Package plants

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Package sewage works – getting it right first time

Good quality data about the composition of effluent or sewage is something else that is critical to the development of a robust and plausible design for a sewage works or industrial effluent treatment plant. These things aren't cheap and it makes sense to base such a decision on good information. You wouldn't buy house using skimpy information, would you? No, me neither. But what do you do if you need a treatment plant but don't have the information to hand? There are a number of ways of estimating the composition and flow of domestic sewage in particular and we had cause to use one particular method recently. Once we got in to the detail, however, we found distinct problems with some of the guidance we'd read. This will undoubtedly be heretical to some and welcomed by others, that's just the nature of sewage works design but it highlighted to us a danger of relying too heavily on guidance figures and not accounting for uncertainty in their use.

Our client has a number of sites with small package sewage works treating what is effectively domestic wastewater. One site had a problem with poor bacteriological growth in their package plant but that's a story for another day. We looked into how the plant had been sized and we found that it was actually considerably larger than it needed to be. The process was old and the original design specifications weren't available but we suspected it had been based on accepted guidance about the volume and composition of sewage discharged by various facilities. Using that guidance we went back to basics and “re-sized” the plant from scratch. Some samples of the effluent had been taken fairly recently and we compared the sewage load they indicated with what the guidance figures suggested. What we found was that the sewage plant was about 75% bigger than the lab samples suggested it should be.

Now, it's always wise to be cautious when comparing a small handful of lab samples with what seems to be a well-thought out but venerable design for a sewage works. However, in this case we were confident we were on the right track. We tested our view at another site, where we knew the works design had been developed using the guidance. In that case the existing works was actually too small. The answer, to us at least, was clear. The accepted guidance doesn't account for variability in flow or composition of sewage; it's conservative and assumes the same figures for things like BOD, COD and solids always apply all the time. Of course, they don't. We've been able to resolve the operational problems at the client's sites by changing operating procedures but the need to really account for variability was made very clear.

If we've identified the problem then what's the solution? It has two parts and the first is simply to sample the effluent as much as budget allows. Look at the variation in composition and flow (if you can measure the flow) and develop meaningful robust estimates of mean, maximum, minimum and standard deviations. That is a good basis for starting the design. Here at Blackwell Water Consultancy Ltd we take it a step further and use the statistical figures in a Monte Carlo model. That simulates several years of operation of the works by randomly varying the flow and composition of the incoming wastewater. It shows the expected peak compositions and gives a very robust (if the data allow) basis for designing the plant. And if you can't sample the wastewater (e.g. if the scheme is yet to be built)? Use the guidance, by all means, but think about realistic ranges for composition rather than absolute values and then use the Monte Carlo approach. This may sound complex and somewhat academic but accounting for uncertainty is essential when designing any plant, particularly a small package plant. Guidance is good, but that's all it is. It'll give you 'ball-park' figures but don't rely on it for detailed design.

Blackwell Water Consultancy Ltd provide consultancy about all aspects of sewage treatment, industrial effluent treatment and water efficiency.

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