MicroC 2000™ Stable and Consistent COD Content

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Facilities achieving Enhanced Nutrient Removal (ENR) limits require precise addition of an external carbon source with known Chemical Oxygen Demand (COD) properties. Variability in COD content, COD stability and COD composition of an external carbon source results in process control challenges and potential permit violations.

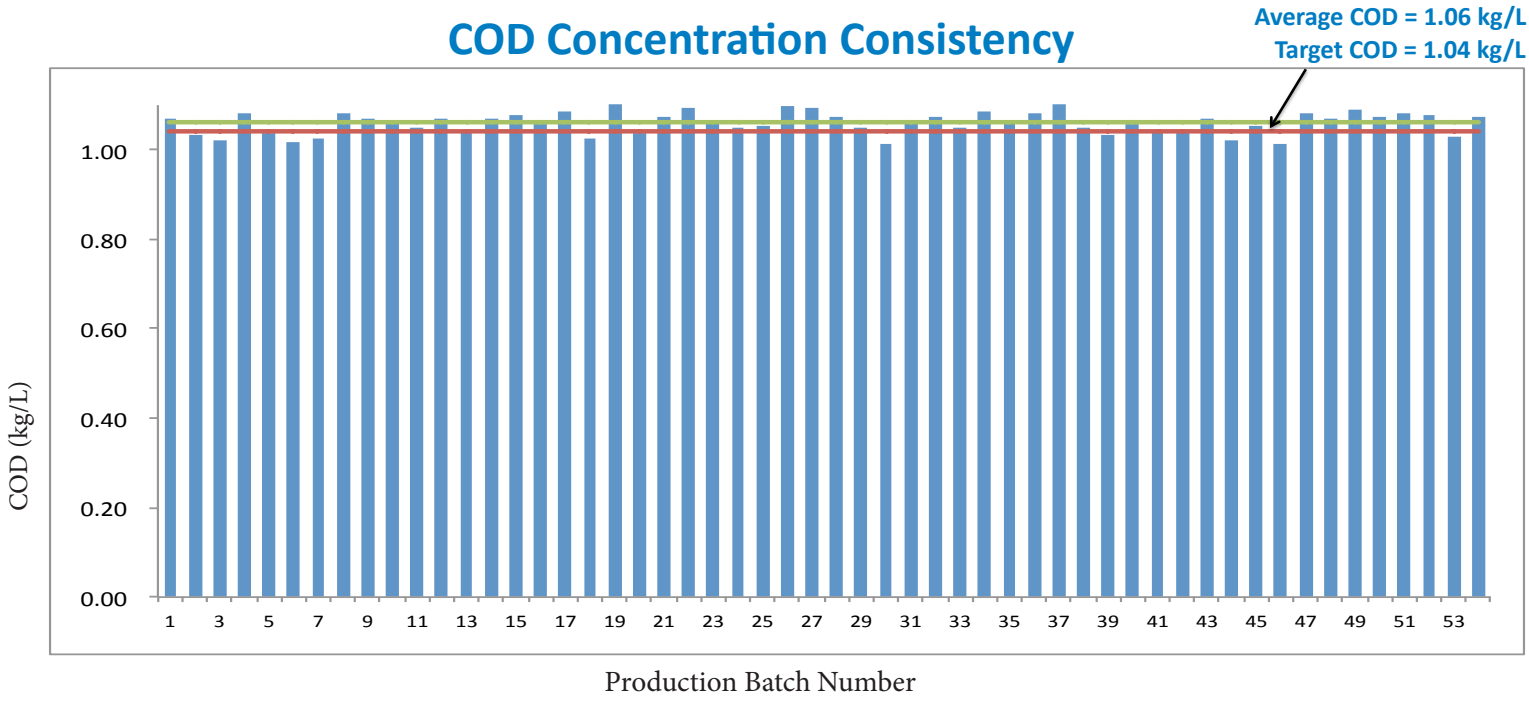
- **COD Concentration** - Even small variations (+/- 10%) in COD content can result in reduced nitrate removal performance or a potential carbon breakthrough
- **COD Stability Over Time:** COD content may decline with time unless the solution is stable
- **COD Composition:** Although two carbon sources may have similar COD, the composition and biodegradability of the COD may vary greatly

As a supplier of alternative carbon sources since 2003 with 350+ users and over 55 million pounds delivered, EOSi understands the need for consistent COD concentration, stability and composition to achieve ENR and BNR permit limits.

COD Concentration Consistency

In 2011 the EOSi quality assurance team implemented additional procedures to further improve COD concentration consistency. EOSi developed new testing methodologies to monitor COD concentration throughout the production cycle. These new quality assurance procedures enabled EOSi to exceed its 4.0% error tolerance in COD concentration for MicroC 2000™. In fact, EOSi was able to maintain an average error less than 2.7%.

The exhibit below shows a measured COD value for each MicroC 2000™ batch manufactured by EOSi since the new quality assurance procedures were implemented. The data set includes 58 production batches or nearly 12.5 million pounds of MicroC 2000™. The red horizontal line shows the target COD concentration of 1,040,000 mg/L, and the green horizontal line shows the average COD concentration of 1,062,000 mg/L. The positive deviation from target COD is primarily caused by variability in small quantities of the non-core ingredient.



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MicroC 2000™

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COD Stability Over Time

The exhibit below compares COD values measured for samples immediately following a production batch with COD values for the same samples at a later point in time. The x-axis shows the number of days between a COD test conducted in conjunction with a production batch and a second test of the same "aged" sample. The y-axis computes the percent difference between the two values. The plot shows that the measured percent difference is randomly distributed around a 0% change in COD. Random distribution is a result of the inherent measurement error in the COD test itself.

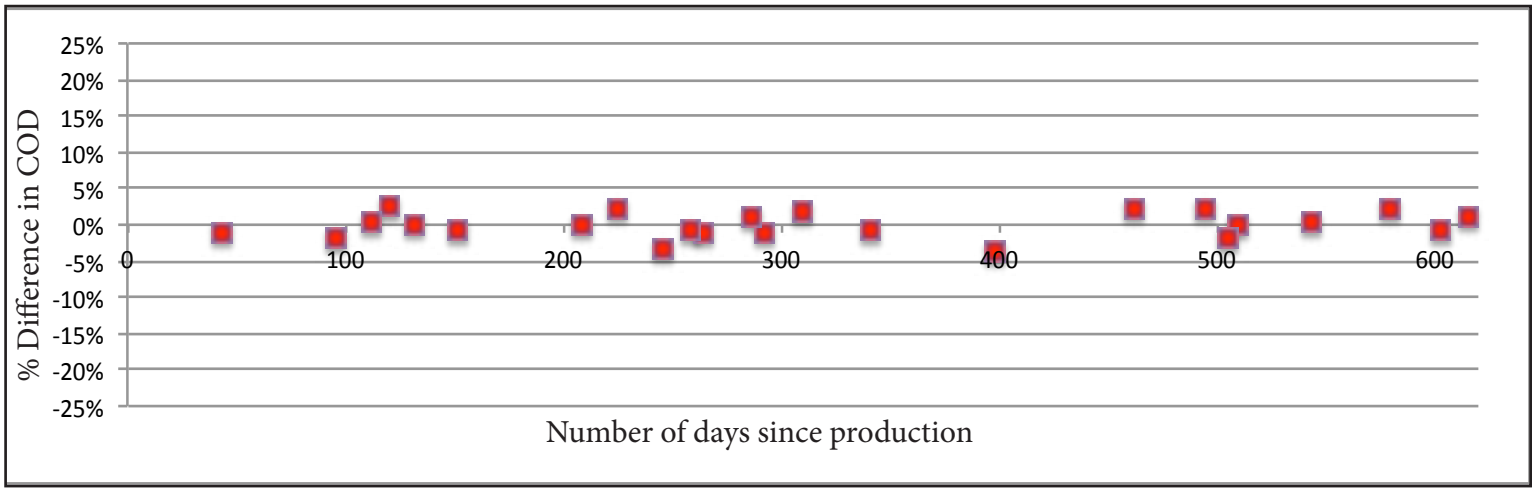
The Importance of COD Stability

COD stability is imporant for all users of external carbon. A decline in COD content over time can result in significant denitrification optimization challenges. As a result of COD variability, facilities with flow pacing capability for carbon source feed will require constant adjustments as the "strength" of the carbon source declines.

Intermittent Users

COD stability is also important for intermittent users and for those facilities that store carbon for use on an as-needed basis. Long term carbon storage is commonplace amongst these users. A loss of COD content indicates biological instability which can result in nuisance growth in storage tanks, feed lines, and pumps. This will require additional maintenance and create unnecessary distractions to operations staff. As the exhibit shows, EOSi has developed expertise in providing carbon sources that satisfy COD stability requirements over long periods of time.

COD Stability Over Time



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