

Process intensification in mAb capture using an innovative, high capacity Protein A resin in batch operation

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Introduction

The cost of Protein A resins is one of the major contributors to the cost of goods sold (COGS) in the manufacturing of mAbs, especially at the clinical stages. Innovative approaches such as intensified batch processing and continuous chromatography help to alleviate this burden and bring down the COGS by increasing the productivity (g purified mAb/L resin/hour), reducing facility foot print and buffer consumption without negatively impacting the product quality.

In this study, we compare a latest generation Protein A resin, Praesto Jetted A50, a jetted agarose bead, against the market leading batch emulsified protein A resin. The results show that a significant increase in productivity and reduction in COG's can be achieved by using purpose-designed jetted resins for Protein A affinity chromatography in either batch, intensified batch processing or continuous chromatography format.

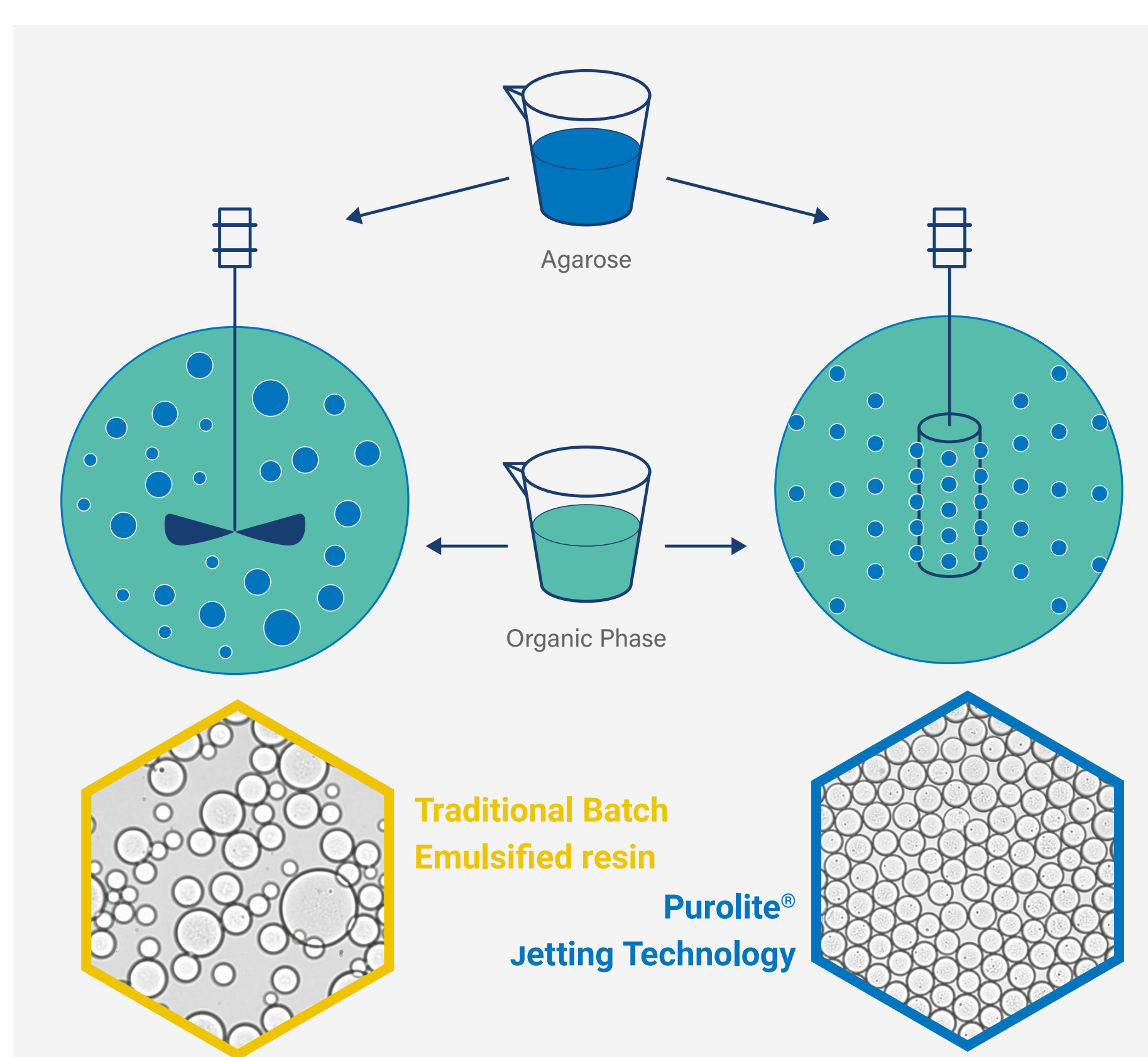


Figure 1. Comparison of batch-wise emulsified Competitor protein A resin and Praesto® Jetted A50

Maximizing Cost-Effectiveness

The improvement in mass transfer and diffusion kinetics with Praesto Jetted A50 allows the user to maximize cost effectiveness through process intensification. Here we show the effectiveness in modifying bed height and internal diameter.

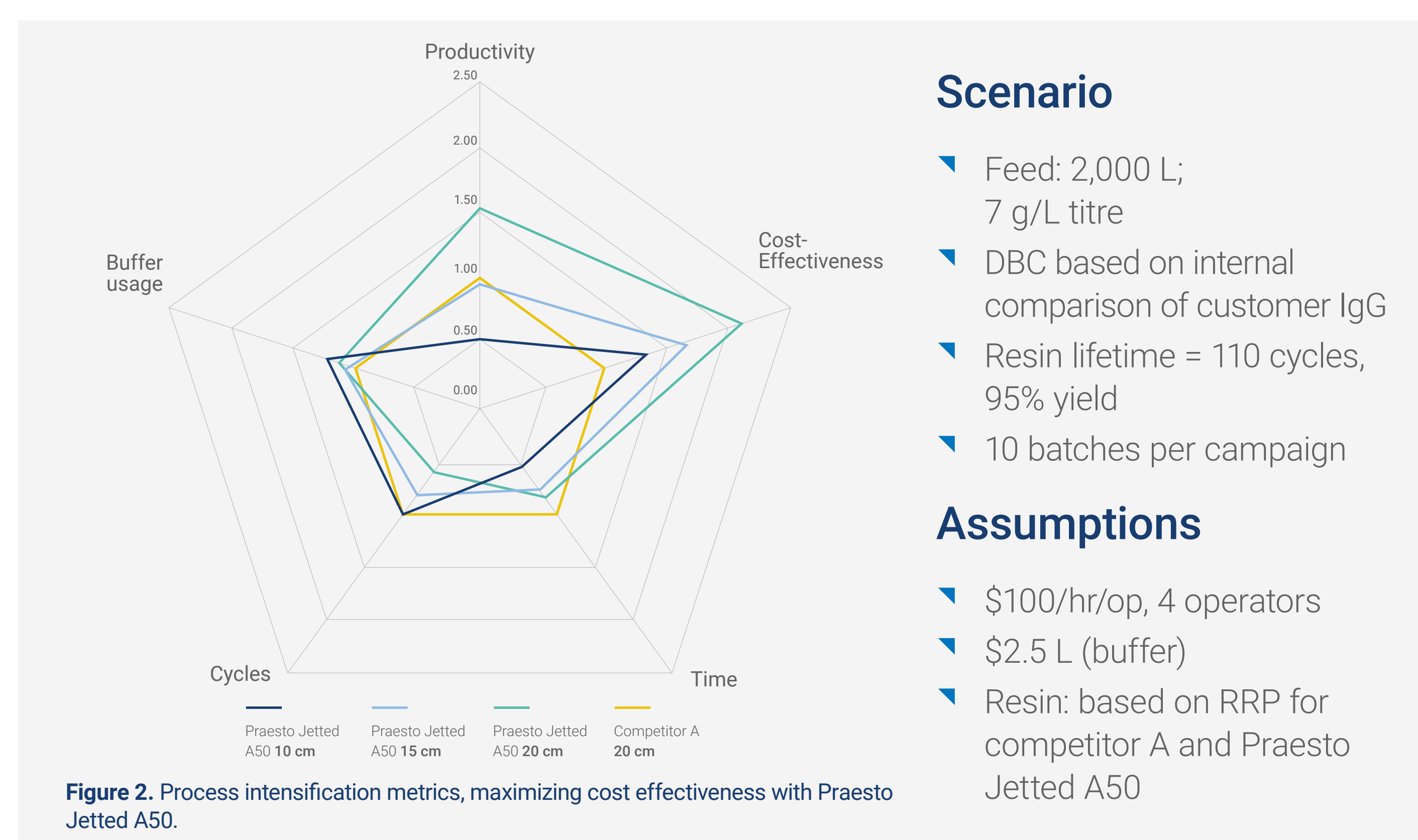


Figure 2. Process intensification metrics, maximizing cost effectiveness with Praesto Jetted A50.

An improvement in performance is represented by an increase in the metric relative to the benchmark batch emulsification protein A resin.

Summary

- Praesto Jetted A50 has very high capacity for IgG, with excellent diffusion and mass transfer properties.
- The innovative jetting technology coupled with Repligen ligand technology results in a protein A resin with high capacity and excellent capacity at low residence times.
- These unique properties allow users the flexibility to employ varying strategies to maximize the cost effectiveness of protein A resins during the capture step of downstream purification.

Batch Emulsification vs Jetting

Most agarose-based resins on the market are produced by batch emulsification, which has been used since the mid- 1900s. However, this method produces a relatively wide particle size distribution and requires extensive sieving to achieve the column performance demanded in modern processes. In contrast, a continuous manufacturing process named 'jetting' can be used to produce chromatography resin beads with a narrow, uniform particle size distribution.

Praesto® Jetted A50

The base bead of Purolite's Praesto Jetted A50 is produced by jetting technology and coupled with Repligen's ligand technology, this results in a high capacity resin with improved diffusion kinetics.

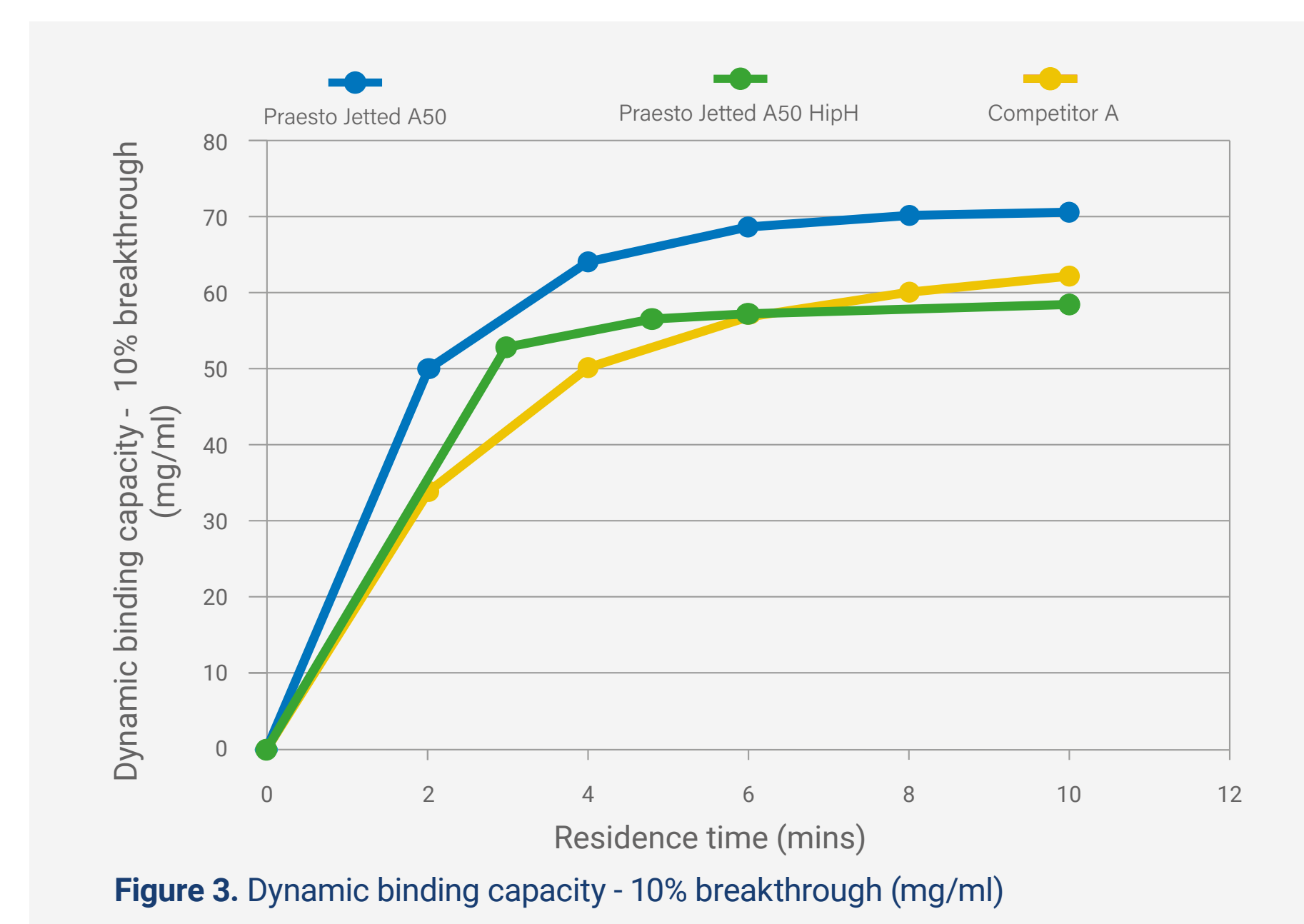


Figure 3. Dynamic binding capacity - 10% breakthrough (mg/ml)

Bed Height Effect on Total Protein A Costs

- Bed heights and residence times optimized towards the greatest cost-effectiveness.
- Steeper dynamic binding capacity for Praesto Jetted A50 enables a broader range of bed heights to be used - particularly at shorter bed heights.
- So greater utility – and therefore lower cost.
- Here, Praesto Jetted A50 leads to cost savings of 76% (20 cm), 61% (15 cm) and 48% (10 cm) versus the benchmark batch emulsified protein A resin.

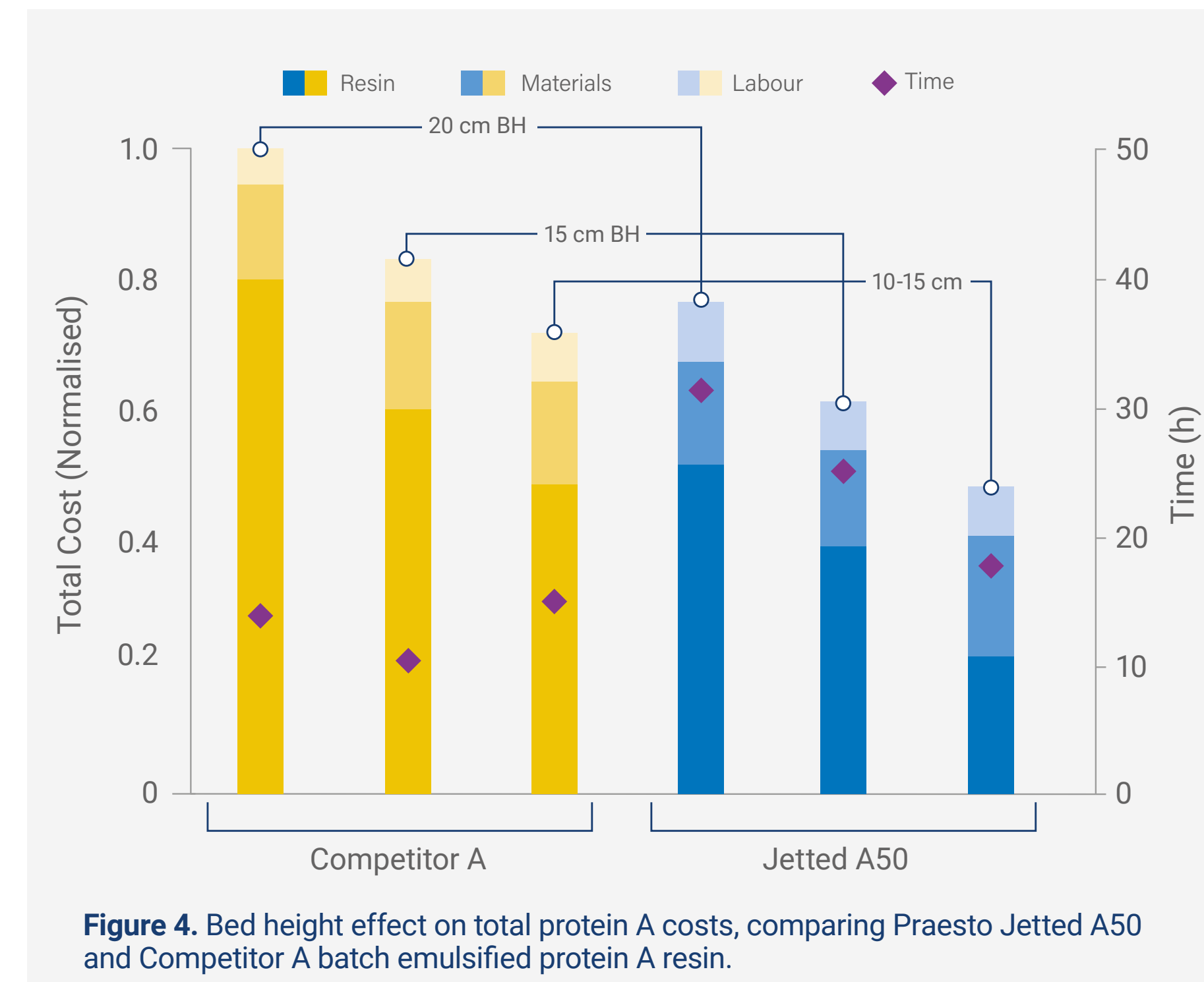


Figure 4. Bed height effect on total protein A costs, comparing Praesto Jetted A50 and Competitor A batch emulsified protein A resin.

Strategies to Reduce Cost

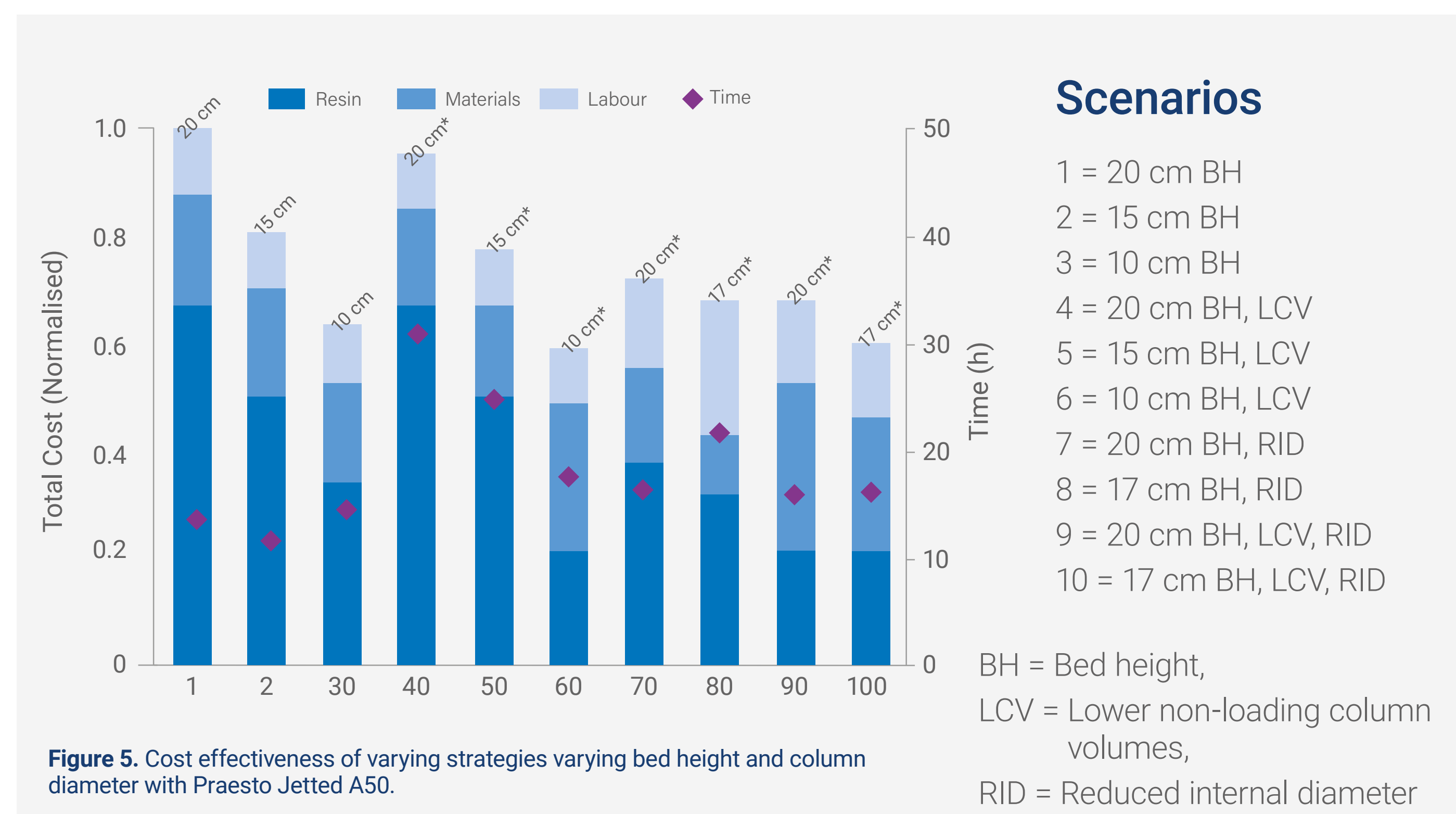


Figure 5. Cost effectiveness of varying strategies varying bed height and column diameter with Praesto Jetted A50.

Various strategies exist to support process intensification with Praesto Jetted A50, leading to greater reductions in cost.

