

## Challenges and future solutions in Pavement Design and Road Engineering



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### Abstract

**This presentation gives an overview of the condition of the road network and points out the challenges we have in the area of road engineering. It will also provide an overview of the development trends that affect us and that should be taken into account in the planning and development of design standards and guidelines for road construction. Finally suggestions are provided as to what one should do in order to obtain better solutions in design, strengthening and rehabilitation of roads. The presentation is primarily based on Norwegian conditions but similar challenges and development trends are known to exist in most countries.**

The most extensive construction of road network in Norway and other comparable countries took place in the 1950s, 1960s and 1970s. These roads are today so old that they have to be rehabilitated and in some case totally reconstructed. This is a big challenge because it is expensive to rebuild these roads to satisfy the current requirements. Often solutions that are neither economically nor technically optimal over the long term are chosen. At the same time the level of expertise in the area of road engineering has seen stagnation and degradation. Too little recruitment for many years has led to a significant lack of competent people in the area. Also there is now less interest than before to take education and start a career in this field. Outsourcing of the production departments from the public road authorities and focus on economy and completion time in contracts seem to have led to less focus on quality and workmanship.

The most important development trends and changes that can significantly affect the developments in the road engineering area are:

- Increased focus on the environment with requirements on emission and better utilization of resources.

- Climate change with increased effect of water and moist climate.
- Greater demand from users
  - Greater demand for standard of the roads
  - Less tolerance for traffic delays.
- Big developments in the machinery and equipment for road construction.
  - Big construction machines make the work to go fast with little time for making changes/adjustments to local or unexpected conditions and to conduct appropriate quality control.
  - New quality control methods

How non-destructive quality control methods can be used to manage the production and quality of the finished product has been shown. Using these methods, one can quickly determine if the right quality is achieved or not, which is very important with regard to today's fast production technique.

It also appears that, in the future, one has to direct the monitoring more to the use of performance requirements instead of detail recipe specification and requirements on construction control. New materials that are suitable for the future environmental requirements and the modern production methods will also be utilized.

In the future it will be very important to be able to document the future performance and budget needs better than we do today. Further development of performance prediction models for roads as well as better methods for measurements of condition for existing roads is therefore important.

The design systems that we have today have to be improved and adopted to the current traffic loading, production method and climate. Construction of more robust road foundations and frost protection should be weighted more than it has been so far.