Technical Bulletin # 220904
Occupational Safety & Health

Hazardous Vapors Exposure

The graph included in this bulletin was part of a report, which was submitted by Imtech Research, Inc. to telecommunications company giant, Verizon, entitled **"Flashpoint Testing".** As a result of this report, and extensive in-house lab and field study, Verizon issued an Environmental Policy Statement to maintenance personnel and technicians advocating the use of Imbiber Beads® for hydrocarbon clean-up.

The application was for the safe removal of migrant hydrocarbons, which would run into confined spaces such as vaults and manholes located on city streets. Among Verizon's concerns were dangers inherent with "free" liquids in confined spaces, and the increased risk of hazardous vapors concentrating within the space.

While the application described is specific to hazardous materials in confined spaces, the information contained in this bulletin is relevant for all situations involving flammable, combustible and toxic liquids.

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 -4O° (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 the entire light fraction in gasoline has evaporated. A mixture of 1.5% to 7% volume % gasoline in air is explosive if ignited.

For #2 fuel oil, #2 diesel, JP-5 or Jet A-1, and similar fuels, 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.

Verizon was contemplating the use of Imbiber Beads® as an alternative method to pumping, for the removal of hydrocarbons from manholes and vaults. They wanted to assess if there would be any additional risks to maintenance personnel if Imbiber Beads® were used instead of adsorbent materials such as polypropylene.

One of the demonstration liquids chosen for the test protocol was benzene because it represents a range of aromatic liquids that might be found in a manhole, (such as gasoline), but has a higher flashpoint than gasoline, making it safer to handle.

The test compared 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 because 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.**

The graph illustrates that both of the **"surface-coating" adsorbent** materials released 100% of their contents through simple evaporation **within 1 hour**, due to their spreading the liquid out over a greater surface area. Where aromatic liquids are present the application of a surface-coating material enhances the rate of hazardous vapors being released, thereby ***increasing the risk*** to response personnel, facilities and equipment.

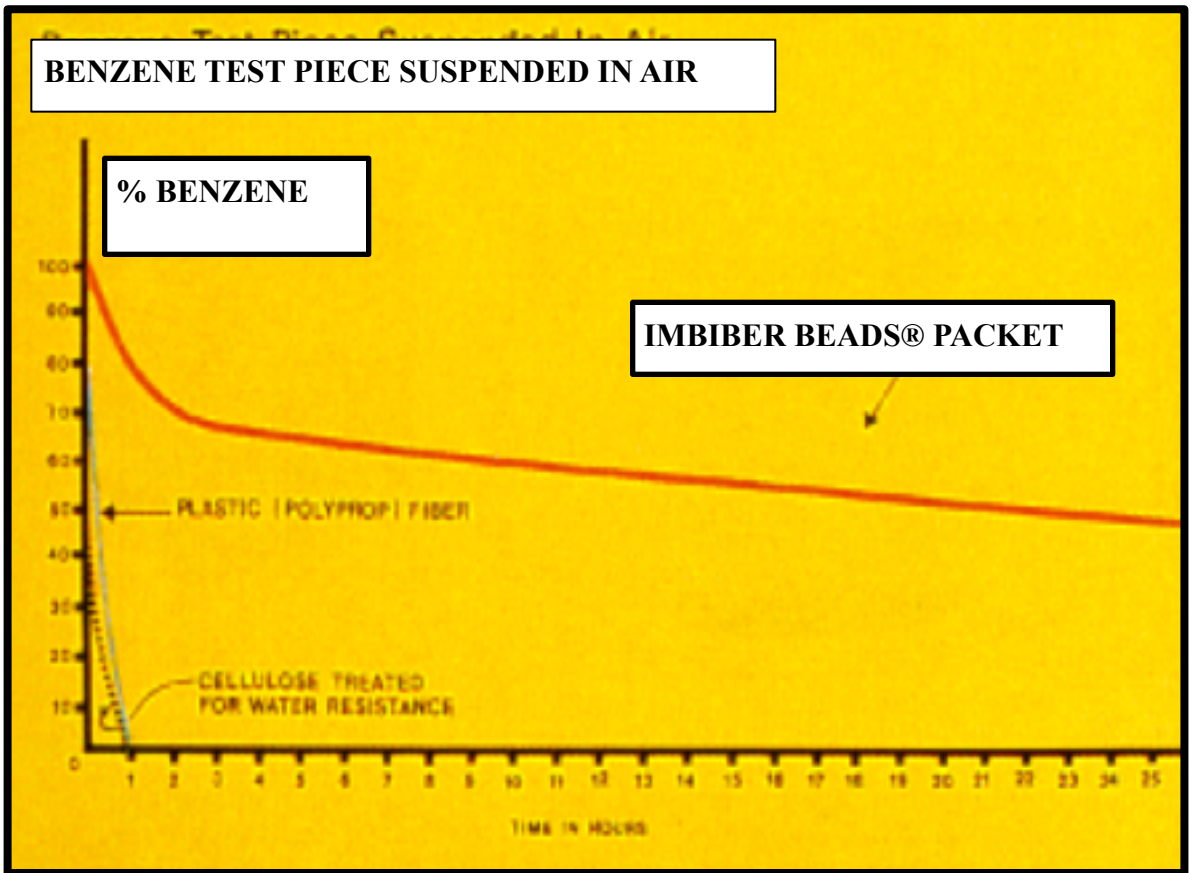
Conversely, Imbiber Beads® products contain the liquid gasoline. The graph illustrates that after an initial vapor release from the packet's retaining fabric, Imbiber Beads® slowed the rate of vapor release to the point where after 26 hours over 60% of the liquid is still within the Imbiber Beads®. The gasoline is a semisolid and cannot be stirred up to generate more vapors. **Vapor is the hazard**.

Imbiber Beads® products 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 any fire involving imbibed liquids 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.

The photos above were taken during a demonstration conducted by the Royal Dutch Air Force. The photo on the left-hand side illustrates an aviation fuel fire enveloping an aircraft fuselage. The photo on the right-hand side shows an Imbiber Beads® "blanket" saturated with jet fuel and ignited. Note the difference in the height of the flame due to the drastically reduced rate of the vapors being released. Following this photo being taken the "imbibed" fuel was extinguished with a single water-fog pass.

There should be no doubt that the use of IMBIBER BEADS® Packets and Blankets for fuel and solvent cleanup represents the **"Best Available Technology"** (BAT) and for safety the **"Best Management Practice"** (BMP).




PLASTIC (POLYPROP) FIBER


CELLULOSE TREATED


TIME IN HOURS