# TECHNICAL DATA SHEET (TDS)

## 1. IDENTIFICATION OF THE PRODUCT AND THE COMPANY

### 1.1 Product Name Description

| | |
|---|---|
| Commercial: | Hydromx |
| Chemical name: | Solution |
| Formula: | Solution |
| CAS No: | Solution |
| EINECS No: | Solution |

### 1.2 Use of Product

A solution composed of various organic fluids in different proportion and used as 50% Hydromx 50% water in closed circuit cooling and heating systems as a heat transfer fluid.

### 1.3 Manufacturer Information

Company name: Hydromx Inc

Address: 58-75 57th Road, Maspeth NY 11378 USA

Phone: +1 (718) 381 0351

### 1.4 Emergency Telephone Number

In case of emergency endangering health or the environment involving this product, Professionals should contact local National Poison Information Service Members of the Territory.

### 1.5 Standard Availability

Bulk

22.5 kg net drums.

1000 kg net IBC Tanks.

### 1.6 Storage Conditions

Keep packaging unopened and undamaged.

Keep the product in a dry place away from humidity and sunlight.

### 1.7 Quality Management Standard

The Manufacturer of HYDROMX® has been certified to;

| | |
|---|---|
| ISO 9001:2008 | Quality Management System |
| ISO 14001:2004 | Environmental Management System |
| ISO 22000:2005 | Food Safety Management System - Requirements for any organization in the food chain |
| OHSAS 18001:2007 | Occupational Health and Safety System |

*Please visit our website at hydromx.com for the documents

## 2. PHYSICAL PROPERTIES (INDICATIVE VALUES)

In Table 2, the physical characteristics of the Hydromx and the Hydromx Solution (50%) with tap water* (50%), are shown.

**Table 2.** Physical properties of the Hydromx (100%) and the Hydromx Solution (50%) with tap water* (50%)

| Hydromx Measurement Parameters | Method | Hydromx (100%) | Hydromx Solution with tap water* (50%) (Use of Product) |
|---|---|---|---|
| Colour (at 20° C ) | ASTM D 1500 | Red | Red |
| Odour (at 20° C ) | | Intrinsic | Intrinsic |
| pH (at 20° C ) | ASTM D1287 | 9.00 - 9.20 | 8.20-8.80 |
| Concentration (at 20°C) | Refractometric measurement | | 1.36 |
| Total Suspended Solid (TSS) | TS 9546 EN 12880 | <0.1 | |
| Dissolved oxygen (mg/lt) | SM-4500 OG | | 8.46 |
| Humidity Weight | TS 9546 EN 12880 | | %100 |
| Freezing Point | Potential differences reading by multimeter, under application of liquid nitrogen. | -73°C | -61°C |
| Boiling Point | Heating in atmospheric conditions and, temperature measurement by thermocouple | 200°C | 118°C |
| Vapor Pressure (at 25°C ) | ASTM d6378 (at 25°C ) | | DVPE : 2.9 kPA ASVP : 3.8 kPA |
| Vapor Pressure (at 50°C ) | ASTM d6378 (at 50°C) | | DVPE : 8.3 kPA ASVP : 9.6 kPA |
| Vapor Pressure (at 80°C ) | ASTM d6378 (80°C) | RVPE : 6.7 kPA ASVP : 10.1 kPA | RVPE : 36.4 kPA, ASVP : 39.0 kPA |
| Density (g/cm³) | Pycnometer (at 25°C ) | 1.122 | 1.065 |
| Electrical Conductivity (City Water 401(µS)) | Conductometer (Hanna Branded) (at 25°C) | 90 | 570 |
| Total Fe (ppm) (City Water: 0.069) | Atomic Absorbtion Spectrometer | 0.169 | 0.0565 |
| Dynamic Viscosity (Pa.s) (at 20°C) | Malvern Bohlin Gemini II Rotational Rheometer | $2.5\ 10^{-2}$ | $7.2\ 10^{-3}$ |
| Kinematic Viscosity (Pa.s) (at 20°C ) | Dynamic viscosity divided by density | $2.228\ 10^{-2}$ | $6.76\ 10^{-3}$ |

* The physical parameters of the tap water sample are as follows; **pH** 7.35, **electrical conductivity** 401(µS), **total Fe (ppm)** 0.069.

## 3. VAPOR PRESSURE
## TEMPERATURE RELATIONSHIP FOR THE SOLUTION OF HYDROMX WITH TAP WATER (50%)

In Table 3, measured temperatures and pressures of the Hydromx Solution, are shown.

**Table 3.** Measurements of the Vapor Pressures as a function of temperature

| Temperature °C | Pressure (atm) | Temperature °C | Pressure (atm) |
|---|---|---|---|
| 10 | 0.0168786 | 90 | 0.545474 |
| 20 | 0.0290577 | 100 | 0.7580317 |
| 25 | 0.0375031 | 110 | 1.0354644 |
| 30 | 0.034524 | 120 | 1.392164 |
| 40 | 0.07678 | 130 | 1.8444479 |
| 50 | 0.1193004 | 140 | 2.4105863 |
| 60 | 0.1805279 | 150 | 3.110893 |
| 70 | 0.266657 | 160 | 3.967634 |
| 80 | 0.385274 | | |

In Figure 3, measured values from Table 3 for the vapor pressure of Hydromx Solution as a function of temperature are shown.

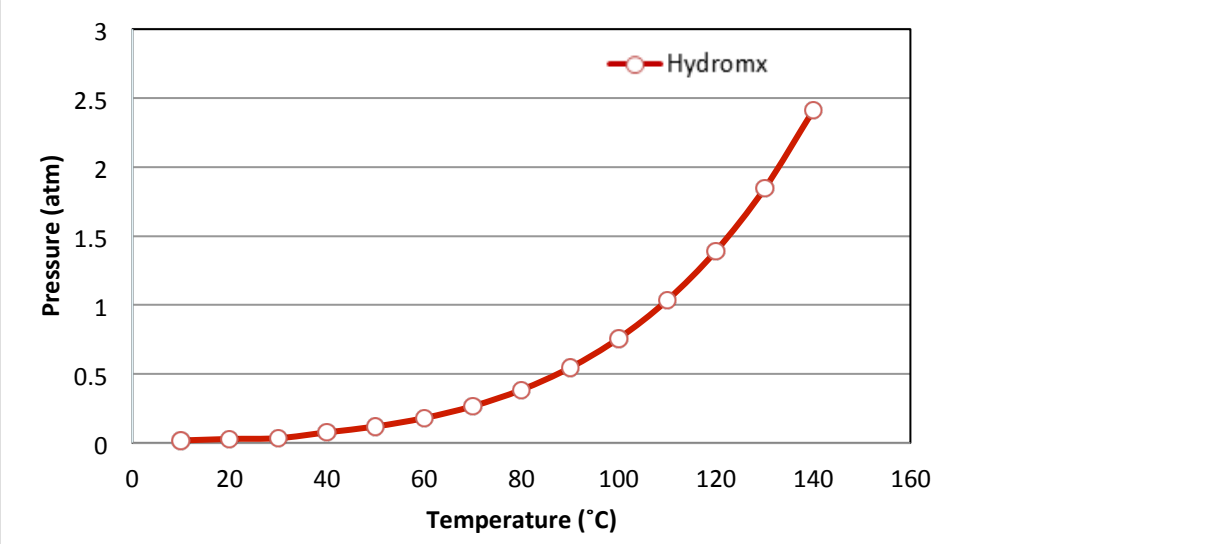



**Figure 3.** The Graph of Hydromx Solution Pressure-Temperature

## 4.DENSITY MEASUREMENT

**Sample:** Hydromx (50% v/v diluted with distilled water)

The density was measured by filling a glass volumetric flask of known volume (100 mL), and placing it in a temperature controlled bath. Every time temperature stability was achieved, the extra liquid Hydromx was removed and the remaining 100 mL were weighted very accurately.

The measurements of the density of Hydromx are shown in Table 4.

**Table 4.** Measurements of the Density as a function of temperature

| Temperature | | Density (kg $m^{-3}$) | | Deviations |
|---|---|---|---|---|
| (˚C) | (K) | measured | fitted | (%) |
| -17.30 | 255.85 | 1088.5 | 1089.1 | -0.06 |
| 3.20 | 276.35 | 1078.3 | 1076.7 | 0.14 |
| 11.00 | 284.15 | 1071.3 | 1072.0 | -0.07 |
| 14.40 | 287.55 | 1070.2 | 1070.0 | 0.02 |
| 18.40 | 291.55 | 1067.4 | 1067.6 | -0.02 |
| 30.40 | 303.55 | 1061.1 | 1060.4 | 0.07 |
| 42.60 | 315.75 | 1053.4 | 1053.0 | 0.04 |
| 53.90 | 327.05 | 1046.7 | 1046.2 | 0.05 |
| 62.70 | 335.85 | 1040.8 | 1040.9 | -0.01 |
| 71.30 | 344.45 | 1035.1 | 1035.7 | -0.06 |
| 79.80 | 352.95 | 1030.5 | 1030.6 | -0.01 |

The measurements were fitted to the equation

$\rho = 1243.3 - 0.6027T.$

In the above equation, ρ (kg/$m^{-3}$), is the density, and T (K), is the temperature. In Table 4, values calculated by this equation are also shown. The percentage deviations of using this equation are less than 0.2%. In Figure 4, the measured densities of Hydromx are shown. For comparison reason, typical literature values of the density of water and ethylene glycol 50%, is also shown.

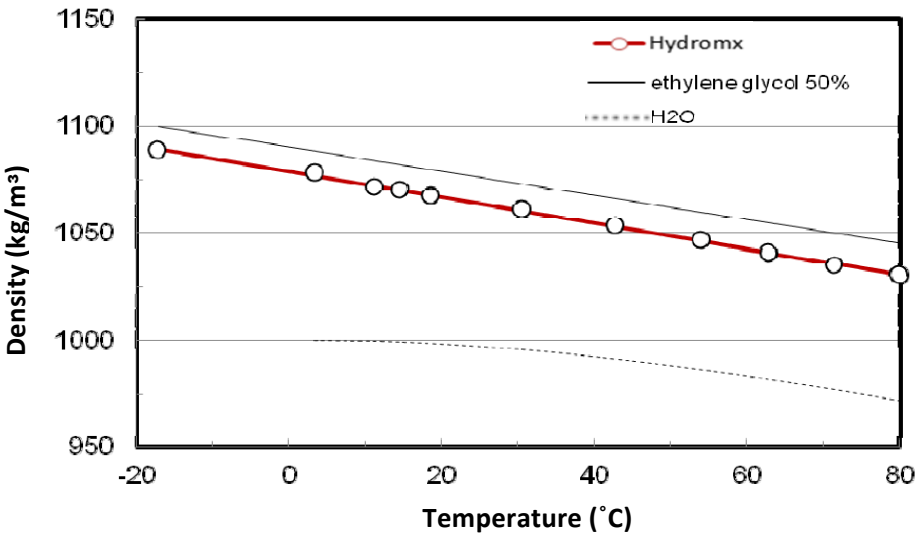



**Figure 4.** Measurements of the density of Hydromx as a function of temperature.

## 5. VISCOSITY MEASUREMENT

**Sample:** Hydromx (50% v/v diluted with distilled water)

Vibrating-Wire Viscometer, employing a 150-µm diameter tungsten wire. The method is characterized by high precision, the availability of a full theoretical background in interpreting the results, and an uncertainty of better than ±1%.

In Table 5, the actual measurements of the viscosity of Hydromx as a function of the temperature are shown.

**Table 5.** Measurements of the Viscosity as a function of temperature

| Temperature ('C) | (K) | Density (kg m$^{-3}$) | Viscosity (µPa s) measured | fitted | Deviations (%) |
|---|---|---|---|---|---|
| -18.52 | 254.63 | 1089.8 | 17250.2 | 17357.3 | -0.62 |
| -7.91 | 265.24 | 1083.4 | 9752.5 | 9728.7 | 0.24 |
| -7.71 | 265.44 | 1083.3 | 9669.6 | 9633.6 | 0.37 |
| 1.57 | 274.72 | 1077.7 | 6320.4 | 6358.0 | -0.59 |
| 1.75 | 274.90 | 1077.6 | 6307.0 | 6311.2 | -0.07 |
| 20.22 | 293.37 | 1066.5 | 3303.7 | 3291.4 | 0.37 |
| 20.25 | 293.40 | 1066.5 | 3284.6 | 3287.8 | -0.10 |
| 39.71 | 312.86 | 1054.7 | 1958.9 | 1966.8 | -0.40 |
| 39.71 | 312.86 | 1054.7 | 1969.1 | 1966.8 | 0.12 |
| 59.27 | 332.42 | 1043.0 | 1316.5 | 1320.3 | -0.28 |
| 59.25 | 332.40 | 1043.0 | 1326.5 | 1320.9 | 0.42 |
| 78.12 | 351.27 | 1031.6 | 969.2 | 971.9 | -0.28 |

The measurements were fitted to the equation

$$\eta = 60.4 \exp\left(\frac{527.26}{T-161.49}\right).$$

In the above equation, η (µPa s), is the viscosity, and T (K), is the temperature. In Table 5, values calculated by this equation are also shown. The percentage deviations of using this equation are less than 0.7%. In Figure 5, the measured viscosities of Hydromx are shown. For comparison reason, typical literature values for the viscosity of water and ethylene glycol 50%, is also shown.

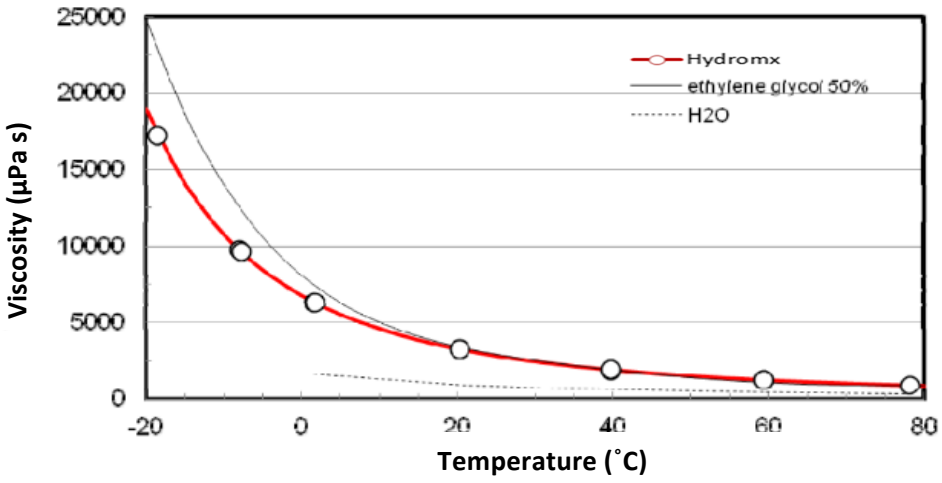



**Figure 5.** Measurements of the viscosity of Hydromx as a function of temperature.

## NOTICE TO THE READER

Hydromx® provides complete protection against corrosion, calcification, and contamination. Categorized as non-toxic Nanofluid. Supplied in either premixed or concentrated forms. All guarantees and warranty conditions are voided upon shipment. Hydromx® explicitly disclaims all warranties, whether stated or implied, and makes no guarantees regarding any operational results from product use.