Reserve Alkalinity

TT-025-0494

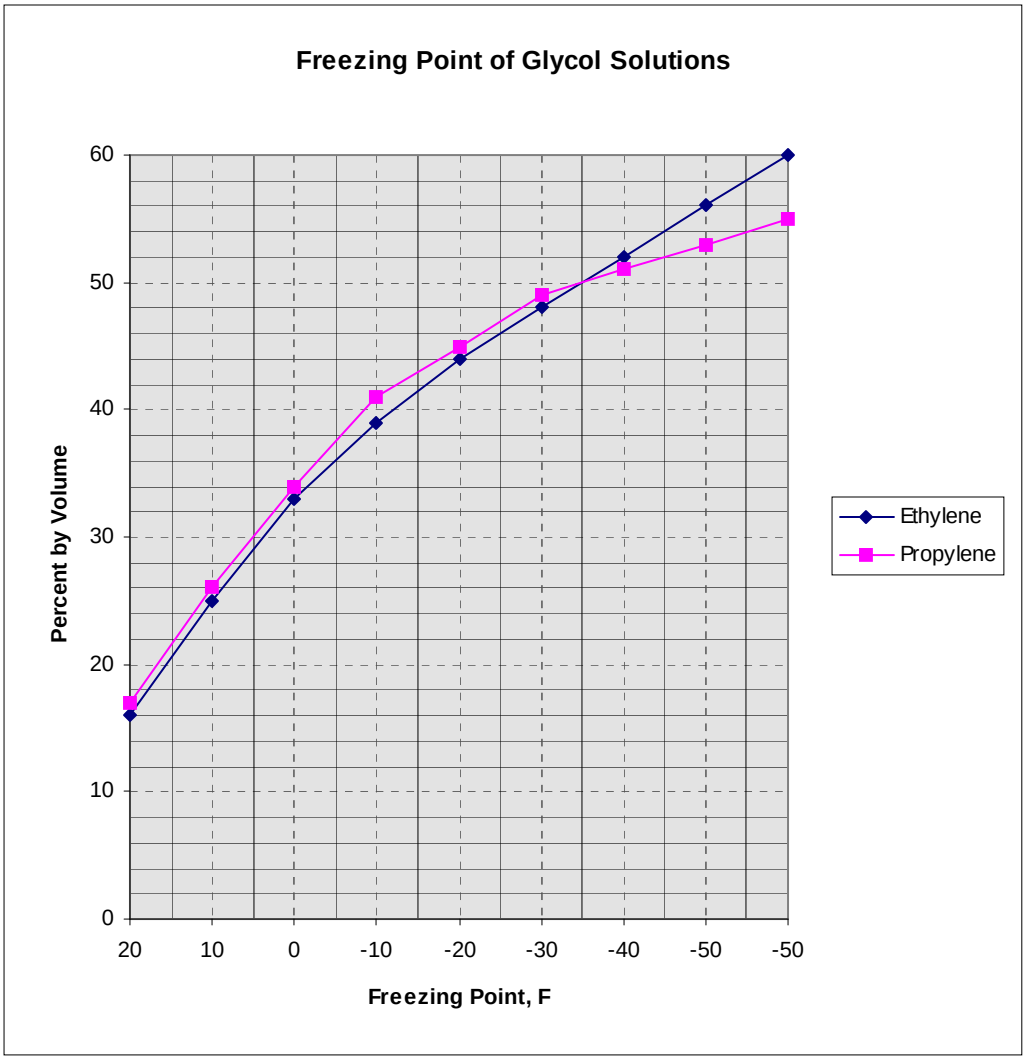
In areas of the country where freezing temperatures occur, glycols are added to water-based heat transfer fluids to provide freeze protection. The addition of glycols tend to make heat transfer fluids more corrosive than plain water. This is caused by the degradation of glycols into organic acids in the presence of oxygen and heat. Therefore, the fluid must include an inhibitor formulation to prevent corrosion by the acids. The inhibitor formulation should contain a buffering agent and metal passivators. It functions to buffer the acids as they are formed, and passivate metal surfaces to control corrosion.

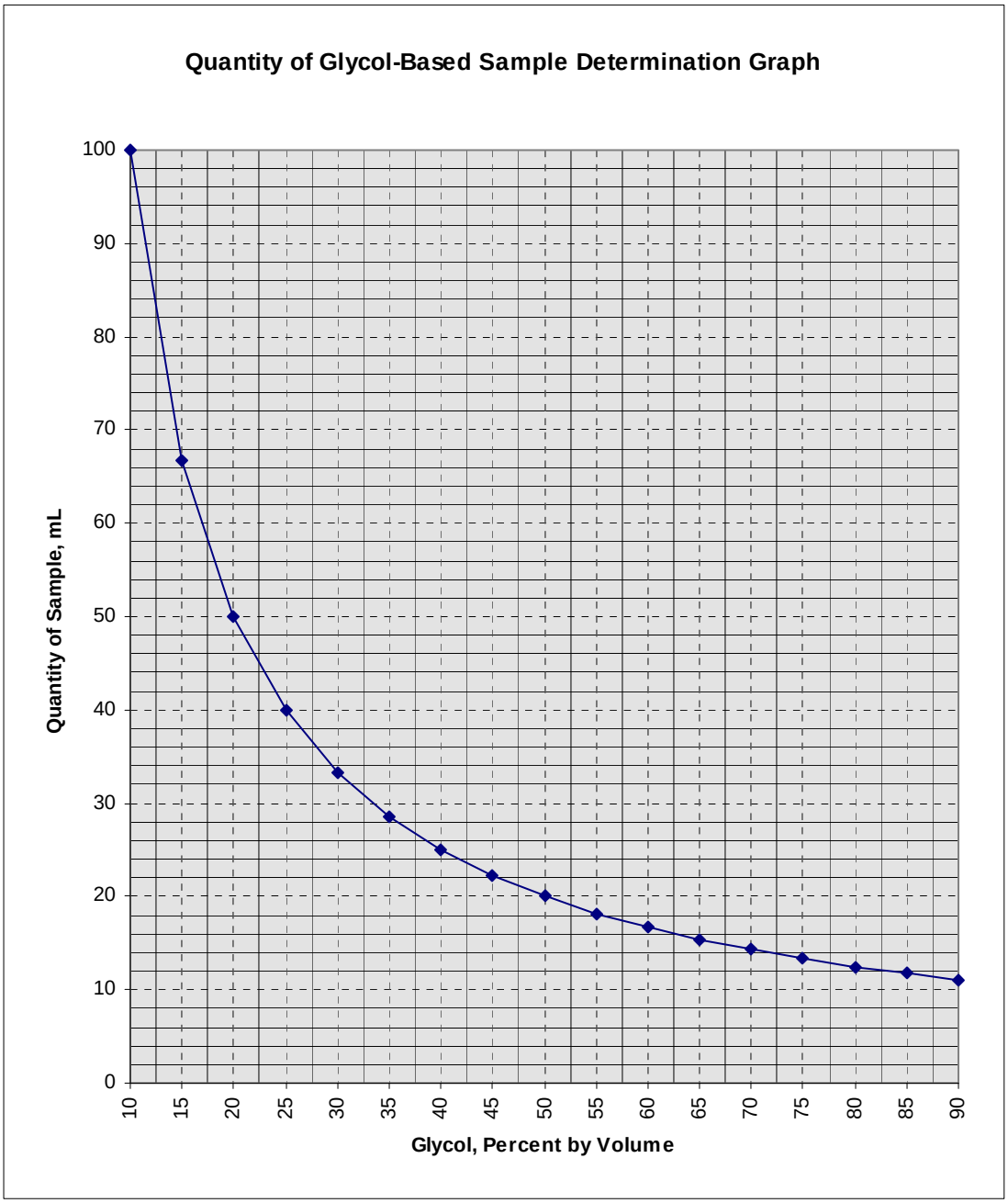
The specific term used to describe this buffering is reserve alkalinity. It is measured as the number of milliliters of N/10 hydrochloric acid needed to titrate 10 milliliters of glycol to a pH of 5.5. It indicates how resistant a fluid is to becoming acidic.

Reserve alkalinity is important because it determines how often the system should be tested, and how the inhibitor level should be adjusted. A fluid with little or no reserve alkalinity would require constant testing and adjustment. A reserve alkalinity of 10 to 12 is adequate in most situations. An extremely high reserve alkalinity, 20 to 25, may be needed if the fluid is exposed to very high heat or if the installation is difficult to monitor.

Reserve alkalinity should be measured periodically by laboratory analysis or by using a test kit. In addition, the metal passivators such as molybdate or nitrite should be maintained at proper levels. All inhibitors will lose their effectiveness over time. International Chemtex Corporation can provide the proper inhibitor in order to maintain both reserve alkalinity and the metal passivators.

TO DETERMINE RESERVE ALKALINITY
1. Using a glycol refractometer, determine the freeze point of the glycol-based sample
2. Obtain the percent glycol from the ***Freezing Point of Glycol Solutions Graph***
3. Obtain the number of milliliters of glycol-based sample required for the reserve alkalinity determination from the ***Quantity of Glycol-based Sample Determination Graph***
4. Transfer the required amount of glycol-based sample obtained in step #3 to a 100 mL graduated cylinder. Dilute to 100 mL with distilled water.
5. Transfer contents of graduated cylinder into a 250 mL Erlenmeyer flask
6. Titrate using N/10 hydrochloric acid until a pH of 5.5 is reached. Record the volume of N/10 hydrochloric acid titrated in milliliters as reserve alkalinity


Freezing Point of Glycol Solutions
Percent by Volume
60
50
40
30
20
10
0
20
10
0
-10
-20
-30
-40
-50
-50
Freezing Point, F
Ethylene
Propylene


Quantity of Glycol-Based Sample Determination Graph
Quantity of Sample, mL
100
90
80
70
60
50
40
30
20
10
0
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
Glycol, Percent by Volume