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DIVIDED-FLOW-APPARATUS

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C. E. Schnarr

Quality Division

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INTRODUCTION

Due to programmatic requirements a necessity developed for a system to rapidly and accurately calibrate dew point measuring devices. Two modes of operation appeared to be desirable, both "in-place" and "batch" operations. The system needed to be a generating type to produce the required dew point spectrum. The system also needed to be sensitive and stable, as the lower end of the spectrum is 5 parts per million by volume.

After a number of different approaches, a mixing system evolved, and was called a "Divided-Flow-Apparatus" (Figures 1, 2, and 3). The device was capable of calibrating dew point probes from -65°C to -20°C with an accuracy of 2°C . Later, a "six-pack-adaptor" was added to "batch" calibrate the dew point probes (See Figures 4 and 5). With the addition of the "six-pack-adaptor" the system fulfilled all of the design criteria.

DISCUSSION

The Divided-Flow-Apparatus mixes a dry gas (-70°C dew point or less) with a gas that moisture has been added to in varying amounts. This results in a system with a variable moisture content. The variable moisture output is achieved through pressure drops in the moisture laden gas and the mixing technique is used to make the device wider ranged without having to resort to unreasonably high pressure.

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The dry gas used in this device is put through a dryer (Figure 1) and Gage G1 (Figures 2 and 3), the flow is adjusted with metering valve M1 to the desired flow on Flowmeter F4. Another dry gas is put into the A2 inlet. It flows through the partially filled water container, saturating the gas. The expansion valve (pressure regulator) M7 allows the moist gas to expand, decreasing the moisture content to the desired level. The flow is governed by the metering valve and noted on Flowmeter F3. The moist gas from F3 and dry gas from F4 are then introduced into a vortex type mixing chamber where the gases are blended. The output from the mixing chamber is divided, with a small quantity of the flow being sent through the calibrated moisture monitor, while the rest of the flow is routed to specific devices under test. With a little practice it is possible to obtain quite close and repeatable control of the moisture content of the gas. The moisture monitor has an output that can be recorded using one pen of a dual pen strip chart recorder. The output of the "dew point" read-out is connected to the second pen and the "zero" adjustments are offset so when the two devices are in equilibrium, two parallel lines are drawn on the chart and we know the system is stable. This has the advantage of permitting adjustments to be made and the technician to go about his business and check from time to time for stability of the system without having to be in constant attendance.

CONCLUSION

This device, costing approximately \$2,500.00, permits rapid and accurate calibration of humidity devices and over the past few years paid for itself by savings in labor alone.

ACKNOWLEDGMENT

The author wishes to express appreciation to R. A. Wilcox and Mike Zaiser for their patience and encouragement throughout this project.

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4 - SIX PACK ADAPTER

FIGURE 5 - SIX PACK ADAPTER