

Alfa Laval PureFerm 750

Disc stack separation system for bio based processing

Introduction

For more than 100 years, Alfa Laval has been supplying separators for various industries. Today, Alfa Laval has the most complete and diverse offering of separators – each fully optimized for its specific duty and supplied with all auxiliary systems and key components.

The use of disc stack separators in fermentation applications is not new. Based on the long experience, Alfa Laval bactofuge separators are specially designed to meet the requirements and demands of high-density biomass fermentation application and high-density broths as it offers the combination of high separation area and continuous solid discharges.

The unique hermetic design assures gentle acceleration of shear-sensitive particles, minimal pick-up of oxygen, optimal performance and considerable reduction of power consumption.

Application

Self-cleaning disc stack separation systems in the PureFerm series are specially designed for high- density industrial fermentation harvesting where the biomass loading cannot be handled by conventional ejection of solids.

Typical separation applications are the following:

- Clarification of cell culture fermentation
- Microbial cells and cell debris separation

Caters to wide range of duties in:

- Sustainable food applications
- Cellular agriculture processing
- Bio based processing duties

Benefits

- Continuous removal of solids
- Foam-free handling in absence of air
- Gentle treatment of the product
- Low temperature pick up through the machine
- High yield
- Low power consumption
- Easy to operate
- Easy to maintain



Design

The PureFerm 750 separation system consists of a separator which can be equipped with a customized process liquid unit as well as electrical & control system unit.

The disc stack separator is based on the Alfa Laval's fully hermetic concept with bottom fed design. The bowl is sealed mechanically to prevent oxygen pick-up in the clarified product. The frame has a horizontal drive shaft, worm gear, lubricating oil bath and a hollow vertical bowl spindle in the lower part. The bowl is mounted on top of the spindle, inside the space (bowl casing) formed by the upper part of the frame, the solids collecting cover and the frame hood. The bowl casing is jacketed for cooling and noise reduction. The machine top part also includes an outlet for clarified liquid and outlet for solids leaves the bowl pressurized.

The inside of the bowl is hermetically sealed from its surroundings, by mechanical seals. The two separated phases (the light supernatant, and the heavy concentrated biomass) are continuously fed out through the two outlets on top of the separator. The separator has intermittent solids discharge with variable volume used mainly for cleaning in place (CIP). The discharged liquid and solids leave the separator via the sludge cyclone.

All metallic parts in contact with the process liquid are made of stainless steel. Gaskets and seals in contact with the product are made of FDA approved material and are approved according to food regulations (EC1935/2004).

The centrifuge is available with main connections as sanitary Tri-clamps. The electric motor is suitable for variable frequency drive. The drive system is splash-lubricated without any need for an external lubrication circuit. The machine is equipped with nozzles for flushing of the bowl top, the bowl bottom, the solids collecting chute and optionally in the cyclone. The tools for assembly and disassembly of the bowl are made of stainless steel.

The system can be selected with an optional feature — eMotion™, which applies partial vacuum (low atmospheric pressure) between the bowl and the bowl casing to reduce air friction. Alfa Laval's innovative eMotion™ add-on not only further reduces the power consumption, but it also minimizes cleaning and cooling requirements while reducing noise levels.

The separation system is designed for automated Cleaning in Place (CIP).

Scope of supply

The standard PureFerm 750 includes the following main components:

- Disc stack separator
- Cyclone
- OWM (Operating Water Module)
- Foundation plate
- Set of tools
- Commissioning spares
- Documentation

Options

- eMotion™
- Feed pump
- Skid & control system
 - The centrifuge can be fully equipped with process liquid unit and electrical & control system unit on request.
 - Solids receiving unit
- Service options
 - Commissioning
 - Operators training
 - Basic service agreement
 - Performance agreement
 - ConditionAlert™
 - connectivity based subscription

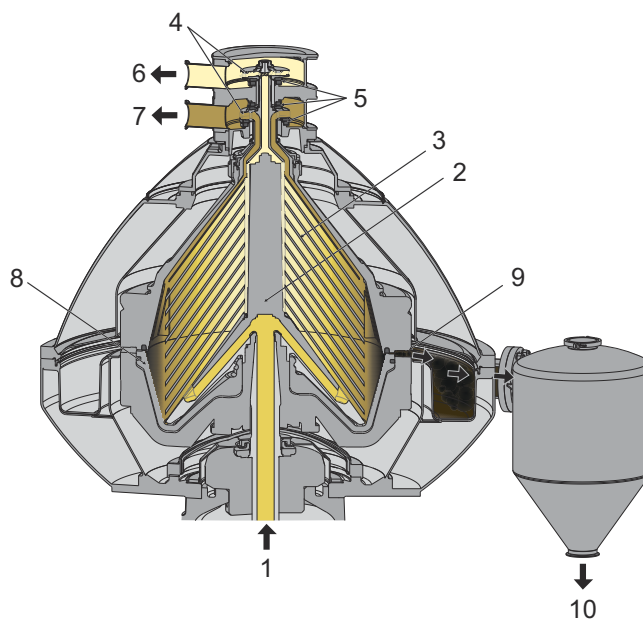
Working principle

Fermentation broth is continuously fed from the bottom into the separator bowl through the hollow spindle (1), which

assures gentle acceleration. Separation takes place in a solids-ejecting centrifuge bowl, between the discs (3).

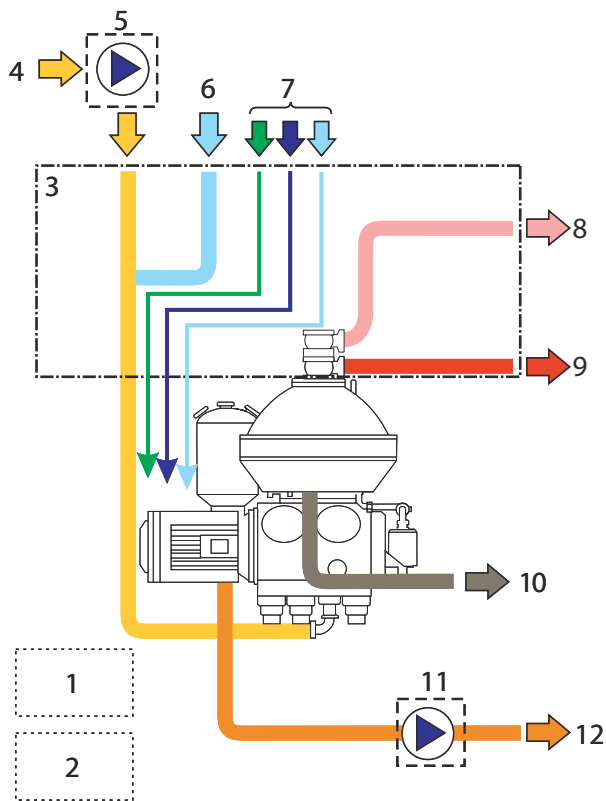
However, the intermittent solids ejecting function is primarily used to CIP the separator. In normal production mode there are two continuous outlet flows from the top of the separator. One is clarified liquid (supernatant) and the second is concentrated biomass. Both these flows are continuously pumped out of the hermetically sealed bowl under pressure by two integrated impellers (4). During production mode the bowl bottom is hydraulically pressed into a closed position, ensuring a tight seal against the bowl hood. Solids, which move toward the bowl periphery under centrifugal force, pass out of the separator over the top disc. During cleaning (CIP), the intermittent discharge function can be employed to clean the bowl internals. The separator is fed with cleaning solutions continuously. Periodically, at predetermined intervals, the sliding bowl bottom (8) is lowered hydraulically and waste residue is evacuated through the discharge ports (9). The bowl is then closed again by hydraulic action. The intermittent discharge is done at full speed without shutting off the feed of cleaning liquid. Mechanical seals on the inlet and outlet maintain a full hermetic condition, which prevents air from contacting product liquids

The discharged solids decelerate in the sludge cyclone and can be pumped out of the system by the optional solids receiving unit.



Typical bowl drawing for a solids-ejecting separator. The details illustrated do not necessarily correspond to the separator described.

1. Inlet
2. Distributor
3. Disc stack
4. Impeller
5. Hermetic seal
6. Light liquid phase outlet
7. Heavy liquid phase outlet
8. Sliding bowl bottom
9. Solids discharge ports
10. Solids outlet from cyclone



Typical flow chart of a separator system. The details may differ slightly between different systems.

1. Control cabinet with PLC
2. Motor starter panel and VFD
3. Process & service liquid unit
4. Feed inlet
5. Feed pump (optional)
6. Standby / safety water supply
7. Utilities
8. Heavy liquid phase outlet
9. Light liquid phase outlet
10. Separator drain
11. Solids receiving unit (optional)
12. Discharged solids outlet

Technical data

Performance data

Hydraulic capacity ¹	25 000 l/h
Max. motor power	37 kW (49.6 HP)

¹ Actual capacity and power consumption depend on application, solids content and operating conditions

Connections

Feed inlet	DIN 63.5, ISO 2852 Clamp coupling
Heavy phase outlet (solids)	DIN 63.5, ISO 2852 Clamp coupling
Product outlet	DIN 63.5, ISO 2852 Clamp coupling
Discharge solids outlet	DIN 100, ISO 2852 Clamp coupling

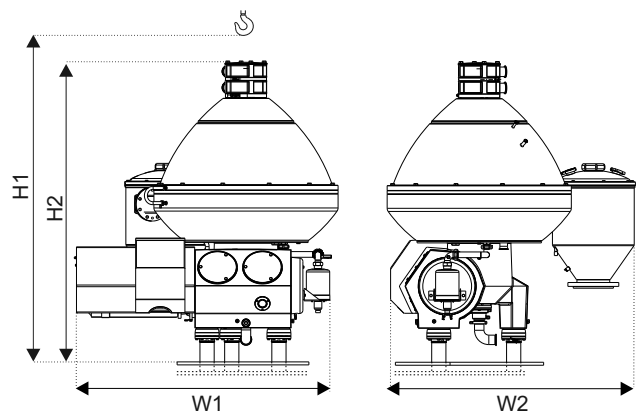
Material data

Bowl body	Stainless steel EN 1.4501
Frame top part	Stainless steel 316, EN 1.4401
Frame bottom part	Cast grey iron, clad with stainless steel 304, EN 1.4301 (with or without sheet covering)
Inlet and outlet parts	Stainless steel 316, EN 1.4401
Gaskets (product wetted)	EPDM FDA

Weights

Separator, bowl and motor	2440-2516 kg (5379-5547 lbs)
Bowl	1160 kg (2557 lbs)

Dimensional drawing



Dimensions

H1 (minimum lifting height)	2865 mm (9 ft 4 51/64 inches)
H2	1935 mm (6 ft 4 3/16 inches)
W1	1703 mm (5 ft 7 3/64 inches)
W2	1663 mm (5 ft 5 15/32 inches)

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