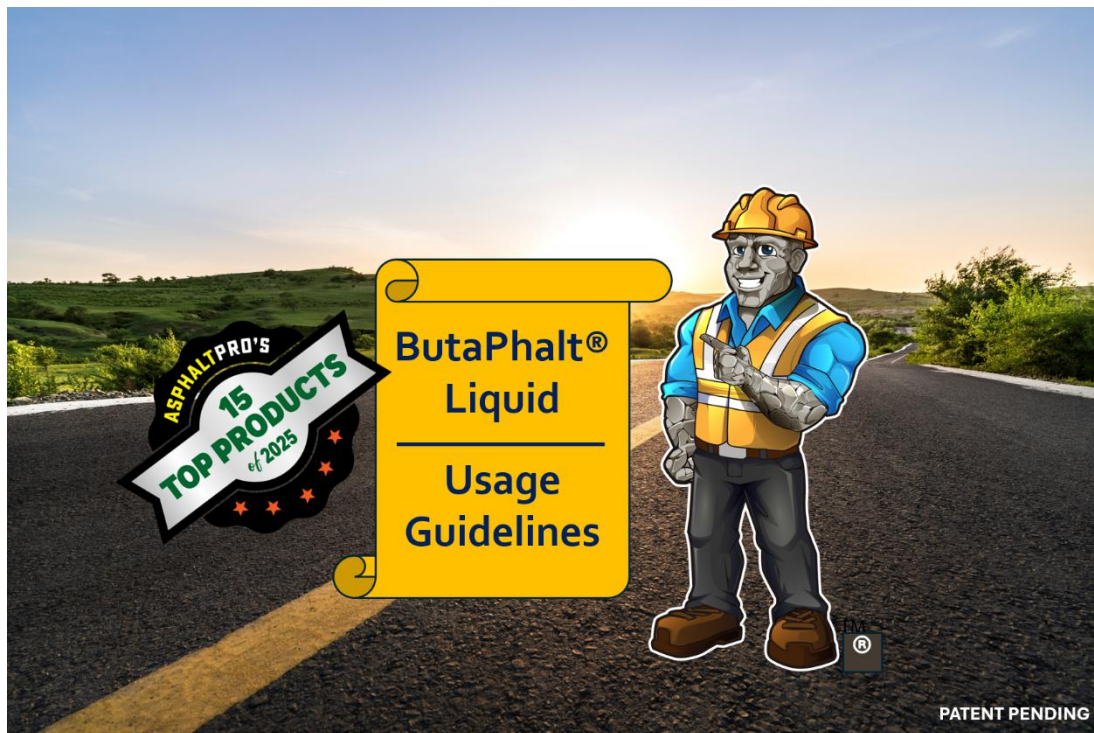




ButaPhalt® Liquid: Crosslinking Additive

Usage Guidelines for ButaPhalt® Liquid Grades



INTRODUCTION

ButaPhalt® is a crosslinking additive engineered to provide superior performance by allowing sulfur to more effectively form the bridge between the polymer and bitumen, resulting in better Polymer Modified Bitumen (PMB) stability. It works with typical elastomeric polymers used in the manufacture of PMBs, such as radial, linear or high-vinyl Styrene-Butadiene-Styrene (SBS).

ButaPhalt helps reduce and mitigate hydrogen sulfide (H₂S) emissions and odors, providing better working conditions and a safer approach to crosslinking. It helps improve productivity and provide better thermal stability.

ButaPhalt Liquid grades are shipped in 275 gallon totes, nominally 910 kg (2000 lbs.). When handling the product, always use proper personal protective equipment (PPE) and follow established safe handling practices. For details, please refer to "ButaPhalt Liquid" Safety Data Sheet (SDS). Commonly recommended PPE includes: PVC gloves, safety glasses with side shields, safety shoes, dust mask, and clothing that covers bare skin. The work area should be well-ventilated.

Currently, there are two grades of ButaPhalt Liquid available, the Performance Grade L60 and the Ultra-Fast Grade L120. Refer to "ButaPhalt Liquid" Technical Data Sheet (TDS). It should be noted

that the dosage level for the ButaPhalt Ultra-Fast Grade (L120) is typically half of the dosage for the ButaPhalt Performance Grade (L60).

These guidelines are intended to help effectively utilize ButaPhalt Liquid to deliver desired PMB performance and process efficiency, in both a laboratory environment and a PMB plant.

STORAGE & HANDLING GUIDELINES

Follow all established safe storage and handling protocols. It is recommended that following guidelines are incorporated into standard operation protocols. Review the "ButaPhalt Liquid" SDS.

- a) Store sealed totes of ButaPhalt Liquid indoors, in a cool and dry location.
- b) During storage and use avoid exposure of ButaPhalt to moisture, water, mist, or rain; to direct sunlight; and to copper.
- c) Store ButaPhalt Liquid away from any strong oxidizing and reducing agents.
- d) Exercise care when transporting the product to avoid any spills. Promptly clean up any spills.
- e) Under appropriate storage, handling and usage conditions, the product can have a shelf life of one year from date of manufacture.

LABORATORY USAGE GUIDELINES

Always follow established laboratory procedures. The following guidelines may be incorporated into standard laboratory practices and protocols.

- 1) First create the desired PMB either by using established laboratory protocols or by following the guidelines below.
 - a) Slowly stir in the desired amount of SBS into the heated bitumen binder, typically maintained at 180 °C (360 °F), in a container equipped with a high-shear mixer.
 - b) Continue stirring until all of the SBS has been homogeneously dispersed into the binder. In a high-shear mixer, this typically takes about 30 to 45 min, at a speed of around 2,500 to 4,000 rpm. At this point, the blend is considered to be a Polymer Modified Binder (PMB).
- 2) Use ButaPhalt Liquid for crosslinking by following the guidelines outlined below.
 - a) Replace the high-shear mixer with an axial flow high-efficiency impeller mixer.
 - b) Shake the ButaPhalt Liquid sample bottle or stir the contents to homogenize product.
 - c) Weigh out desired amount of ButaPhalt Liquid. Refer to the "ButaPhalt Liquid" TDS for typical dosage levels. Note that the dosage level for the ButaPhalt Ultra-Fast Grade (L120) is typically half the dosage for the ButaPhalt Performance Grade (L60).
 - d) Slowly add ButaPhalt Liquid, typically over a 5-minutes period, continue to stir, while maintaining binder at temperature. Continue to stir the blend.
 - e) To ensure reaction completion, withdraw samples at different intervals and measure desired properties against established specs. Typically, it is desirable to continue stirring for approximately 2 to 4 hours while maintaining temperature, maybe a shorter time for Ultra-Fast L120 grade. Certain blends may need more time to achieve the desired level of cross-linking.
- 3) Ascertain that the crosslinked PMB is ready to use or test.

- a) Next, visually check the surface for undissolved material.
- b) Stir with spatula and sieve over a 425 µm (40 mesh) metal screen. If all of the PMB blend passes through the screen, then the PMB is ready to use or test.
- c) If undissolved materials are captured on sieve, troubleshoot the above procedure.

PLANT USAGE GUIDELINES

Always follow established manufacturing procedures. The following guidelines may be incorporated into standard operations practices and protocols.

- 1) First create the desired PMB either by using established protocols or by following the guidelines outlined below.
 - a) Add the desired amount of heated bitumen binder, typically at 180 °C (360 °F), into a wetting tank equipped with an axial flow high-efficiency impeller mixer for stirring.
 - b) Stir the binder while slowly adding desired amount of SBS and maintain the temperature. Circulate the blend, pumping it from wetting tank, via a high-shear mill, into process tank, and returning to wetting tank.
 - c) Continue till the SBS is completely dispersed and the blend is homogeneous. At this point it is considered to be a PMB.
- 2) Use ButaPhalt Liquid for crosslinking by following the guidelines outlined below:
 - a) Homogenize the tote of ButaPhalt Liquid before use and/or as needed. Suggested methods include, stirring the liquid using a wand delivering a gentle stream of clean dry air or using an axial flow impeller tote mixer or any similar stirring equipment.
 - b) The use of the high-shear mill is not necessary for this step, but the continued use of the high-shear mill will not interfere with ButaPhalt's ability to act as an effective crosslinker.
 - c) Adopt a suitable method of incorporating ButaPhalt Liquid into the process tank.
 - d) Slowly introduce the desired amount of ButaPhalt Liquid into the PMB blend. Continue to circulate / mix, while maintaining temperature. Refer to the ButaPhalt Liquid TDS for typical dosage levels. Note that the dosage level for the ButaPhalt Ultra-Fast Grade (L120) is typically half the dosage for the ButaPhalt Performance Grade (L60).
 - e) Once the addition of ButaPhalt Liquid is complete, continue to circulate / mix until the PMB meets the desired properties. This can typically take 2 to 4 hours, may be shorter for Ultra-Fast L120 grade. Certain blends may need more time to achieve the desired level of cross-linking.
 - f) Once the desired properties are achieved, the crosslinked PMB blend may proceed to the next step in the process.

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