Best Tests

Lab testing versus field testing: a rhetorical argument?

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In the storm water solutions market, technology companies compete to deliver products that meet performance objectives at the lowest possible cost. In that environment, defendable performance claims are the key to success, and to back up those claims, data is needed. Performance data can come from the laboratory or from field studies, and the debate about which one is more important is a wasted exercise: Both are important. Let's consider why these data sets are collected, what they verify and how they are used.

The advantage of laboratory testing is control over variables, which accelerates data collection and yields precision and repeatability of result. In a lab, tests can be run with tightly controlled flow rates, temperatures, pollutant concentrations and particle size distributions around the clock on a sunny day. You can take many paired influent and effluent samples and perform precise mass balance calculations based on recovery of captured pollutants. You can perform similar test runs many times while varying parameters one by one. In the end, with the large volume of data, you can generate performance curves relating removal efficiency to flow rate, which can be used as a basis for design and comparison between technologies.

But the lab may be too controlled and too clean. In the real world, pollutants are messy and come in many different forms. Storms too large to simulate can scour out captured pollutants. Rocks, 2-by-4s and tire treads may come down the outfall. Biofilms may grow and smother filtration surfaces. For all of its advantages, lab testing tells us little about the operational feasibility of a system or how often you might have to clean it to keep it operating. Also, because lab testing cannot simulate the complex runoff, washoff, temperature and pollutant characteristic changes that happen in the real world, it is not a reliable estimator of long-term field performance.

A field study is the only definitive way to prove that a certain treatment technology will meet a water quality goal on a specific site. Without performance verification through field testing, it is impossible to know whether lab success will translate into field success. For example, a filter that is very effective at removing silica-based sediment may quickly become smothered by similarly sized organic particles. Field monitoring also is the only way to tell if your design methodology produces systems that will perform as expected on a long-term basis.

But, for all of its benefits, field testing is comparatively complicated, expensive, slow and imprecise. After all, you have to wait for it to rain before data can be collected. After that, everything must go right on site to retrieve a sample for analysis. Comparing field data from different technologies is almost impossible unless rainfall volume, peak runoff rates, pollutant characteristics and other variables are similar.

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Lab testing should therefore be used to establish relationships between flow rate, particle size, influent concentration and other crucial variables. This information, when combined with a robust design methodology, should produce systems that meet performance goals. It is important, however, to test the assumptions of that design methodology, as well as the operational feasibility of a system, in the field.

So, which is more important, lab or field data? That is a trick question. There is no need to settle for a system with only one or the other. SWS

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