Description Evodos 50A

Spiral plate technology

To make the mechanical separation of fine particles in the micron range such as algae possible, the Evodos *Spiral Plate Technology®* (SPT®) has been developed. The challenge for Evodos was to design a technology where the path that particles need to travel before they settle, is minimized. Evodos achieved this through the development of its *Spiral Plate Technology®*. This novel *Spiral Plate Technology®* uses the principle of thin layer laminar flow. This principle is implemented by mounting curved plates at close distance between each other. This reduced the travelling distance of the particles in the flow between the curved plates. The settling speed is furthermore accelerated by applying increased artificial gravity. The combination of a small settling distance in laminar flow conditions and under increased artificial gravity results in an optimal set of conditions to provide superior settling conditions for very small size particle (cut-off rate approximately 1 micron). Also through the application of curved plates, the energy transfer between machine and the process feed fluid is optimized.
Spiral Plate Technology® has not only in the separation cycle but in the discharge cycle as well. The Evodos discharge technology is very gentle and even sticky materials are discharged in the form of an almost dry consistent cake.
The theory of Evodos *Spiral Plate Technology®* is very much alike the theory of a static settler. And through applying artificial gravity, the separation process is transformed has moved from a static to adynamic process. Therefore we call them Evodos *dynamic settlers®.*

Application description - Algae harvesting

Our customers achieve excellent results in harvesting algae with our Evodos *dynamic settlers®*. Today we have over 100 customers worldwide in the algae market. Additionally, Evodos is a partner in many large R&D (grant) projects of the European Union and the Department of Energy (DOE) in the United States of America.
The Evodos *dynamic settlers®*, with our unique *Spiral Plate Technology®*, outperform the competition. With Evodos, even the smallest algae (species of *Nannochloropsis*), fragile algae (species of *Dunaliella* and *Diatoms*) and both fresh and marine water algae are harvested successfully, including e.g. *Spirulina, Chlorella, Tetraselmis, Scenedesmus, Phaeodactylum, Haematococcus, Isochrysis.*
The separation efficiency is typically over 95%, and the Dry Weight (DW) of the output algae paste is generally 150% – 200% higher compared to traditional centrifuges. The high DW of the algae paste saves significant costs in the downstream process e.g. less water has to be evaporated in the drying process.
Even more important, the algae paste is of excellent quality, all algae cells are harvested intact, un-damage and without changes in structure and in temperature. Evodos offers the only algae harvesting solution where all valuable components (ingredients) inside the algae cells are fully retained. This significantly increases the value of the output algae biomass.
The Evodos *dynamic settlers®* are easy to connect and operate. As an additional advantage, the Evodos in operation produces minimal noise.

Summary of main reasons why clients choose for Evodos:

- Clients harvest a top quality algae paste with a high dry weight percentage
- Even the smallest and most fragile algae are harvested successfully
- All algae cells are harvested intact and undamaged
- All valuable components inside the algae cells are retained
- Clients minimize the energy consumption in the downstream process

Technical description Evodos 50A rev 2

Description

The Evodos 50 is an automatic machine for continuous operations.
The machine is a *dynamic settlers®*that deploys *Spiral Plate Technology®*. The highly effective separation process takes place at 4,500xG and can manage 5 automatic discharges per hour.

Characteristics

-Low shear through smooth automatic discharge process
-Harvesting a top quality algae paste with a high dry weight content
-Production unit designed for 24/7 processing and can be equipped with remote monitoring for operating and maintenance support
-High separation effectiveness through *Spiral Plate Technology®*

Technical datasheet Evodos 50A rev 2

Capacity

- The feed pump is operated from the PLC and can be varied from 500 to 4,000 litres/hour.
- The unit can discharge up to 30 liters of paste per discharge cycle. Maximum of 5 discharges per hour.
- Number of discharge cycles depends on algae concentration in the feed.

Power requirements

- Standard suitable for 380-440 V, 50-60 Hz
- Control voltage 24 Volts DC
- Drive motor 18,5 kW

Dimensions

Dimensions of the unit including the sub frame

	Unit	Control cabinet
Height	2.800 mm (9'2")	1,800 mm (5'10")
Width	1.300 mm (4'3")	1,200 mm (4'7")
Length	1.350 mm (4'5")	500 mm (3'11")
Weight	2.250 kg (4,950 lbs)	200 kg (440 lbs)

Construction materials

- Wet surfaces: 316L Stainless steel
- Other metal surfaces: 304L Stainless steel
- Siemens PLC, integrated, touch screen operated.
- Control panel on processing unit
- External contacts for automatic start / stop and alarm
- All seals and gaskets are made of NBR

Control cabinet

- Standalone cabinet, which can be located at a maximum distance of 5 m (16 ft) away from the processing unit
- Control cabinet is connected to an operator control panel on the processing unit

Compressed air

- Pressurized air requirement: 6 bar
- Connection ¼ "

Process fluids

- The machine can cope with both fresh and marine water.
- Fluids can be processed from 5°C. to 65°C.
- All fluids connections are 1'' BSP.

Discharge method

- The discharge is via a rotating circular splash screen with scraper into a collecting bin below the unit
- The discharged algae paste contains a minimum amount of extracellular water
- Discharge is fully automatic

Feed pump

- The feed pump is a monotype pump
- The pump discharge pressure is max. 0.2 bar
- The feed pump is placed externally
- The feed pump is frequency controlled from the control cabinet

Algae paste

- The algae paste Is discharged downwards into a collecting bin on wheels (standard option).

Certification

- CE Standard