CryoStart Case Study

Introduction

Environmental Business Specialists, LLC (EBS) put its cold weather bioaugmentation product, CryoStart, head-to-head with a general, mesophilic bioaugmentation product in a cold-weather aerated stabilization basin (ASB) reactor study. Data was collected for two months, during which different treatment scenarios were investigated.

Methodology

Two parallel reactors were set up and operated identically, other than the bioaugmentation product received. Reactors were incubated at 10.5°C (51°F) for the duration of the two-month study period. Routine measurements were taken for biological oxygen demand (BOD) and total suspended solids (TSS) in the influent, aeration basin, and effluent of the reactors.

Each reactor consisted of two aerated stages to simulate plug-flow conditions with a five-day retention time. The reactors were inoculated with an ASB sample from a pulp and paper mill. Influent to the two reactors was communal and collected weekly from the same plant used to seed the reactors. Partway through the study, a high loading event was simulated using EBS MicroCarb, a glycerin-based product. Supplemental nutrients were added to the influent to support bacterial growth in the aerated portion of the reactors.

Both bioaugmentation products were bacillus-based and are sold as dry products. Both bioaugmentation products were grown up for 18-24 hours prior to addition to the reactors to simulate an EBS BAC unit. This meant that bacteria were in the log growth phase upon introduction to the first aerated stage. Both reactors were dosed with a target dose of 5.0x105 CFU/mL of product.

Results

During the initial phase of the study, both reactors were able to completely degrade the soluble BOD in the influent, with relatively low biological solids in the reactors. When a high loading event was simulated with additional EBS Microcarb, the reactor receiving Cryostart bioaugmentation demonstrated superior performance. Specifically, the reactor receiving CryoStart bioaugmentation was able to produce higher TSS concentrations in the aerated stages and lower effluent soluble BOD concentrations than the reactor receiving the traditional mesophilic bioaugmentation product. During the high loading simulation, the average effluent soluble BOD concentration of the CryoStart reactor was 32% lower than the average effluent soluble BOD concentration of the mesophilic bacteria reactor. The TSS of the CryoStart reactor was 113% higher than the TSS of the mesophilic bacteria reactor, indicating more biological activity and reproduction with CryoStart compared to the mesophilic bacteria.

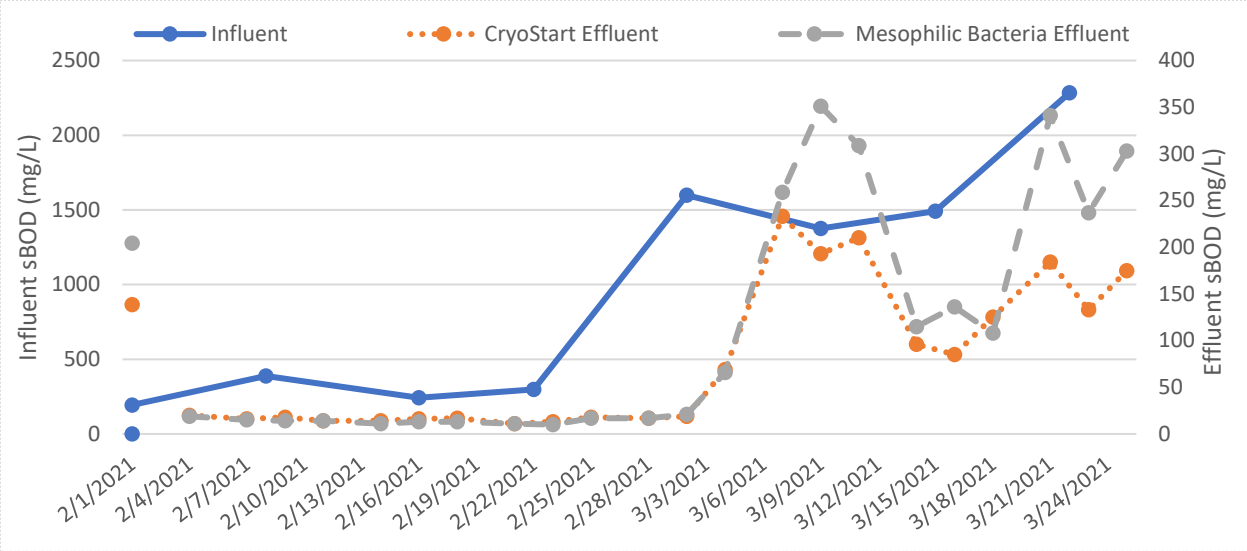

Figure 1 – Influent and effluent soluble BOD concentrations

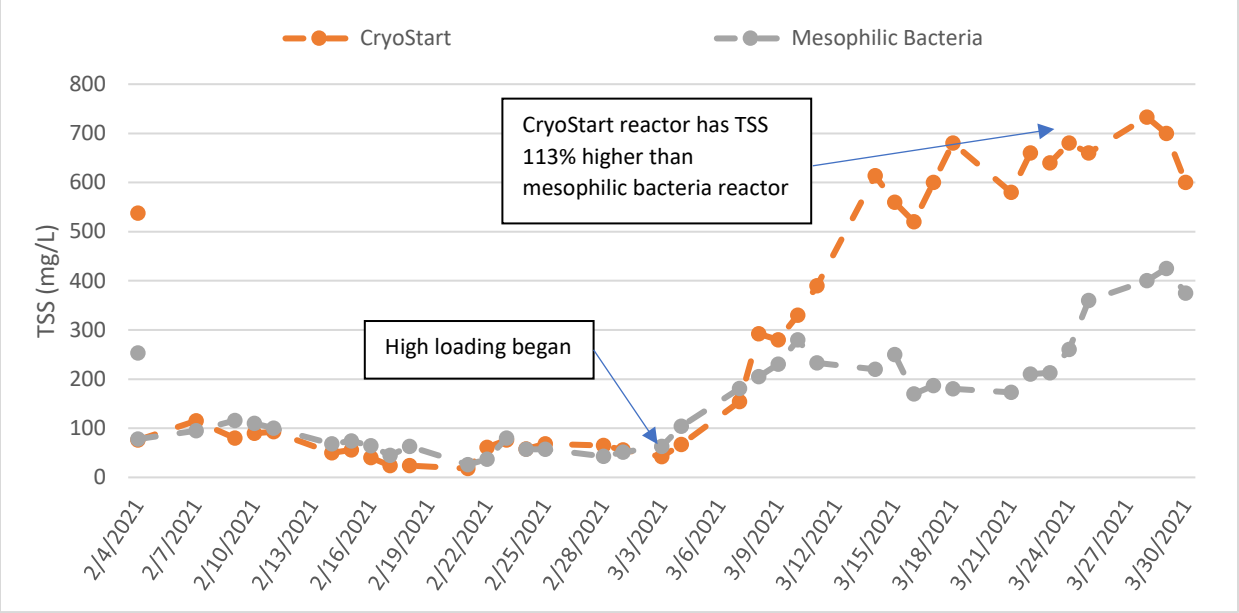

Figure 2 – Reactor Stage 2 TSS concentrations

Conclusion

When one of the eight biological growth pressures, in this case temperature, is outside of ideal range for biological treatment, it can make systems less resilient. Although both reactors functioned well under typical loading conditions, CryoStart, with strains specifically formulated for cold weather performance, outperformed the mesophilic product under higher BOD loading conditions. For systems that use bioaugmentation regularly or as a troubleshooting tool, it can be worthwhile to use an alternate, cold-weather product during the winter months. By supplying a cold aeration basin with bacteria that are more active at colder temperatures, treatment plant operators have a greater chance of meeting effluent permit limitations and avoiding production reduction during high BOD loading events.