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AKROWAXES

USE OF AKROWAXES IN OZONE PROTECTION:

Petroleum waxes perform a wide variety of functions in elastomer formulas. Among these are internal lubrication for improved flow; release from mills, internal mixers and molds; and most importantly, to help prevent ozone degradation of the rubber.

Wax prevents ozone attack by migrating ("blooming") to the surface of a rubber product and creating a barrier film to ozone molecules. The temperature at which the migration occurs, the thickness of the film, and finally the flexibility of the film all contribute to the ozone resistance of a rubber part and can be predicted by the types of wax present. This bloom will also carry chemical antiozonants to the surface of the rubber, improving their performance.

There are two major classes of petroleum wax. First is the paraffin waxes. Paraffins are linear, relatively short hydrocarbon chains typically crystalline in nature. Paraffin wax tends to bloom rapidly especially if the ambient temperature is close to the highest mobility temperature of the wax (which is determined by a wax's molecular weight and complexity of structure). As the molecular weight rises, complexity (branching) increases, melt point rises and the optimum temperature for migration increases. This leads to the second class, microcrystalline waxes.

Microcrystalline wax is a high molecular weight, highly branched and high-melt-point wax. It migrates very slowly to the surface of a rubber part and thus offers minor ozone protection by itself. However, microcrystalline wax performs some important functions in ozone protection. First, because of its amorphous (non-crystalline) nature it tends to give a more flexible wax film. Thus small amounts of microcrystalline wax become mixed with paraffin waxes and disrupt the crystalline structure giving the wax film a less-brittle, more durable nature. Microcrystalline wax also provides some protection at the high temperature end of ozone attack, around 110°F to 125°F.(above 125°F, ozone begins to break down from O_3 to O_2 and results in fewer ozone reactions).

Using the previous guidelines, waxes can be designed to provide the maximum ozone protection a rubber part may need.

** For maximum outdoor service where temperatures will vary considerably, a full temperature range wax-blend with several melt-point paraffins and a microcrystalline is desired (for example, Akrowax 5084).

** For an ozone chamber test where the temperature is a constant 40°C, the wax should be predominantly high-melt paraffin with a little microcrystalline (Akrowax 5026).

** For a primarily cold-weather application, a low temperature paraffin (Akrowax 130) could be blended with a small amount of microcrystalline (Akrowax 23).

Below is a brief summary of Akrochem's petroleum waxes. These represent pure paraffins, pure microcrystalline, as well as a variety of pre-blended waxes for ease of addition.

Akrowax	Wax Type	Typical MPt.	Comments
23	Microcrystalline(MC)	176°F	Pure Microcrystalline
130	Paraffin (P)	130°F	Lo Temp
145	Paraffin (P)	145°F	Med Temp
5073	Paraffin (P)	152°F	Hi Temp
5026	Blend (P)/(MC)	blend	Ozone Chamber testing
5030	Blend (P)/(MC)	blend	Hi Temp
5031	Blend (P)/(MC)	blend	Full Range Blend
5032	Blend of Paraffins	151°F	High Temp Primarily
5050	Blend (P)/(MC)	blend	Bimodal wax blend
5084	Blend (P)/(MC)	blend	Full Range Blend

For assistance in selecting the best wax for your application contact your Akrochem Technical Representative or call and ask for the Akrochem Technical Services Manager.