

Processing of Biomass

Using a Teledyne ISCO Syringe Pump

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Introduction

Bench-scale evaluations at high temperature and pressure involving biomass feed that requires precise control and delivery are a major technical challenge. This is due to the fact that the majority of available pumps capable of operating at low flow rates (<100 ml/min) are not suitable for high temperature operation. In our research, we require precise delivery of feed material to a separation device at temperatures up to 200 °C and pressures up to 600 psi depending on feed properties. A Teledyne ISCO 1000D syringe pump [see note] was utilized to process a variety of biomass materials such as algal, cellulosic, and lignocellulosic at flow rates ranging from 10 to 300 ml/min.

Experimental Procedures

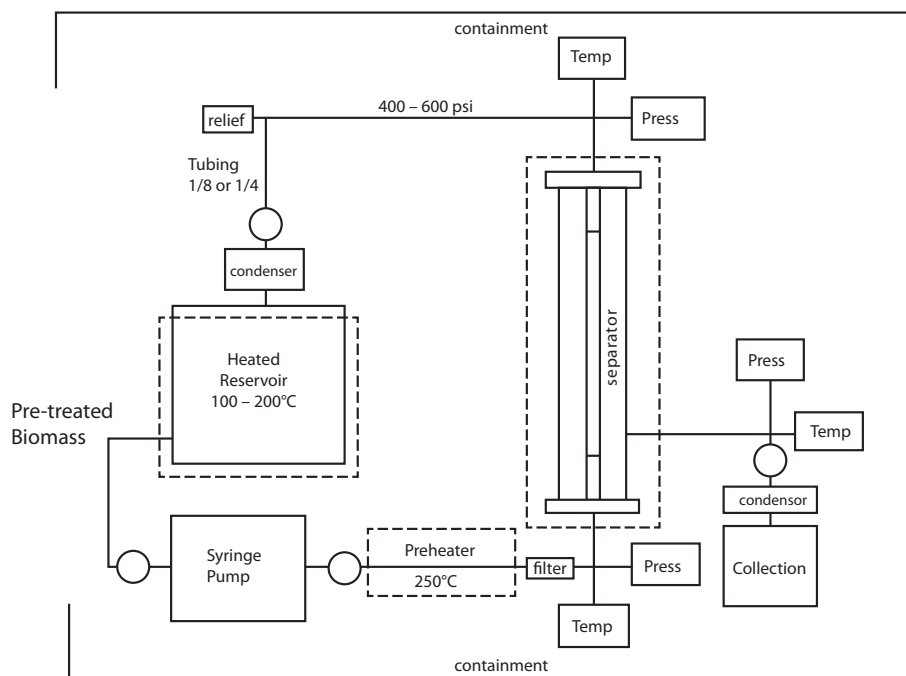
The processing of aqueous biomass at temperatures up to 200 °C requires pumping feed material at moderately elevated pressure with high precision and reliability. In this process, high temperature pretreated biomass containing small loading (up to 1%) of suspended solids is fed to a separator for downstream processing.

The Teledyne ISCO 1000D syringe pump, equipped with a high temperature package, delivers feed material at precise flow rates ranging from 10 to 300 ml/min, at pressures up to 600 psi, with operating temperatures up to 200 °C. The test setup incorporating the high pressure syringe pump is shown in the figure below.

Feed biomass samples contain both soluble and insoluble components. Operating the system at temperatures up to 200 °C with the high temperature upgrade ensures uniform concentrations and prevents precipitation of certain biomass components in the pump cylinder. Another useful feature of the Teledyne ISCO pump is the ability to operate at constant pressure or constant flow. This allows the evaluation of system performance under two independent operating parameters, which is required to better understand the critical factors impacting biomass processing.

Note

The 1000D model pump, which was used during the original experiment, is discontinued. Current model 1000x is the recommended replacement for the older 1000D model.



Use and Disclosure of Data: Information contained herein is classified as EAR99 under the U.S. Export Administration Regulations. Export, reexport or diversion contrary to U.S. law is prohibited.

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Teledyne ISCO is continually improving its products and reserves the right to change product specifications, replacement parts, schematics, and instructions without notice.



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Product model names have been updated in this document to reflect current pump offerings.