

IMBIBER BEADS®
Technical Bulletin
#22996

Reference: Report on Flash/Fire Point Testing

The presence of diesel fuel in a manhole may present a flash point problem. If the material in the manhole is gasoline -you do have a serious flash point problem as well as the potential for fire and explosion.

As long as liquid gasoline remains in the manhole and temperature is above -40° (C or F) there will be a flash point problem. Ventilation will slowly remove the gasoline liquid as it evaporates. However, the flash point problem will continue until all of the light fraction in gasoline has evaporated. A mixture of 1.5% to 7% volume % gasoline in air is explosive if ignited.

Gasoline in a confined space such as a manhole is similar to gasoline in the engine compartment or bilge of a boat. When gasoline is present in the bilge or engine compartment of a boat the proper procedure requires flooding the space with AFFF^R foam. The foam fills the compartment with a “gasoline vapor free” material. IMBIBER BEADS® Packets placed into the foam where they sink to the bottom of the foam. If there is water in the bilge they will float on the water and under the foam which is where the gasoline is located. When the liquid is imbibed the packets are pulled up through the foam removing practically all of the liquid gasoline. The grommets on the packets and blankets can be tied to a line to make removal from the top relatively easy without disturbing the foam. The foam and any residual water are then pumped out. Forced ventilation can then quickly remove the last traces of gasoline coating the surfaces. Now the ventilation is very efficient because there is little or no free gasoline liquid to generate large volumes of vapor. This technique would be the same for JP-4 turbine fuel and #1 winter diesel.

For #2 fuel oil, #2 diesel, JP-5 or Jet A-1 the flash point temperature is higher and is supposed to be 100°F minimum. As the temperature approaches 100°F the amount of vapor in the air increases and may reach concentrations that can explode. The same procedure described above can be used to remove #2 diesel, #2 fuel oil, JP-5 or JET A-1.

Flash Point Testing

Imtech Research tested the flash/fire point of #2 fuel oil from a local source using the procedure of ASTM D-92 COC (Cleveland Open Cup) and a Fisher /Tag apparatus. The average of six tests using #2 fuel oil gave a flash point/fire point at the temperature of 95-6°C (range of 92-102). This test (ASTM D-92) is not normally used for solids nor recommended for solids. What we did was take the quantity of beads used in one IMBIBER BEADS® Packet with the amount of recommended #2 fuel oil capacity and placed this mixture in the ASTM (COC) test cup. This ratio works out to 6.0/1.0 weight percent #2 fuel oil to IMBIBER BEADS®. The average of 6 tests gave a flash point of 131°C (range of 116-142). Even though this is not a true ASTM test, the good news is the flash point was raised. We did not use gasoline since even a similar 24°C increase would raise the gasoline flash point to -16°C (4°F). If gasoline is in a manhole the only way to raise the flash point is to remove the gasoline or purge the space with nitrogen to avoid explosive mixtures with air.

Another type of test compares the rate of evaporation of benzene in a saturated IMBIBER BEADS® Packet with a saturated melt blown polypropylene fiber pad and a cellulose material. The tests were run using benzene rather than gasoline for the following reasons. The boiling point of benzene is in the same range as approximately 75% of the gasoline. The various boiling fractions of gasoline would change the zero point but not the relative rate of release. As shown in the graph after the initial loss from the polypropylene fabric of the IMBIBER BEADS® Packet the rate of release compared to the melt blown polypropylene (MBPP) is drastically reduced. Since only vapors burn - not liquids, the amount of flash/fire hazard is reduced.

An IMBIBER BEADS® Packet will contain the liquid gasoline. The gasoline is a semisolid and cannot be stirred up to generate more vapor. Vapor is the hazard. IMBIBER BEADS® Packets, Pillows, Blankets and Minibooms will minimize the vapor hazard for personnel as well as minimize the flash/fire hazard. As long as gasoline is in an IMBIBER BEADS® Packet, Pillow, etc. it can be ignited. However, the rate of vapor release is smaller (as well as no free liquid) and fire resulting is more controllable.

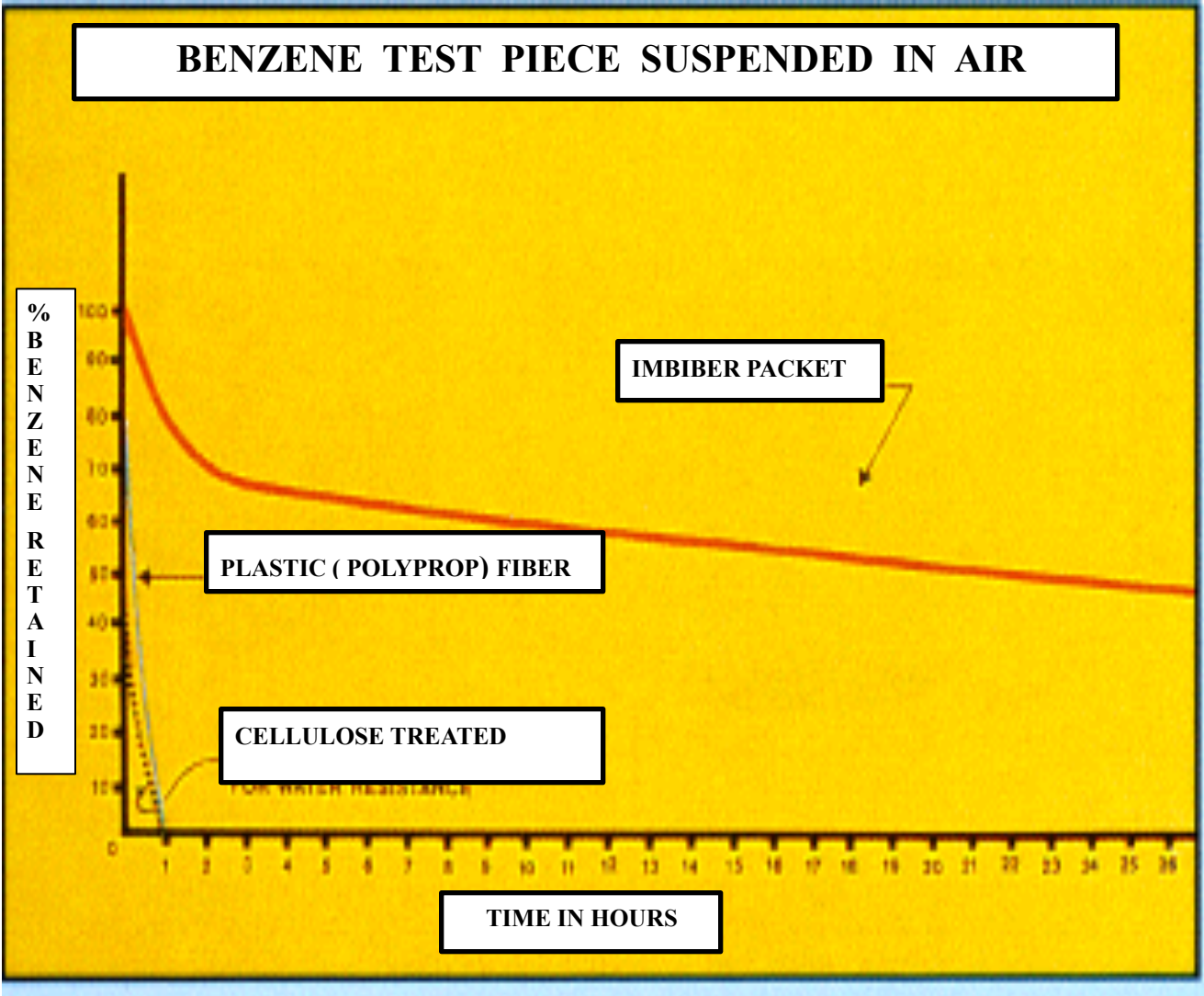
Now what happens if for some reason a fire starts? First the heat of a fire will cause a faster vaporization - and only vapors burn. liquids do not burn. If the burning fluid is impacted with fire fighting water the fluid will be stirred up and a larger fire will result floating on the water. If the liquid (gasoline, diesel, etc.) is imbibed at the recommended capacity in IMBIBER BEADS® Packets, etc., there is a no free liquid. Therefore, water fog will cool and extinguish even a gasoline fire.

There should be no doubt that the use of IMBIBER BEADS® Packets and Blankets for manhole cleanup represents the “Best Available Technology” (BAT) and for safety the “Best Management Practice” (BMP) that we know of.

NOTE: AFFFR[®] foam is a registered trademark of 3M

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EVAPORATION CHART CLASS I & II LIQUIDS



CELLULOSE TREATED FOR WATER RESISTANCE
TIME IN HOURS
ER PACKET