A Novel Ultrasonic Dynamic Drainage Tester

Jinlan Ju, Xujun Hua and Huining Xiao*

FPInnovations, Canada

* University of New Brunswick, Canada

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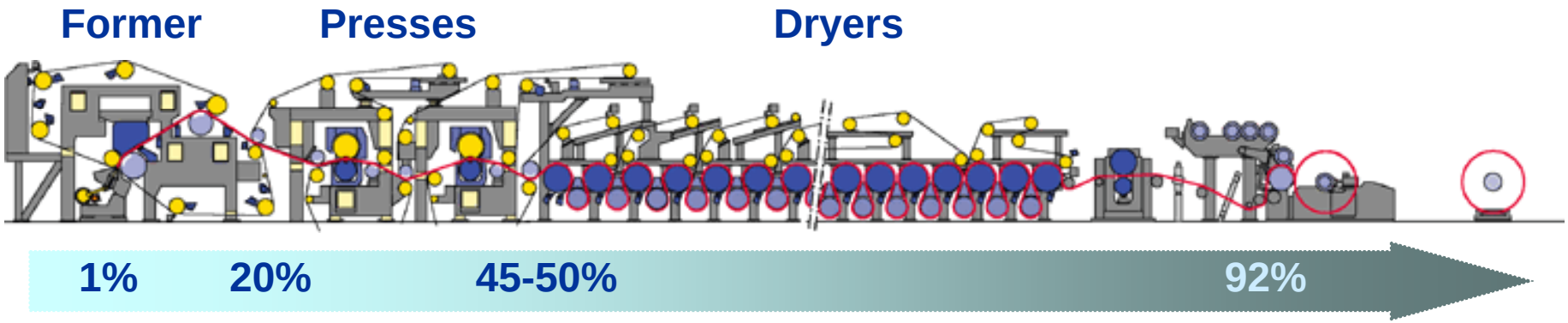
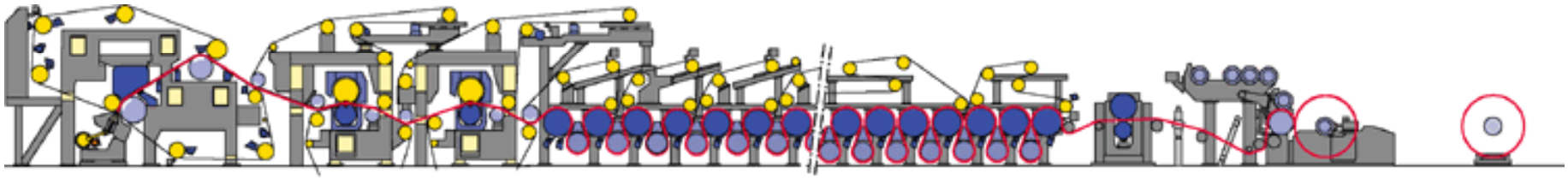
RETHINK PAPER:
Lean and Green

Water Removal in Papermaking



Cost of Water Removal



Relative cost to remove a given quantity of water:

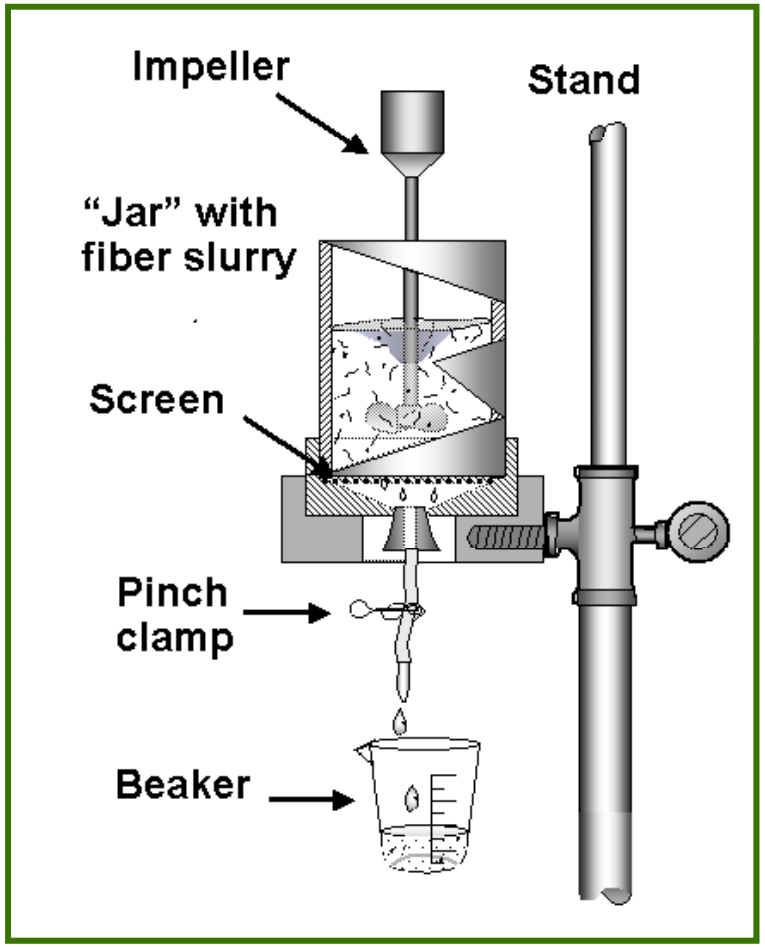
Former	Presses	Dryers
$1	$58	$220

Conventional Drainage Tester

Canadian Standard Freeness Tester:

Excellent tool for pulp quality control

Dynamic Drainage Jar



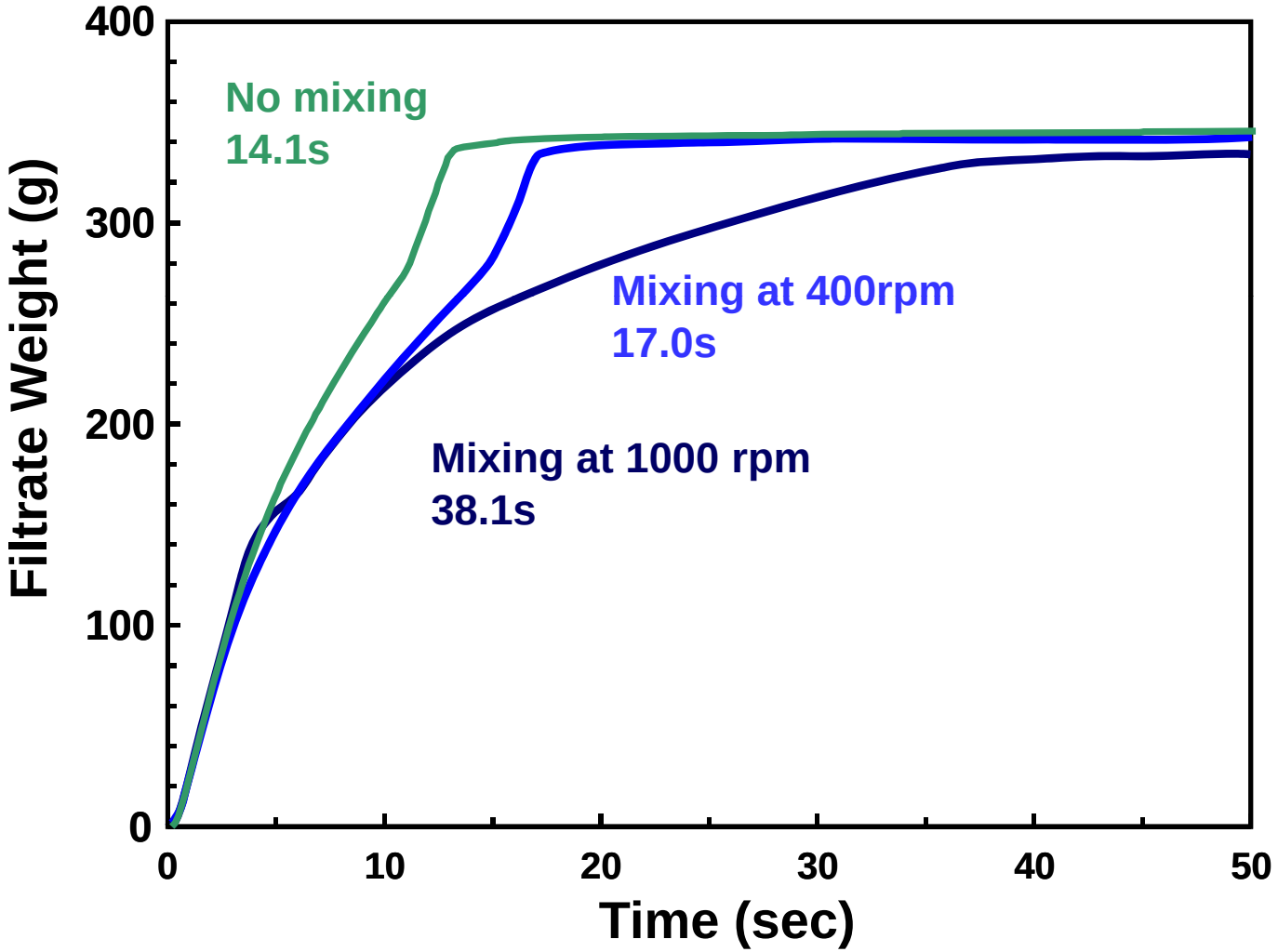
A very useful device for determining first pass retention.

Modified Dynamic Drainage Jar

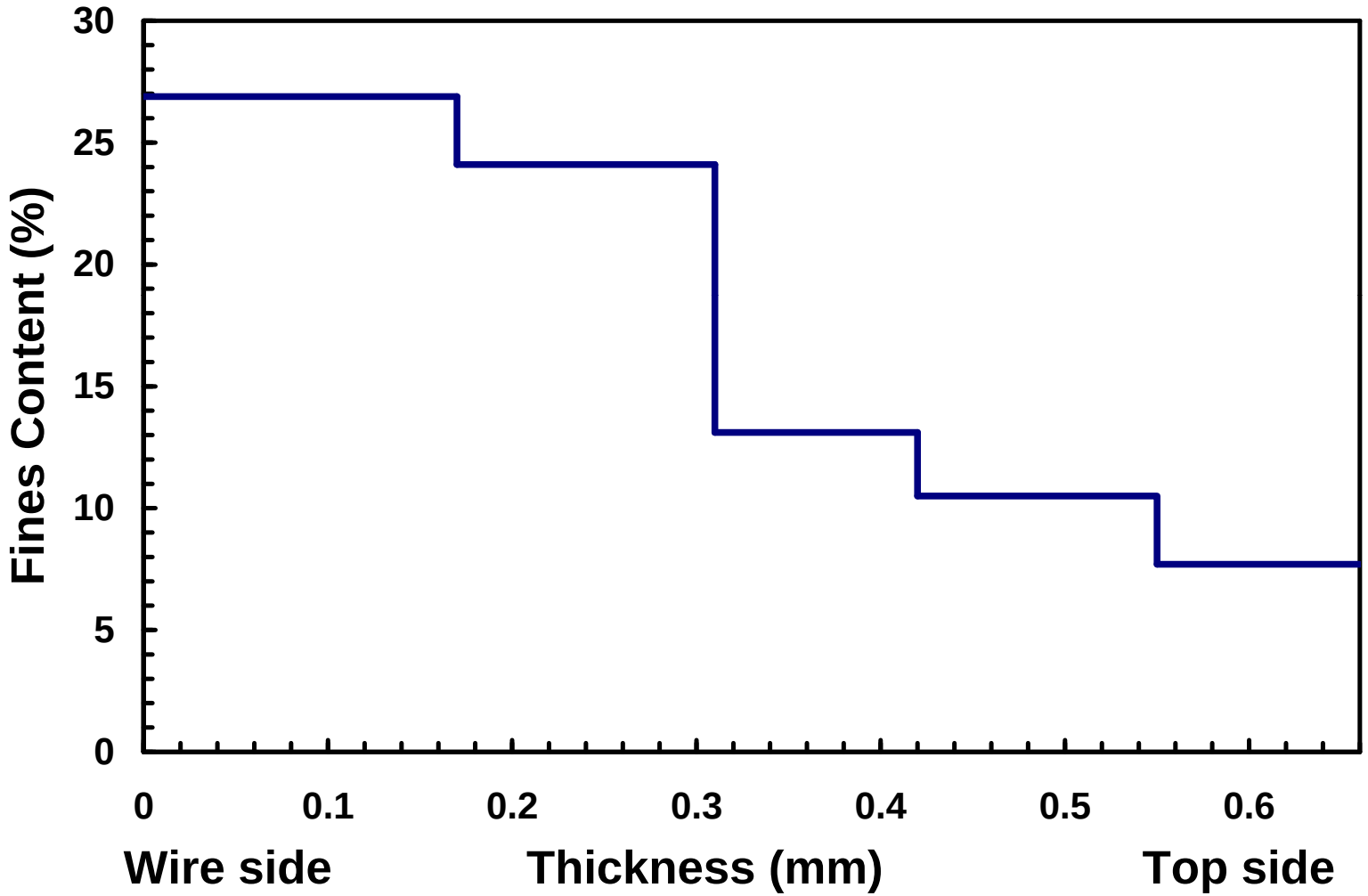
Dynamic Drainage Analyzer:

A simple test,
but no turbulence during drainage

Effect of Mixing on Drainage in Modified DDJ



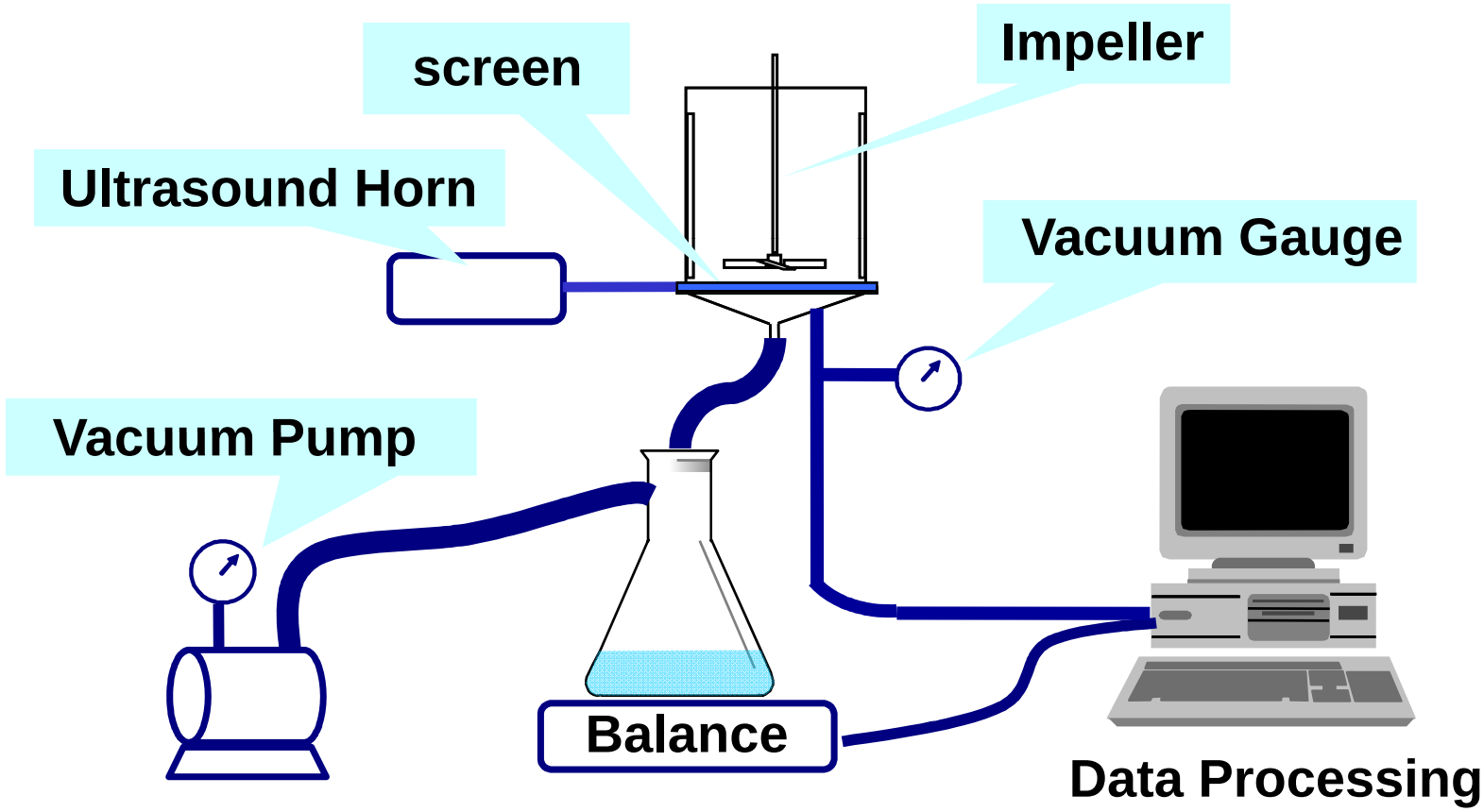
Fines Distribution of a Sheet Formed in a DDJ Under Continuous Mixing



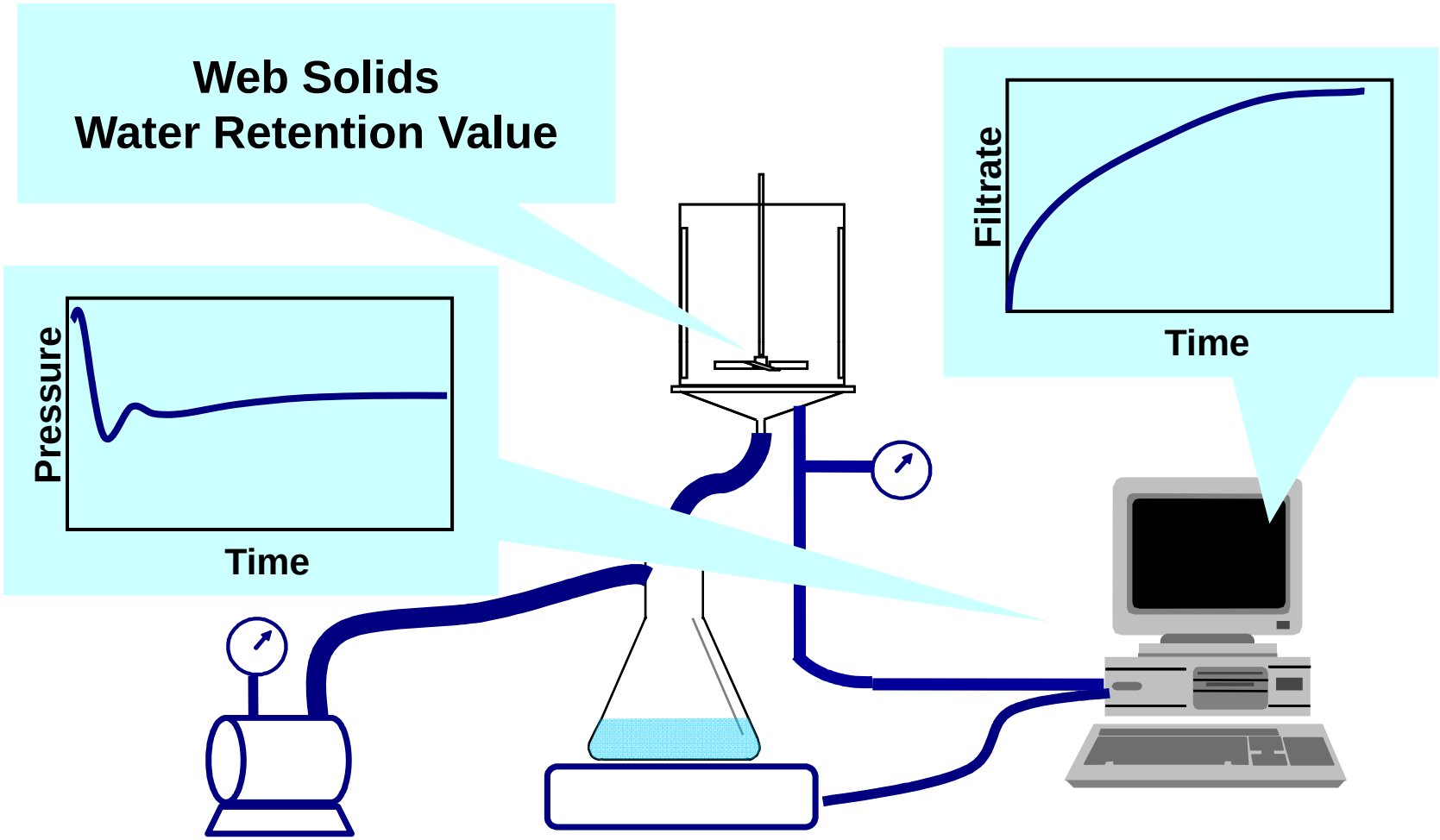
Other Drainage Testers

Moving Belt Drainage Tester
Pulsed Drainage Device
…

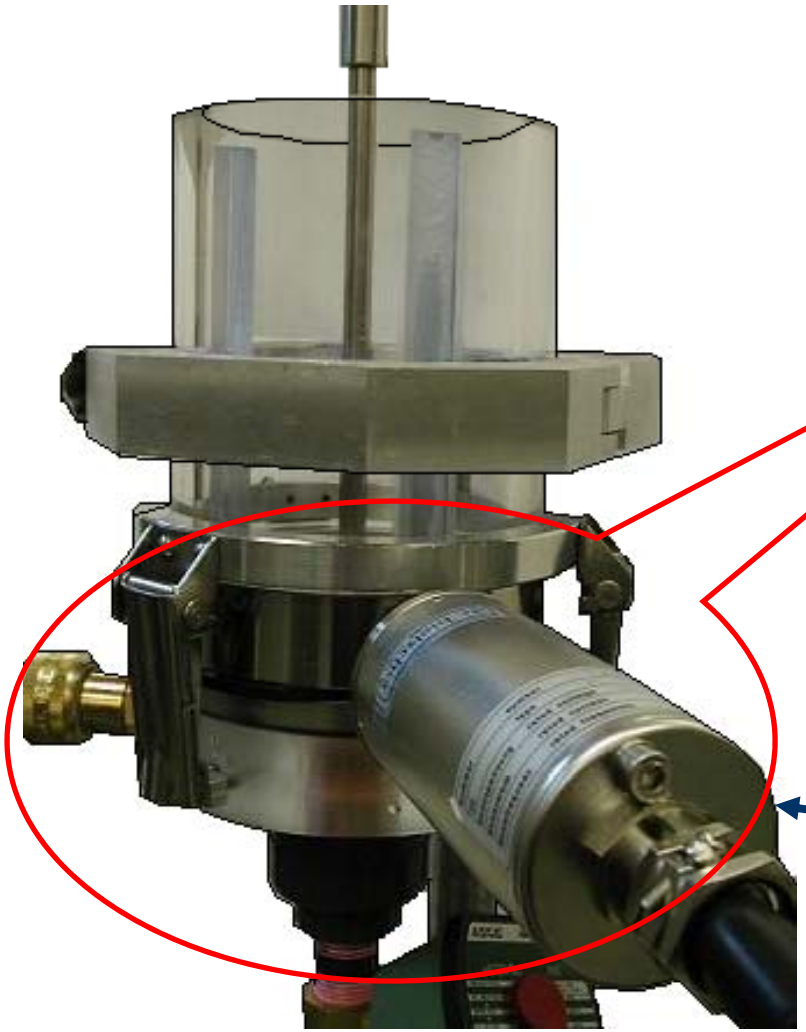
Ultrasonic Dynamic Drainage Tester



Data Collection



Ultrasonic Filtration Screen

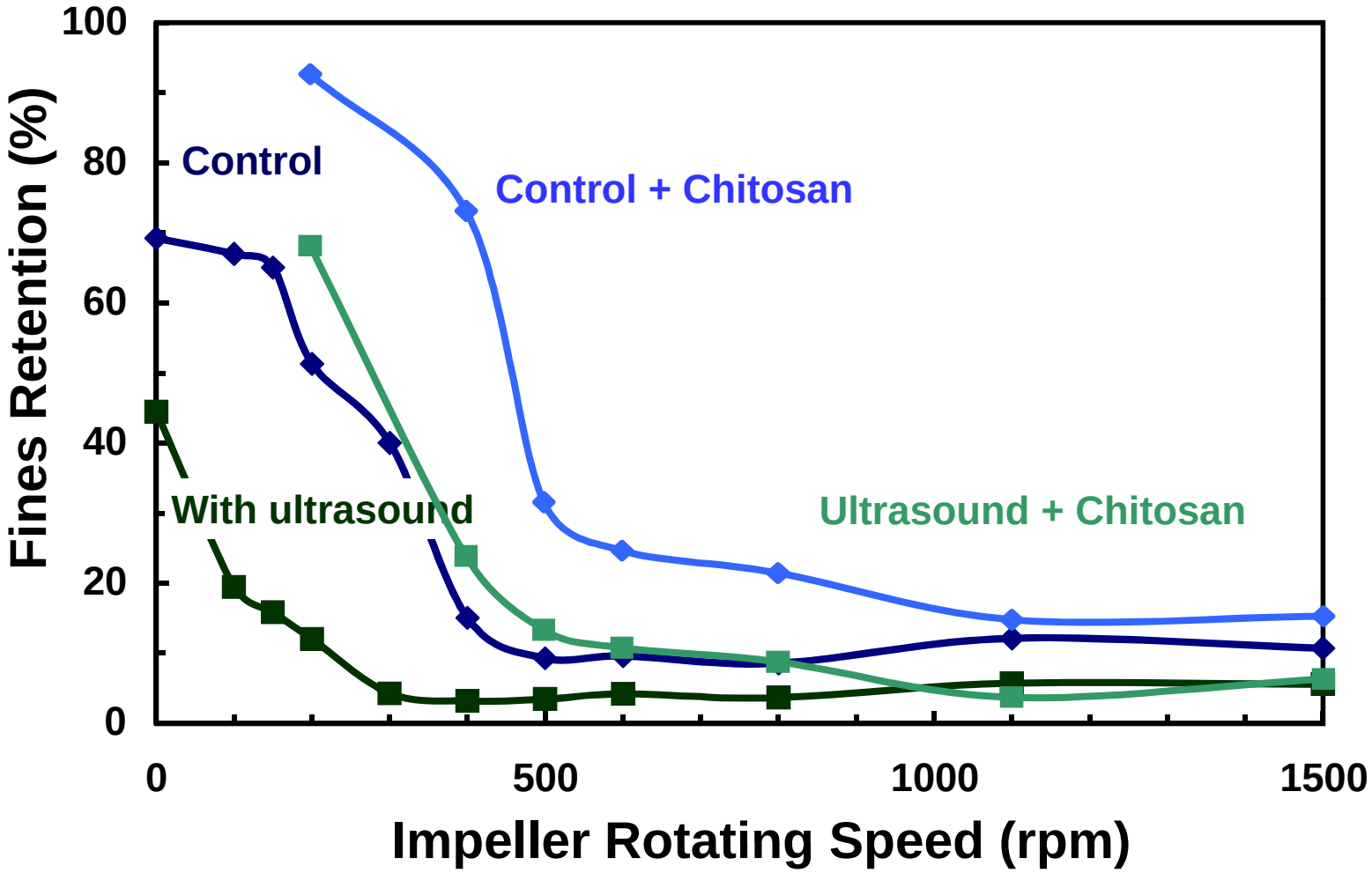


Ultrasonic processor

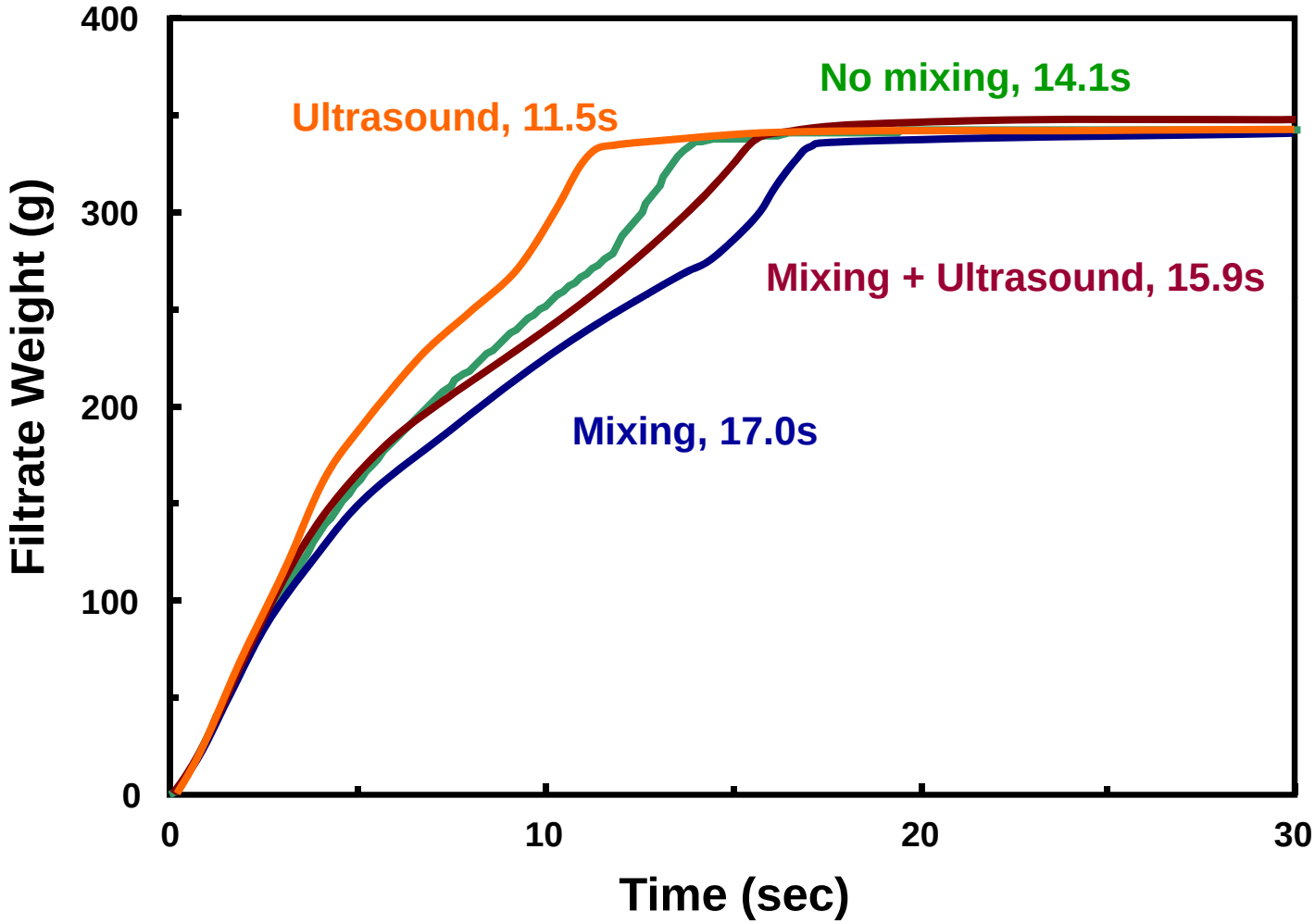
Filtration screen

Ultrasonic filtration screen

Screen Unblocking and Deflocculation by Ultrasound in Standard Retention Test



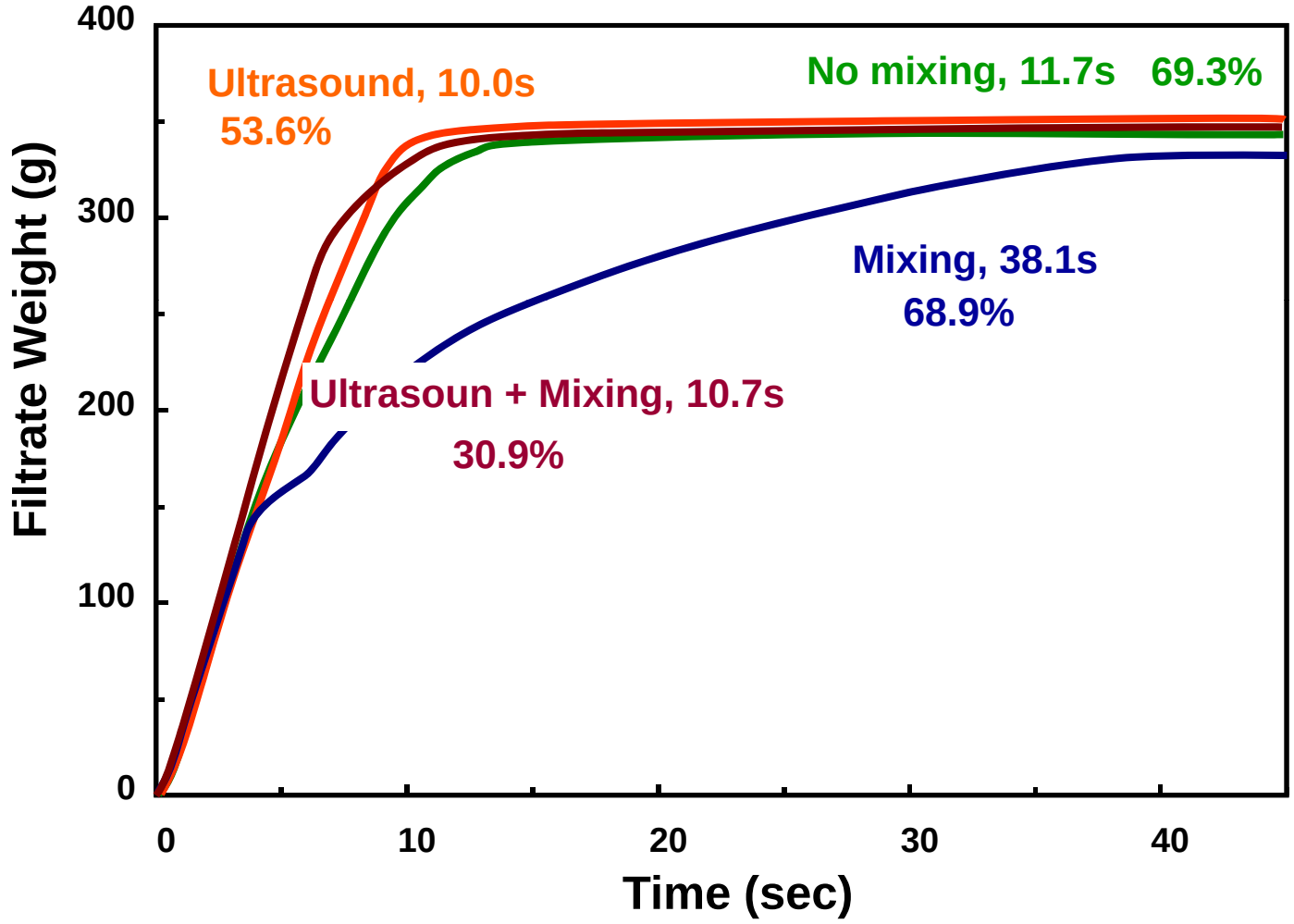
Drainage Profiles of a Newsprint Furnish
At 400 rpm with Mat Formation



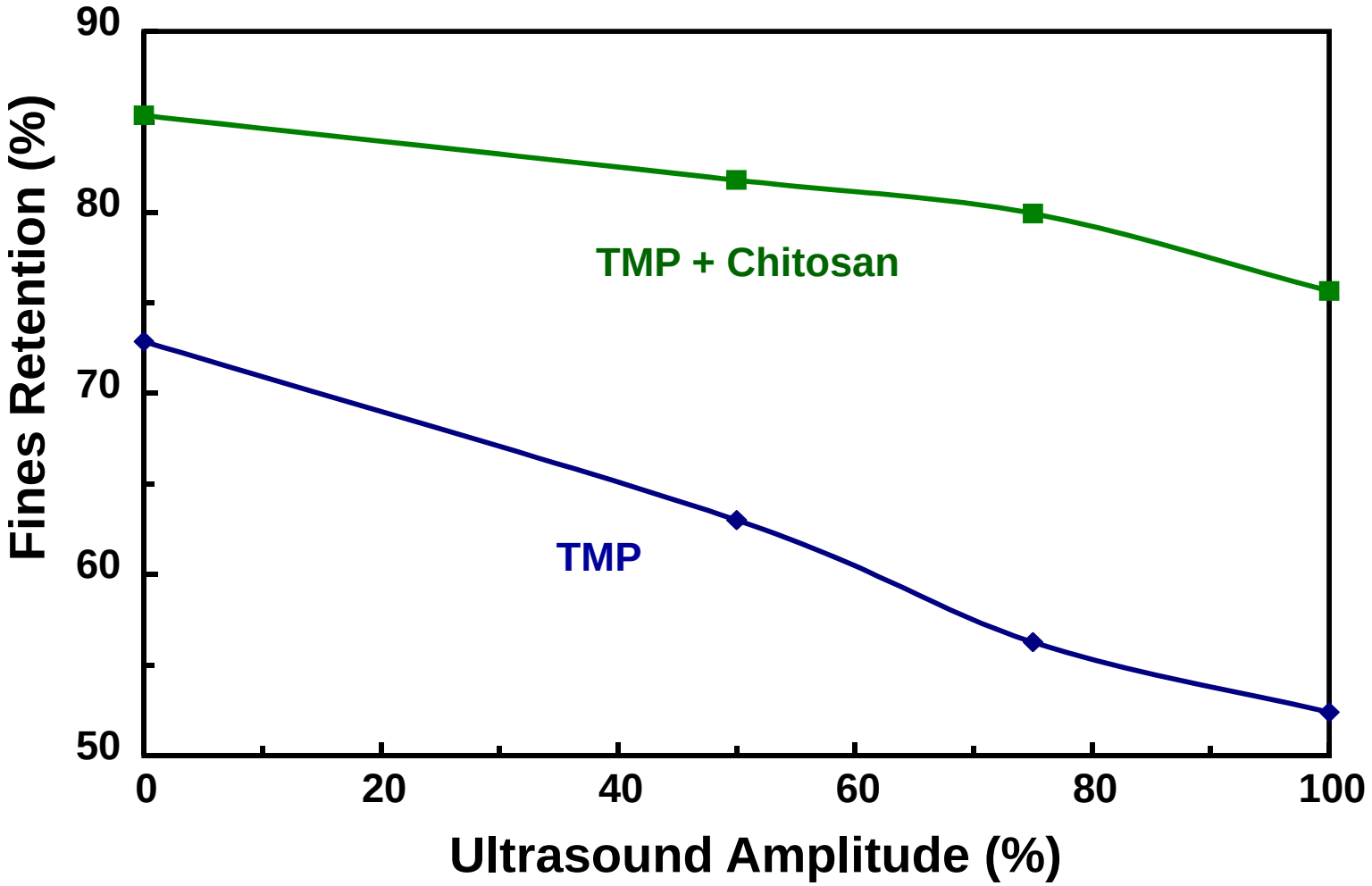
Drainage and Retention with Chitosan
At 400 rpm with Mat Formation

Sample	No Mixing	Mixing at 400 rpm	Ultrasound
	Drainage Time (s)		
Pulp Alone	14.1	17.0	11.5
Pulp + Chitosan	12.3	14.1	11.8
	Fines Retention (%)		
Pulp Alone	77.6	79.7	64.1
Pulp + Chitosan	88.6	87.3	80.9
Increase in Retention	11.0	7.6	16.8

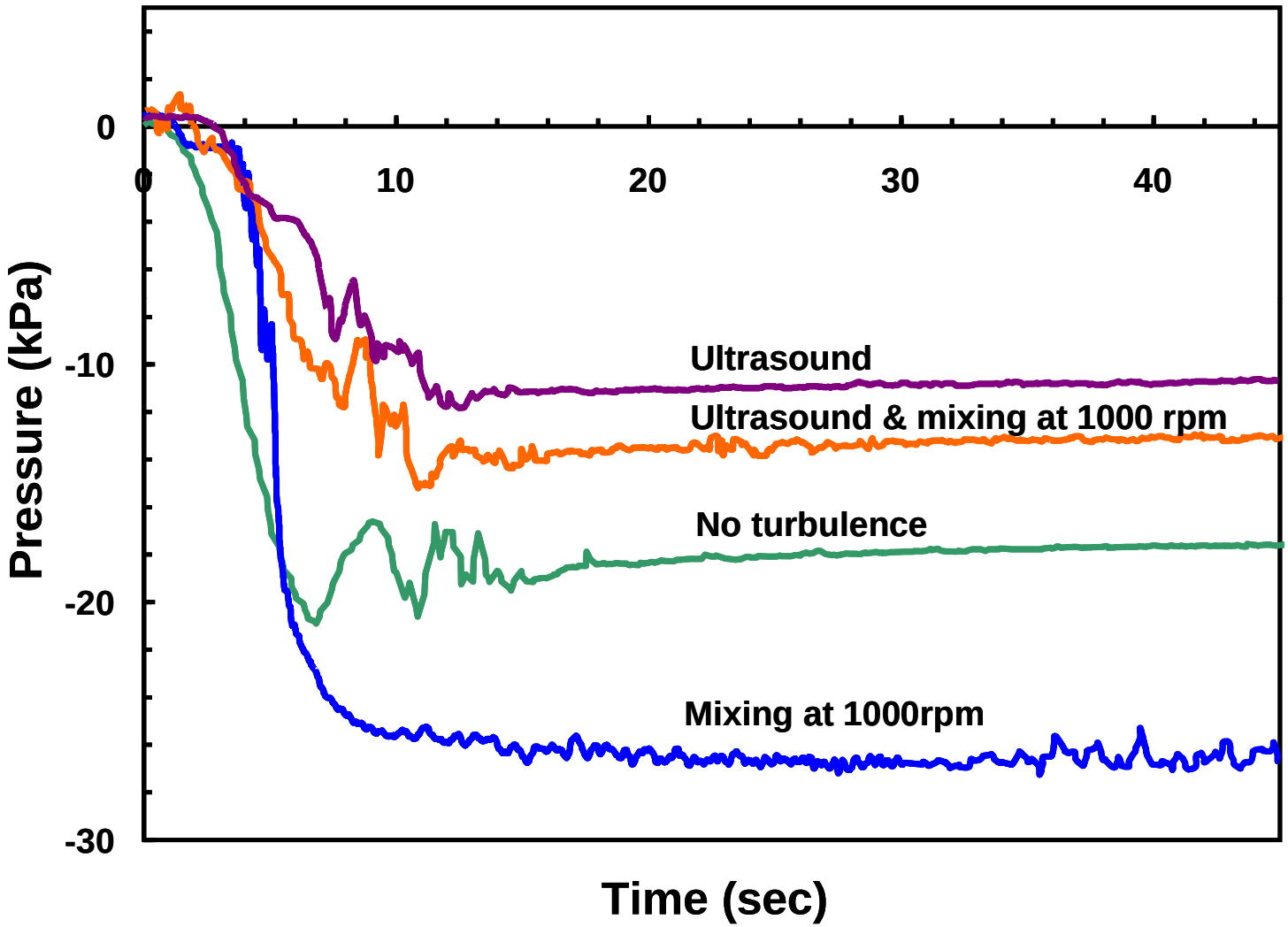
Drainage Profiles of a Newsprint Furnish
At 1000 rpm with Mat Formation



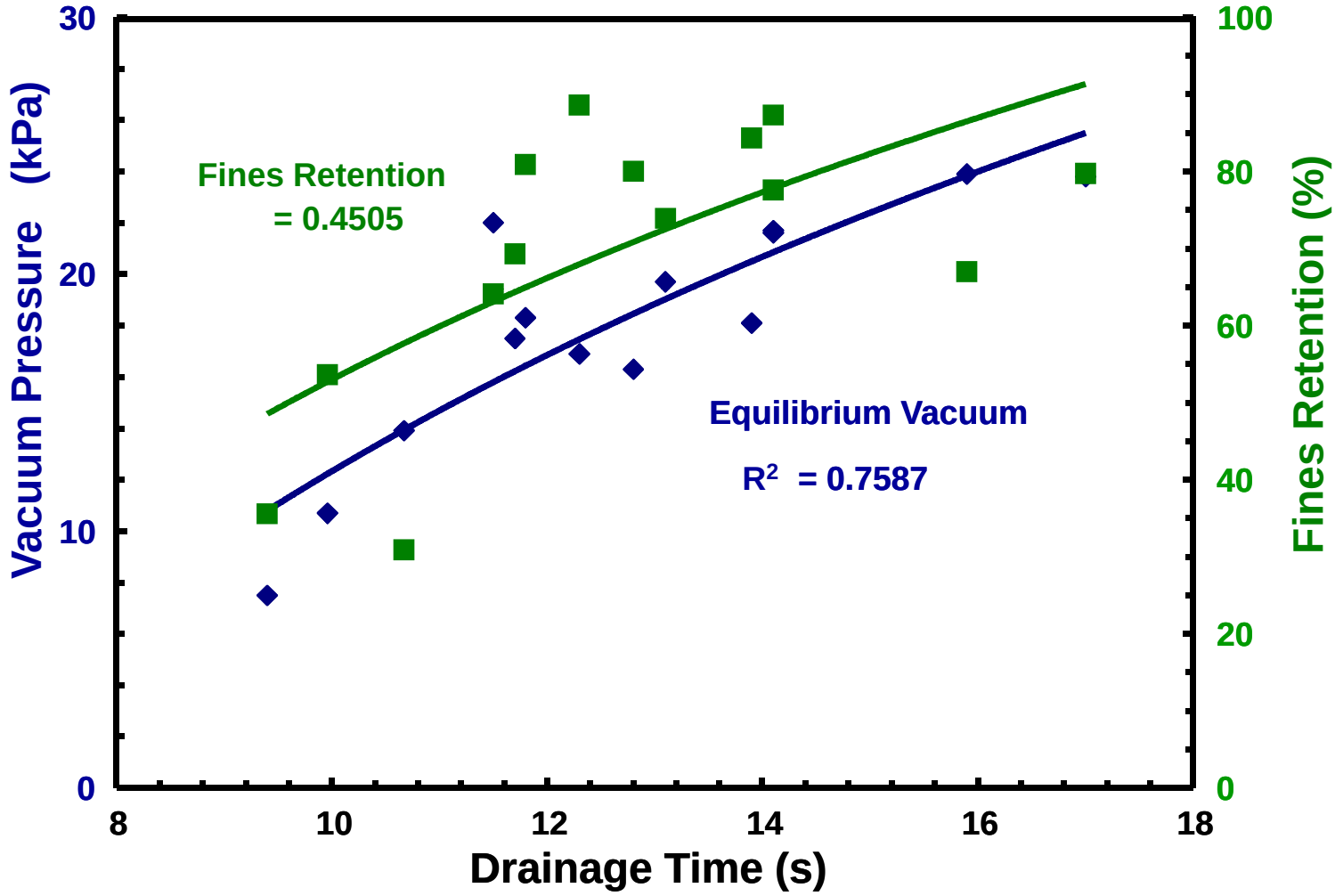
Retention Is Changed by Ultrasound Intensity



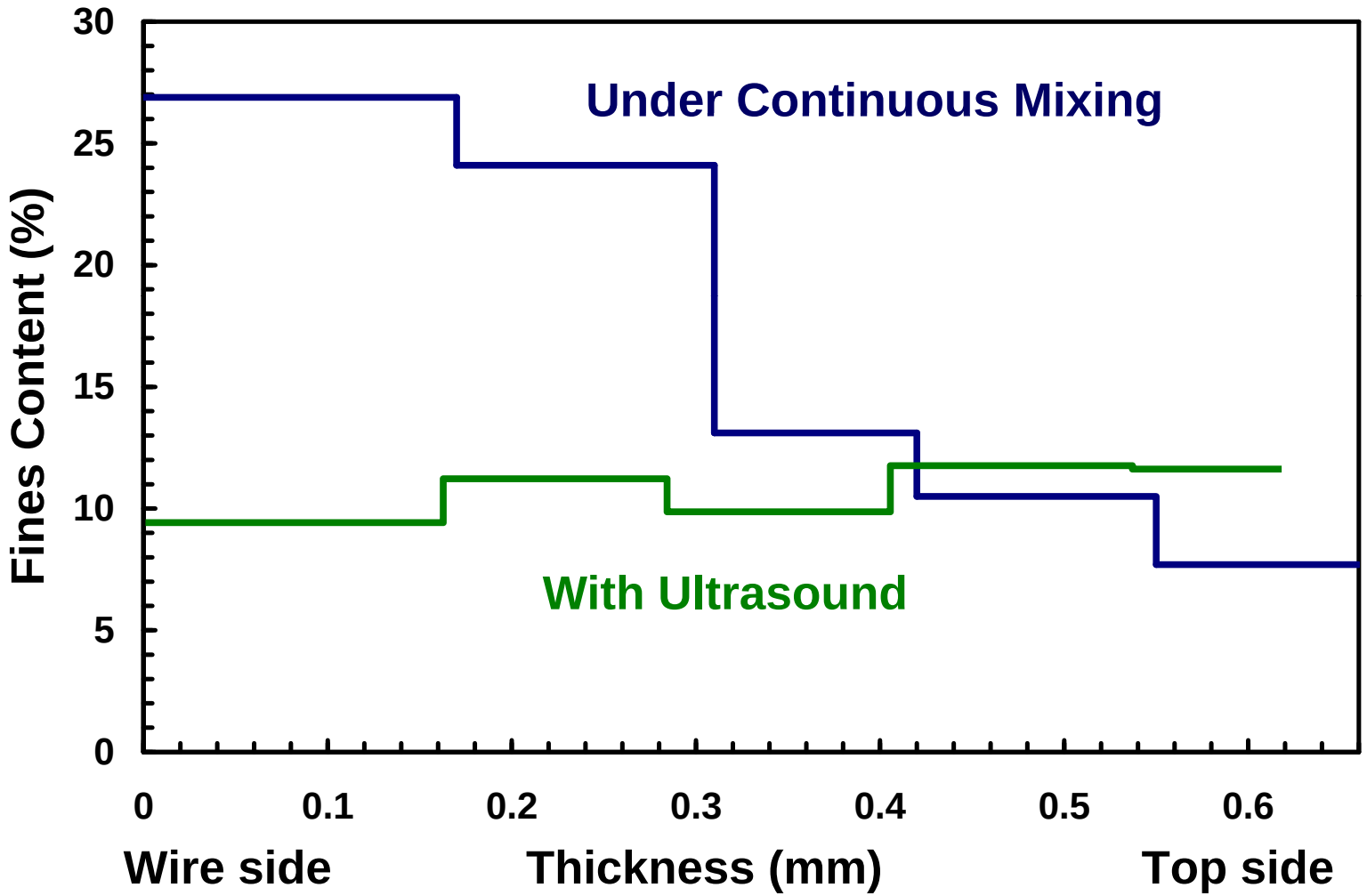
Pressure Profile under Various Turbulence Conditions



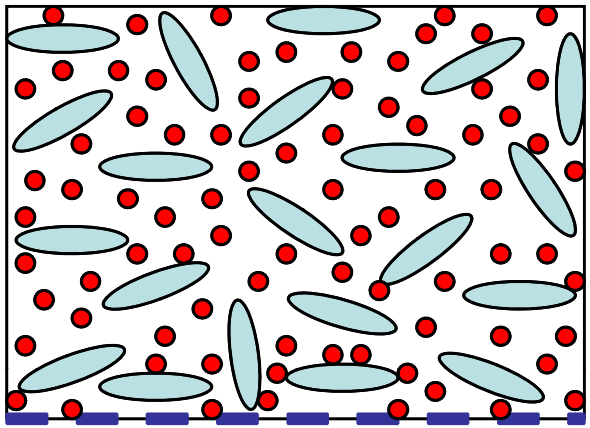
Drainage vs. Pressure and Retention



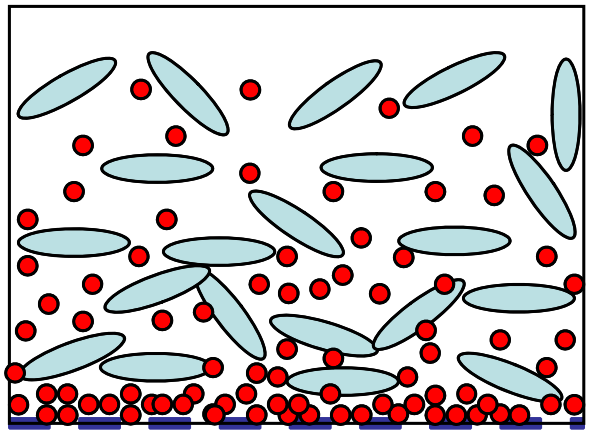
Fines Distribution of a Sheet Formed with Ultrasound



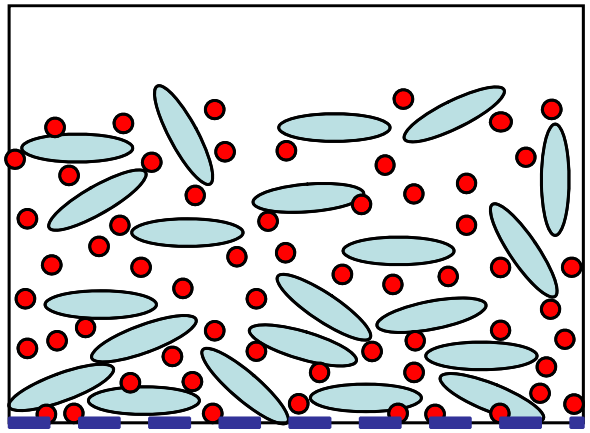
Drainage Mechanism with Ultrasound



Before starting drainage test



Dewatering under mixing



Dewatering under ultrasound

Conclusions

- **The turbulence induced by impellor in a conventional DDJ increases filtration resistance enormously.**

- **Ultrasound can**
  - ✓ **Deflocculate fiber suspension**
  - ✓ **Unblocking forming wire**
  - ✓ **Enlarge dewatering channel in the web**

- **The Ultrasonic DDJ could be very useful laboratory tool to determine drainage under dynamic conditions**
  - ✓ **Drainage profile**
  - ✓ **Vacuum profile**
  - ✓ **Retention**

Acknowledgements

- **T. Owston**
  - ✓ Initial experimental work
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  - ✓ Data processing program
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  - ✓ Valuable discussion
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