D.C. Atkins and Son, Inc.

Consulting Chemical Specialists

CHEMICAL MILLING SPECIALISTS
SURFACE CHEMISTS

INDUSTRIAL
RESEARCH AND DEVELOPMENT

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January 29, 1998

Ms. Liz Aquirre
President
Ultraseal International, Inc.
1100 North Wilcox Ave.
Los Angeles, CA 90038

Dear Ms. Aquirre,

In response to your verbal request we have examined Ultraseal with respect to its flammability as related to standard ASTM testing techniques. You indicated that your product was a mixture of ethylene glycol and water along with some polymeric materials to allow it to function in the manner for which it was designed.

There are a number of ASTM accepted procedures for measuring the flash point (an indication of product flammability). These include the Setaflash Closed tester, Pensky Marten Closed Tester, and the Cleveland Open Cup Methods. All of these procedures are performed at ambient pressure and measure the flash point of the products under that condition. We know of no standard ASTM procedure which is performed at greater than normal atmospheric pressure. It is our understanding that these techniques are the ones acceptable under the Uniform Fire Code.

Our initial work was with the Setaflash Closed tester since it represents the most accurate and convenient procedure. Our model of this instrument will measure the flash point of fluids up to a temperature to approximately 230 degrees F. At this point there was no flash of Ultraseal.

Because of our concern to test at a higher temperature, we used the Cleveland Open Cup method. At approximately 232 degrees F there was considerable boiling of the Ultraseal which continued as we raised the temperature to 252 F. The evolution of gases was substantial and although we exposed the gases to a flame, there was no flash. On another sample we introduced a few drops of a silicone defoamer with the hope that the evolution of the gases would be faster with the breaking of any foaming film that might form. We found no change in results. On a third test the thermometer reading was 265 degrees F and was accompanied with copious evolution of the boiling liquids. Introducing a flame resulted in the flame going out and there was no flash. It is reasonable to conclude that Ultraseal will not flash at a temperature up to 265 F under atmospheric pressure.

Although it was not part of your original request, we opted to make a cursory examination of the film remaining after all of the liquid had evaporated. We found that although the remaining film would burn when a flame was exposed to it, the film immediately went out once the flame was removed. This certainly indicates that the remaining film from Ultraseal is not a fire hazard.

It is our conclusion that your product Ultraseal does not represent a fire hazard as indicated by flash point tests. Furthermore, it is our conclusion that the remaining film from Ultraseal will not pose a fire hazard even when exposed to flame.

We would be most pleased to conduct any further tests should you or your customers want them. Please let us know if we can be of further technical support.

Yours truly,

Don C. Atkins, Jr.

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December 28, 1999

Ms. Liz Aguirre, President
Intraseal International, Inc.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

Dear Ms. Aguirre:

In a recent conversation you remarked that one of your customers in China expressed a concern about the compatibility of Ultraseal Tire Sealant with a tire manufactured in China. In response to this concern it seemed appropriate to conduct definitive tests which would address this concern. The following information represents the results of these tests as well as the test procedures used.

CONCLUSION:

Simulated road and puncture tests proved conclusively that Ultraseal Tire Sealant is compatible with tires manufactured in China and effectively will seal puncture holes in the tires.

PROCEDURE:

A P215/75-R15 tubeless Warrior tire was treated with 15 ounces of Ultraseal Tire sealant and charged with 32 pounds of air pressure. This tire was run on a dynamometer test wheel for 24 hours at 55 miles per hour with a 2000 pound pressure arm against the tire and drum. After running on the test wheel for 880 miles, the tire was punctured with a 0.25" awl in the center tread area. When the awl was removed, the escaping air caused the tire sealant to be drawn into the punctured area and sealed the tire, preventing further air from escaping.

This same tire was left on the test wheel for sixteen hours with the 2000 pounds of pressure against it. Subsequent examination showed that the air pressure was the same, indicating a satisfactory seal. The tire again was run at 55 miles per hour with 2000 pounds pressure against the tire. After eight hours there was a total of 1320 miles run on the tire.

A second puncture was made on the tire, about 1.5 inches from the shoulder,; using a 0.25" awl. On removing the awl the escaping air sucked sealant into the punctured area and stopped the air from further escaping. The punctured tire recovered well and sealed immediately. Again the tire was left on the test wheel with 2000 pounds against it. After running for another eight hours there was a total of 1740 miles. There was no pressure lost when tested the next day. The tire again was run for twenty-four hours making a total of 2620 miles.

The tire remained on the test wheel for another sixteen hours with 2000 pounds pressure against it. Even with two punctures the air pressure was the same, indicating a complete seal. The tire again was run for a total of 2620 miles and it was allowed to remain on the test wheel with 2000 pounds of pressure against it.

The following day the air pressure remained at 32 psi, indicating no air loss. The tire then was punctured with a 0.25" awl in the tread area. Also, using a 0.125" awl, a puncture was made in the area one inch from the shoulder. The tire, now having four punctures, was run for an additional twenty-four hours. This made a total of 3500 miles.

Again, the tire was left on the test wheel for sixteen hours under 2000 pounds of pressure. Examination of the air pressure the next day indicated no loss and also indicated the Ultraseal is functioning properly.

The tire again was run for twenty-four hours under 2000 pounds pressure to make a total of 4380 miles. The tire was left on the test wheel overnight with 2000 pounds pressure on it. Examination of the tire the next day showed that the air pressure was still holding at 32 psi. This was the status even though four punctures had been made in the tire.

These tests conclusively indicate that Ultraseal Tire Sealant is compatible with and will function effectively with the rubber compound used to manufacture the P215/75 -R15 Warrior All Weather Tire.

FURTHER TESTS:

No further tests are deemed necessary and none are scheduled.

Don C. Atkins

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December 28, 1999

Ms. Liz Aguirre, President
Ultraseal International, Inc.
1100 N. Wilcox
Los Angeles, CA 90038

Dear Ms. Aguirre:

In accordance with your request, we investigated the concern expressed by one of your customers. The attached is the result of our investigation.

Cordially,

Don C. Atkins, Jr., D.Sc.

Attachment

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December 28, 1999

Compatibility of Ultra Seal with Lithium Graphite Grease

PROBLEM: Customer reported that Ultra Seal failed to seal a front loader tire which had been punctured by a nail.

CIRCUMSTANCES: The tire mounting lubricant solution used by the customer was found to be soap (identified as Murphy's soap) and a lithium graphite grease known as No Rim Rust.

EXAMINATION UNDERTAKEN:

Using a P225/70-R15 tubeless tire containing 10 ounces of Ultraseal and one ounce of the lithium graphite grease, the tire was run on a dynamometer test wheel at 55 miles per hour with a 2000 pound pressure arm against the tire and drum. The tire was run on a test wheel for eight hours for a total of 440 miles. The tire then was punctured with a 0.25" awl in the center tread area. When the awl was removed, the escaping air sucked sealant into the punctured area and stopped the air from further escaping. The punctured tire recovered well and sealed immediately. The tire was left on the test wheel for 24 hours with 2000 pounds of pressure against it.

Examination of the tire the next day revealed that the air pressure was the same, indicating a satisfactory seal. Another ounce (making two ounces total) of the lithium graphite was added through the valve stem. Again the tire was run at 55 miles per hour with the 2000 pound pressure against the tire and drum. This was done for eight hours to make a total of 880 miles.

The tire again was punctured about 1-1/2 inches from the shoulder using a 1/4 inch awl. In addition another puncture was made with a 1/8 inch awl. Neither hole would seal until the tire was rotated several times. Then the sealant stopped oozing out. The tire was left on the test wheel over night. The next morning the tire was low on air pressure, indicating that the plugs were not holding satisfactorily. The tire was re-aired and run on the test wheel for five more hours (275 miles), making a total of 1,155 miles. At that time the tire was going flat and the test was terminated.

When the tire was dismounted from the wheel it was noted that the casing was well coated. However, the sealant fibers had coagulated and were in small clumps throughout the casing. This suggests that there is an interaction between the sealant fibers and the lithium graphite grease. This prevents the sealant fibers from doing their job.

continued....

CONCLUSION: For a tire puncture to seal properly, the rubber adjacent to the puncture must at least partially close. Fibers from the sealant augment this closing and seal off the puncture and prevent air escaping. However, if a lubricant, such as the lithium grease, excessively lubricates the area of the puncture and/or interacts with the sealant fibers, it interferes with the rubber itself from returning to place. This, in turn, does not allow the fibers in the sealant to close over the hole and make a perfect seal.

Excessive use of the lithium grease so that it flows over the bead and into the tire, will interfere with the normal action of the sealant to do its job. Use of a lithium grease sealant in appropriate amounts to lubricate the bead of the tire normally will not interfere with the effective use of a tire sealant. When properly used the sealant effectively will perform its function.

FURTHER WORK: These tests proved that the excessive use of lithium grease was the interfering factor in the tire's ability to seal the puncture, and it was not due to the sealant. No additional tests currently are scheduled.

Don C. Atkins, Jr.

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November 2, 1999

Ms. Liz Aguirre, President
Ultraseal International, Inc.
1100 N. Wilcox Avenue
Los Angeles, CA 90038

Dear Ms. Aguirre:

In response to your verbal request to investigate reports of the failure of Ultraseal to perform properly in certain tires, we investigated the possible effects of tire mounting lubricants on the performance of your product.

One of the widely used lubricants for mounting tires is a soap, often derived from the combination of various oils saponified with an alkaline material, usually sodium or potassium hydroxide. Although the oils from which the soap may be made may be mixtures and could include soybean oil, coconut oil, tall cottonseed oil and other vegetable oils, the end product is much the same in terms of its performance as a tire mounting lubricant.

We considered the possible interaction of Ultraseal with this type soap. To this end we visited Mr. Walt Boucher, the manufacturer of tire mounting soaps, in Long Beach. He confirmed our opinion that the tire mounting soaps are of the composition we expected. He also provided us with a sample of such soap which he sells on the open market. We investigated the possible interaction of this soap with a sample of Ultraseal which you provided us. Mixing this soap with Ultraseal both at room temperature and at elevated temperature (approximately 160 F) revealed no interaction of Ultraseal with the soap. The viscosity decreased, as expected, but the fibrous nature of the Ultraseal did not seem to be impaired.

Mr. Boucher also reminded us that in many cases, particularly with truck tires, often a “flap” is placed inside the tire. This “flap” is placed on the flat portion of the tire (the surface that would be closest to the road) and often is held in place with the use of tire lubricants during the mounting step.

It is our understanding that when a foreign object punctures a tire, the punctured area is pushed upward (into the tire), the rubber of the tire closes around the intruding object but does not, in itself, seal the aperture. The tire sealant (Ultraseal), through its fibrous nature, does close around the aperture and effectively seals the leak. If there is material in the tire which interferes with the action of the tire sealant, there will not be the anticipated seal and the tire may leak.

The question then is what might be a material that would prevent the proper action of the tire sealant. Obviously, a tire mounting lubricant is a possible material which could cause this problem. It was for this reason that we investigated the most widely used lubricant, soap. This soap is a very slippery material and if excessive amounts are used, the tire sealant may not properly close the leak. The tire sealant fibers may just slip through the hole. It also has come to our attention that sometimes a lithium soap (possibly a stearate) may be used as a mounting lubricant. Typically such tire mounting lubricants are mixed with carbon to further enhance their lubricity. The result is an extremely slippery mixture. Indeed, lithium stearate mixed with carbon black has been sold as a specialty lubricant for other purposes. It was not possible, within the allotted time frame, for an experiment to determine whether or not such lithium type lubricants would or would not be compatible with Ultraseal in other than a physical sense. However, based on our previous experience with lithium soaps, we would not anticipate any specific chemical imcompatibility.

After this examination of the concerns of the alleged failure of Ultraseal to perform properly, it is our opinion that:

1. There is no chemical incompatibility between Ultraseal and the major tire mounting soaps.

2. The possible failure of Ultraseal to make an effective seal probably is due to a physical problem rather than a chemical problem. Specifically, we believe that excessive tire mounting lubricants can physically cover the puncture and not allow Ultraseal to form an effective plug and thus seal the hole.

3. Also, it is our opinion that foreign materials within the tire space may prevent Ultraseal from performing. The result would be the same as having excessive tire mounting lubricant in the tire.

4. The presence of rust within the tire (from rims, etc.) is not expected to cause the problem of air leaks.

We urge that when using Ultraseal, the customer be fully advised that the inside of the tire should be relatively clean and free from foreign materials. The presence of such materials could invalidate the effective performance of the tire sealant.

No further work currently is scheduled. If you have any questions or comments, please let us know.

Cordially,

Don C. Atkins, Jr.

Don C. Atkins, Jr., D.Sc.
D. C. ATKINS AND SON, INC.