

## Paving the way forward A case study in innovation and process control

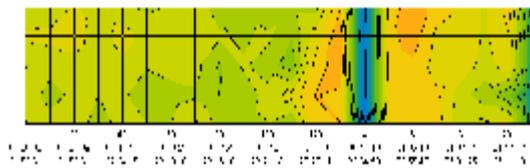
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The Dutch Ministry of Transport sponsored innovation competition led to the collaboration between the Aspari unit and BAM Wegen. Contractor BAM Wegen introduced two innovations for the A35 resurfacing project viz. to use a combination of a dual layer asphalt paving process with shuttle buggy for improved homogeneity; and to use themographic imagery and continuous GPS (Global Positioning Systems) tracking on the paver and compactor rollers for improved process control during the asphalt paving process. The Aspari team monitored key process parameters during construction since their research is aimed at improving quality and consistent reduction of quality variability in the hot mix asphalt (HMA) paving process.

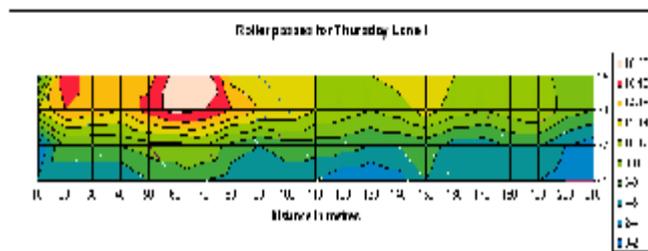


The temperature profiling has enabled the contractor to measure the extent of variability in surface temperature and hence draw a number of conclusions about temperature homogeneity. The monitoring of equipment movements using GPS systems has highlighted a number of operational issues. A number of benefits are apparent. The consequences of on-site operational behaviour and discontinuities are made explicit. The temperature profiling highlights the resultant variability in temperature



homogeneity and identifies potentially segregated areas. Temperature contour maps and compaction coverage plots are digitally “geo-referenced in layers” and saved in permanent records. Thus, future reviewing and matching with on-site pavement distress and failure is possible. Logging the movements of the equipment using GPS captures the results of

the operational choices made by the paver and roller operators. The animations provide evidence of the rolling patterns and of how rolling is undertaken during the construction process. Mapping the heuristics the operators use allows a deeper understanding of the on-site paving process. This systematic analysis and mapping of the asphalt paving process should lead to firstly, addressing the important issue of reducing variability in operational behaviour and secondly, to an improvement in consistency and quality in the final product.



This project (although relatively small) provides **several valuable outcomes and insights**:

- Systematic monitoring of surface temperature provides insight in the variability of asphalt temperature, and the shape of the cooling process. This type of monitoring can be useful for improving process and quality control;
- Surface temperature measurement can be used as a reliable indicator of in-asphalt temperature;

- GPS monitoring of the paver and the rollers maps the actions of the machine operators. The generated animations provide valuable insight into the number and spread of compactions during the process. The compiled data can be compared with the density measurements (nuclear gauge and drilled cores);
- The generated animations can be a good evaluation tool for the operators and teams, speeding up process learning and continuous improvement;
- The full array of registered data can be used to develop new strategies for maintenance and product/process improvement;
- The more data-rich approach to road construction opens up new strategies for combined technology and skills development, enhancing the effectiveness and adoption of new technologies in road construction.



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## About the Asphalt paving research and innovation (ASPARI) unit University of Twente, The Netherlands

The team focuses on innovation and performance in the asphalt paving process, having recently consulted key role players in the industry and subsequently publishing a number of conference papers in this research area. Their research is aimed at improving quality and consistent reduction of quality variability in the hot mix asphalt (HMA) paving process, and consciously working towards professionalising the asphalt paving process. The team is currently involved in several initiatives involving key role players in the road construction industry, the national roads authorities, training schools, research institutes and international partners. A few selected projects is shown in the figure below. For more information, see the Aspari website [www.aspari.utwente.nl](http://www.aspari.utwente.nl)

