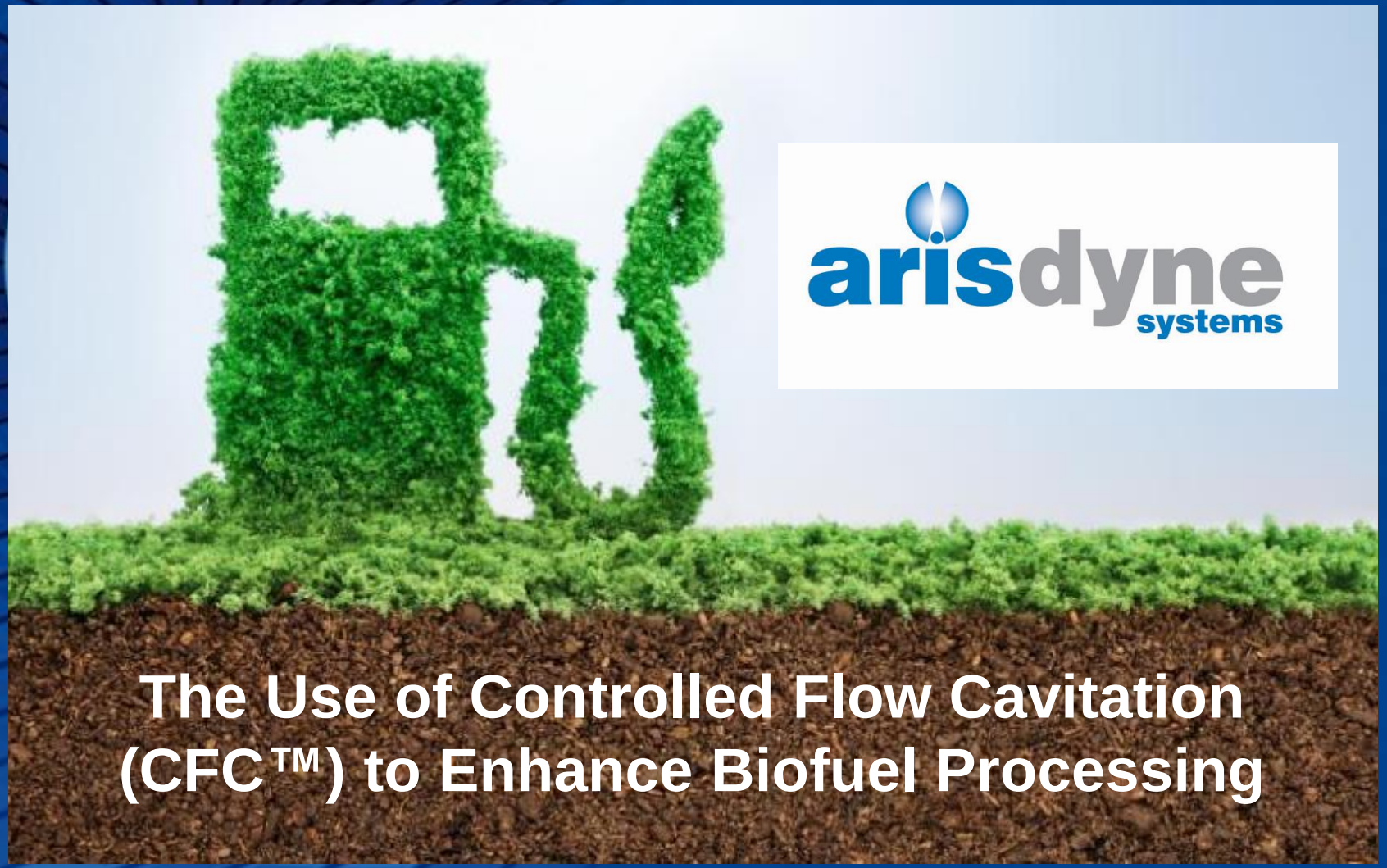

The Use of Controlled Flow Cavitation (CFC™) to Enhance Biofuel Processing

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ONLINE

2021 AOCS Annual Meeting & Expo

Hero BX Public Feedback

CFC™ Operations

- Installed 2011
- Capacity increase > 10%
- Catalyst reduction > 25%
- Report savings in catalyst cost of $450k to $1.35MM USD/year
- MG reduced to be always in spec
- Still using the same pump
- No issues with the CFC™ device
- “Arisdyne's system is easily installed without the need for production shut down, saving about three weeks of production output”

HERO™ BX FUEL FOR HUMANITY

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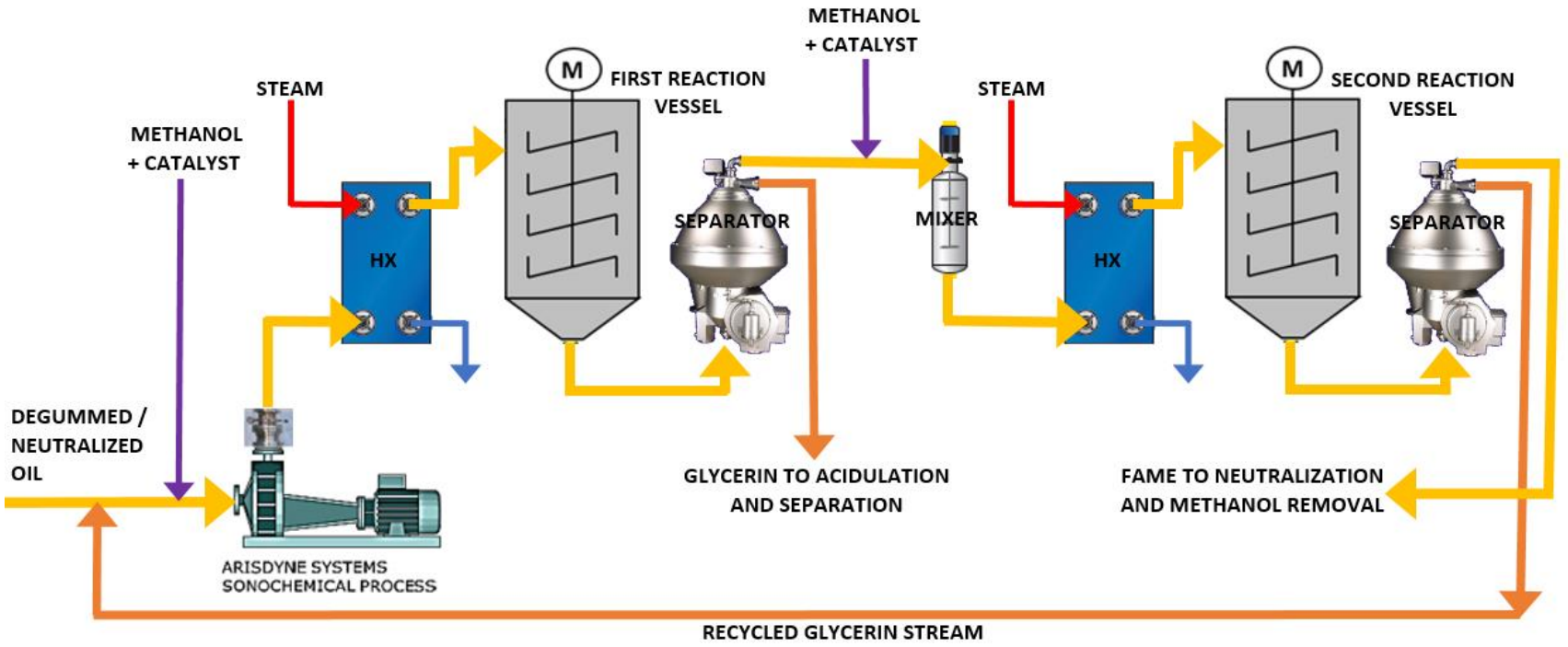
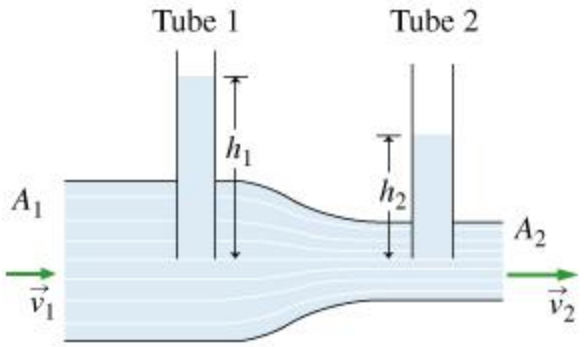
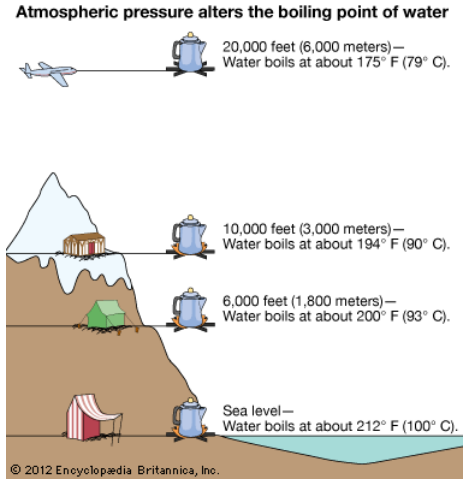
Continuous Biodiesel Production Using Controlled Flow Cavitation



Hydrodynamic Cavitation



Increase of speed leads to reduction of pressure



Reduced pressure leads to evaporation and vapor bubbles

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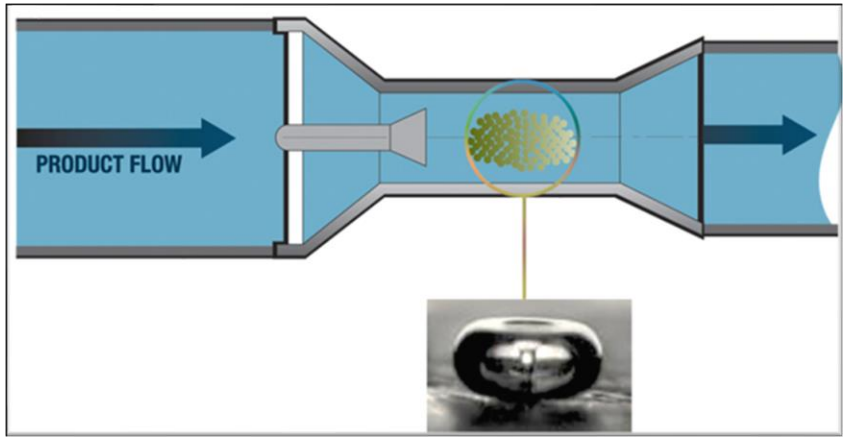
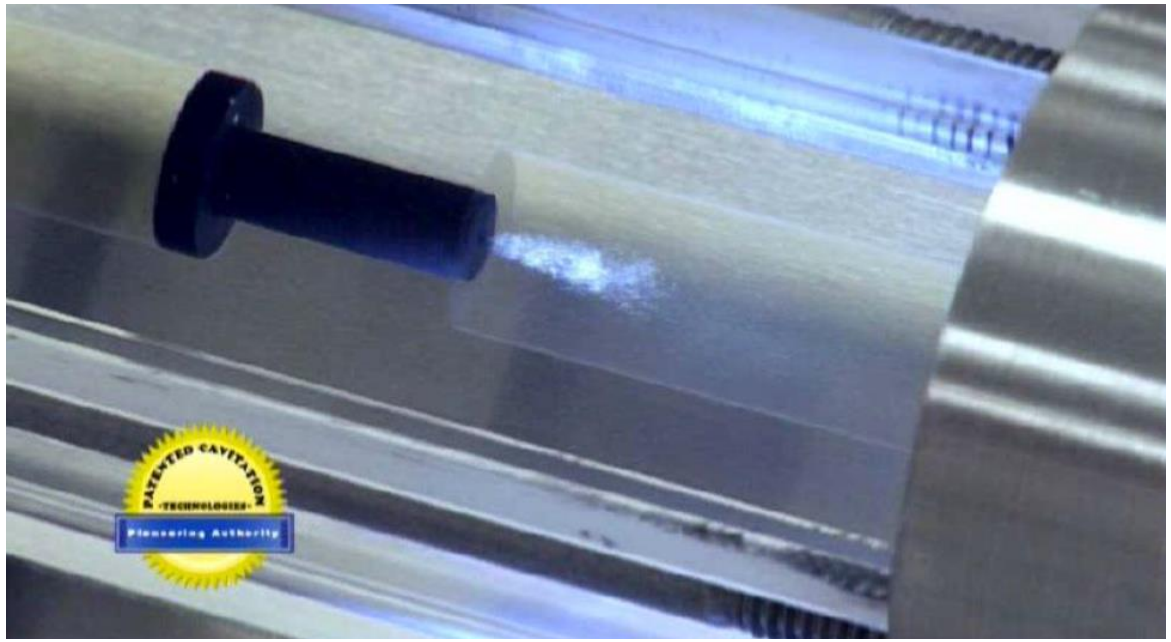
CFC™- cause & control cavitation





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

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Adjustable Device

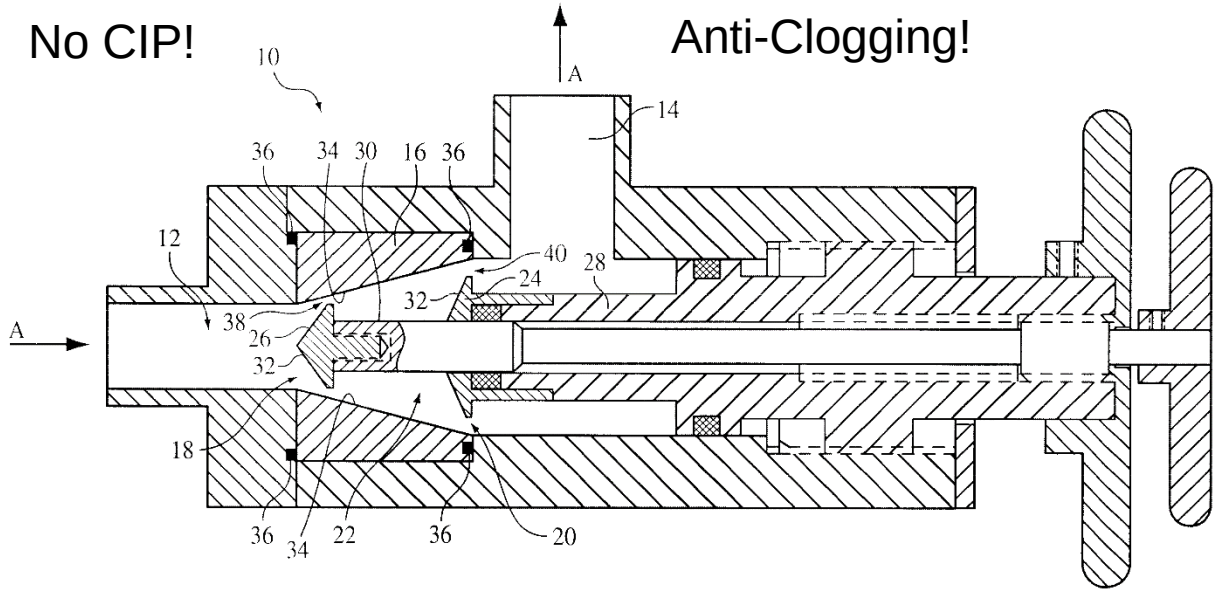
25+ years of design experience

No Recycle!

No Maintenance!

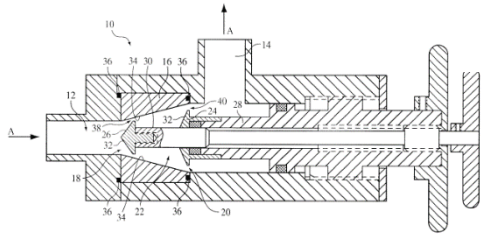
No CIP!

Anti-Clogging!



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

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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Anticipated Improvements With CFC™ Transesterification

- **Increase in Capacity:** **10-20%**
  (Reaction efficiency >99%)
- **Reduction in Catalyst Consumption:** **15-30%**
  (Typical 4.5-5 kg/mt as 100% w/ 6:1 molar ratio of methanol to glycerides)
- **Reduction in Monoglycerides:** **15-60%**
  (Typical < 0.3% Mono Content)
- **Adjustable Device for Optimum Performance at Different Capacities**
- **No Production Downtime for Installation**

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Small Footprint, Simple Design

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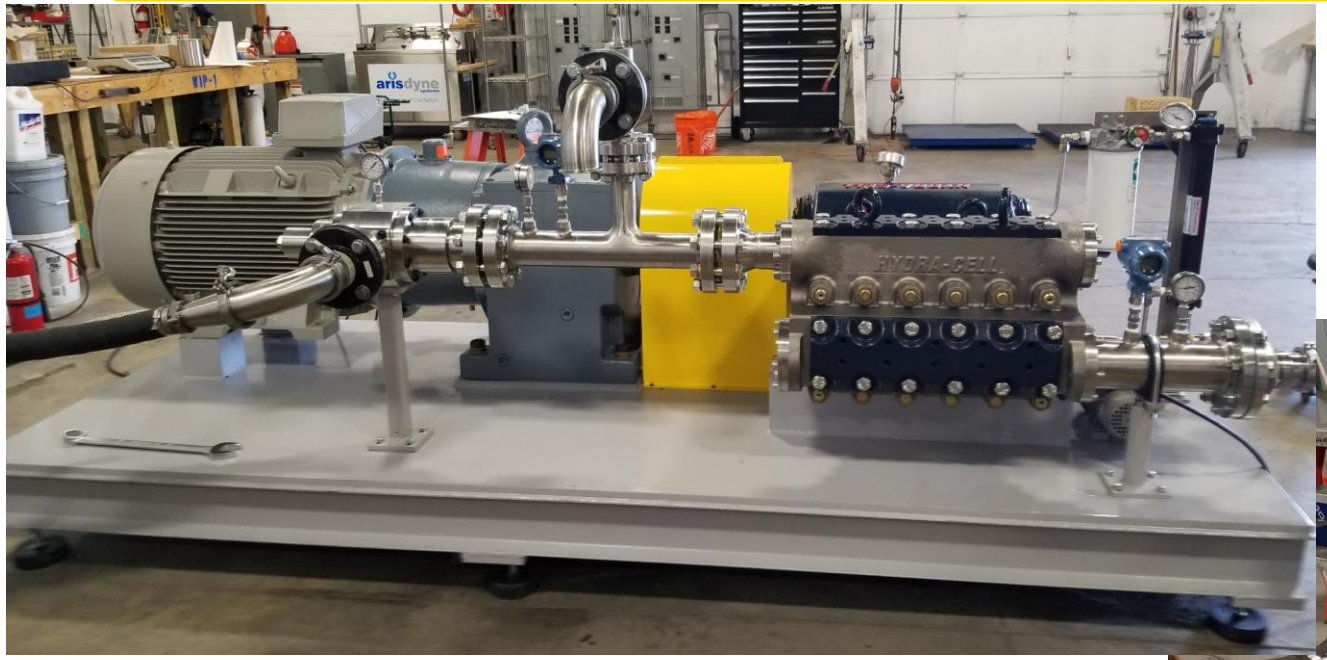
Small Footprint, Simple Design



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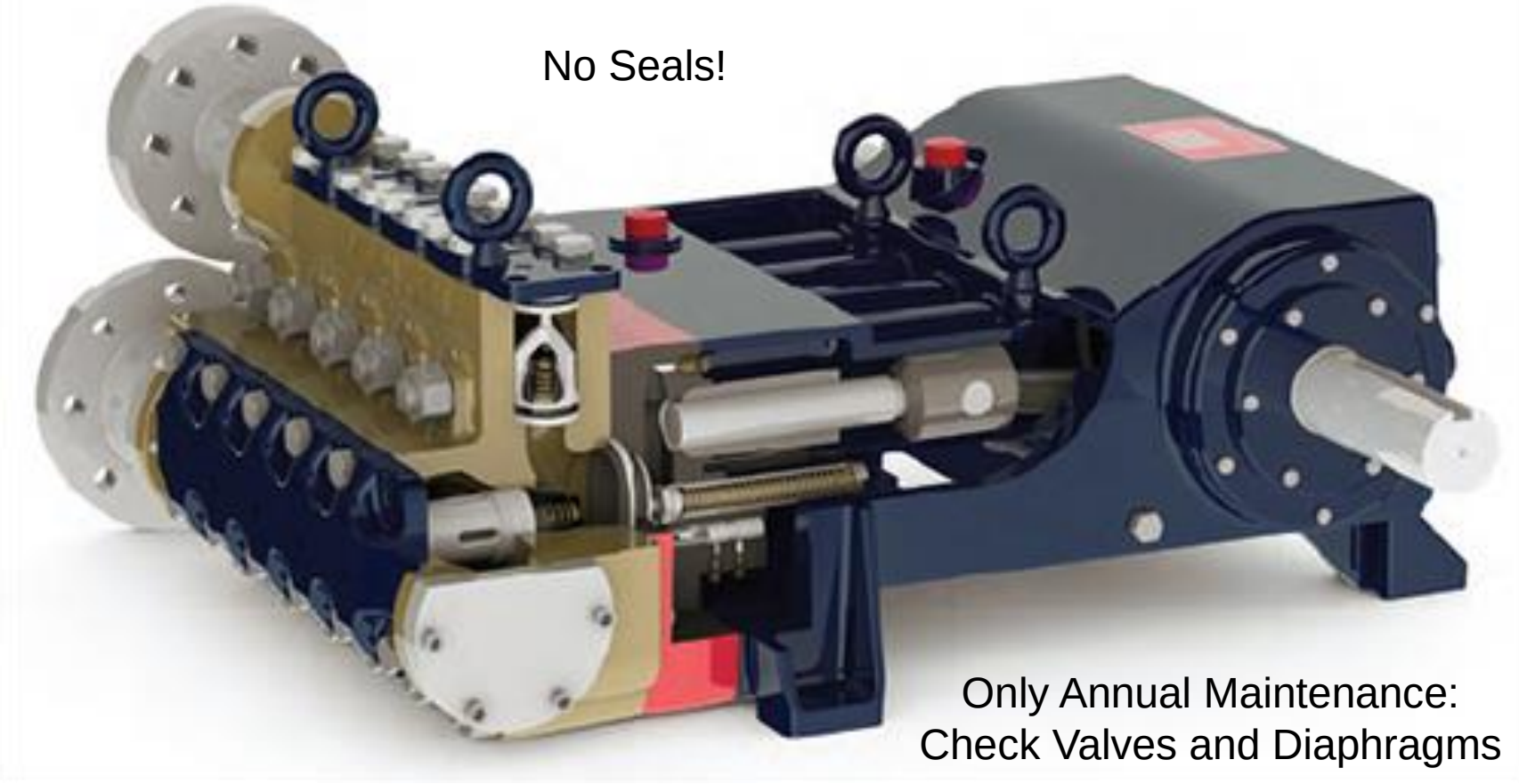
Durable and Low Maintenance

Hydra-Cell® Seal-less Pumps

No Seals!



Only Annual Maintenance:
Check Valves and Diaphragms

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Industrial Scale Example Biodiesel Production

FEED	FFA (%)	Moist (%)	Catalyst Used
UCO, Tallows, Greases, SBO, CNO	< 0.15	< 0.05	30% $NaOCH_3$

Transesterification	Feed Rate [kg/min]	Catalyst Usage [%]	Mono Content [%]
Conventional	317	1.8	0.59
CFC™	363	1.5	0.28 (achieved at 272 kg/min flowrate and 1.8% catalyst usage) Avg. < 0.45 (achieved at 363 lbs/min and 1.5% catalyst usage)

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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 (creating what matters), Crown (Est. 1892), Dow Corning, Dow DuPont, Exxon Mobil, Kraft Foods (make today delicious), Lilly, Merck, P&G Procter&Gamble, Saint-Gobain, Schering-Plough, Xerox

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Thank You For Your Time

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