

Longevity Testing of QuinTron Sample Holding Bags with Calibration Gas

Abstract

This Application Note details the testing performed on the sample holding bags to determine if they could properly store calibration gas before testing with patient breath samples. Calibration gas samples can be stored in these bags for up to 69 days without significant losses in H₂, CH₄ and CO₂ concentration. If long-term storage is needed, QuinTron recommends storing dried patient breath samples in sample holding bags (QT00842-P).

Introduction

When bacteria digest (or ferment) food substances, they produce acids, water and gases. The major gases produced by bacteria include, primarily, hydrogen (H₂), methane (CH₄), carbon dioxide (CO₂) and small concentrations of aromatic gases.¹ These gases are absorbed into the blood circulating near the site of digestion and are carried to lungs, where they are equilibrated with the air in the alveoli. When a patient exhales, gases contained in alveolar air can be captured and measured.

QuinTron manufactures instruments and accessories which are designed to capture and analyze the contents of a patient's breath sample. Specifically, our instrumentation measures concentrations of breath hydrogen (H₂) and methane (CH₄) in parts per million (ppm) and the percentage of exhaled carbon dioxide (CO₂). In the GaSampler collection system, patients exhale into a collection bag (QT00844-P, QT00834-P, QT00841-P, or QT00830-P) which holds the alveolar air sample until it is ready to be analyzed. Samples in the collection bags must be analyzed within a matter of hours. If this is not possible, the sample should be transferred to a sample holding bag for long-term storage.

QuinTron sample holding bags (QT00842-P) are made of a proprietary aluminum foil-laminate. Hydrogen, being the smallest element, can easily diffuse through many materials; one exception to this being metal foils due to their low permeability rating. The purpose of this study was to determine how long the sample holding bags could adequately hold a calibration gas sample without significant losses in H₂, CH₄ and CO₂ concentration. Another study demonstrated the ability for the sample holding bags to contain a patient breath sample (QuinTron Application Note #2).

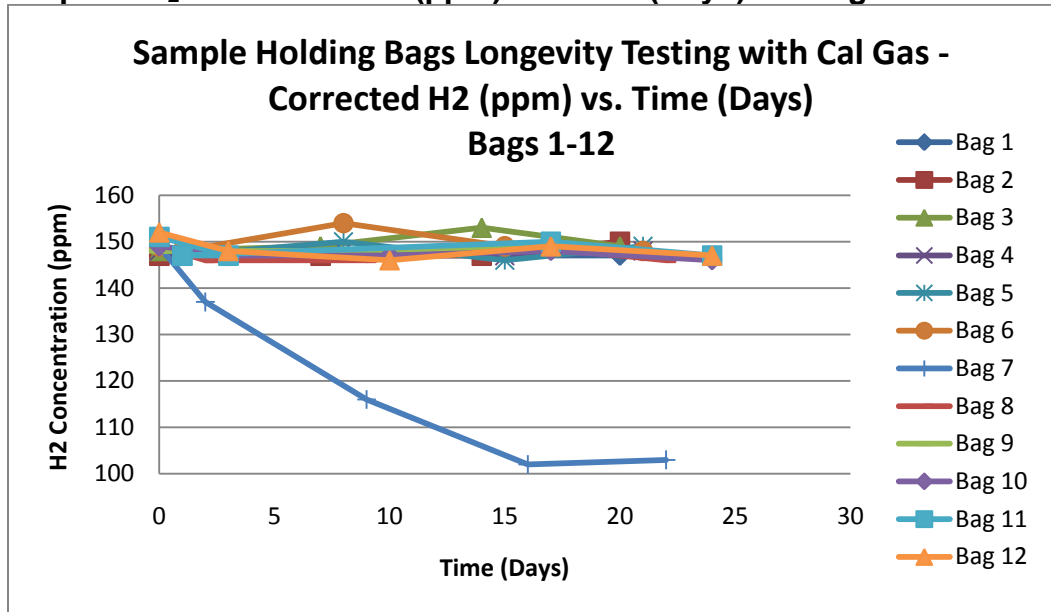
Materials/Method

Fifteen sample holding bags were filled with calibration gas. The tank values were H₂=150ppm, CH₄=75ppm, CO₂=6.2%, with an uncertainty of ±2ppm for H₂ and CH₄ and ±0.2% for CO₂. The H₂, CH₄ and CO₂ concentrations in each bag were measured on a Microlyzer SC.

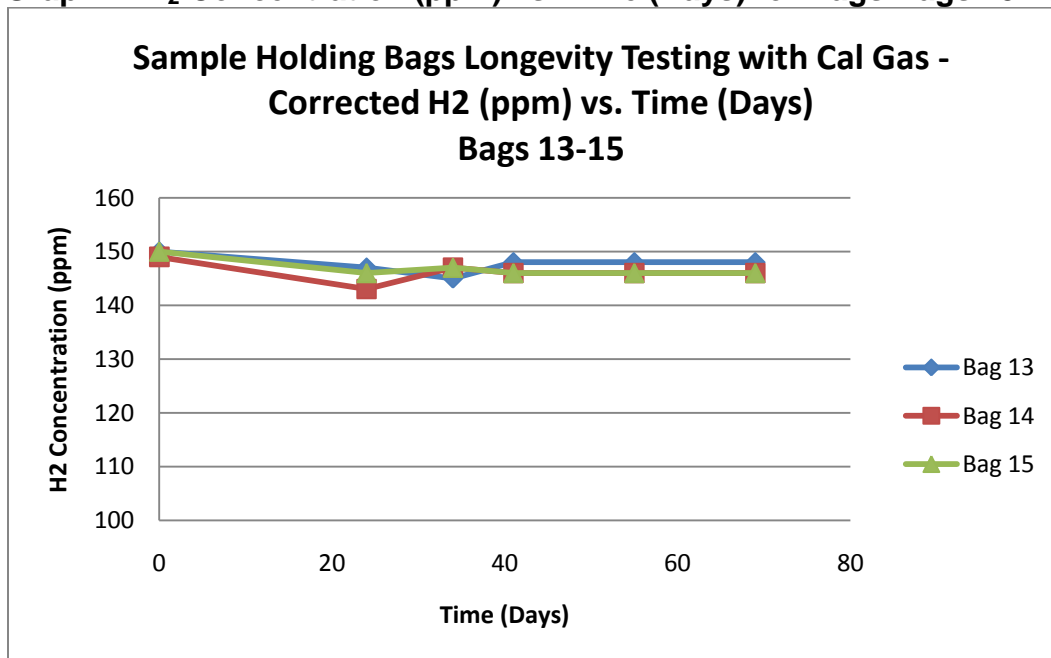
Results

Graphs 1-3 show the concentrations of H₂ (Bags 1-15) and CH₄ (Bags 1-12) corrected for dilutions using the CO₂ concentration (see www.QuinTron-usa.com for an explanation of the CO₂ Correction Factor).

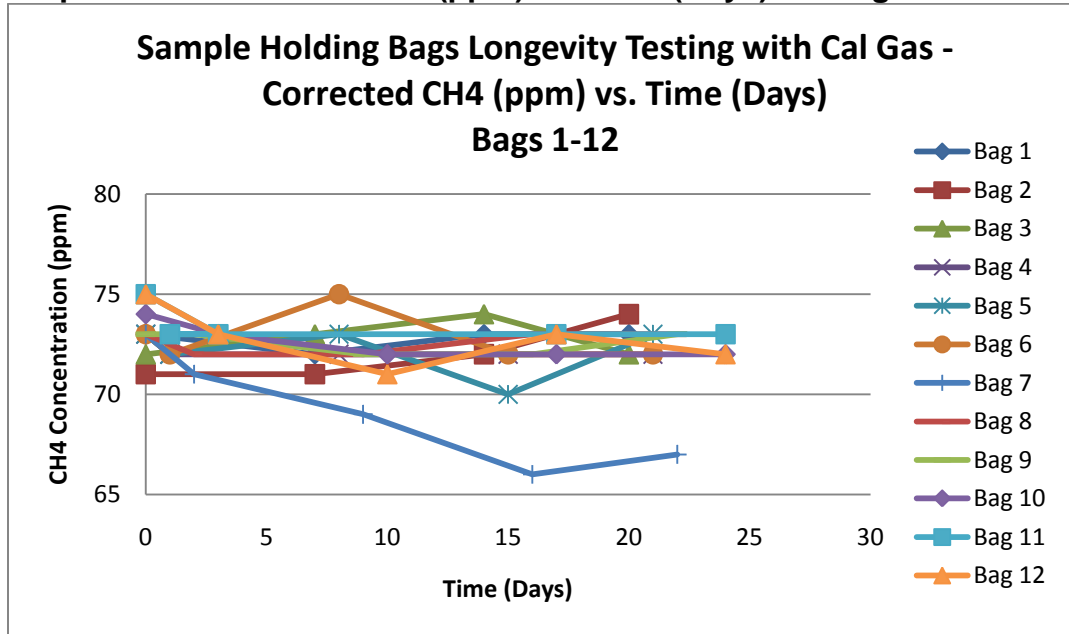
Graph 1: H₂ Concentration (ppm) vs. Time (Days) for Bags 1-12



Graph 2: H₂ Concentration (ppm) vs. Time (Days) for Bags 13-15



Graph 3: CH₄ Concentration (ppm) vs. Time (Days) for Bags 1-12



Graphs 1-3 show that, with the exception of Bag 7, the bags can hold calibration gas up to 69 days. All bags were initially tested the date they were filled. Bags 1-12 were tested up to 25 days, and Bags 13-15 were tested regularly after 30 days and up to 69 days. The CH₄ concentration in Bags 13-15 was not recorded. As H₂ is the smallest element and can diffuse through many materials CH₄ cannot, measuring the H₂ concentration determined if the whole sample could be maintained for long periods of time in the holding bags. Bag 7 showed an unexpected drop in H₂, CH₄ and CO₂ concentrations over time. This bag was visually inspected and it was discovered that multiple creases in the seal caused it to leak. QuinTron now visually inspects every holding bag during assembly for wrinkles in the seal.

Conclusion

The data shows that QuinTron’s sample holding bags can adequately store calibration gas for up to 69 days without significant losses in H₂, CH₄ and CO₂ concentrations. Now that we know that calibration gas can be stored in the bags for a long period of time, the recommended holding time in the bags will be based on how long a patient breath sample can be properly stored. QuinTron Application Note #2 discusses the appropriate sample storage time limits of the sample holding bags with regards to patient breath samples.

For further information on the history and science of breath-testing, sample protocols and collection techniques please reference [Breath-Tests & Gastroenterology, 1998 edition](#), written by Lyle Hamilton Ph.D. or request information from QuinTron directly.

References

1. Bond, J.H., Levitt, M.D. Quantitative measurement of lactose absorption. *Gastroenterol.* 1976; 70(6):1058-62