

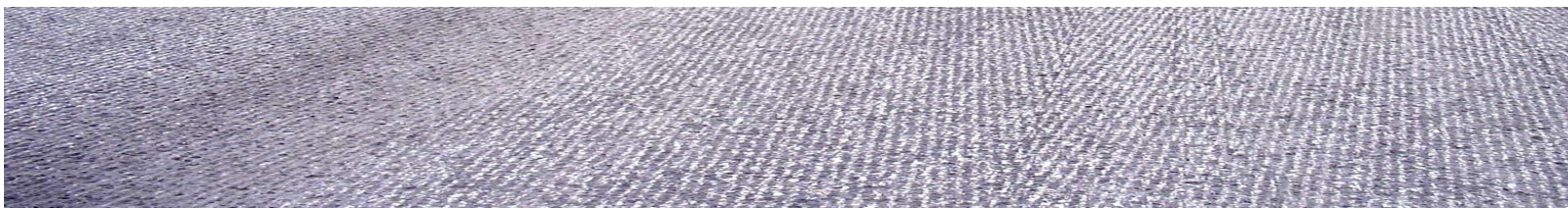
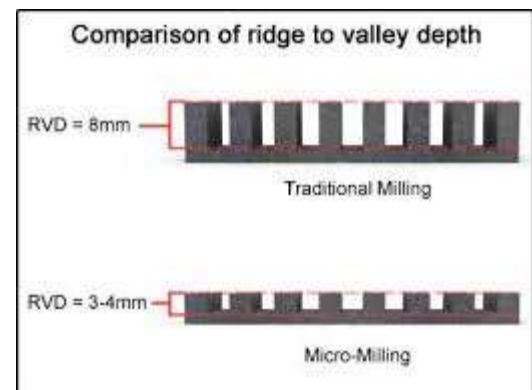
## Introduction

The practice of traditional rotomilling (or milling) has been a long-standing component of asphalt rehabilitation for decades. While its use in road reconstruction and asphalt overlay projects has become standard practice around the world, traditional milling leaves a relatively rough surface which may create limitations in certain roadway rehabilitation applications. The process of micro milling provides an alternative to standard milling when a smoother roadway surface condition is desired - particularly in applications like thin surface treatments/overlays, pavement marking removal, and subtle surface corrections or bump removal. The benefits and uses of micro milling are often overlooked, ignored, or simply unknown, typically to the detriment of the roadway owner.



## Basics

Micro milling utilizes the same equipment as conventional milling equipment, but the cutting drum is equipped with additional cutting teeth in order to produce a finer textured surface. A standard milling drum typically has about 15 millimeters between the points at which any two milling teeth contact the roadway. The additional teeth on a micro milling drum result in significantly reduced spacing of 5 millimeters or less. The increased number of teeth decreases the distance between the ridges and valleys of a milled surface and creates a much smoother texture on the milled roadway.



# Applications of Micro Milling



Since micro milling drums contain additional cutting teeth than a conventional milling drum, cutting depth in a micro milling application is limited. Micro milling is best utilized when the prescribed cutting depth is two inches or less. If rotomilling to a greater depth is necessary, the bulk of the existing material should first be removed with a conventional milling drum, then a micro milling drum may be utilized to remove the final one to two inches of material.

The surface texture of a micro milled surface may be measured by using the same techniques employed in a standard rotomilling operation. Typically, a macrotexture (or “sand patch”) test is performed to determine the pattern uniformity. In this test, a predefined amount of small glass beads are spread on the surface of the roadway in a circular pattern. The smoother the surface (i.e.: shallower valleys and lower ridges) the greater the diameter of the circular pattern. This test allows an owner agency or engineer to specify the tolerance of texture uniformity they wish to achieve in the milling operation. Exact tolerances vary among agencies.

## Applications of Micro Milling

The applications and benefits of micro milling are extensive. The process may be utilized on a variety of roadway rehabilitation and asphalt preservation methods. Generally speaking, micro milling may be utilized for any instance in which a finer (or smoother) milled pattern is desired.





# Applications of Micro Milling

## Surface Treatments



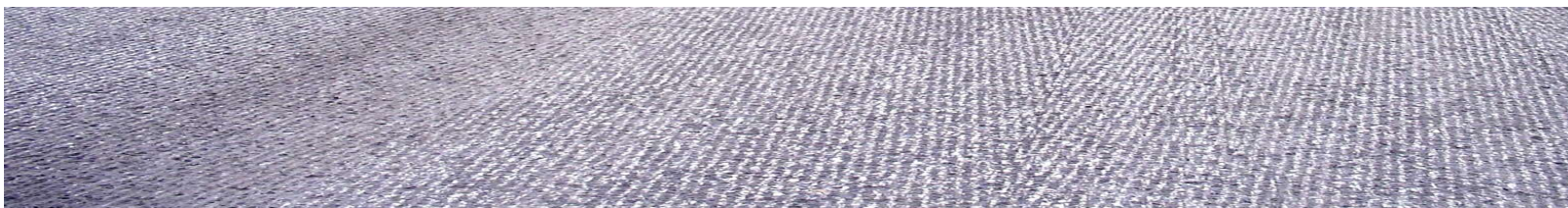
When pavement preservation treatments such as chip seal, slurry seal, cape seal, micro surfacing, thin lift overlays, etc. are applied on a roadway, corrections to existing grades and longitudinal smoothness may be difficult if not impossible to achieve. The very nature of these treatments typically means that they do not include enough material to modify or correct existing elevation, slope, or grade issues. It is likely that these issues can only be remedied via a rotomill prior to applying the surface treatment. Rotomilling may also be required when the existing pavement surface is higher than the elevation of the curb line. Standard milling drums may

create relatively large ridges and valleys that can easily reflect to the surface of the new preservation treatment. Excess surface treatment material must be applied to compensate for these surface variations. Alternatively, micro milling can be used instead of standard rotomilling. Micro milling generates a significantly smoother surface and minimizes the potential for reflection while reducing the quantity of material needed to adequately seal the surface of the roadway.

Micro milling may also be employed to remove these same surface treatments. Micro milling can be used to remove worn surface treatments, including open-graded friction courses, at shallow depths and minimize disruption and impact to the underlying pavement layers and structure.

## Surface Profiling, Grade Correction, & Bump Removal

A micro mill may also be utilized when profiling the surface of an existing roadway or adjusting grade, cross slope, super elevations, smoothness, etc. A major benefit to using micro milling in these situations is that upon completion of the milling operation, the micro milled surface may be opened to traffic immediately. While the same is true for standard milled surfaces, the shallower ridges and valleys of a micro milled surface result in reduced spalling of the asphalt and an overall much cleaner roadway. This means that traffic may utilize the milled area as a driving surface for a longer time and with less road debris until (and if) a surface treatment is ultimately applied.



# Applications of Micro Milling

The benefits of micro milling for smoothness and grade correction may be even greater when used in combination with 3D milling grade control or Automated Machine Guidance. A 3D milling system uses data from a computer modeled surface elevation to allow the mill to automatically cut extremely accurate depths. This precise method of grade correction coupled with micro milling makes for an extremely smooth milled surface prior to use by the traveling public or in preparation for a subsequent surface treatment.

## Cold Recycling Surface Correction

Cold-In-Place Recycling (CIR) and Cold Central Plant Recycling (CCPR) also provide opportunities for enhancement when paired with micro milling. After the placement of a CIR or CCPR mat, minor grade



corrections may be made with a micro mill prior to application of the surface course. Using a micro mill for these corrections may eliminate shoving of the recycled layer compared to substitute methods such as diamond grinding. The nature of the smooth pattern and reduced contact pressures provided by the micro milling drum also minimizes impact to the recycled layer and prevents the unnecessary removal of excess recycled material.

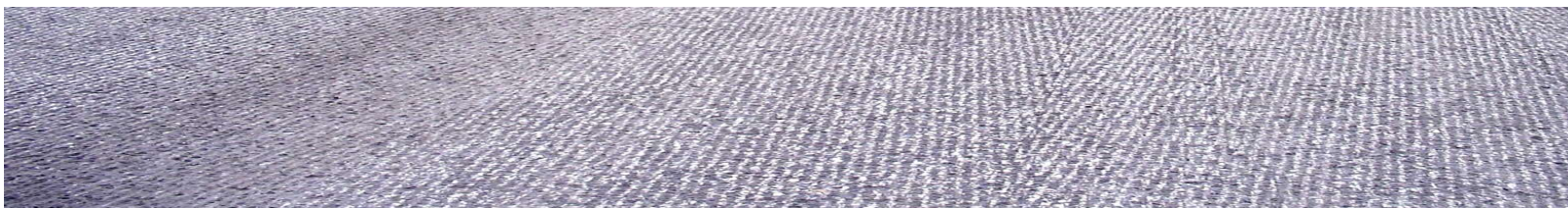
## Pavement Marking Removal

Micro milling is commonly and effectively utilized to remove existing pavement markings. Upon removal of a permanent marking, a milled surface may be exposed to vehicular traffic for a long period of time or even permanently. Therefore, a standard mill pattern may be too rough, generate excessive debris from spalling, retain significant moisture, and generally be unsightly. The milled pattern from a micro mill eliminates or drastically reduces these issues and allows for the removal of only the necessary amount of asphalt to remove the painted surface.



## Friction Restoration

In certain circumstances, a roadway may lose its original degree of friction which may create an unsafe condition, particularly on a wet surface, by increasing the possibility of vehicles hydroplaning. The roadway may be micro milled to restore friction to the surface and increase skid resistance. The milled surface may be immediately opened to traffic and may provide a medium to long term solution until a new surface treatment can be applied. This allows for an immediate and cost-effective solution particularly if budget is of concern.



# Applications of Micro Milling

## RAP

The millings generated from a micro milling operation may provide certain advantages when used as Recycled Asphalt Pavement (RAP). The RAP generated by a micro mill usually contains greater fines content than those generated by a standard rotomilling drum. This results in a reduced need for crushing prior to being recycled into HMA as the material may already be at or near the gradation necessary for the recycling process.

## Conclusion

Whenever rotomilling needs to be employed, and a fine surface pattern is desired, micro milling could be the solution. When used in the proper application, micro milling may help extend the life and safety of a roadway, improve the quality and cost of multiple surfacing applications, and generally provide a potential alternative to traditional milling. To learn more about micro milling and its benefits please contact:

Asphalt Recycling and Reclaiming Association: [www.ARRA.org](http://www.ARRA.org)

