Product Validation Report

QGO-M Test Kit for Cement/Concrete Admixtures

Real-time Microbiological Feedback to Protect Product Quality!

Microbial growth in industrial chemicals can present a major problem. If left unchecked, microbial contamination in raw materials and intermediate products can compromise manufacturing process performance and equipment integrity. These same sources can also impact final product quality, which if not properly maintained can spoil products while sitting on the shelf. The best solution is early, accurate detection for proactive rather than reactive treatment.

Early detection is now possible in Cement/Concrete Admixtures via LuminUltra's **Quench-Gone Organic Modified (QGO-M)** ATP test kit. This advanced, 2nd Generation ATP test kit provides users with the ability to accurately measure total microbial content in admixtures in **5 minutes or less**. When it comes to proactive microbial risk management, LuminUltra's test kits are the ideal tools to help **save time & money** and **reduce risk**!

Validating the ATP Analysis

ATP is the central energy carrying molecule for all forms of life. Successful measurement of ATP provides an indication of total microbial concentration, which is an ideal basis to assess product cleanliness and guide biocide dosing initiatives. This validation report will present results from a laboratory study done using the QGO-M test method on several batches of admixture samples.

Special Considerations

LuminUltra has determined that pre-dilution of admixtures in sterile water assists in promoting a good distribution of admixture samples across filter membranes. A **1mL admixture sample to 9mL water dilution** is recommended.

Method Reproducibility

The QGO-M measurement shows excellent reproducibility when measured on diluted admixture samples. Table 1 summarizes duplicate results for 3 samples and presents the calculation of the Coefficient of Variation (CV), which is a measure of the variability between replicate measurements. A lower CV represents superior reproducibility.

Table 1 – Reproducibility of Duplicate Measurements

Sample	[ATP] Rep 1 (pg ATP/mL)	[ATP] Rep 2 (pg ATP/mL)	[ATP] Average (pg ATP/mL)	[ATP] Standard Deviation	[ATP] Coefficient of Variation
#1	1432	1347	1389	60	4%
#2	1603	1654	1629	36	2%
#3	3912	3657	3784	181	5%
#4	3405	3241	3323	116	3%

In general, the Coefficient of Variation is considered to be satisfactory in the range of 10 to 25%. For all samples, reproducibility was well below this range, indicating excellent performance.

Comparison to Other Microbial Tests

The standard for measurement of microorganisms in admixtures is the culture test. Certain other ATP methods exist for measurement of microorganisms, although they are not ideal for admixture samples. Table 2 summarizes the results of three different microbial monitoring systems for the same samples above. QGO-M is reported as concentration of pg ATP/mL, competing ATP is reported as RLU, and all culture tests are reported as CFU/mL. All numbers are reported as the average of duplicate analyses.

Table 2 – Comparison of Microbial Measurement Methods

Sample	LuminUltra QGO-M ATP (pg ATP/mL)	Competing ATP (RLU)	3M Petrifilm™ Aerobic Plate Count (CFU/mL)
#1	1389	16.0	2.9×10^7
#2	1629	14.5	5.1×10^7
#3	3784	17.0	3.2×10^7
#4	3323	15.0	5.3×10^7

Comparing the ATP methods, LuminUltra's QGO-M method appears to recover much more ATP than the competing method, especially for larger microbial readings. Compared to the competing ATP method, QGO-M measurements are provided in actual ATP concentrations, not arbitrary RLU readings which are unique to the testing conditions (i.e. reagent batch, temperature, and luminometer make/model).

Response to Process Changes

For a test method to be useful for process guidance and control, it must respond logically and sensitively to changes. In lieu of biocide treatments, such changes can be simulated by diluting contaminated samples in clean samples.

To assess the response of the QGO-M test method versus the culture method, one admixture sample was subjected to heat shock to reduce the microbial content. The untreated (contaminated) sample was then diluted 1/10 and 1/100 in the heated sample. Samples were analyzed using both the QGO-M method and the culture test to verify linearity. In Figure 1 these results are presented using a linear fit on a log-log plot.

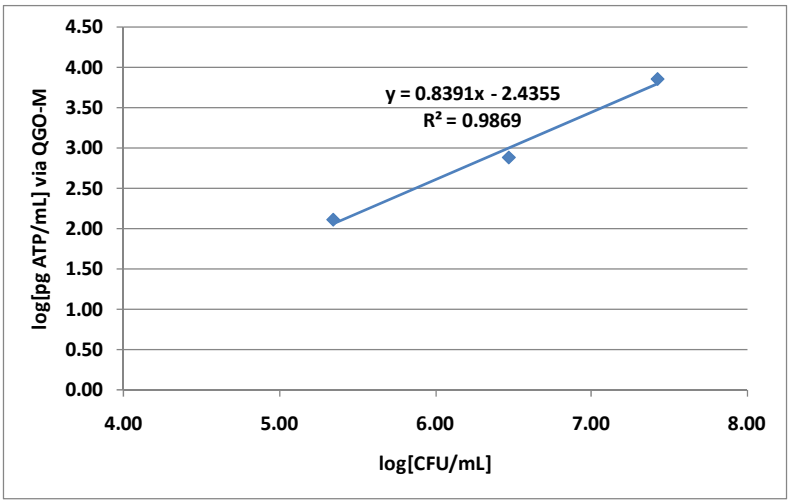


Figure 1 – Response to Dilution for QGO-M versus Aerobic Culture Test (log scale)

These results demonstrate that the QGO-M method will generally trend in the same direction as the culture tests traditionally utilized for quality control checking of admixture samples. Because different culture tests will return varying results and because each manufacturing will have their own defined control ranges, it is important to **establish a baseline** comparing QGO-M, culture test, and other performance data prior to developing control criteria!

Sensitivity

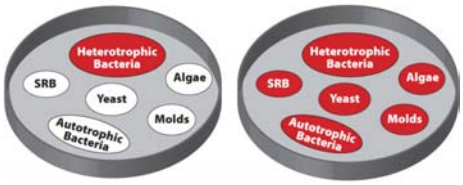
Based on the use of a Kikkoman C-110 LumiTester luminometer and the QGO-M test kit, the low detection limit for admixture samples is approximately **20 pg ATP/mL**.

NOTE: *If required, amplified sensitivity can be achieved. Please inquire for this option.*

Real-time Information for Same-Shift Problem Solving!

Rather than waiting days to obtain test results using traditional culturing methods, QGO-M provides on-the-spot results you need to take action during the same work shift. Moreover, these kits detect all living organisms, not just the relatively small percentage that form colonies in typical growth media.

Traditional 'Total' Plate Counts **LuminUltra Quench-Gone**



Measurement	Traditional Total Counts	LuminUltra Quench-Gone
Speed	Days	**Minutes**
Portability	Not portable	**Portable**
Accuracy	Counts only microbial 'particles' regardless of size	**Counts all cells individually**
Specificity	Detects only organisms that can grow on media	**Detects all organisms**

Microbiological threats are best addressed in their early stages of growth. The real-time feedback and full portability of LuminUltra's test kits allows operators to identify, address, and validate threats during the **same shift**! And, at only dollars per test, LuminUltra's test kits provides you with an affordable compliment to your existing microbiological measurement programs that helps you **save time & money** and **reduce risks.**

Get Started Today!

Spoiled products affect your bottom line. With early detection, most events of product spoilage can be eliminated. **Saving a single batch from spoilage can often pay for the entire annual cost of testing for one plant!** For a modest investment, QGO-M can help you improve your product protection initiatives, resulting in real savings, reduced risk, and increased customer confidence! Contact Aqua-tools today to get started with QGO-M.

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