Chemical conversions, such as the conversion of petroleum feedstocks into plastic polymers, occur in reactors. By utilizing biocatalysts (e.g. enzymes), biobased reactors offer an attractive alternative to chemical based reactors, because they provide cleaner reactions with less by-products and do not require high temperatures and pressures. Continuous chemical product formation is required for a bioreactor to be economically feasible, but an enzyme-based bioreactor cannot continuously make chemical products because product accumulation causes inhibition of enzymatic activity. Evolution has solved the dilemma of product inhibition within microorganisms with mechanisms such as active pumping of the accumulating product to the outside of the microbe. Based on the concept in which microorganisms simultaneously and continuously create and expel product we engineered a continuous separative bioreactor whereby product formation occurs concomitantly with separation. The separative bioreactor is based upon electrodeionization and electrically pumps out charged chemical products (e.g. organic acids). The biocatalysts are localized within the separation system, providing instantaneous product removal upon formation. Applying biological principles to engineering issues has lead to a novel and effective solution to the dilemma of product inhibition in continuous bioreactors.