BioFilmBooster

Cultivating biofilms at pilot scale for biotech applications

DTU Food
National Food Institute

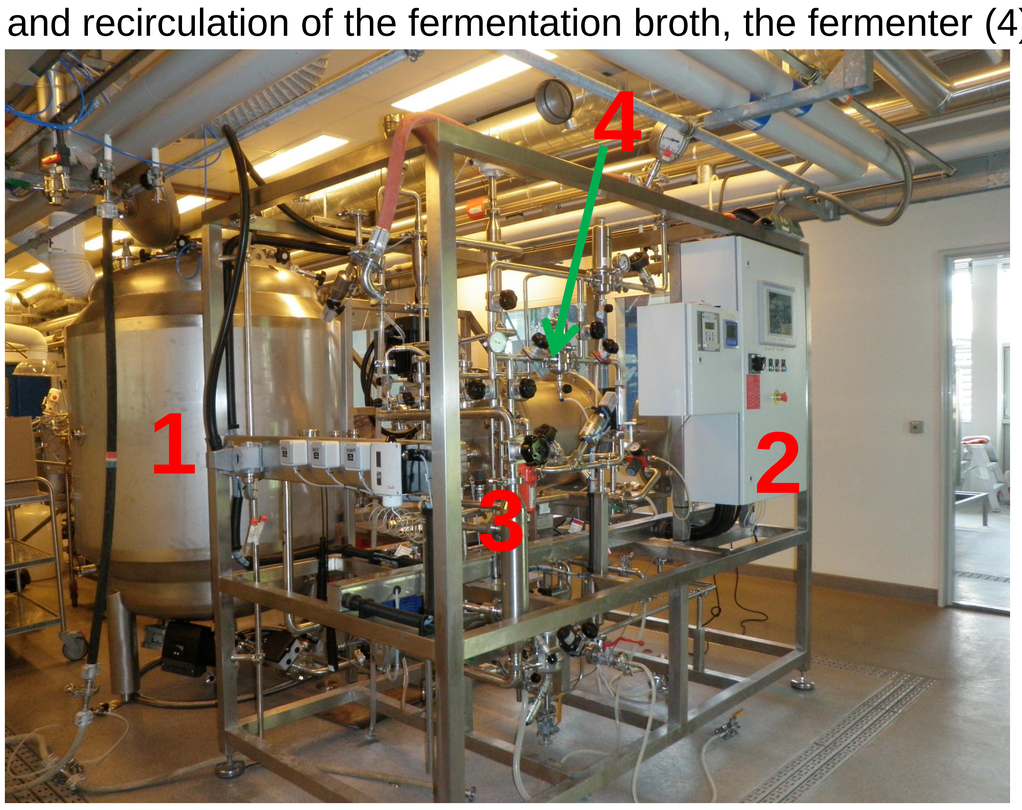
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GRUNDFOS

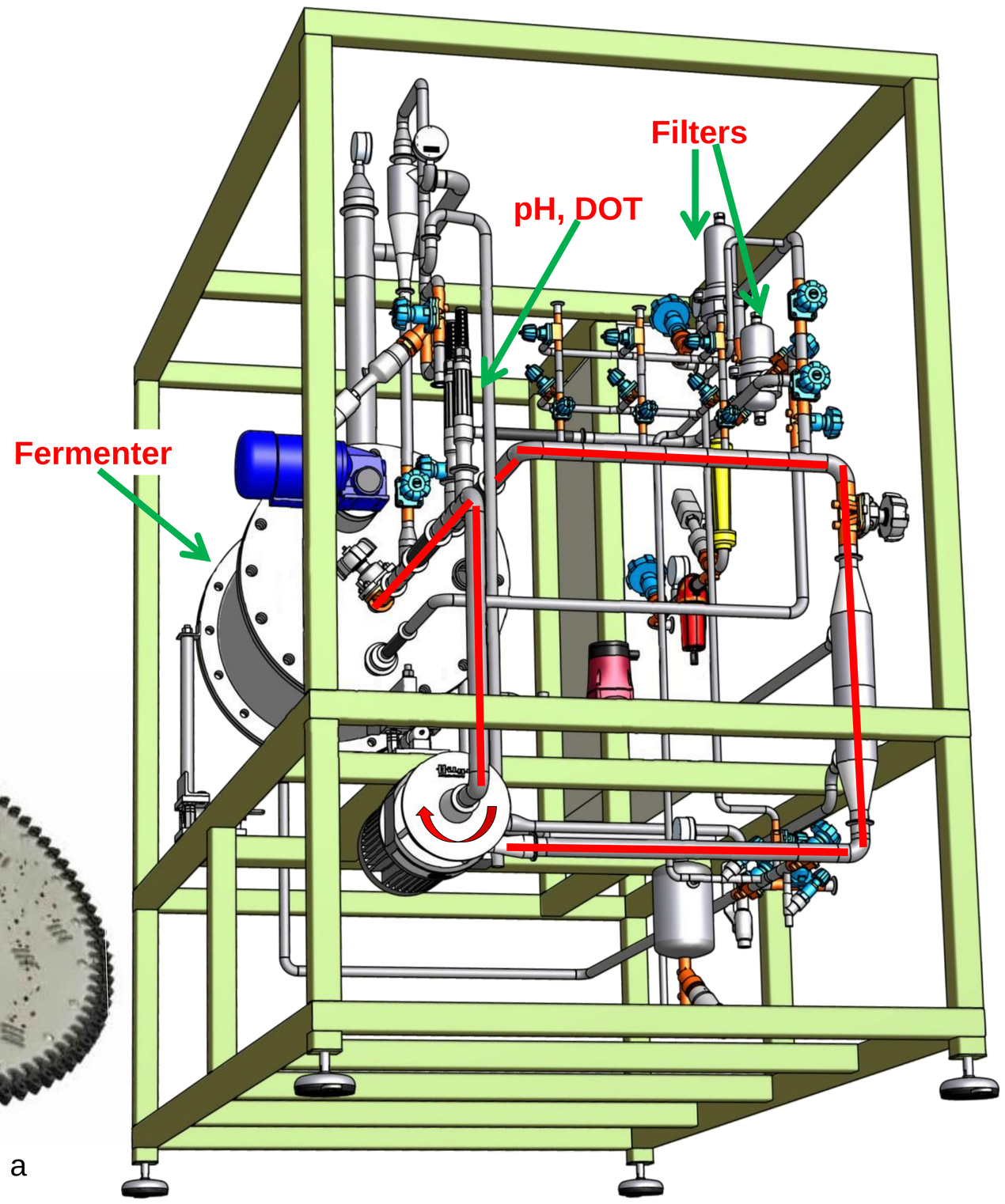
Microorganisms growing as biofilms may potentially have benefits for biotech applications compared with suspension culture (Qureshi et al, 2005). For example they may be capable of producing different types or amounts of metabolites and extracellular products or have greater substrate conversion rates. However to be of interest for biotech applications it is necessary to scale-up cultivation as a biofilm. Here we introduce a new pilot-scale fermenter, the **BioFilmBooster**, capable of continuous cultivation. The design is based loosely on earlier wastewater treatment devices (Janning et al., 2004) but is designed for completely aseptic operation, with full steam sterilization, monitoring and control of the main aspects of a fermentation process (temperature, pH, dissolved oxygen, foam, over-pressure, mixing). The biofilm grows over a total surface area of around 18 square meters of polymer disks. The special design of the disks, maintains the thickness of the biofilm at 0.1 mm. The setup allows cultivation of various types of cells, including fungi, yeast and bacteria.

Our first preliminary results demonstrate that sterility can be maintained in the fermenter. Continuous cultivation at a dilution rate of 0.2 h^{-1} for 48h using biofilm forming *S.cerevisiae* mutants (personal gift from Birgitte Regenberg, KU, Denmark) show that all the main controls of a fermentation process can be applied. Further studies are on going to fully characterise the fermenter and the cells performance in it.

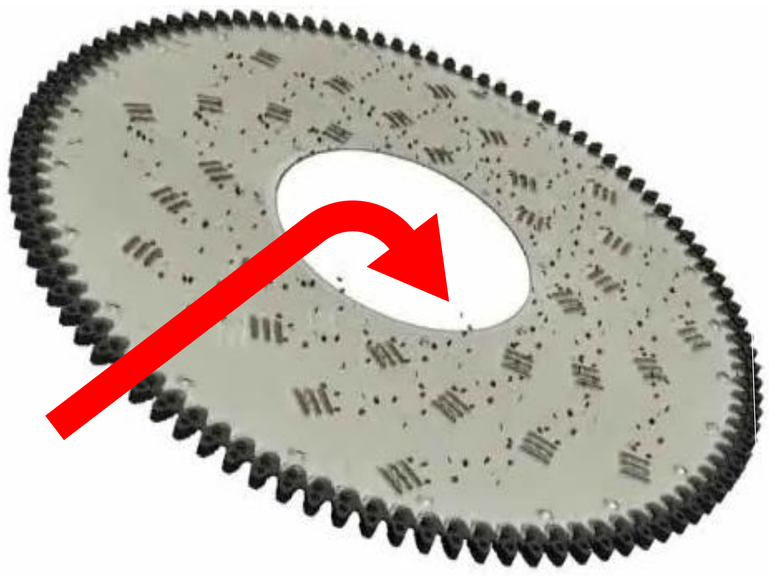
Overview of the BioFilmBooster: the stainless-steel feeding tank (1), the PLC (2) and the piping system (3) for monitoring, control and recirculation of the fermentation broth, the fermenter (4):

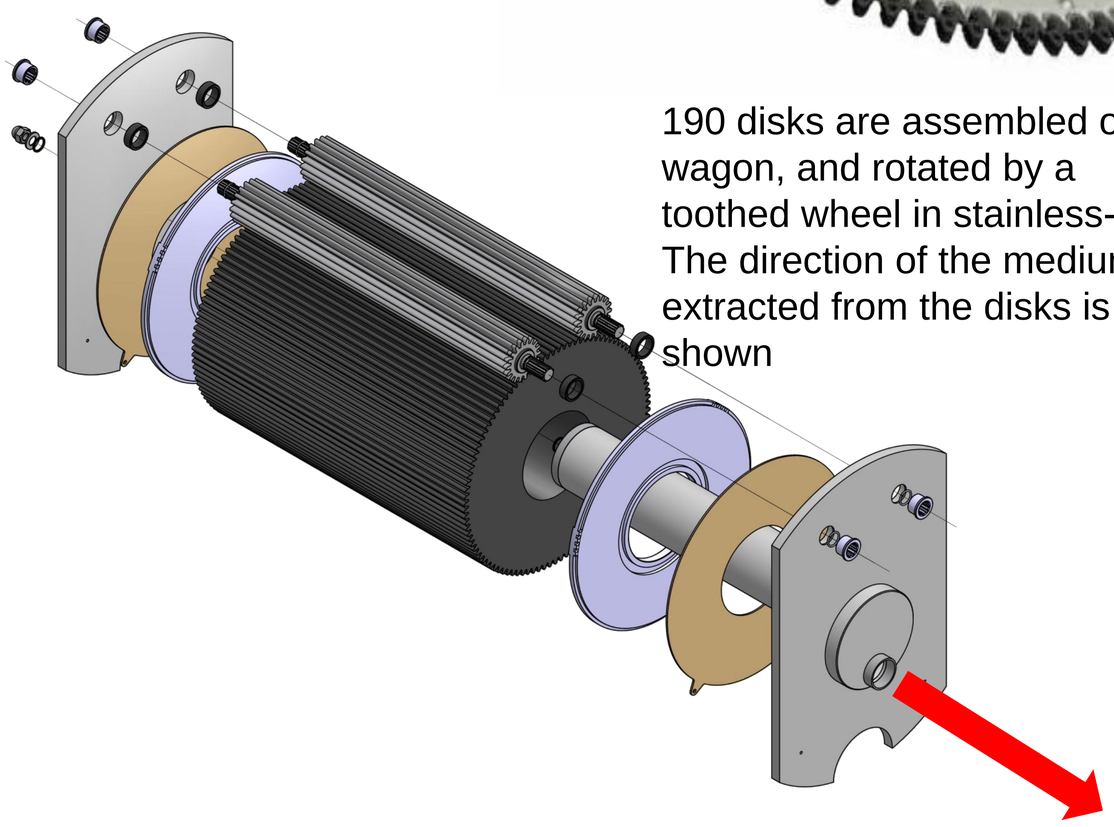


Schematic representation of the pilot fermenter: the recirculation line (red line), pH, DOT, steam and air filters are indicated:



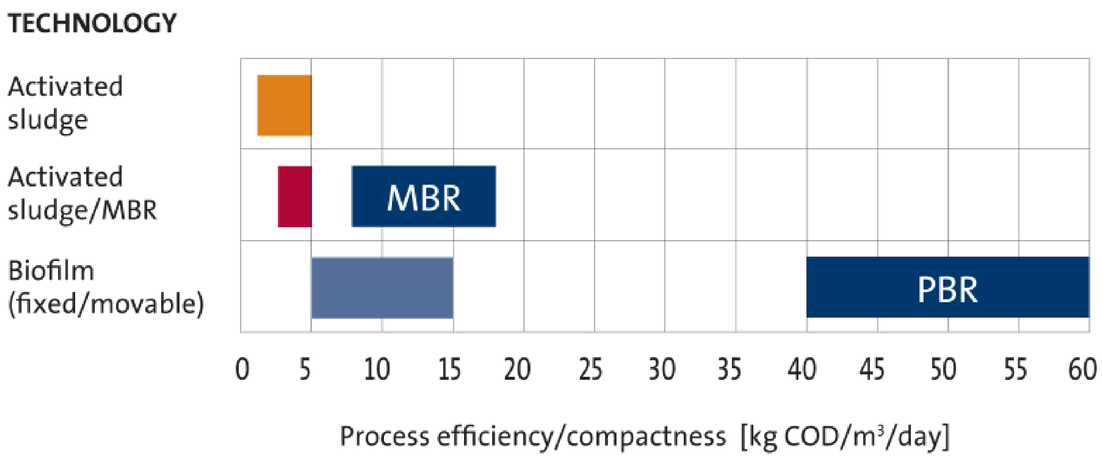
The two-sided disks on which the biofilm grows contain scrapers and cyclonical blades of 0.1mm depth which control the thickness of the biofilm. The radial flow of the medium in shown





190 disks are assembled on a wagon, and rotated by a toothed wheel in stainless-steel. The direction of the medium extracted from the disks is shown

Comparison of the performance of a biofilm reactor used in waste water with other process options shows much greater process efficiency, is possible. MBR: Membrane BioReactor; PBR: Pressurized BioReactor. *Grundfos personal communication*.



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Qureshi et al*, Microbial Cell Factories* 2005, 4:24; Janning et al., proceedings from Biofilms 2004: Structure and Activity of Biofilms – Las Vegas, NV, USA 2004