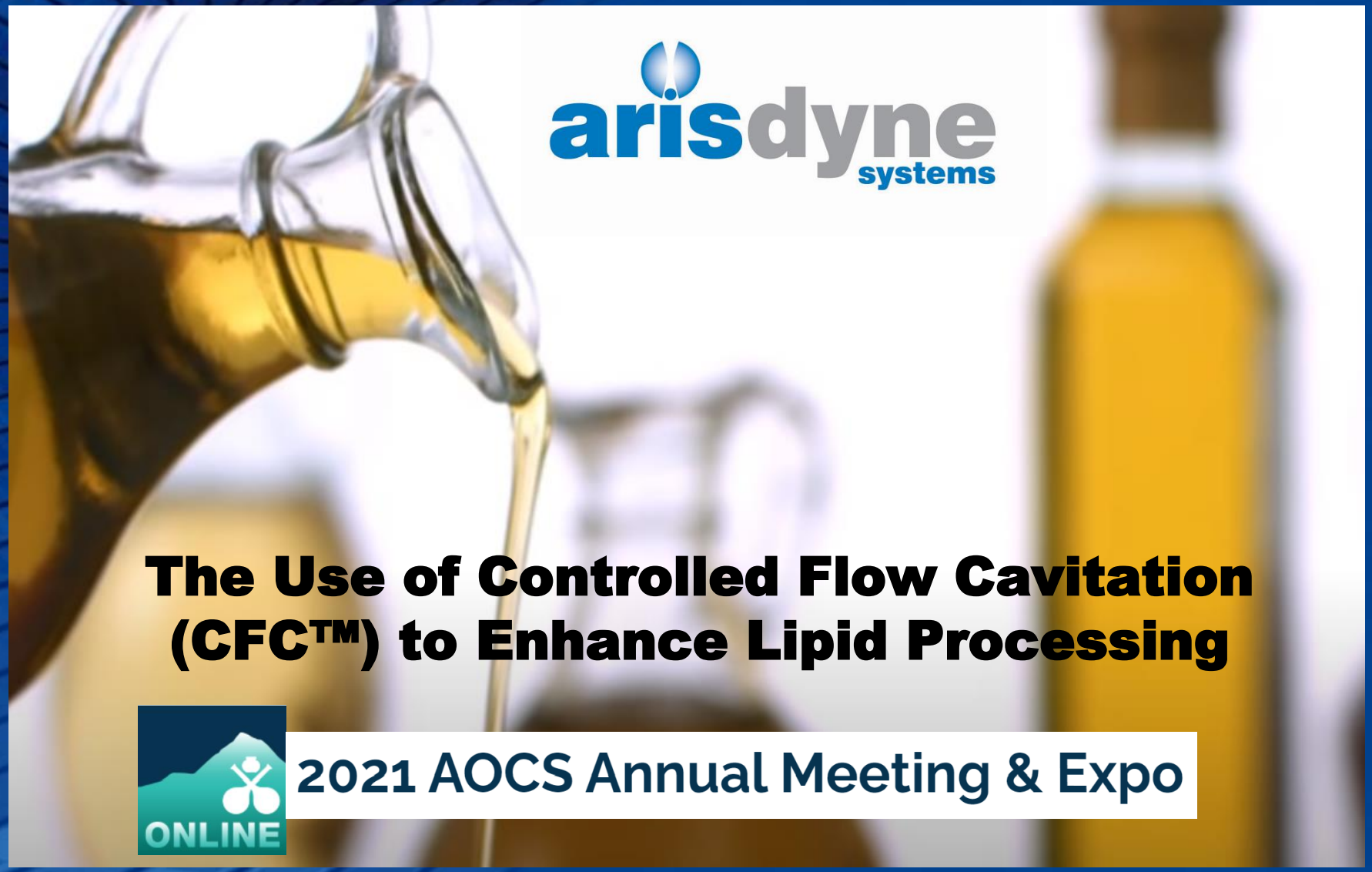
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The Use of Controlled Flow Cavitation (CFC™) to Enhance Lipid Processing
ONLINE
2021 AOCS Annual Meeting & Expo

Why Install CFC™?
(Controlled Flow Cavitation)

Actual Neutralization Install (Commissioned 2021)

	warranty	actual to date
CFC™ benefits		
Acid reduction [%]	40%	45%
acid dosage at conc [kg/mt oil]	3.33	3.05
Caustic reduction [%]	20%	25%
caustic dosage at conc [kg/mt oil]	12.67	11.88
Oil yield increase 1st centrifuge [%]	0.20%	0.40%
RBD oil yield increase [mt/yr]	847	1695
Water reduction at wash centrifuge [%]	25%	100%
water dosage [%]	3%	0%
Phosphorus reduction [ppm]	10	15
Soap reduction [ppm]	400	500
operation annual savings		
Acid reduction	$ 12,274.55	$ 13,808.87
Caustic reduction	$ 76,740.99	$ 95,926.23
Oil yield increase	$ 446,600.88	$ 893,201.76
Water reduction	$ 98,875.58	$ 483,399.51
Silica reduction	$ -	$ -
Clay reduction	$ -	$ -
annual operating cost		
CFC™ annual electricity cost [$/yr]	$ (85,509.86)	$ (47,612.66)

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Payback Period

Actual Neutralization Install (Commissioned 2021)

	warranty	actual to date
net benefit		
Total annual savings	$ 548,982.13	$ 1,438,723.70
Savings per mt	$ 1.30	$ 3.40
Payment to Arisdyne	$ 545,700.00	**CM3000**
Make-ready costs	$ 80,000.00	**Hydra-Cell**
Simple pay back, single pay [yrs]	***1.14***	***0.43***

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ADM Public Feedback
on CFC™ Operations

- First CFC™ installed 2011; over 15 additional refineries

- Yield increase over primary sep: +0.3%
- Additional Yield improved due to elimination of water wash and clay reduction

- Reduction in acid consumption: +50%
- Reduction in caustic consumption: +40%

- Reduction in soap content: typically below 150 ppm

- Easy installation; easy to operate

- No need for CIP, no plugging
- No issues with CFC™

ADM

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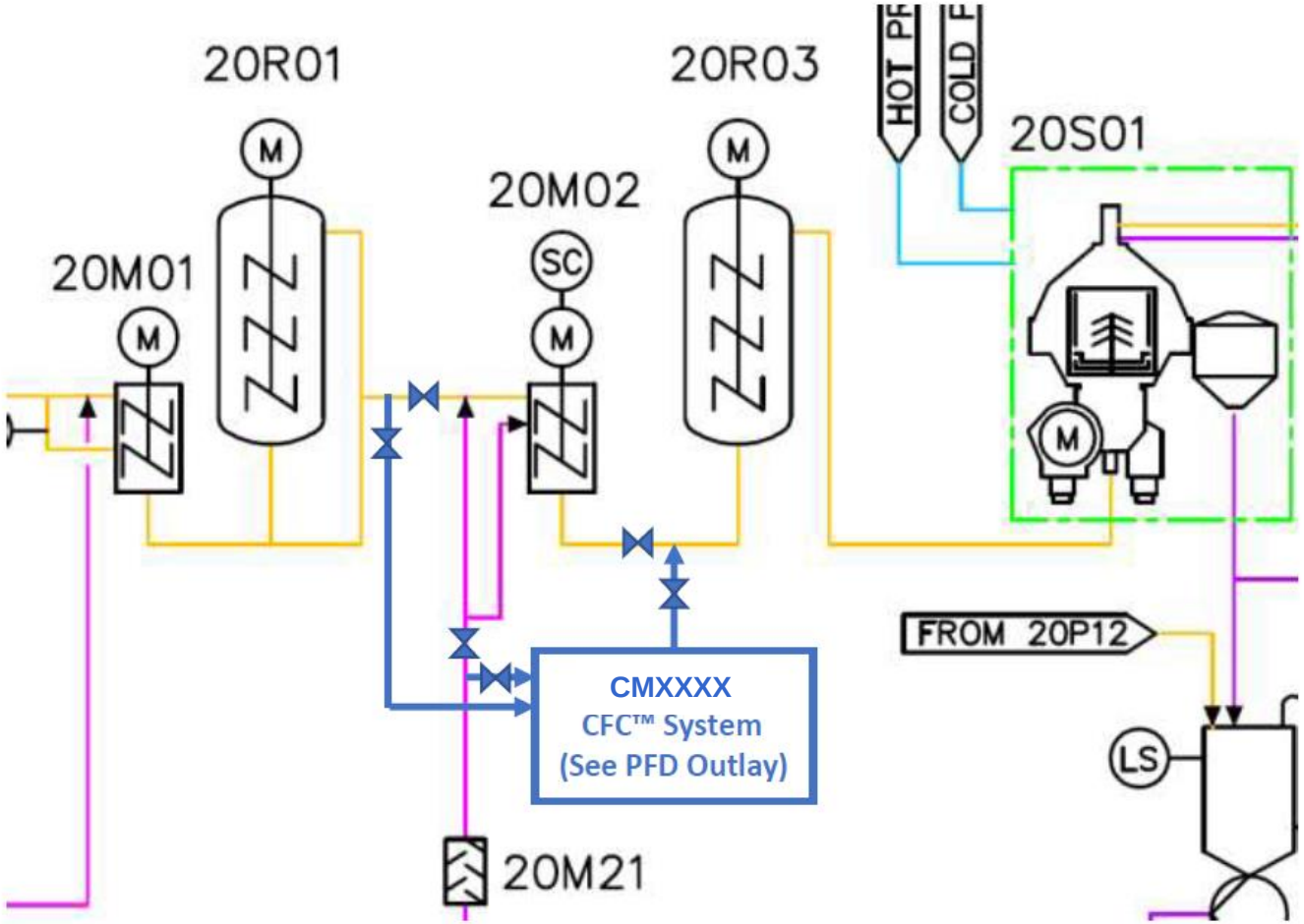
Turn-Key Project Scope



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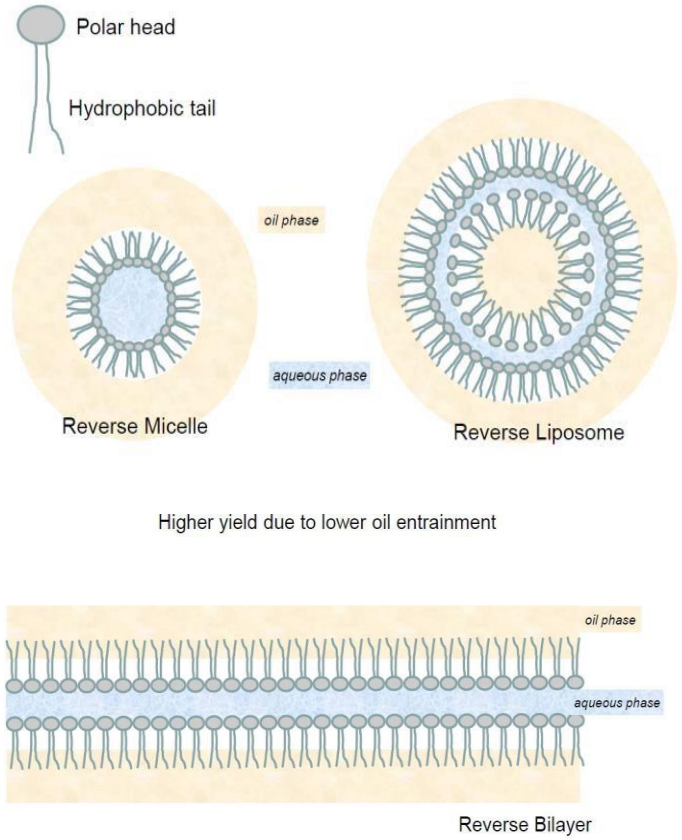
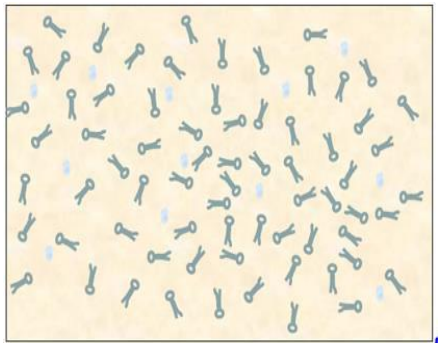
What sets CFC™ apart from mere high shear



Before CFC™ Process, low energy



In CFC™ Process, very high energy zone

Immediately after high energy zone, very low energy zone

CFC™ disrupts phosphatide, ffa and impurity aggregates for efficient reaction with water/acid/caustic

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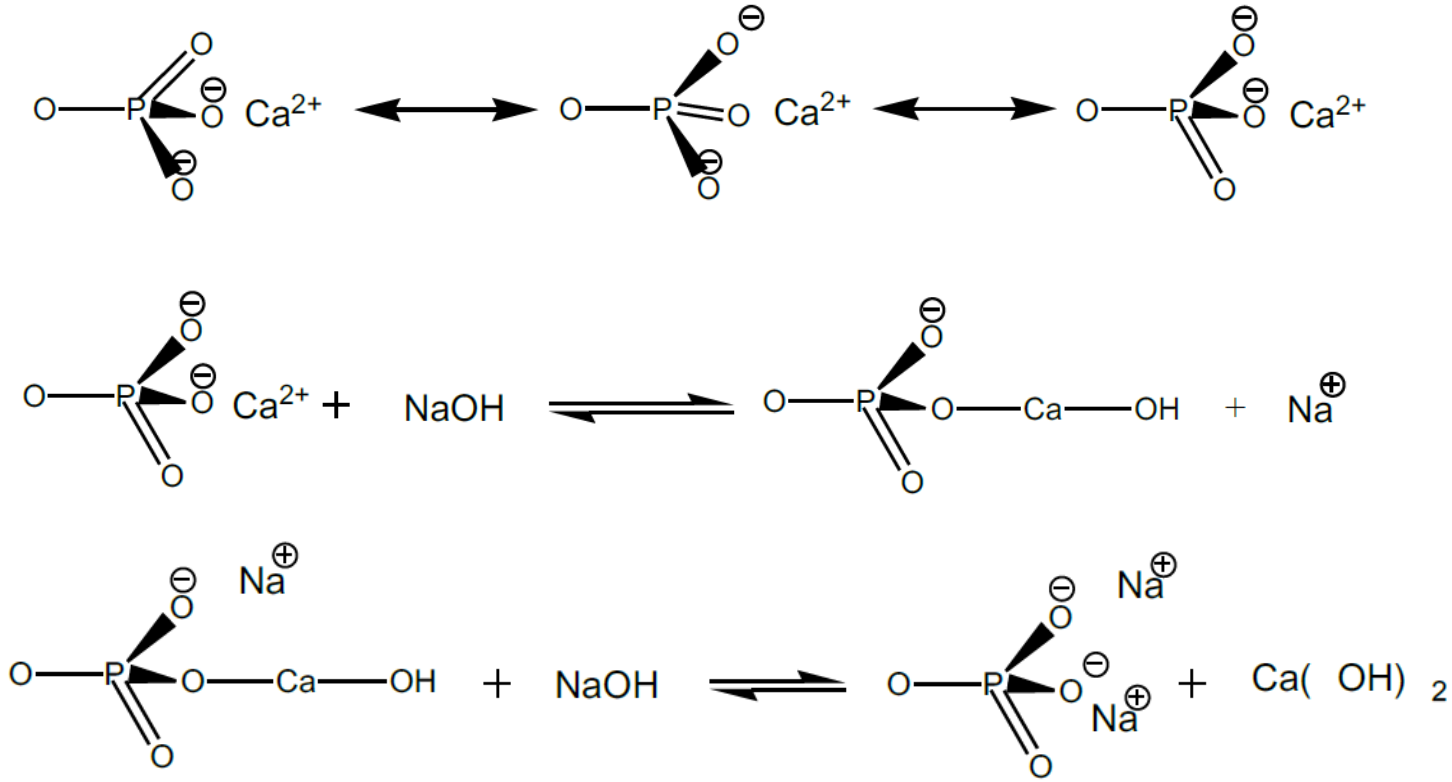
CFC™- Converting NHP w/ Caustic



CFC™ enhances removal of NHP with caustic reducing the amount of acid addition required sometimes to zero

Excerpt Dijkstra, Albert J. “About the Hydration of Non-Hydratable Phosphatides”
World Congress on Oils & Fats and 31st ISF Lecture Series, Rosario, 2015, pp. 30-32.

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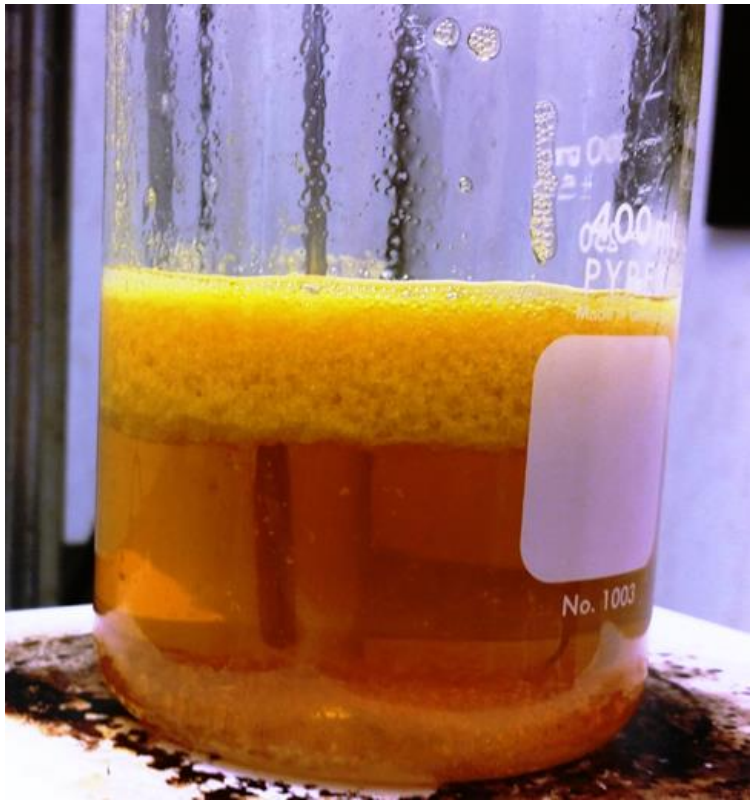
Process Changes

Difference to Heavy Phase

Floc Size!

Separation Time!



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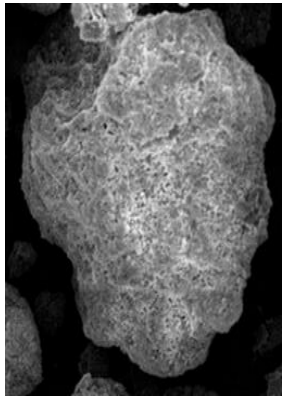
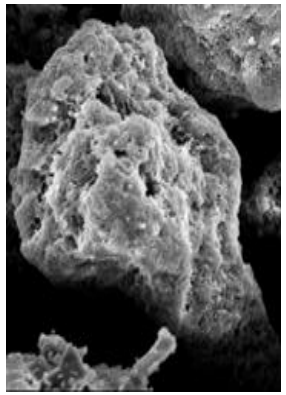
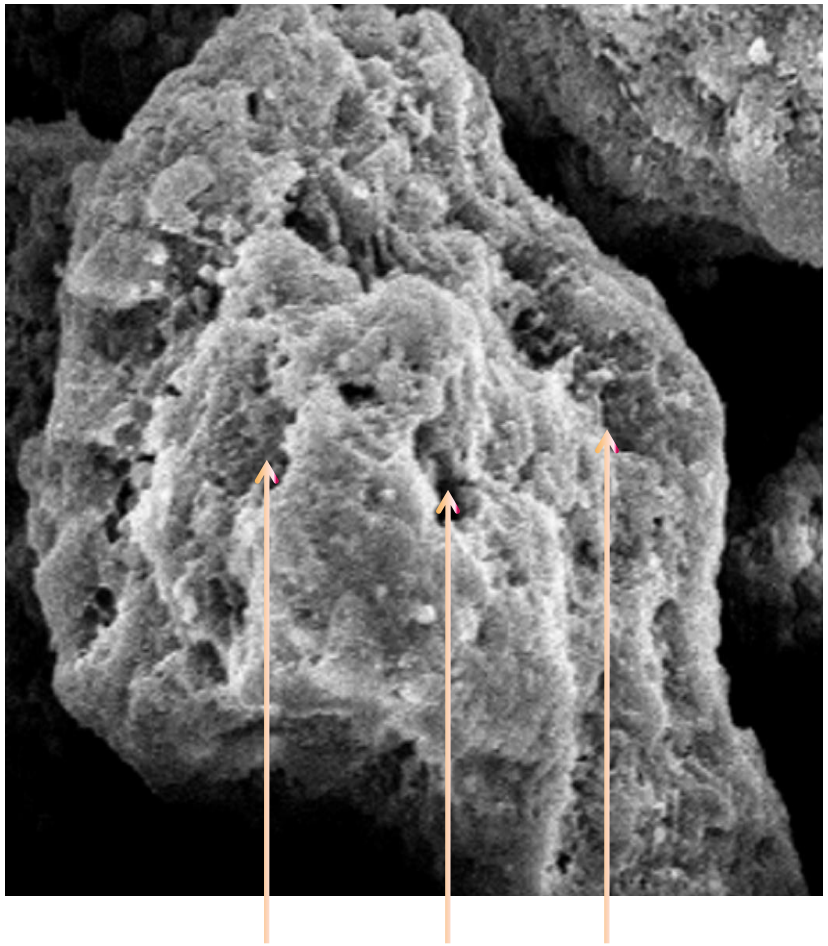
Reduction in Bleaching Clay







Macro porosities in a particle of fully activated adsorbent

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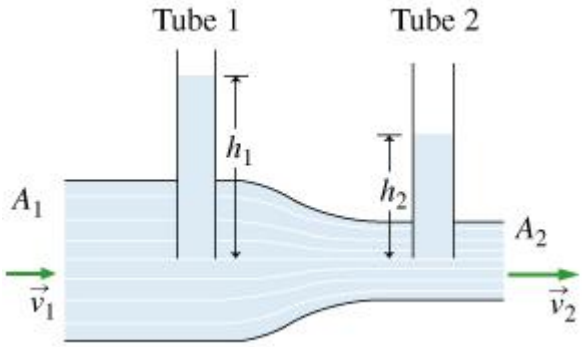
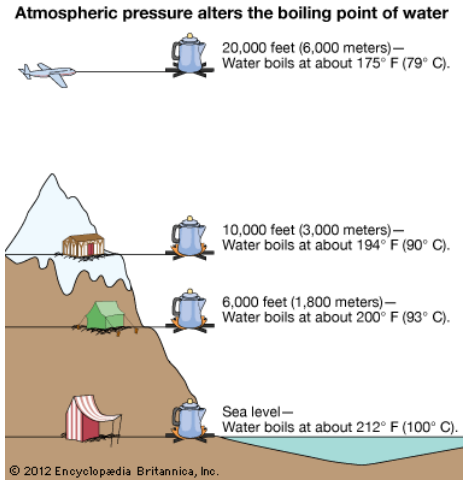
Hydrodynamic Cavitation



Increase of speed leads to reduction of pressure

Reduced pressure leads to evaporation and vapor bubbles



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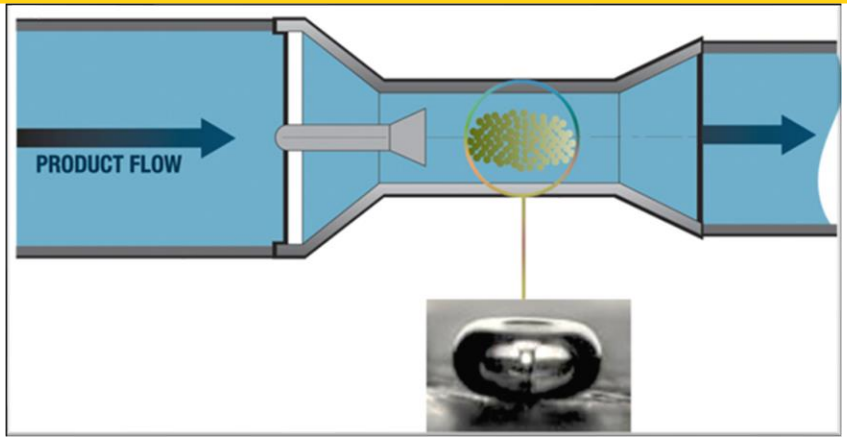
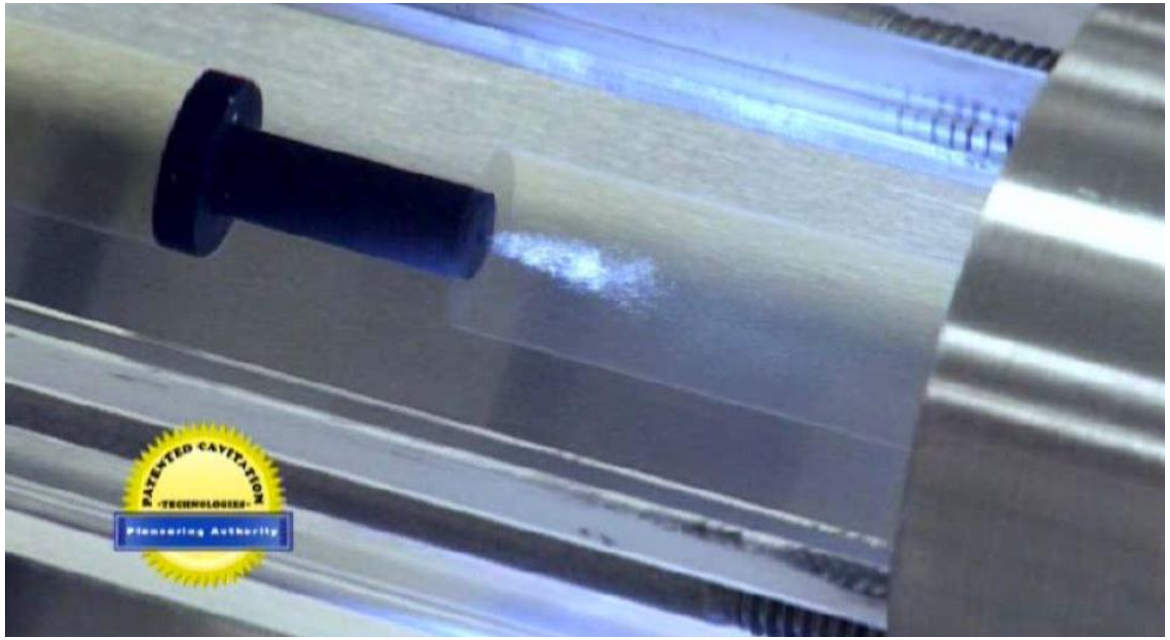
CFC™- cause & control cavitation





Compare
'Controlled' vs.
'Uncontrolled'
Cavitation Demo
at
www.arisdyne.com

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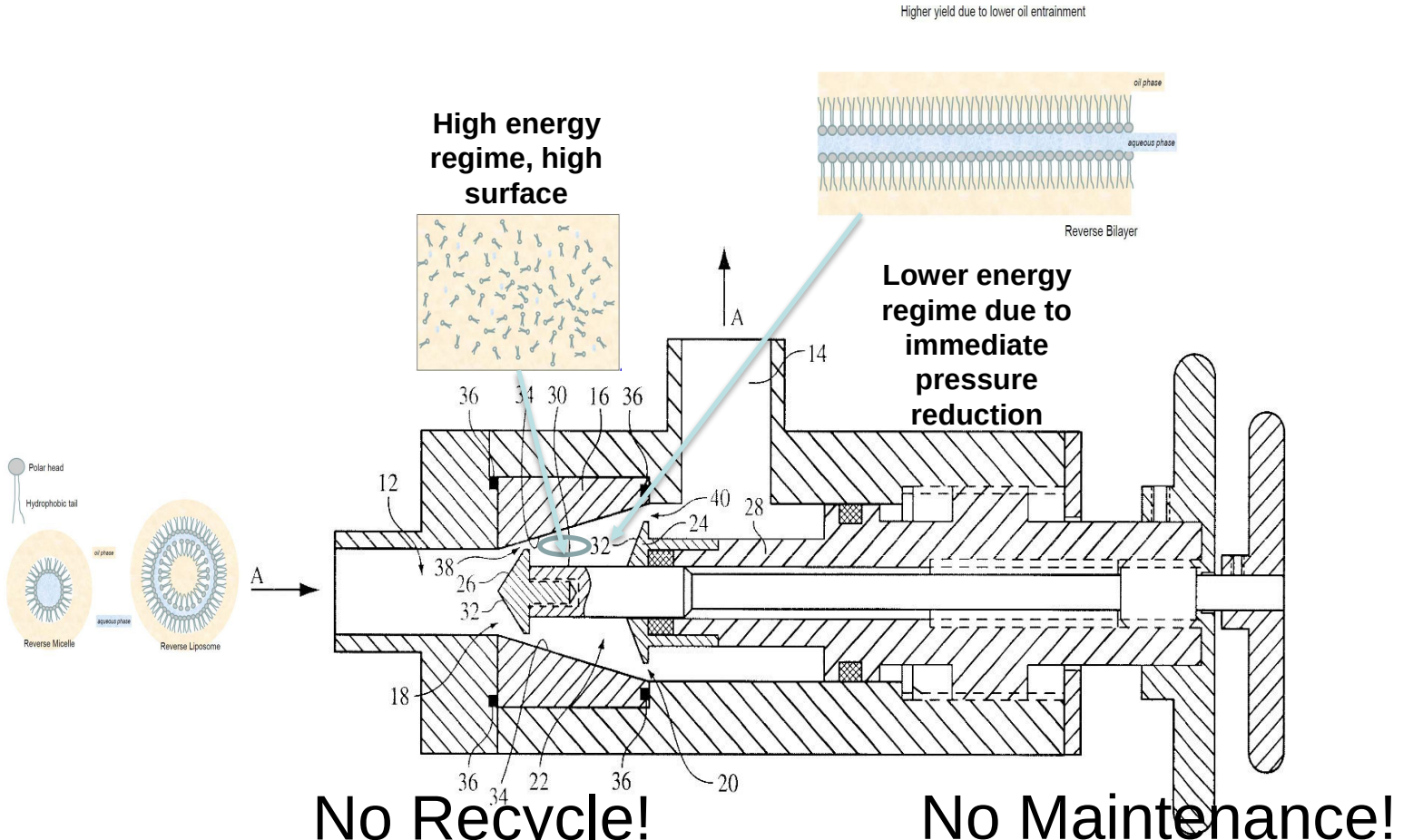
Adjustable Device

30+ years of design experience



No Recycle!

No Maintenance!

No CIP!

Anti-Clogging!

US 6502979 B1: Device and method for creating hydrodynamic cavitation in fluids

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CFC™ Operational Advantages

	CFC™ Technology	Trad. Cavitation
		
Adjustable Capacity?	✓ Always < 2.3 kWh/mt	✗ Dependent on recycle rate
Anti-Clogging Design?	✓ No dark material buildup	✗ CIP required
Pressure Sensitivity?	✓ Works equally well in range of pressure	✗ Fixed pressure necessary

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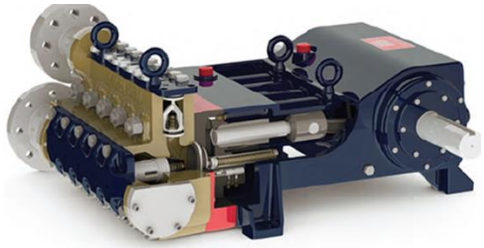
Pump Selection

	Piston Diaphragm	Centrifugal
		
Designed for Abrasives?	✓ **No moving parts in contact with product**	✗ **Bushing lubricated by abrasive product stream**
Lead Time:	2-3 weeks	22-25 weeks
Efficiency:	90+% continuous	< 65% degrading with time
Warranty:	24 months	12 months
Filter:	800 micron	550 micron
Simpler Operation:	No mechanical seals	Double mechanical seal
Annual Maintenance:	Diaphragms and check valves (< 2 hrs)	Bearings, seals, wear parts (6-12 hrs)

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CFC™ 1st Year savings: $363k

(Example based upon 750 mtpd)

20 weeks faster than competition

$315k
(~$3/mt savings at 3360 hours)

60% more efficient than competition

$26.5k/yr
(95% vs 60% + 25% recycle)

No CIP! vs 2x/mth

$9k/yr
(~$3/mt savings at 4h/mo down time)

No impurities exposed to moving parts

$12.8k/yr
($7.2k vs $20k)

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CFC™- over 25 successful years

- First applications: Reaction enhancement, Nanomaterials synthesis,
- Strong IP: 40+ issued patent families, 250+ patents and patent applications
- Currently more than 15% of all soy, canola and sun oil is produced with CFC™
- Non-Confidential Blue-Chip Customers:

ADM, Abbott, Alfa Laval, Cabot, Crown, Dow Corning, LDC Louis Dreyfus Company, ExxonMobil, Kraft Foods, Lilly, Dow DuPont, Merck, P&G Procter&Gamble, Saint-Gobain, Schering-Plough, Xerox

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Thank You For Your Time

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