Problem Statement
Chip Seal and Micro Surfacing are important components of ODOT’s pavement preventive maintenance program. Thorough understanding of how well these treatments are performing is critical to the nature and extent of their continued use in the future. Currently, there is a lack of objective information on fundamental issues such as the expected improvement in pavement condition resulting from the use of chip seal and micro surfacing, the extent to which the treatments slow the deterioration of the pavement, and the optimum timing of the treatment. As a result, present guidelines are based on anecdotal observations and experience. This study was initiated to systematically evaluate and quantify the performance and cost-effectiveness of ODOT’s current chip sealing and micro surfacing practices using the data from completed and in-service projects.

Objectives
The study addressed three basic issues:
1. Treatment effectiveness: how well do chip seals and micro surfacing improve the condition of treated pavements?
2. Extension of pavement service life: to what extent does each of the treatments delay the pavement deterioration process?
3. Influence of treatment time: what is optimal time or pavement condition when the treatment can be most effectively applied?

Methodology
A total of 225 chip seal and 214 micro surfacing treatments were applied in Ohio between the years 1999 and 2006. ODOT’s pavement management information system consisted of relevant information including project location, dates of treatment, Pavement Condition Rating (before the treatment and for every year after the treatment), pavement type and functional classification. An experiment was designed to utilize this data to evaluate the effectiveness of the treatments. In addition, control sections with similar attributes were identified and used as ‘do-nothing’ sections. Effectiveness was evaluated with the aid of following five performance indicators:
1. Service life of treatments based on actual number of years in service
2. Average performance gain
3. Service life of treatments using performance models
4. Cost-effectiveness
5. Life cycle costs.

Service life was calculated as the time from the period of treatment installation till the time another activity was reported in the database. Performance gain was calculated for each project as the average difference in the PCR for each year between the treated and ‘do-nothing’ sections.

Treated pavements were divided into various groups based on the PCR prior to the treatment. Performance prediction models were developed for each of these groups. Life of treated pavements was obtained as the number of years to reach a threshold PCR.

Benefit cost ratio of the chip seal and micro surfacing treatments was obtained as the ratio of area of performance curve and the cost of treatment.

From a previously completed study, benefit cost ratios were available for Thin Asphalt Overlays, another preventive maintenance treatment practiced in Ohio. Life cycle cost analysis of chip seal and micro surfacing treatments was performed by comparing the benefit cost ratios with that of thin AC overlays.

Conclusions:
1. Chip seals are cost effective treatments. They provide maximum benefits when applied on pavements whose PCR is in the range 66 to 80. Under such conditions, chip seals can extend the service life of pavements up to seven years.
2. Micro surfacing treatments on general system (2-lane state routes) are reasonably effective. The best range of prior PCR for their installation is 61 to 70. Life of micro surfacing treatments on general system is nine years.
3. Micro surfacing treatments on priority system (4-lane or more) are marginally effective. The best range of prior PCR for their installation is 61 to 70. Micro surfacing on priority system can extend the service life of treated pavements by eight years.

Implementation Potential:
The results of the study can be translated into appropriate revisions of ODOT’s Preventive Maintenance Guidelines. With this, the district and county officials will be better able to identify which pavements are suited for chip seal and micro surfacing treatments.