Energy saving options by modified stirrer configuration and aeration strategy

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Abstract

A trend in fermentation technology is to shift away from focus on high output per volume towards low cost. This is related to a global overcapacity of installed fermentor volume, and intensified competition especially from emerging economies. A second trend is to improve on eco-footprint and other sustainability metrics in the processing industries. Especially in the field of bulk products like e.g. processing aids for the production of biofuel, and bio-based chemicals low cost is key. As a result, interest is gaining for reduction of costs of energy for agitation, aeration and cooling; items that received limited attention in the past and also become more attractive to investigate with increasing energy prices. We now have executed a study on alternative stirrer configurations (axial versus radial flow impellers) and optimized sparging of air (currently bubble size is depending on high power input by radial impeller, instead of sparger type), resulting in estimates of energy saving potential / pay back time of hardware modifications for existing installations and information that can be used as input for defining the user requirements if new industrial fermentors have to be built.

In case of viscous fermentations it is important to take into account that the design of the stirrer configuration will affect growth rate, morphology and viscosity, because of differences in shear stress applied on the production organism. The fact that this shear effect is also scale dependent makes it even more complex.