Microbial control practices are applied in most industries dealing with water or other liquids, to keep the proliferation of bacteria and other microorganisms under control. To monitor the bacterial contamination of a process, sampling and laboratory analysis of the liquid represent the most common approach. This allows to detect free-floating microorganisms – and it happens quite often to observe large and unexpected fluctuations in the amount of bacteria in the sample (Fig. 1).

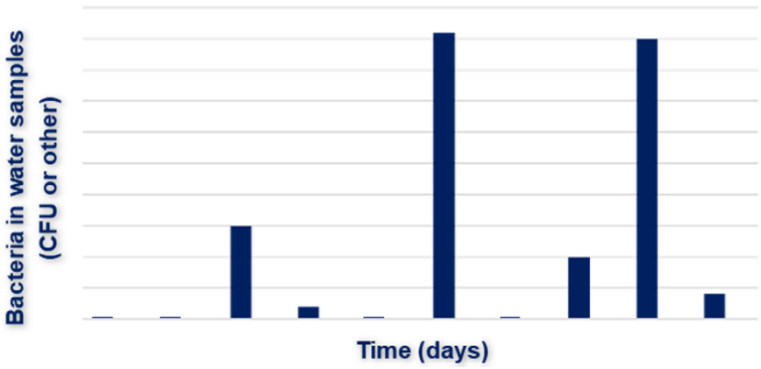

Figure 1: Commonly observed fluctuations in bacterial count

The low bacterial counts that can be observed (Fig. 2, green bars), followed by high values (Fig. 2, red bars), could suggest that something is wrong with the feedwater – since this is expected to be the main source of bacteria. But it is highly unlikely that bacterial count of feedwater fluctuates so much and so often (Fig. 2).

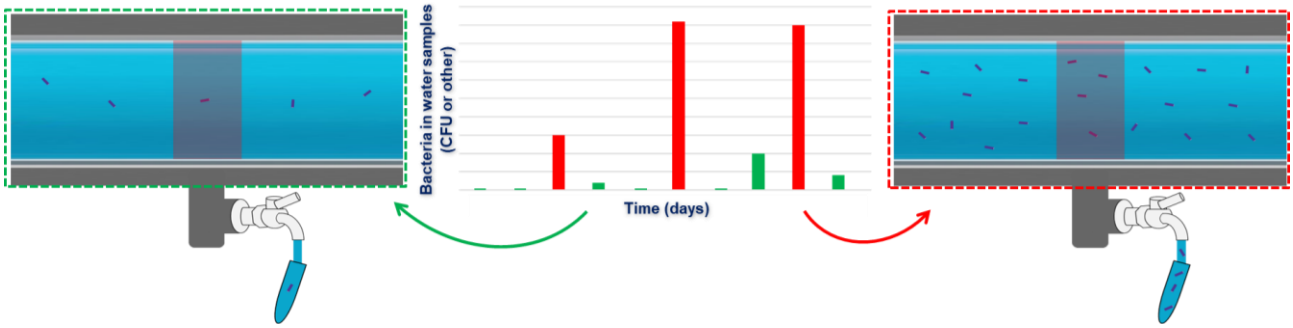

Figure 2: Large and unexpected fluctuations in bacterial count are commonly attributed to microorganisms entering the process with feedwater

On the other hand, the importance of microbial growth on the surface of pipes is often underestimated. The formation of a bacterial layer on surfaces in contact with liquids is an ubiquitous phenomenon, usually known as ''biofilm''. Such microbial slime is formed even when the feed water contains few bacteria - and even when such water is filtered (as reported in this application case).

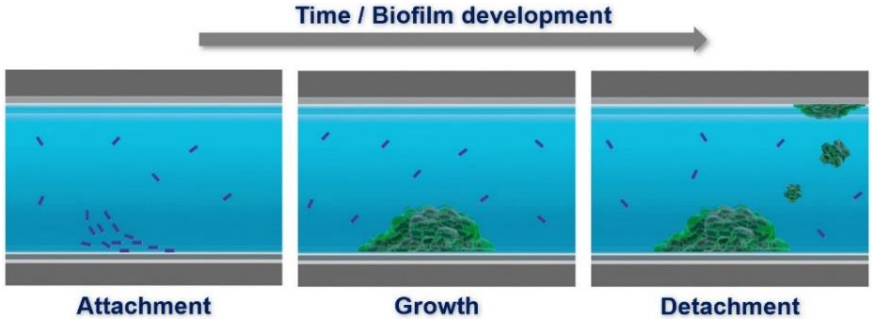

Figure 3: Formation and development of biofilm with time

Once microorganisms settle, they start to duplicate, giving rise to a bacterial layer that hosts many more microorganisms than those free in the water.
When biofilm is mature, parts of it can detach and float away, transported by the water (Fig. 3).

The biofilm contamination of a piping system can explain well the fluctuations in bacterial count discussed above. Indeed, even when biofilm is present on surfaces, the amount of free-floating bacteria can be quite low in the liquid (Fig. 4, on the left). This is why standard techniques based on liquid sampling and analysis cannot provide a fully representative indication of the real microbial risk. On the other hand, when parts of biofilm detach, these can be sampled with the liquid, leading to a high bacterial count (Fig. 4, on the right).

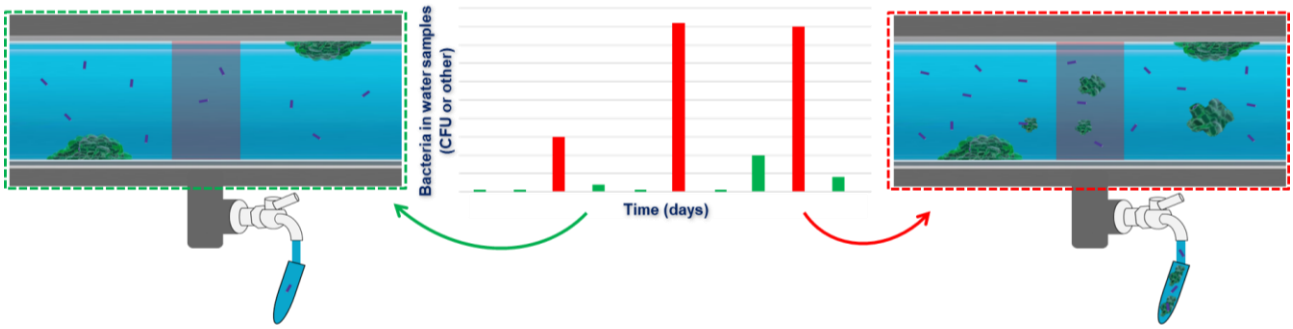

Figure 4: A biofilm contamination can lead to high and sudden spikes of bacteria in the liquid

Based on the indication provided by bacterial count on liquid samples only, a system contaminated by biofilm – and thus, at risk – might be wrongly considered as safe. For this reason, sampling and analysis of the liquid are not enough to prevent microbial contaminations. Biofilm monitoring represents the best approach to ensure the microbial safety of a system, providing an early warning indication of potential problems.

Do you have a similar problem with biofilm? Contact our experts and ask for a free custom-tailored consultancy, you will receive further information about ALVIM products and services.

The ALVIM Biofilm Monitoring System is a reliable tool for the early detection of bacterial growth on surfaces, on-line and in real time, in industrial production lines, cooling water systems, etc.

The ALVIM Technology has been developed in collaboration with the Italian National Research Council, Institute of Marine Sciences, and it is currently used worldwide in many different application fields.

ALVIM Srl | +39 0108566345 | info@alvim.it | www.alvim.it | www.linkedin.com/company/alvimbiofilmsensors