



## Neat Cutting Oils - A Comparison of Vegetable vs Mineral-Based Oils

This technical bulletin provides a comparative analysis of vegetable-based and mineral-based oils, focusing on their distinct performance characteristics.

Aspect	Vegetable-Based Oils	Mineral-Based Oils
<b>Lubricity &amp; Performance</b>	High lubricity due to natural polarity → reduced friction, longer tool life, better surface finish	Moderate lubricity and may require additives to improve performance
<b>Cooling Properties</b>	Higher heat capacity and strong film strength → better cooling in boundary lubrication	Lower heat absorption, less effective in dissipating heat
<b>Tool Life</b>	Typically, longer due to reduced wear and heat	Shorter tool life compared to vegetable oils, unless contain EP additives (e.g., Chlorine, Sulfur)
<b>Surface Finish</b>	Produces smoother, finer finishes	Varies, dependent on viscosity and EP additive levels
<b>Oxidation Stability</b>	More prone to oxidation or rancidity unless stabilized with additives	Naturally more stable over time, and have a higher resistance to oxidation
<b>Shelf Life</b>	It can be shorter without stabilizers	Generally, longer shelf-life and more predictable

Aspect	Vegetable-Based Oils	Mineral-Based Oils
<b>Worker Health &amp; Safety</b>	Low toxicity, less skin irritation, no *PAHs	Potential irritation - may contain *PAHs or other hazardous compounds
<b>Environmental Impact</b>	Readily biodegradable, renewable source, eco-friendly disposal	Petroleum-based, slower to degrade, environmental risk if spilled
<b>Sustainability</b>	Derived from renewable plant sources	Non-renewable fossil fuel resources
<b>Cost</b>	Generally higher	Generally lower
<b>Temperature Sensitivity</b>	Can thicken in cold and thin in heat	More stable across temperature ranges

\*PAH - Polycyclic Aromatic Hydrocarbons

### Summary:

Vegetable-based neat cutting oils provide superior performance, worker safety, and environmental sustainability, often at a higher cost compared to mineral oils. Mineral Based oils have more resistance to oxidation, have higher temperature stability, and can have different EP additives to improve performance.