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Foam Recovery of Biosurfactants from Fermenters



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The AICHE logo, consisting of a cluster of green dots of varying sizes arranged in a roughly circular pattern.
11 AICHE[®]
Annual Meeting, Minneapolis, MN

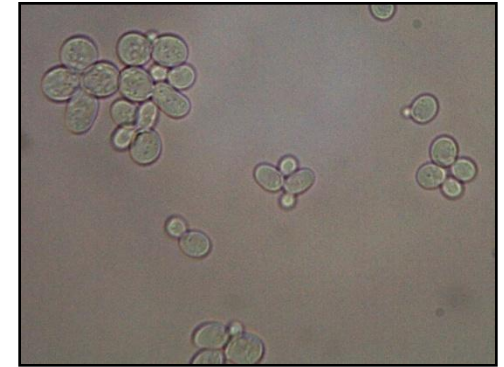
The Unilever logo, featuring a stylized blue 'U' with intricate floral patterns inside, and the word 'Unilever' in a blue script font below it.

Biosurfactants

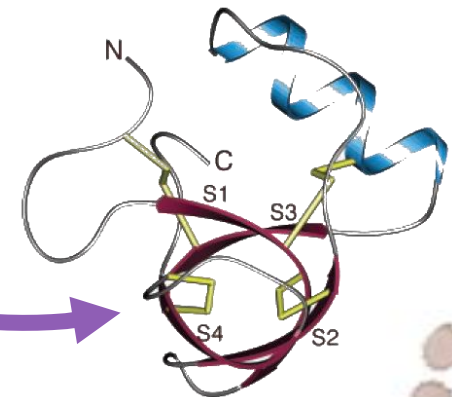
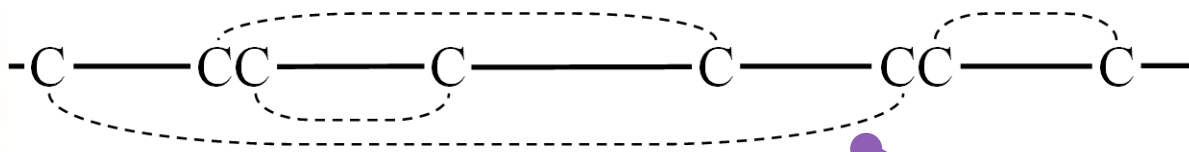
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Surfactants produced by microorganisms



Hydrophobin protein - HFBII



Biosurfactants

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Foams generated from aqueous solutions of HFBII are extremely stable



t = 0



t = 1 month

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Engineering Challenge



Mukherjee S et al (2006) *Trend. Biotech.* 24

Blanch, H.W and Clark D.S (1997) *Biochemical Engineering Handbook* John Wiley & Francis

Engineering Challenge

**Downstream separation
accounts for 60 % of the
total production cost**

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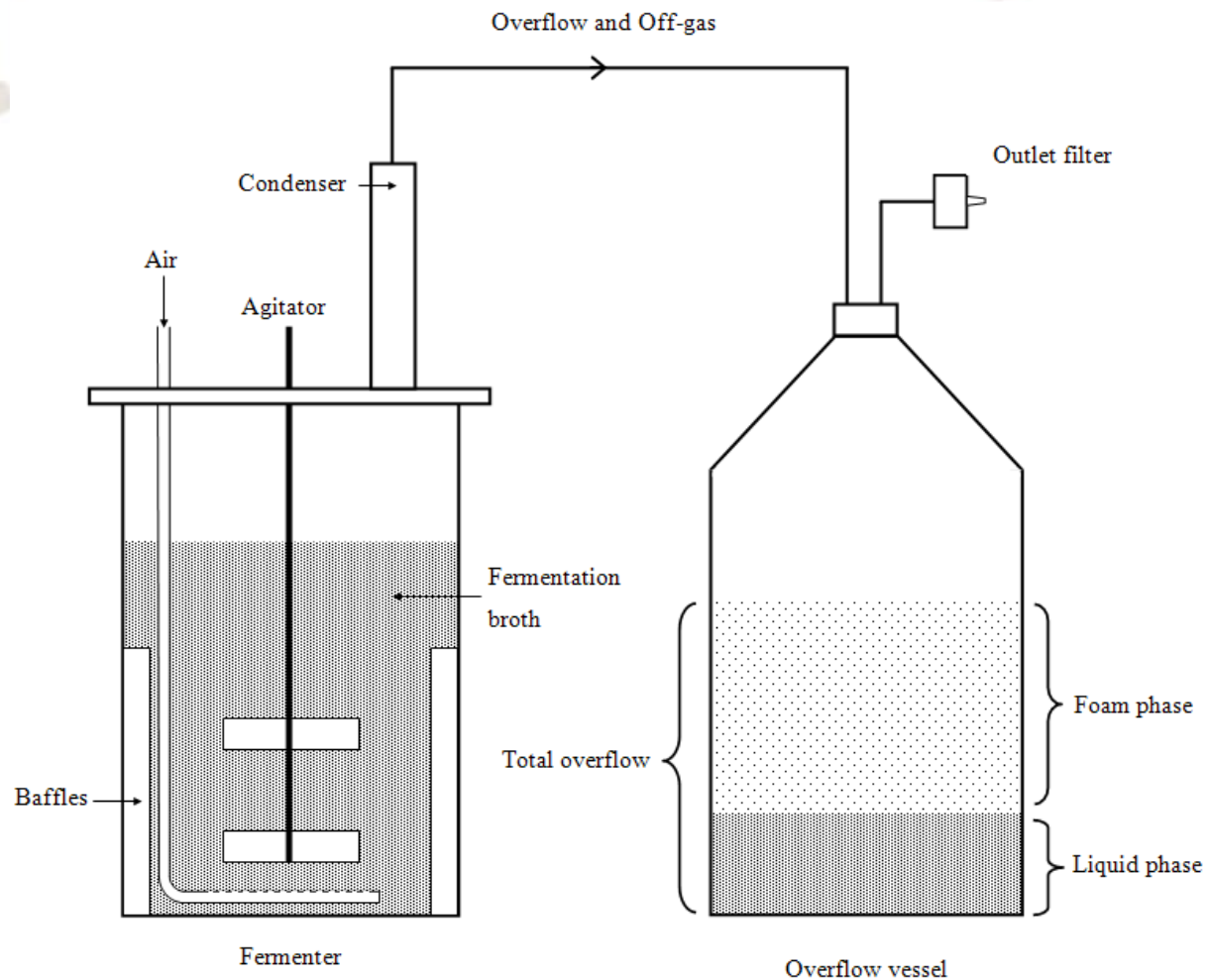
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Nuisance Foaming

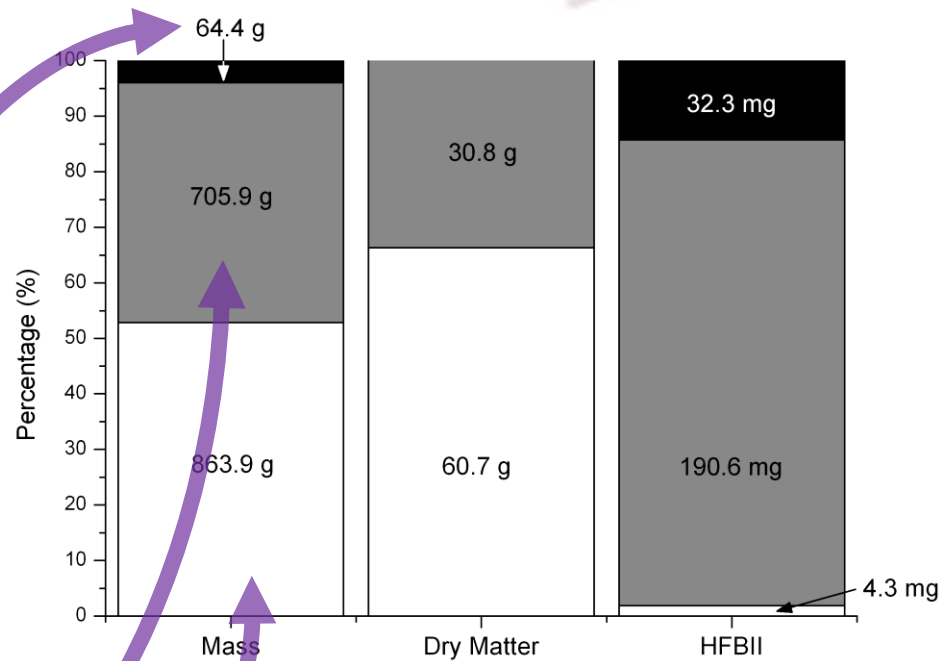
How can foaming be made a virtue?



Effects of Foaming

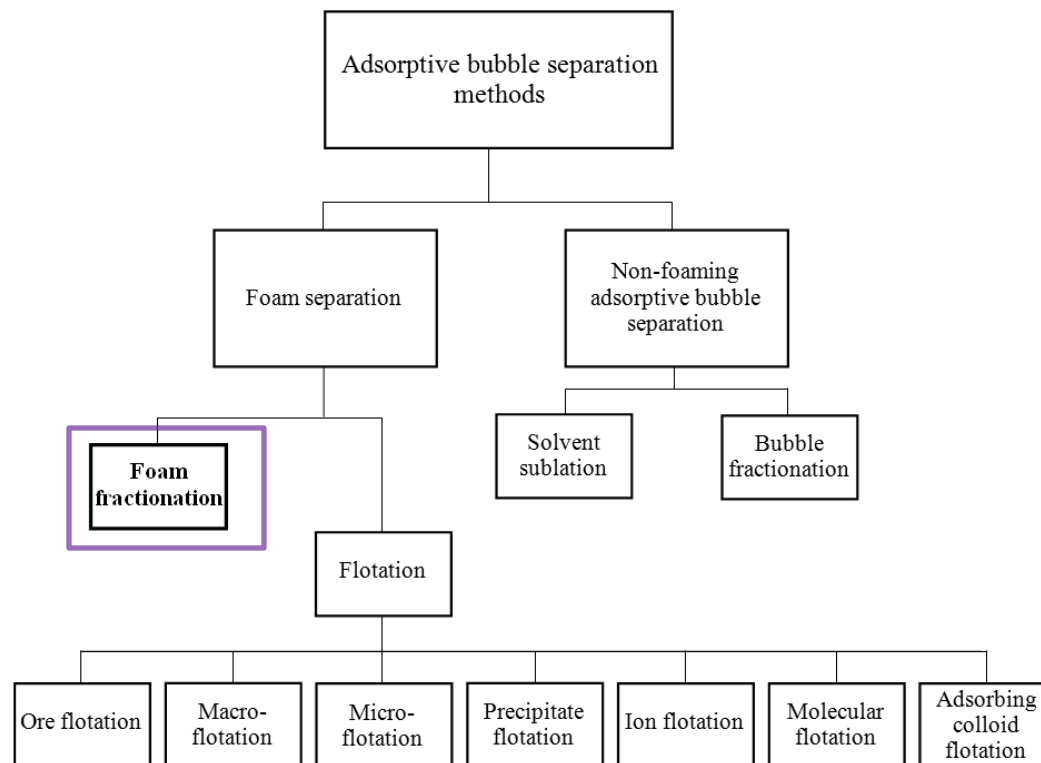


Effects of Foaming

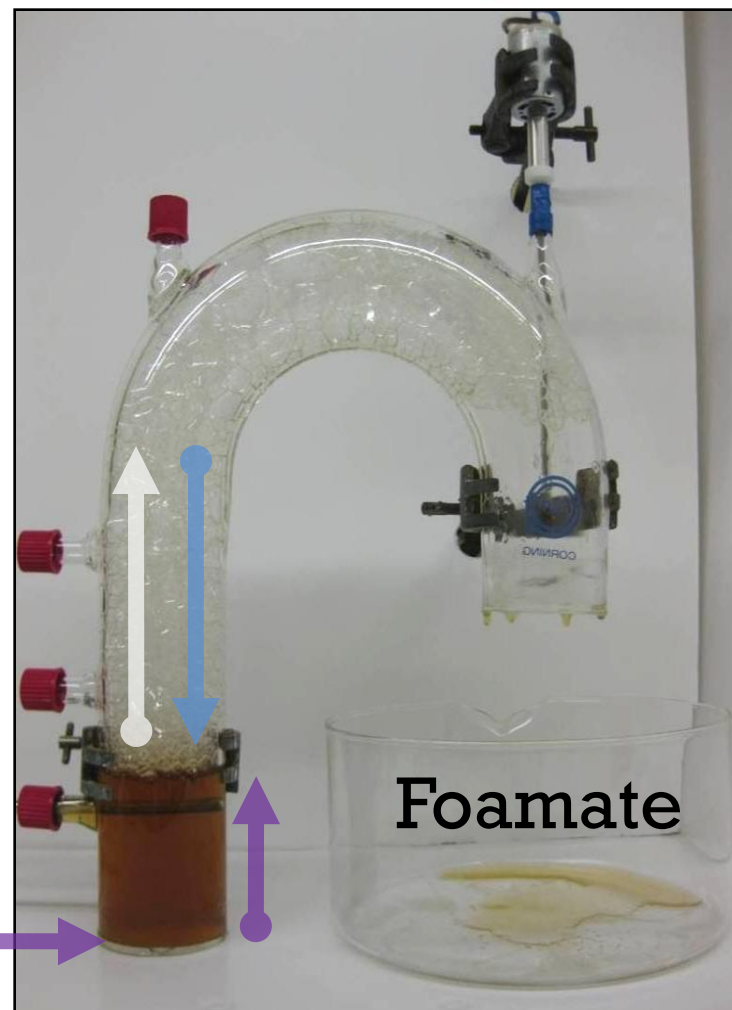
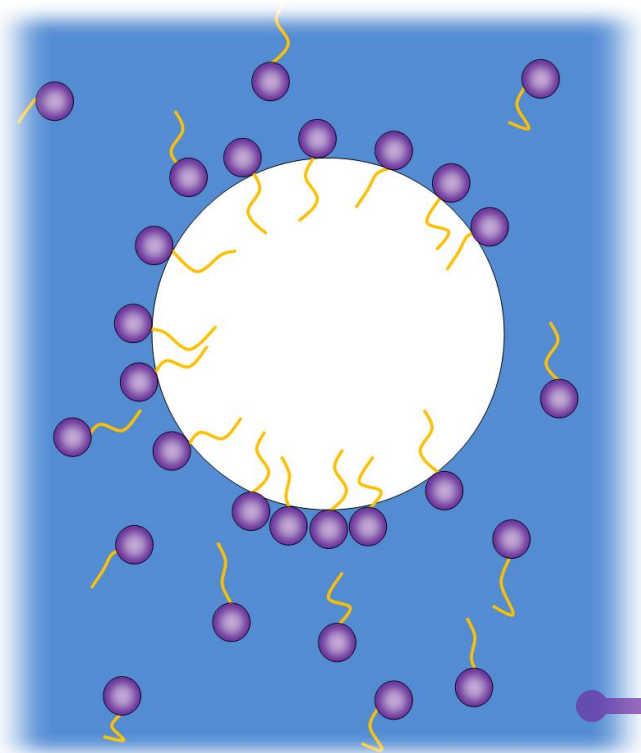


Foam Fractionation

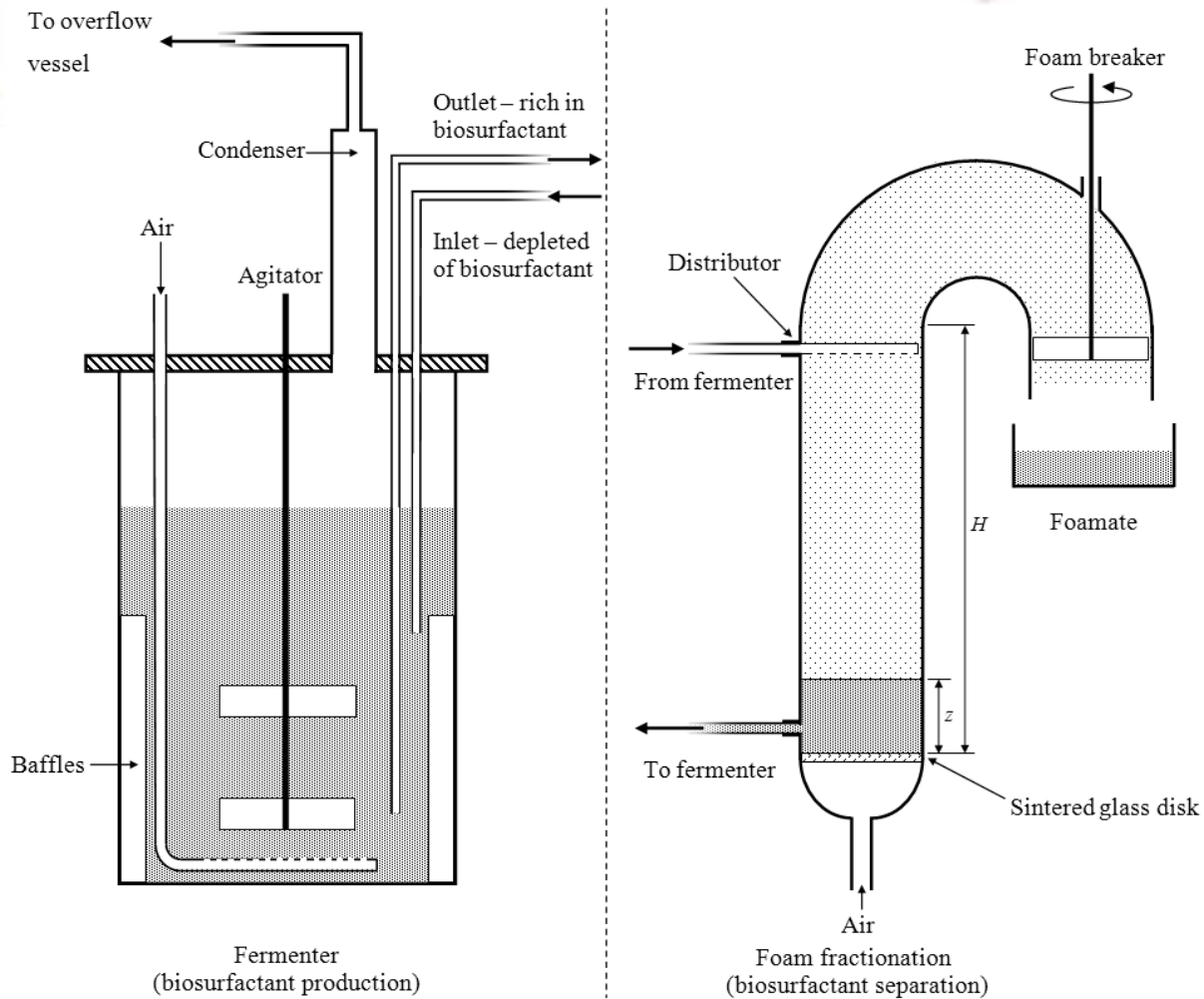
Adsorptive bubble separation method



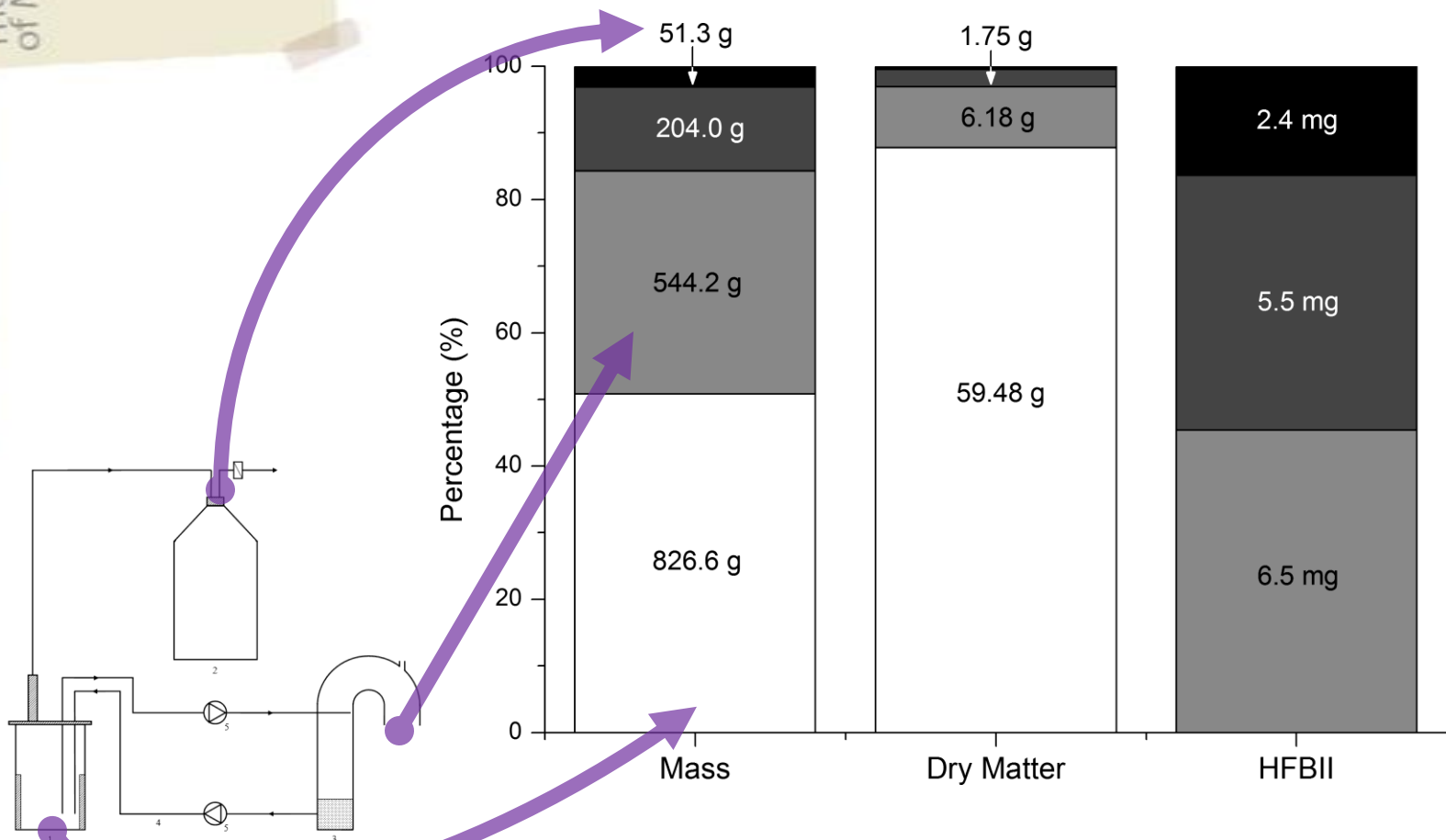
Foam Fractionation



Recovery Process

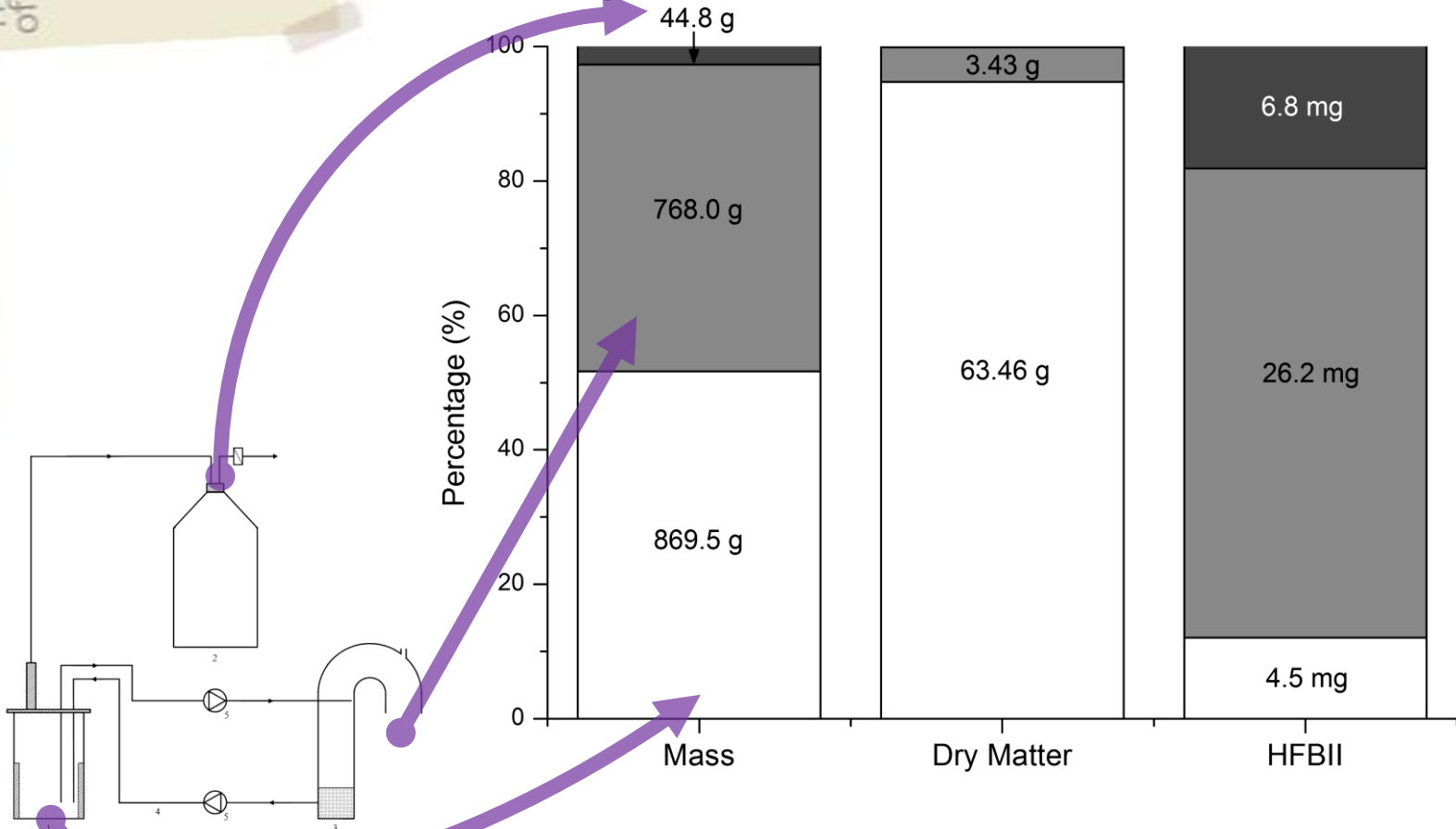


Controlled Foaming 1



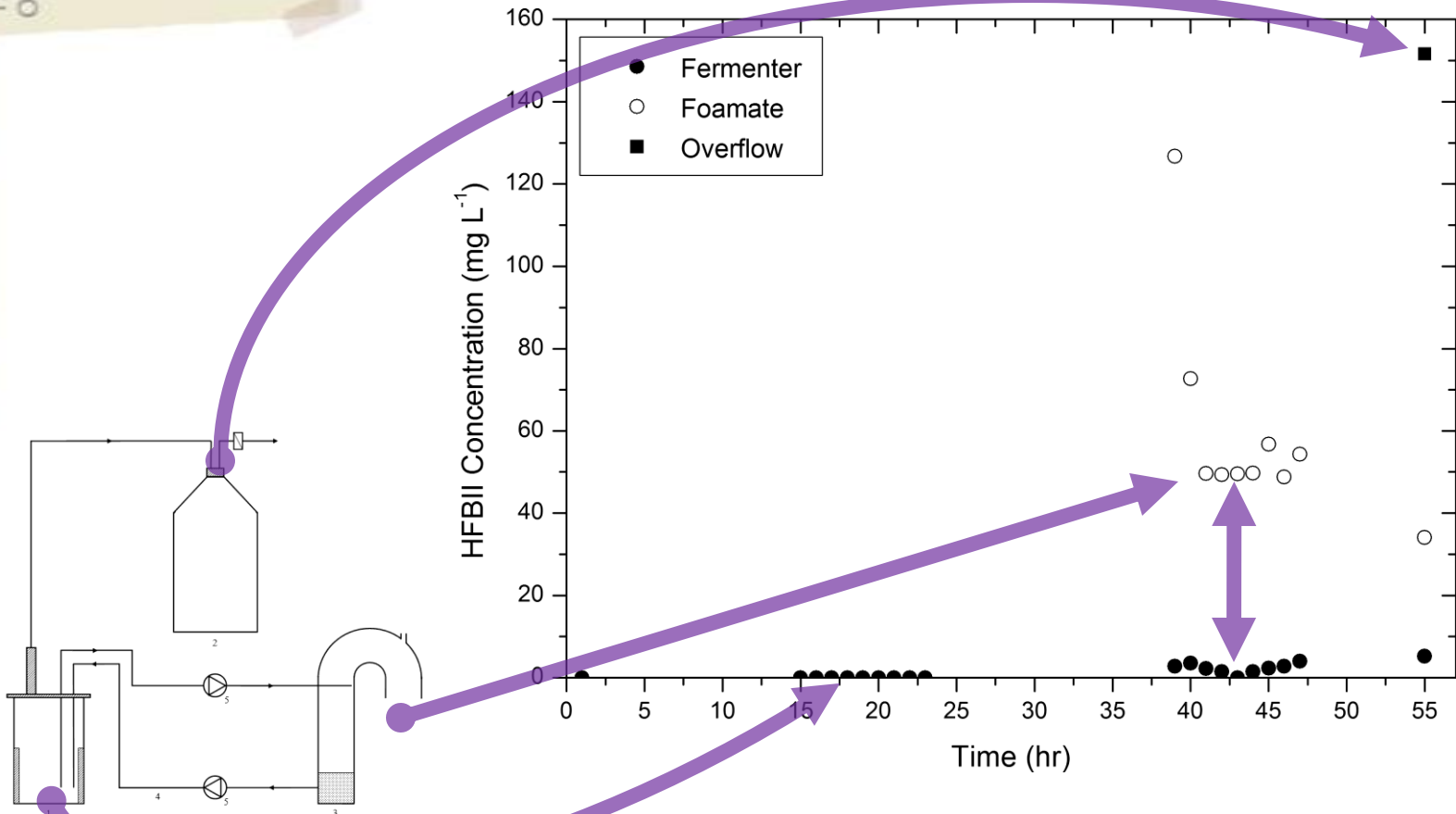
Controlled Foaming 2

Operating conditions modified



Controlled Foaming 2

Operating conditions modified



Final Comments

Foam separation reduced uncontrolled overflow

Biomass retention increased from 66 % to 95 %

HFBII recovery 70 % with an enrichment of 6.6

Total production could be increased

Acknowledgements

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Dr Andrew Russell, Unilever R&D, UK



Unilever

EPSRC

Engineering and Physical Sciences
Research Council

Thank you for listening