Water Vapor (Pipeline) H_2O No. H-10-120-20

	Extended Range	Standard Range	Extended Range
Range (lbs/MMCF)	3 - 20	6 - 40	12 - 80
No. of Pump Strokes	2	1	0.5
Sample Volume (mL)	200	100	50
Sample Time (min)	2 x 1.5	1.5	1
Correction Factor	0.45	1	2.3

Precision (Relative Standard Deviation)*: ≤±20%

Linearity with No. of Pump Strokes: $r^2 = 0.994$

Temperature Range: 0 - 40°C (32 - 104°F)

Temp (°C/°F)	0/32	10/50	25/77	40/104
Corr. Factor	1.3	1.1	1.0	0.74

Storage Life: 2 years in darkness at 5 - 25°C (40 - 77°F) Refrigeration preferred
Color Change: Yellow → Dark Green**
Reaction Principle: $H_2O + Mg(ClO_4)_2 \rightarrow Mg(ClO_4)_2 \cdot H_2O$

Cross-sensitivity: Substance	Concentration (ppmv)	Reading* (lbs/MMCF)
CH_4	100%	0
CO	200	0#
CO_2	10%	0#
SO_2	1500	0#
H_2S	2000	<3#
NH_3	250	35
HCl	300	0#
Methanol	80	0‡
Gasoline	saturated	0
Heptane	saturated	0
Ethylene glycol	saturated	0
Triethylene glycol	saturated	0
Toluene	saturated	0

* Data based on Honeywell pumps and tubes used in standard range.
# No interference in mixtures with water vapor. ‡ No response below 80 ppm. Light green stain when methanol is above 80 ppm, 340 ppm alone reads ~30 lbs/MMCF. Water can be measured in a mixture with methanol by reading the dark green stain only, ignoring the light green methanol stain beyond the dark green end point.

**Note: Color tends towards purple as temperature decreases.

Other Possible Interferences: Amines, alcohols; no effect of 500 ppm PH_3.

Technical Note

Effect of Methanol & Glycols on Water Vapor Tubes

Introduction

Colorimetric tubes for water vapor are commonly used to measure the humidity of natural gas because of their rapid response compared to instrumental methods. To minimize corrosion and to obtain a better selling price for the gas, water vapor levels are often reduced by passing the gas through a liquid scrubber containing ethylene glycol or triethylene glycol. In addition, methanol is sometimes added to the natural gas pipeline as an antifreeze so that ice does not accumulate during cold weather. This technical note describes how to read water vapor tubes that may have interference from these chemicals.

Resistance to Glycol Response and "Rich" Gas

Newer versions of Honeywell water vapor tubes have been improved to remove any response to ethylene glycol or triethylene glycol. These changes were implemented in the 6-40 lbs/MMCF tubes (p/n H-10-120-20) shipped after November 2003 and in the 2-10 lbs/MMCF tubes (p/n H-10-120-10) shipped after November 2004. Higher alkanes such as pentane, hexanes and octanes present in "rich" natural gas also cause no response.

Effect of Methanol

Methanol alone causes a light green response in both H-10-120-10 and H-10-120-20 tubes when its concentration is above about 80 ppm. When water and methanol are present together, a two-tone stain is seen. On the H-10-120-10 (2-10 lbs/MMCF) tubes, the water forms a medium-dark green stain followed by a light green stain for methanol (see Figure 1).

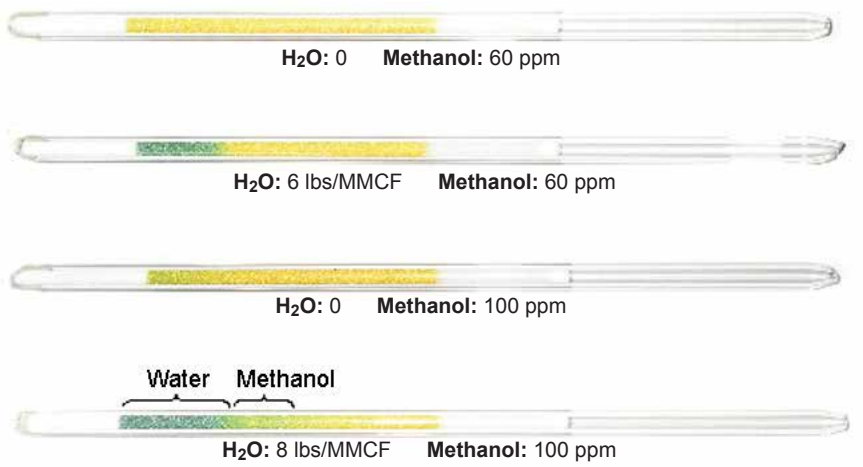

Figure 1. Methanol response on H-10-120-10 (2-10 lbs/MMCF) tube.

On the H-10-120-20 (6-40 lbs/MMCF) tubes, the water forms a purple stain followed by a light green stain for methanol (see Figure 2). This light green color can be ignored and only the darker stain read to obtain the water vapor concentration.

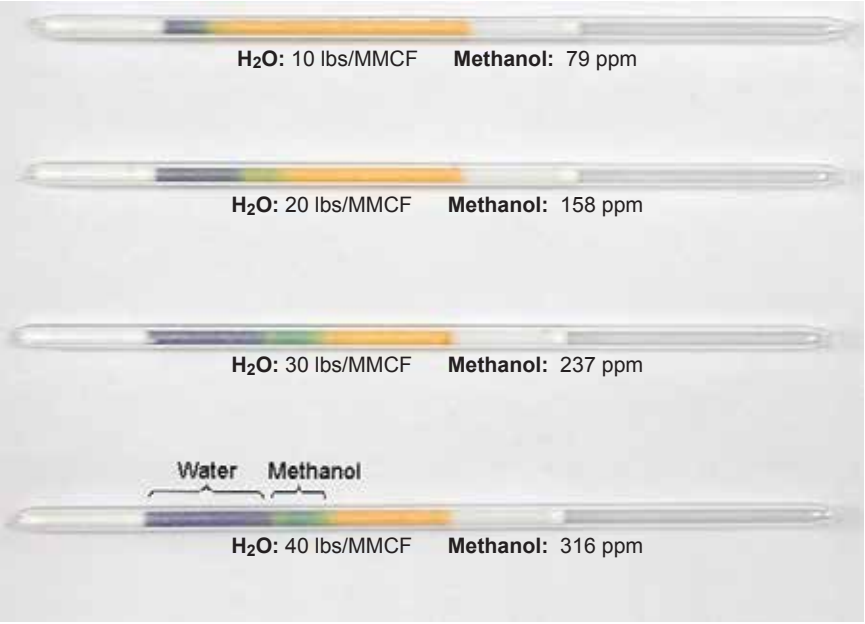

Figure 2. Methanol response on H-10-120-20 (6-40 lbs/MMCF) tube.

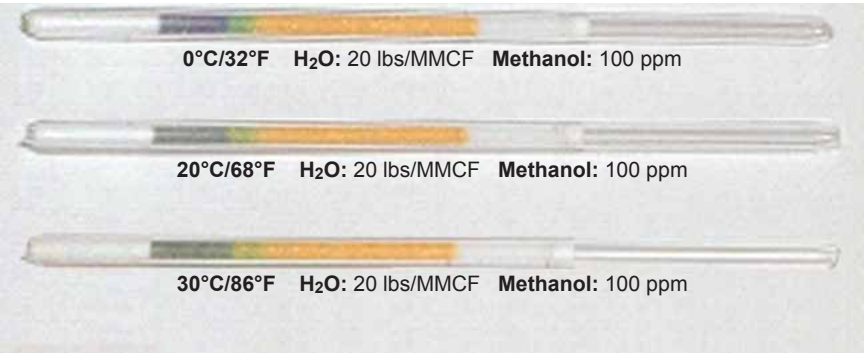

Figure 3. Effect of Temperature on H-10-120-20 tube.

Figure 3 shows that the color stain for water vapor is greener at higher temperatures and tends towards purple as the temperature is lowered. Therefore the distinction between methanol and water vapor response is clearer at lower temperatures.