
ALFA
LAVAL

Technology Innovation in Separation for Edible Oil Industry

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Alfa Laval
07/10/2023

Safety F1rst

Protective Equipment

Assembly Point

Alarm

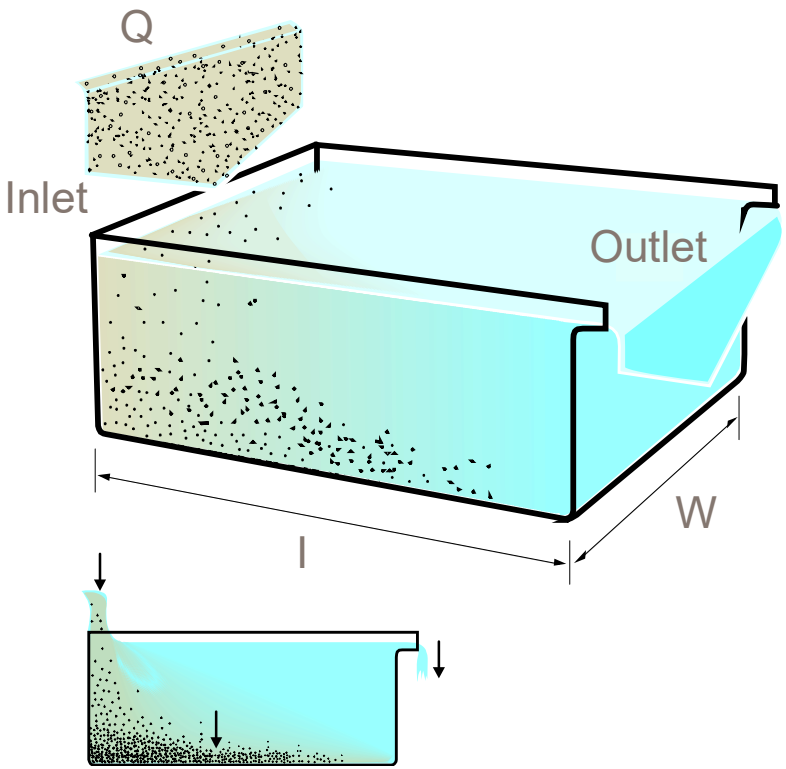
Emergency Number

Emergency Exit

COVID 19

Our purpose

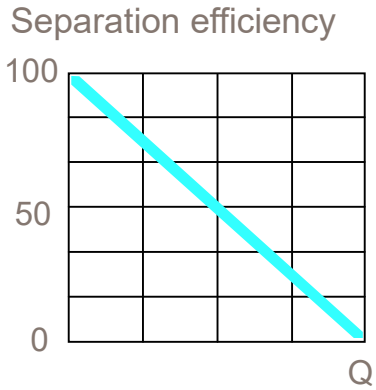
Continuous Gravity Separation

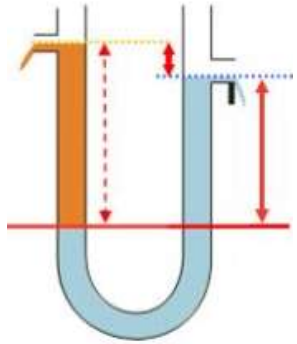


Throughput capacity is directly proportional to settling area and velocity

$$Q = V_g \cdot A$$

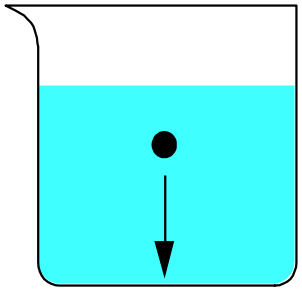
Q = Throughput capacity (m^3/s)
V_g = Gravitational settling velocity (m/s)
A = Settling area (m^2)



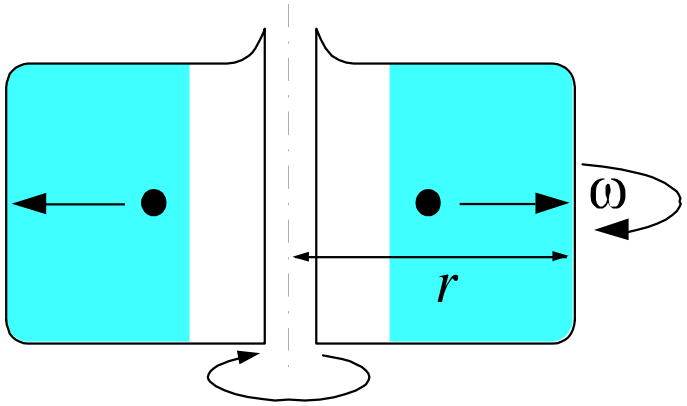


Centrifugal Separation
Forced coalescence/sedimentation

Settling velocity stated by Stokes' Law



Gravity separation
Driving force: 1g

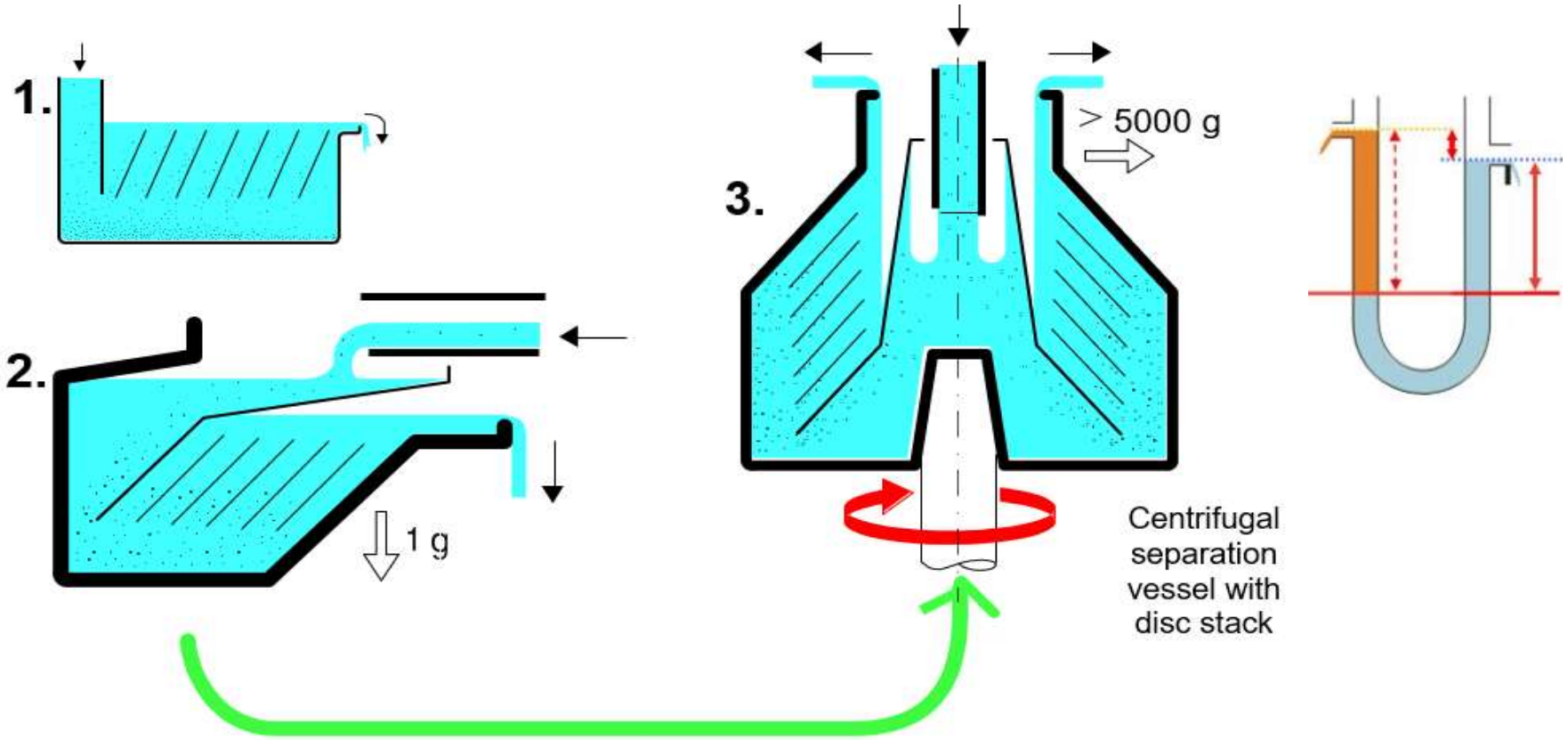


Centrifugal separation
Driving force: $\omega^2 r$

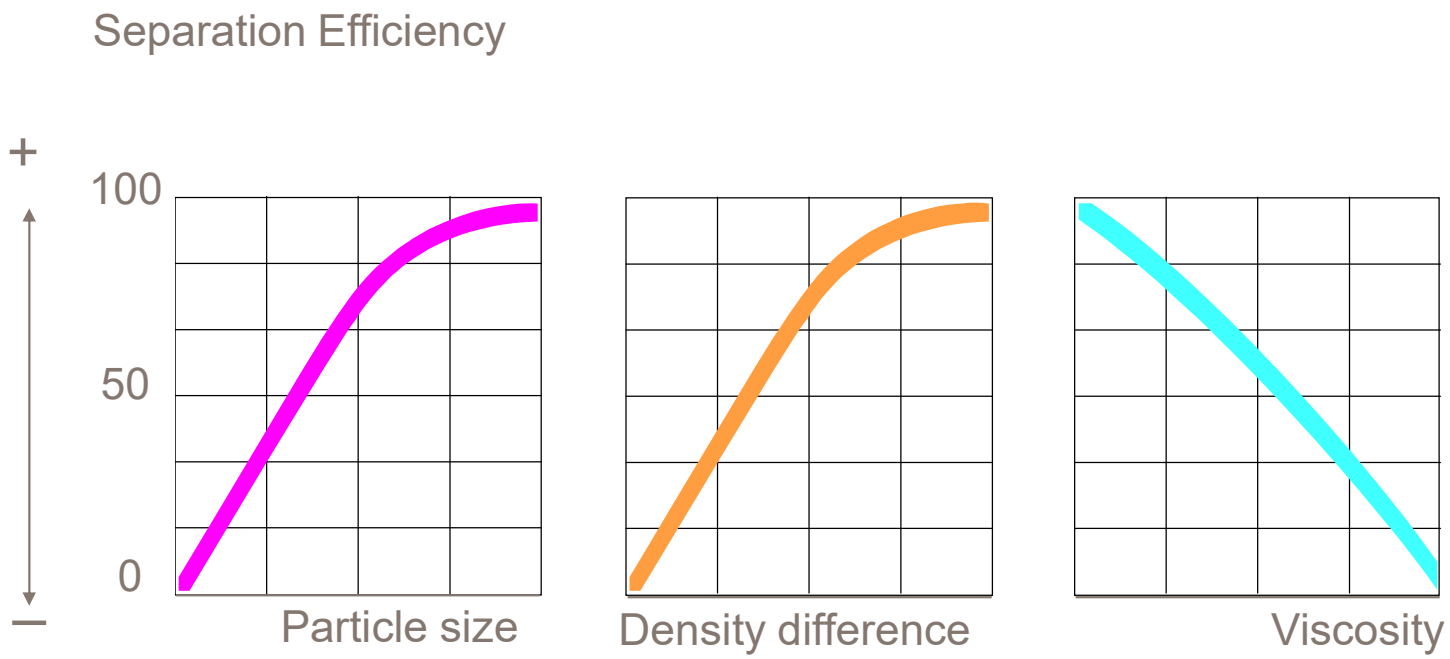
$$V_g = \frac{d^2(\rho_p - \rho_l)}{18\eta} g$$

$$v_C = \frac{d^2(\rho_p - \rho_l)}{18\mu} \omega^2 r$$

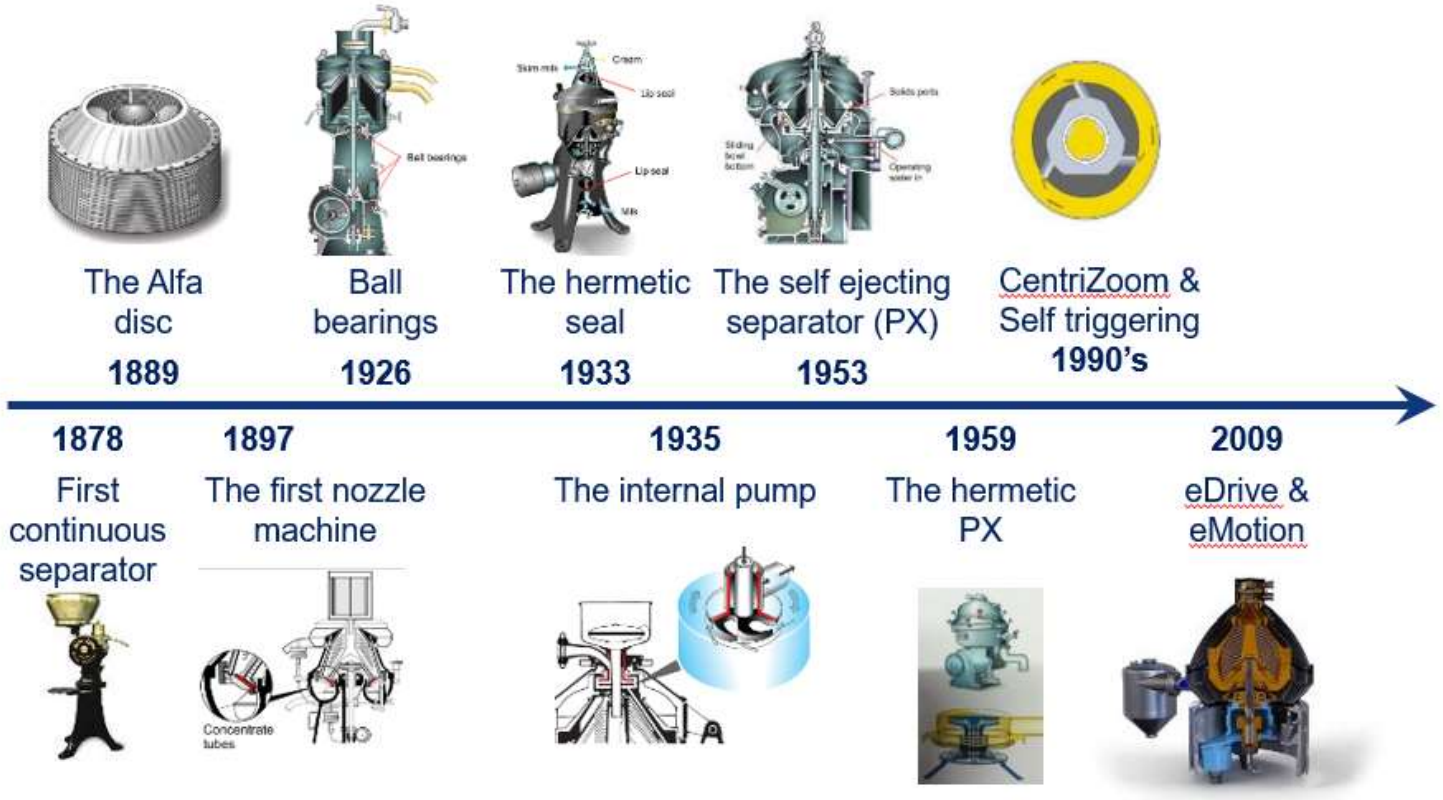
From Gravitational to Centrifugal force



Stokes' Law and efficiency

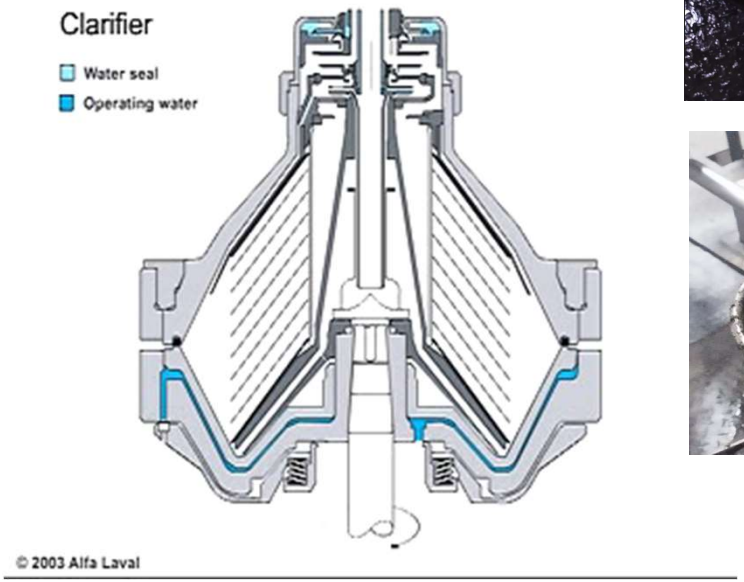


A History of Innovation



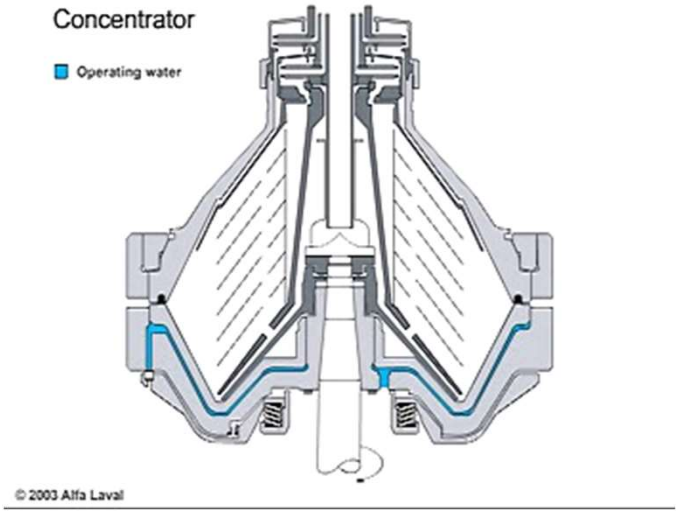
Fluid Clarification
–High Speed Separator

- Two phase
- Sludge/ particle removal



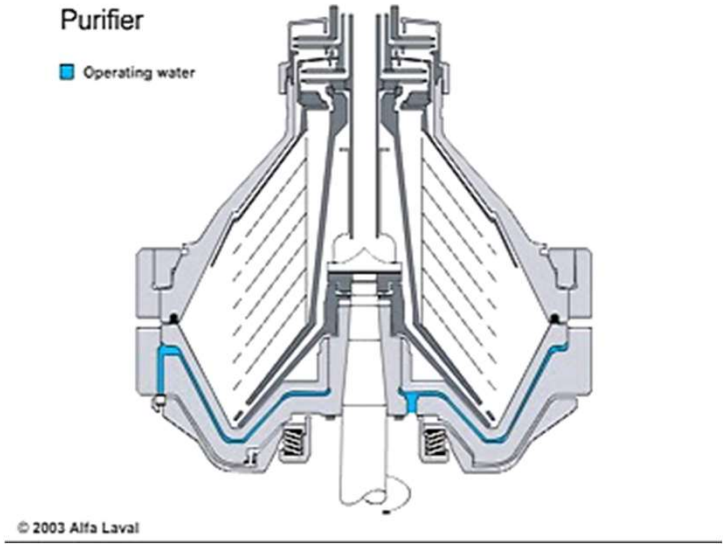
Fluids handling - Concentrator –High Speed Separator

- Three phase
- Heavy phase dominates



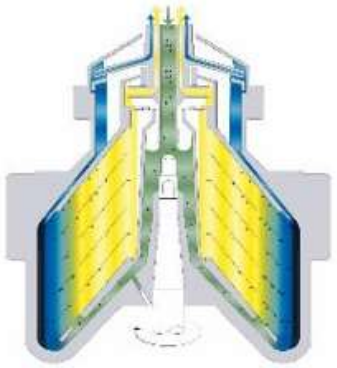
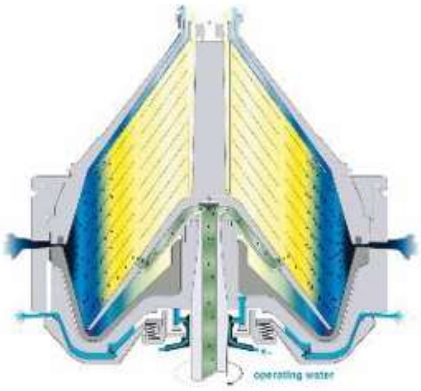
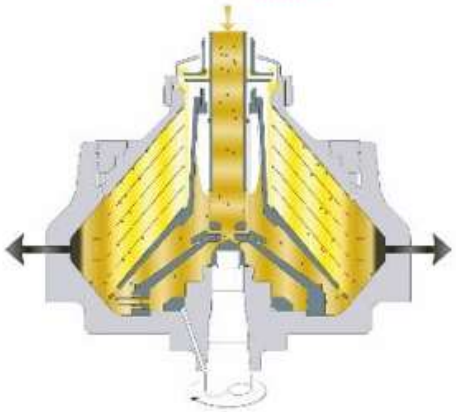
Fluids handling - Purifier –High Speed Separator

- Three phase
- Light phase dominates



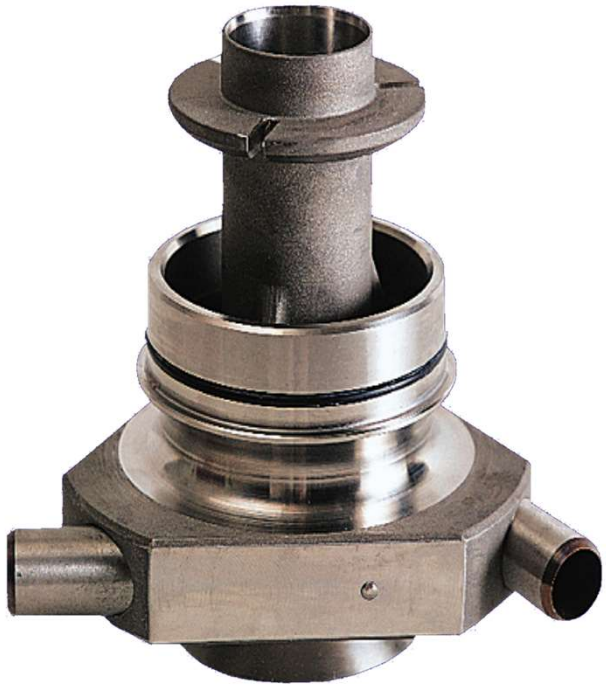
Particles handling
High Speed Separator

Solids concetrations in feed

<0.5% feed solids	~0.5-5% feed solids	~5-30% feed solids
		
Solid Bowl	Intermittent solid discharge Solid ejecting Self-cleaning PX type	Continious solid discharge Nozzle type

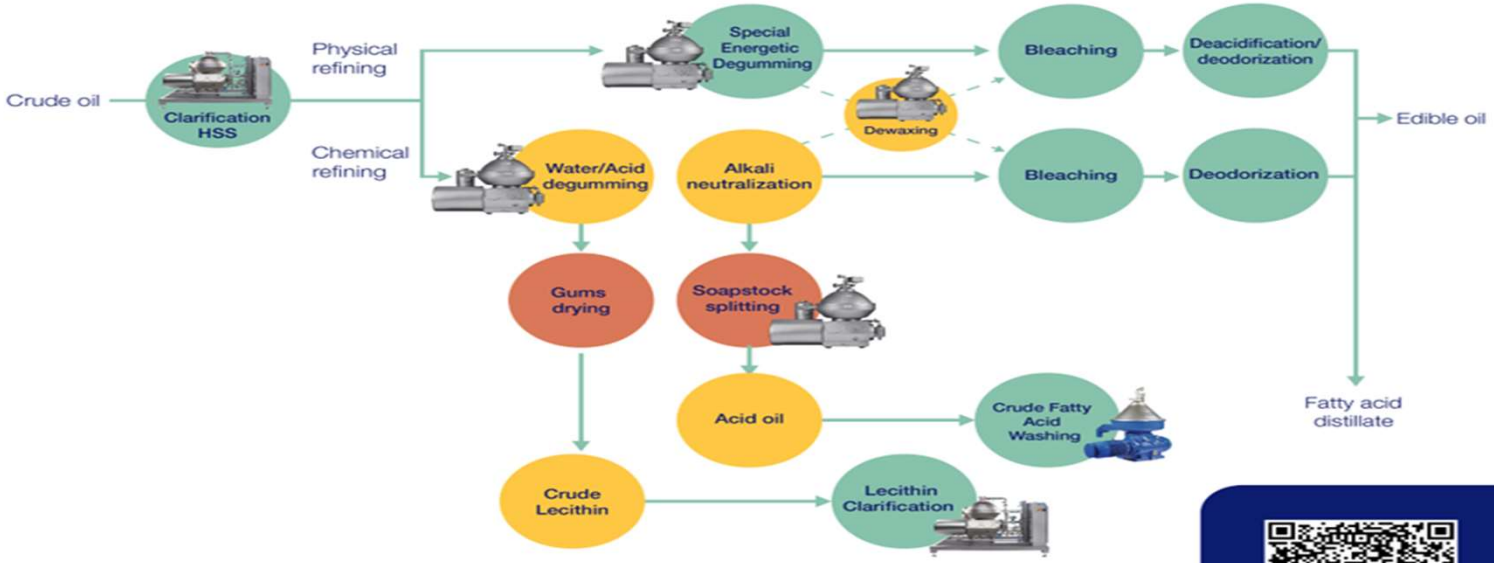
Centrizoom
Adjustable Pairing Disc

- *Gives optimal separation.*
- *Permits rapid, “stepless” adjustment*
- *Allows handling of a wide range of gums and soap stocks.*
- *Radically reduces energy consumption.*



Process
–Separator Location in Refinery

Separator locations in Edible Oil Application



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VO Separator Module
–Sustainability

- *Self-Cleaning Centrifuge*
- *Consistent round the clock production*
- *Reduces Water Consumption*
- *Improve plant performance*
- *Separator with Interface adjustment facility (Centrizoom)*
- *Module facilitate to Plug-&-Play to Refinery*
- *Sealless design reduces maintenance cost*
- *The separator is with highly efficient motor with rigid coupling and VFD starter.*
- *The supply of separator as module with PLC control panel.*
- *Man-power reduction*
- *Make In India*

VO Separator Module
−Sustainable Solution

Plant Capacity	100 TPD	100 TPD
FFA %	1.5	1.5
MIV %	0.1	0.1
Phosphatides%	0.5	0.5
Wesson or Theoritical Loss (assumed)	2.1	2.1
Centrifugal Separator	Manual Cleaning	Auto Cleaning
Water (LPH)		
Operating water for discharge	0	36
Sealing water	150	0
Bowl Flushing	150	0
Flushing liquid	0	25
Bowl Cleaning	25	0
Total (LPH/separator)	325	61
Water required in 24hrs (LPD)	7800	1464
Water (m3/ton)	0.08	0.01
Effluent (m3/ton)	0.08	0.01
Power (kWh/ton)	0.99	3.33
Shutdown per month (hrs)	45.00	0.00
Neutralization Loss (kg/ton), Indicative	28.35	26.25
Manpower (Rs/ton)	10.00	0.00
Operation (days/year)	300	300
Operating Cost (Rs/Year)		
Water	140,400	26,352
Effluent	351,000	65,880
Power	223,049	750,254
Production loss duing Shutdown	375,000	-
Loss	51,030,000	47,250,000
Manpower	300,000	-
Operating Cost (Rs/Year)	52,419,449	48,092,486
Saving (Rs/Year)	4,326,962	
Utility Price	Rate	
Cost for Make up Water	60	Rs./m³
Effluent Cost	150	Rs./m³
Electrical Power Cost	7.5	Rs./unit
Crude Oil	60	Rs./kg

Alfa Laval Separator Features

-PX Separator

Centrizoom™ adjustable paring disc

Needle bed paring chamber

Hollow spindle

Single Seal

Benefits - Alfa Laval Innovation in HSS

Product Sample differentiating quality with Innovation

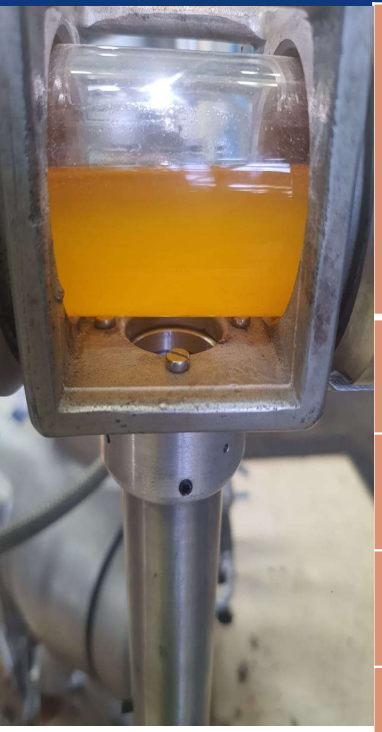
AL Innovation

Old Configuration

Feed- INLET	OUTLET-Innovation		SOAP STOCK		Old-OUTLET	
SOAP	SOAP	P-Con	FFA	TFM	SOAP	P-Con
1447	217	8.38	59.34	45.07	684	17.43
1384	138				634	
1276	163				950	
2242	182				633	

Oil Recovery from Wash Water.

– Sustainability



Sr No.	Flow rate	TFM Inlet %	TFM Outlet (Heavy Phase) %	TFM separated	% TFM Separated
1	1000	0.7	0.15	0.55	78.57
2	2000	0.73	0.28	0.45	61.64
3	1200	0.37	0.33	0.04	10.81
4	4000	0.25	0.1	0.15	60
5	5000	0.61	0.37	0.24	39.34

Palm Oil Mill
–Mass Balance

CST In- and Out-Flows

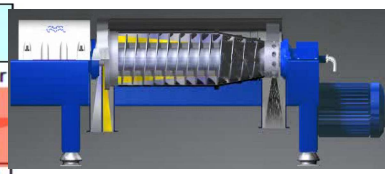
Composition	From Press		Sterilizer + EFB + Dilution Water		NX + SX Oilphase		Skimmed Oil		Underflow	
	%	mt/hr	%	mt/hr	%	mt/hr	%	mt/hr	%	mt/hr
Oil	55.00	9.000	2.26	0.275	80.00	3.219	98.90	9.120	14.47	3.373
Moisture	38.00	6.218	94.74	11.511	19.99	0.804	1.00	0.092	79.09	18.441
NOS	7.00	1.145	3.00	0.365	0.01	0.001	0.10	0.009	6.44	1.501
Total	100.00	16.364	100.00	12.150	100.00	4.024	100.00	9.222	100.00	23.316

Purifier In- and Out-Flows

Composition	CST Skimmed Oil		Purified Oil		Discharge	
	%	mt/hr	%	mt/hr	%	mt/hr
Oil	98.90	9.120	99.49	9.119	1.65	0.001
Moisture	1.00	0.092	0.50	0.046	84.12	0.046
NOS	0.10	0.009	0.015	0.001	0.14	0.008
Total	100.00	9.222	100.00	9.167	85.91	0.055

Decanter In- and Out-Flows

Composition	CST Underflow		LightPhase		Cake		HeavyPhase	
	%	mt/hr	%	mt/hr	%	mt/hr	%	mt/hr
Oil	14.47	3.373	80.00	3.1304	3.00	0.066	1.03	0.177
Moisture	79.09	18.441	20.00	0.7826	75.00	1.638	93.04	16.021
NOS	6.44	1.501	0.00	0.0000	22.00	0.480	5.93	1.021
Total	100.00	23.316	100.00	3.9130	100.00	2.184	100.00	17.219



Nozzle Separator In- and Out-Flows

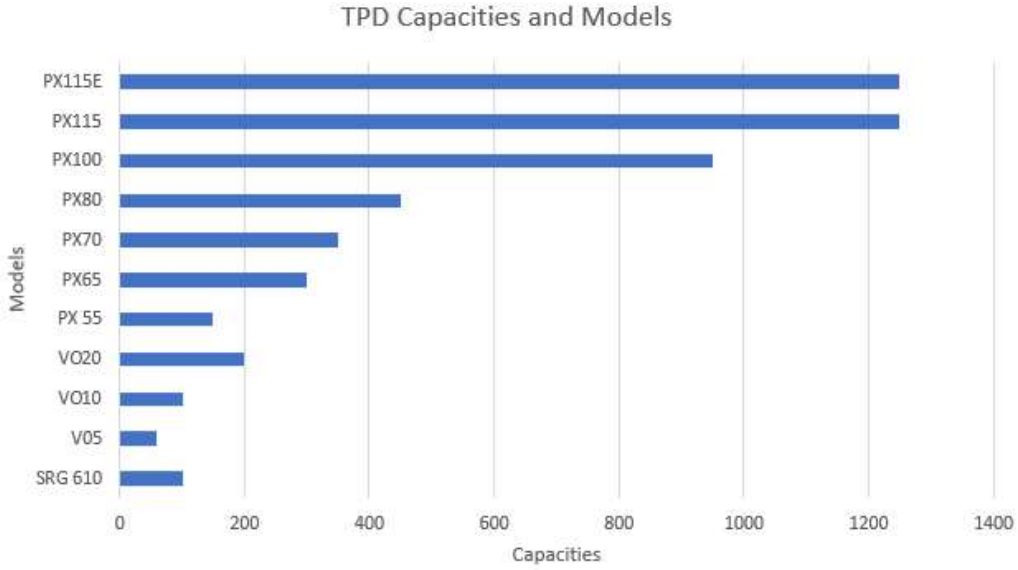
Composition	Feed		Oilphase		Nozzlephase		Balance Water	
	%	mt/hr	%	mt/hr	%	mt/hr	%	mt/hr
Oil	1.03	0.177	80.00	0.089	0.55	0.089	0.00	0.000
Moisture	93.04	16.021	19.50	0.022	93.56	16.209	100.00	-0.210
NOS	5.93	1.021	0.50	0.001	5.89	1.020	0.00	0.000
Total	100.00	17.219	100.00	0.111	100.00	17.325	100.00	-0.210

Oil Losses

	mt/hr	% of FFB
Decanter cake	0.07	0.15
PASX nozzlewater	0.09	0.20
PAPX discharge	0.00	0.00
Total	0.16	0.34

Alfa Laval Product Portfolio
–High Speed Separator-Refinery

- Solid Bowl
  - SRG 610
- Basic Range
  - VO5
  - VO10
  - VO20
  - VO 30
- Premium Range
  - PX55
  - PX65
  - PX70
  - PX80
  - PX100
  - PX115
- Direct Drive



Alfa Laval Product Portfolio
–High Speed Separator-Green Fuel

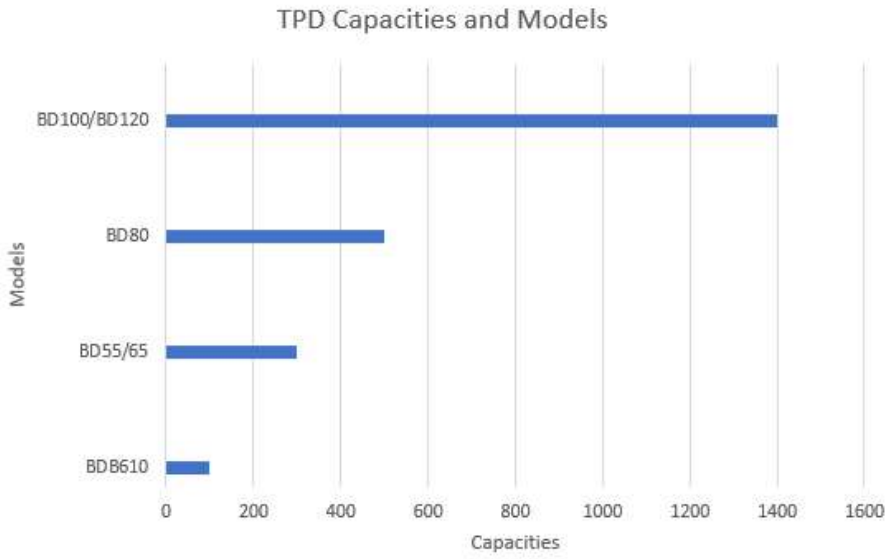
Biodiesel

BDB 610

BD 55/65

BD80

BD100-120

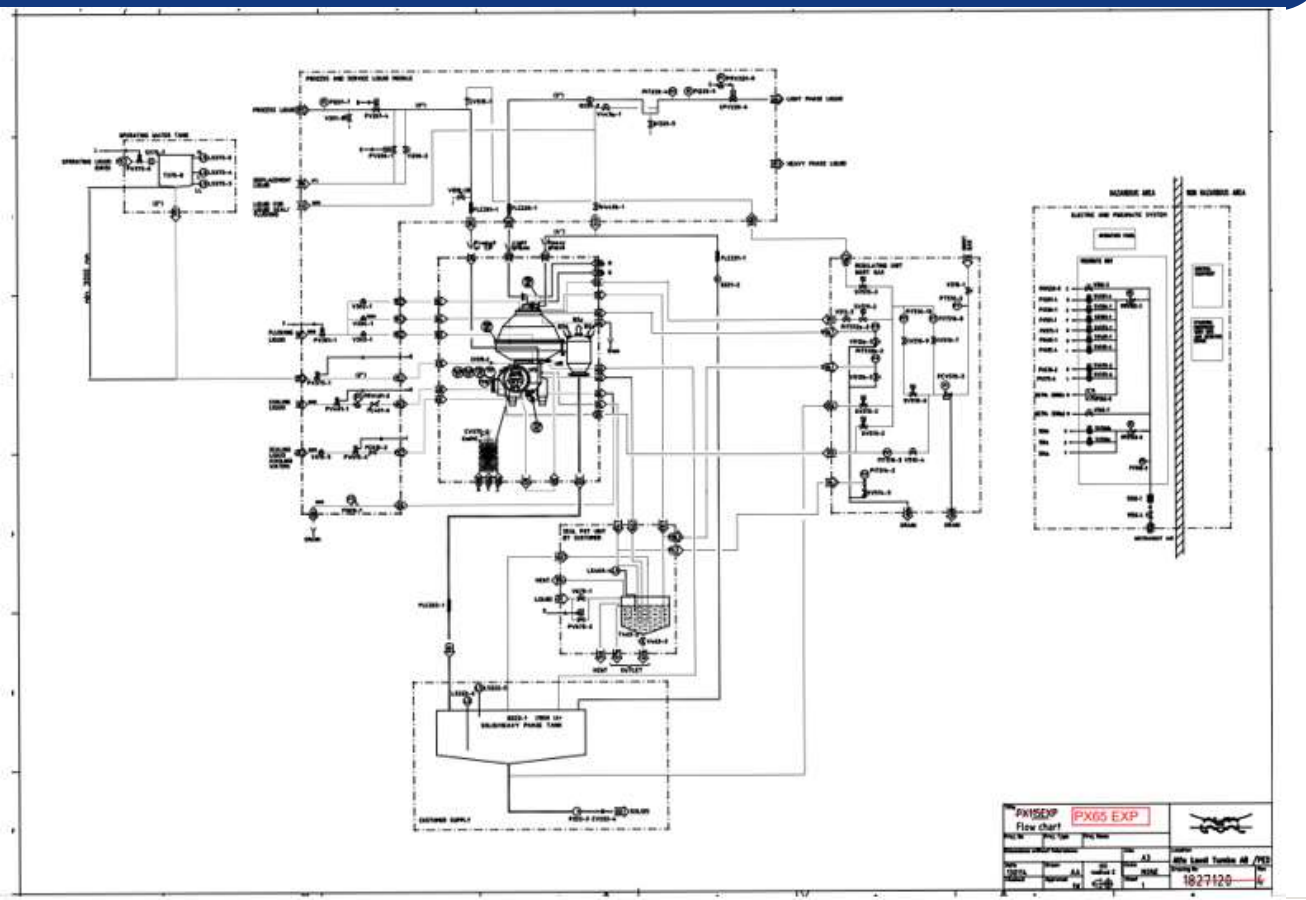


Alfa Laval Product Portfolio

− High Speed Separator- Miscella Refining

Miscella Refining

PX-EXP Separator



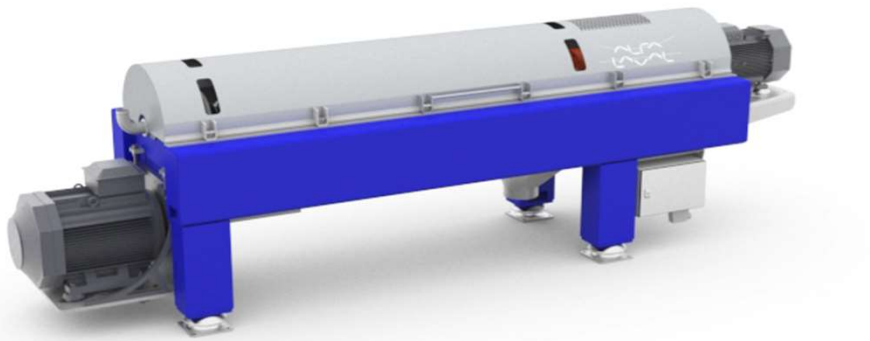
PX Separator Installation

- Site Installation

VO HSS

- Site Installation

Decanter
-Working



Q&A

Thank You