences in regard to knowledge and attitudes toward traffic safety issues, as well as problems in regard to the Norwegian driver licence training among immigrants. In sum; the focus groups interview and the survey reveals that the challenges in regard to immigrants and traffic safety is to be found on three dimensions.

The immigrants bring along knowledge and attitudes from their country of origin that are usually not favourable for safe behaviour in traffic. However, the knowledge and attitudes seem to change along with higher integration, measured as command of the Norwegian language.

Secondly, coming from another country with different driver- and traffic conditions makes it difficult to drive in Norway.

Thirdly, the language is a challenge for immigrants in the Norwegian driver licence education.

Accidents risk and traffic safety among immigrants. TØI-report 988/2008 Authors: Susanne Nordbakke, Terje Assum

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Road User Ability and Behaviour – the Basis for a Road User Friendly Road Design

Innovation Project Initiated by The Nordic Road Geometric Group

The main focus of this project is to collect information on research based knowledge about physical and mental abilities of road users and create a structured overview for practical use in road design and development of Nordic road design standards.

Lene Herrstedt, Denmark

The present models for estimating capacity and choice of road design and road equipment described in the existing road design standards include parameters of road user behaviour based upon a fictive "standard road user" in the sense of physical and mental ability. The national definition of the "standard road user" is the result of a "political" decision.

From research we already know a lot of differences in physical and mental capacity/ability among different groups of road users. In some cases and in certain traffic environments, it might sometimes be relevant to take these differences into account as an integrated part of the models used for road design. To be able to do so, existing research based knowledge about the ability differences of the different road user groups as elderly and adults, children and disabled road users related to different modes of transport is being collected.

Walking speed is an example of such a parameter included in the model for design of traffic signals at intersections.

The aims of the project

The project includes three main purposes:

- Collection of information on research based knowledge about physical and mental abilities for different groups of road users. The focus should be on elderly people, children and disabled road users. The collection of information must be presented as a structured overview suitable for practical use related to road design.
- Development of a new "explaining model" for road user behaviour.
- Discover the lack of knowledge and define the needs for additional research.

Project program includes six parts

Part I: Project Introduction and Preparation

A workshop with participation of practitioners and researchers – psychologists and engineers - was held in spring 2005 with the purpose to discuss the first project specification, clear up different questions and set up a kind of priority for the work to be done to create a consensus among partners.

Part II: Physical abilities, limits and problems among different groups of road users

This part of the project includes an international literature study with the purpose of creating an overview of research based knowledge on physical ability factors e.g. reaction time and decision time, essential visual factors, walking speed etc.

Part III: Mental abilities, limits and problems among different groups of road users

This part of the project includes an international literature study with the purpose of creating an overview of research based knowledge on the mental/cognitive ability factors e.g. perception of speed, distance and space; information overload and distraction; divided, selective and switching attention etc.

Part IV: Explaining model for road user behaviour

Quite a lot of empiric knowledge upon road user behaviour related to different traffic situations and different lay outs of road design is available in international research references. The huge amount of information is handled in the project parts II and III with the purpose of ending with a summary structured overview for practical use.

The substance in these two parts makes up the basis/foundation for development of the "Explaining Model" for road user behaviour. The model should be a frame for understanding.

The model must include a set up for fundamental ways of thinking and must define/formulate some general principles for road user behaviour. Besides, the model must be easy understandable. The intention is to create a tool for understanding and explaining the problems of road users and for specification of good and bad solutions for solving these problems. This frame for understanding should be the foundation for explaining the choice of solutions.

Part V: Choice and location of road user information in different specific traffic environments

This part includes cases of selected specified traffic environments. Using the results from part II – IV every case must be described as regards geometric design and traffic information to different groups of road users. Cases include roundabouts, merging lane sections, signalised intersections etc.

Part VI: The needs of additional research based on discovering knowledge gaps

An integrated activity of working out the preceding parts of the project will be to identify knowledge gaps and describe the needs for additional research activities.

Part II and Part III are a kind of "bottom up" activities where empirical results are summarised in the form of general conclusions while Part IV is more like a "top down" activity, where some general principles for road user behaviour are defined from general theories of human behaviour. Together those three parts make the foundation for a user friendly road design. The substance of part V is rooted in a "bottom up" as well as a "top down" perspective which means that it is based on empirical results as well as theoretical considerations.

Results so far

- The work is carried out by researchers and engineers from TÖI (N), VTI (S), Trafitec (DK), G. Helmers Consulting (S) and the Nordic Road Directorates in Sweden, Norway, Finland and Denmark. So far nine summary reports are available in Nordic languages which can be found on www.nmfv.dk\vejgeometrigruppen

In 2009 the work will focus on Part IV and Part V. Summary articles dealing with different topics from the project will be published in Nordic Road & Transport Research during 2009.

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More information: www.nmfv.dk\vejgeometrigruppen

Evaluation of local ITS solutions in urban areas

Title: Evaluation of local ITS solutions in urban areas
Series: VTI rapport 646
Author: Anna Anund, Christer Ahlström, Sverker Almqvist and Mohammad-Reza Yahya
Language: Swedish with English summery
Available at: www.nordicroads.com/publications
Name: Evaluation of local ITS

This study investigates the acceptance and effect of variable message signs (VMS). Two different systems was evaluated; one where a speed limit sign was combined with a message to slow down and another where a speed limit sign was combined with flashing lights. Both VMS were activated (lit up) if the passing vehicle was driving too fast as it approached the speed limit sign. The technical solution behind was radar. The aim of the study was to evaluate if the using a variable speed limit sign gave rise to lower speeds, the same approach was used in order evaluate the effect of an additional message system or flashing lights.

The investigation was conducted in two Swedish villages, Grästorp and Färgelanda, at road sections where the speed limit was momentarily reduced to 50 km/h. In both locations, the use of a variable speed limit sign resulted in speed reduction (mean and 85 percentiles) amongst the drivers. This means that the majority of the drivers, including those that drove much too fast, reduced their speed owing to the VMS. However, no further speed reductions were found when combining the variable speed limit signs with either a messaging system or flashing lights.

PHOTO: H. WILLIAMSSON, VTI

Interviews with the drivers revealed that they believed that both VMS systems would increase traffic safety by reducing the speeds. They also stated that variable speed limit sign was enough to increase their awareness of the current speed limit and that no additional messaging systems or the blinking lights was necessary.

Based on the results of this report, we recommend variable speed limit signs to be used in certain exposed locations. However, an additional system to attract the drivers attention is not supported since any further reduction in speed was seen.

Better everyday mobility through improved public transport – the Public Transport Action Plan 2009–2015

Title: Better everyday mobility through improved public transport – the Public Transport Action Plan 2009–2015
Authors: Marja Rosenberg, Virpi Britschgi, Anu Tuominen, Henriika Weiste, Riikka Kallio, Riikka Rantalainen, Mette Granberg, Heikki Metsäranta
Series: Publications of the Ministry of Transport and Communications
Language: Finnish with English abstract
Available at: www.nordicroads.com/publications
Name: Improved public transport

The Public Transport Action Plan 2009–2015 includes short and medium-term measures to increase the status of public transport policy in Finland. The measures were formulated for rural areas, towns and for long-distance transport. The public transport image, marketing, and development of ticket and information systems were examined as a service entity. The influence of land use and planning on public transport demand was also considered important. Bicycle and pedestrian traffic was discussed to such an extent that one of the measures suggested is the implementation of a similar action plan for pedestrians and cyclists.


PHOTO: VTI/HEJDLÖSA BILDER

Ten leading measures were chosen for implementation:

1. Constant competitiveness of public transport
2. Better standard of service of public transport in towns
3. Basic public transport services for rural areas
4. Compatible travel cards
5. Passenger information service
6. Fluent and precise public transport service
7. Easy access to long-distance public transport
8. Public transport zones into land use planning
9. Marketing of public transport
10. Getting around on bicycles, on foot and on public transport.

The role of government in implementation and financing is significant, but the contribution of municipalities, transport companies and other public transport organisations at least in implementation is equally important.

As a result of these measures, passengers will receive improved public transport services in both urban and long-distance traffic. In rural areas and small towns, people without cars will receive an adequate public transport service for everyday mobility. The competitiveness of public transport compared over the use of private cars can be improved through the combined effect of all the measures listed above. This would bring about a decrease in the kilometrage of cars and in greenhouse gas emissions from traffic, and a growth in numbers of passengers on public transport of some 20 million a year.

Traffic noise measurements in Malmö – Results from 1st and 2nd year

Title: Traffic noise measurements in Malmö – Results from 1st and 2nd year
Author: Bent Andersen and Hans Bendtsen
Language: English
Available at: www.nordicroads.com/publications
Name: Traffic noise in Malmö

On a small road in the suburbs of Malmö, Sweden, two old wearing courses of dense asphalt concrete with 11 and 16 mm maximum aggregate size were substituted by two new stone mastic asphalt wearing courses – one with 11 mm maximum aggregate size as a reference surface, the other with 8 mm maximum aggregate size being optimized for noise reduction. Statistical pass-by noise measurements were carried out before rebuilding the road, one month after repaving, and again one year later. Only results for cars (at 50 km/h and 20 °C) were evaluated.

The initial noise reduction of the optimized SMA 8 wearing course was very good, being almost 7 dB compared to the old 16 mm wearing course, and 3.3 dB compared to the new reference SMA 11. Frequency bands above 1 kHz were reduced 2 - 3 dB indicating that the surface was open textured (reducing aerodynamic "air-pumping" noise). Also frequency bands below 1 kHz were reduced indicating that the surface was even (reducing vibration noise). However, after one year (one winter with traffic using studded tyres) this noise reduction has more or less vanished. The difference between the noise levels at the two new SMA surfaces was reduced to 0.5 dB. This noise level is almost identical to the noise level from the old dense asphalt concrete with 11 mm maximum aggregate size. A small reduction was still seen around 1 kHz for the SMA 8 surface compared to SMA 11, presumably due to the smaller maximum aggregate size.


PHOTO: PHOTOS.COM

Thin asphalt layers for highways optimised for low tyre/road noise

Title: Thin Asphalt Layers for Highways
Author: Bent Andersen and Hans Bendtsen
Language: English
Available at: www.nordicroads.com/publications
Name: Thin asphalt

The Danish Road Directorate/Danish Road Institute (DRI) has been cooperating with the Dutch Road and Hydraulic Engineering Institute (DWW) in the DRI-DWW noise abatement programme as a part of the Dutch IPG programme. Focussing on highway application thin asphalt surface layers have been optimised for low tyre/road noise and followed over a couple of years. Two test sites have been established: a heavily trafficked motorway near Copenhagen (M10) where 6 different thin layers were constructed in 2004, and a highway near Herning (M64) where 11 test sections were constructed in 2006. The purpose of the experiments was to document the noise at each test surface and to examine possible ageing effects on the noise reduction. The noise measurements have been supplemented by measurements of surface profiles as well as friction. Noise measurements were carried out both as statistical pass-by measurements (SPB) and as close proximity (near field) measurements (CPX) according to ISO 11819. At both test sites a reference surface of the same age and traffic load was constructed as a dense asphalt concrete surface with 11 mm maximum aggregate size. At the first test site an initial range of variation of SPB noise results was almost 3 dB between the quietest and the noisiest pavement for passenger cars. For trucks a range of variation from 2 - 2.5 dB was found. During the first 2 years the noise levels increased slightly, and the noise reduction decreased to 0 - 1 dB for cars, but was unchanged for trucks. At the second test site (M64) the initial noise reduction was 1 - 2 dB better than at M10. The most promising concepts for low noise thin asphalts layers seem to be open graded asphalt concrete (AC 6o / AC 8o), optimized stone mastic asphalt (SMA 6+ / SMA 8), but also thin semi porous asphalt layers (BBTM 6 Cl.2) may be developed further. The changes of the noise levels have been compared to changes in surface texture (including texture spectra) but this comparison did not show any systematic relationship. The friction was for all test pavements with maximum aggregate size 6 - 8 mm better than the friction for the reference DAC 11 pavement.

Light pavement surfaces in tunnels – reduction of energy

Title: Light pavement surfaces in tunnels – reduction of energy
Author: Bjarne Schmidt and Kåre Ulrich Hansen
Language: Danish
Available at: www.nordicroads.com/publications
Name: Light pavement

The Danish Road Institute has together with A/S Øresund performed a literature survey on the use of light pavement types in tunnels in order to save on the energy consumption from illumination of tunnels. The highlighted result of the literature survey is given in this report. The aim of the literature survey is also a pre-study to investigate the potential of carrying out a second phase including tests of different pavement types to quantify the potential of reducing the energy consumption in tunnels by use of lighter pavement surfaces.


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