Methanol Gasoline Blends Require Good Water Monitoring Practices

Phase Stability
Good phase stability for methanol gasoline blends can be achieved with sufficient water tolerance (water solubility limits) and by implementing good water monitoring practices in the gasoline product distribution system. Like other alcohol gasoline blends, the methanol blend will separate into two phases when exposed to amounts of water that exceed its water tolerance properties. The bottom phase will generally contain most of the alcohol and water along with some of the aromatics from the gasoline. This two-phase situation needs to be avoided, since the bottom phase can cause poor vehicle operation as well as contribute to corrosion of the metals in the fuel system.

Experience suggests that the methanol blend at point of production should have a minimum water tolerance of 0.15 volume percent in the gasoline blend at room temperature (21°C) to provide adequate protection from potential water exposure in the gasoline distribution system. The nearby chart shows higher methanol concentrations provide increased water tolerance at 21°C, but M15 (15% methanol) blends still fall short of the preferred water tolerance target. The water tolerance target for the M15 blend can usually be achieved by adding one to two volume percent of higher alcohols such as ethanol, propanol or butanol that act as co-solvents for the methanol in the gasoline.

As the chart illustrates, the lower methanol blends will produce lower water tolerances which will then require greater additions of co-solvent alcohols to achieve the targeted water tolerance property for the finished gasoline blend supplied to the retail market.

Good Water Monitoring Practices
In addition to achieving targeted water tolerance properties in the methanol blend at point of blending, good water monitoring practices also need to be established in the gasoline distribution system from the point where methanol is first blended into the gasoline product. As Chart 1 illustrates, the gasoline distribution system from point of production at the oil refinery until it reaches the consumers’ vehicle tanks at the retail market can potentially be complex, depending on the distance and terrain between the refinery and the retail gasoline market.
For quality control, there are generally two potential points for methanol to be blended in the gasoline. The preferred point is at the refinery gasoline operations, where the refinery can take full advantage of methanol’s high octane and where there is also an on-site laboratory to ensure that the blend meets all gasoline specifications.

However, if the risk of water exposure cannot be controlled in the gasoline distribution system between the refinery and market terminals, then the methanol blending will have to be conducted at the market terminal and blended at the targeted volume concentration in the tank truck that delivers the finished gasoline to the retail stations. In this case, the refinery will have to produce a sub-octane and sub-RVP gasoline basefuel that is designed to meet the finished gasoline specification when the targeted concentration of methanol is blended into the delivery tank truck.

Because of lower quality control in terminal blending, some excess quality in terms of higher octane and lower RVP may need to be allowed in the finished gasoline blend.

**Methanol Can Be Potentially Blended at Two Points In Gasoline Distribution System**

**Blending at Terminal Requires Special Basefuel with sub-RVP and sub-Octane**

**Typical Gasoline Distribution System**

**Water Monitoring Practices at Retail Gasoline Stations**
Since retail gasoline stations have the highest potential for exposing gasoline to excess water, particular attention needs to be applied to the water monitoring practices at the retail gasoline stations. The diagram in Chart 2 illustrates the various points for water to enter the gasoline storage system at the retail stations. Procedures need to be established to minimize the water entering the storage system so
as to prevent the water tolerance of the methanol blend being exceeded before it is sold to the gasoline consumers.

During the daily inventory check for gasoline supplies in the underground storage tank at the retail station, the operator will also check to see if there is any ‘free’ water at the bottom of the underground tank, by applying a water detection white paste to the bottom length of the inventory measuring stick so as to detect any free water as illustrated in Chart 3. The white paste will normally turn red up to the point where the water is in contact with the paste on the measuring stick. When water is detected in the underground tank, the station operator will contact a pump out service for removal of the water, and will also locate the source of the water so as to correct the situation.

In the case of alcohols blends, the water bottom phase is mostly alcohol, and will not cause the conventional white paste to turn red which thereby produces a false indication of having no free water. Therefore, when alcohol blends are being sold, it is necessary to switch to specially formulated water detection paste like that shown in Chart 3.

CHART 3

**Methanol Blends Require Regular Checking for Water in Underground Tanks**

The use of a co-solvent alcohol is critical to any gasoline / methanol blend. The co-solvent alcohol prevents water from separating out of the tank gasoline in service station storage tanks.