

By David A. Leighty

Improved reliability for continuous emissions monitoring systems

CONTINUOUS EMISSIONS MONITORING systems (CEMs) to track the release of acid rain gases are a necessity due to the mandates of Title IV of the Clean Air Act. Unfortunately, these systems are often a disagreeable necessity due to reliability and performance problems related to poor gas sample conditioning. Modern gas analyzers work quite well when given a cool, clean, dry sample, but preparing the hot, dirty, wet sample from a stack for the analyzer without changing the concentrations of the gases of interest can be challenging. The GASS™ gas analysis sampling system (PermaPure, Toms River, NJ, *Figure 1*) is designed to be a solution to this problem.

The main problem is typically removal of water. In the past, the preferred sample cleanup methods were to dilute with clean, dry air to lower the sample dewpoint or to condense the water with a chiller system then drain it away. Dilution is increasingly in disfa-

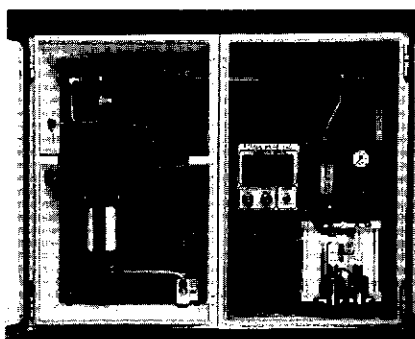


Figure 1 GASS-II gas analysis sampling system.

vor because it can be difficult to detect low levels of acid rain gases after their concentration has been reduced 200 times. Chillers have difficulty processing samples that are highly corrosive or those that have a very high water content or flow rate. Furthermore, since chiller/condensation systems typically operate above freezing, at least 0.6% water remains in the sample under the best circumstances.

Chillers also drain away water-soluble acid gases such as sulfur dioxide (SO₂) and hydrogen chloride (HCl) along with the water. HCl is so soluble in water that it is impossible to use chillers to prepare a sample for analysis of it; all of the HCl is removed along with the water. High-temperature analyzers that keep the gas sample hot until after it is ana-

Table 1

Sulfur dioxide solubility in water as a function of temperature

Temp °C	SO ₂ solubility in H ₂ O mL SO ₂ /100 mL H ₂ O
0	79.8
1	77.2
2	74.7
3	72.2
4	69.8
5	67.5
6	65.2
7	63.0
8	60.8
9	58.7
10	56.6
11	54.7
12	52.7
13	50.8
14	49.0
15	47.3
16	45.8
17	43.9
18	42.4
19	40.8
20	39.4
21	38.0
22	36.6
23	35.3
24	34.0
25	32.8
26	31.6
27	30.4
28	29.3
29	28.2
30	27.2
35	22.5
40	18.8
90	2.1
100	0.0

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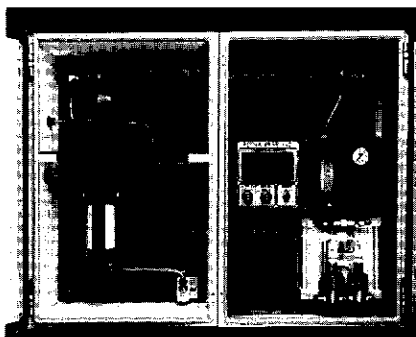


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