

MP-EDW

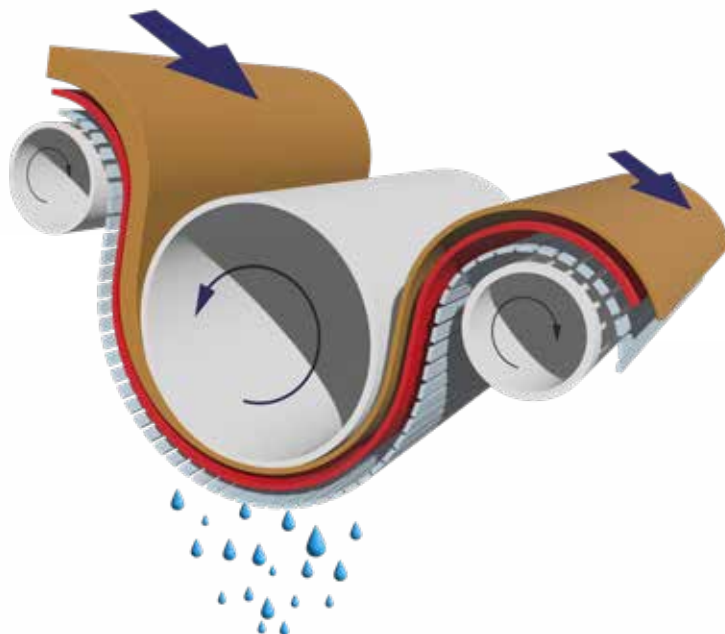
Electro osmotic
Dewatering



MIVALT

MP-EDW

The MP-EDW system was developed to increase the dry solid content following conventional mechanical dewatering methods (screw press, centrifuge, belt press, etc.). It serves as a secondary stage of dewatering to reduce the overall volume of the sludge cake, thereby lowering costs for transportation, disposal, or preparation of the material for subsequent processing or reuse (incineration, pyrolysis, composting, etc.).



Sludge on inlet with a dry matter content of 12-25%, is transported to the belt conveyor at the inlet of the device. This belt, functioning as the cathode, then follows the path along the circumference of the central drum, which serves as the anode. The sludge is situated between the drum and the belt in a predetermined layer, and an electrical voltage (<math><100\text{ V RMS}</math>) is applied to the electrodes (the drum and the belt), which, depending on the conductivity of the sludge, causes an electric current to flow.

Description

The MP-EDW is a dewatering device that utilizes the principles of electrophoresis (where the electric field induces the separation of solids from the surrounding water) and electroosmosis (where water is driven into a separation belt/membrane by the electrostatic Coulomb force generated by the electric field). These combined principles cause solids to be attracted to the drum, while water (possibly containing residual polymer from mechanical dewatering) is pushed toward the perforated conveyor belt.

These principles also lead to the destruction of cells and the subsequent removal of bound water within the cells, which is a limitation of any mechanical dewatering method that cannot disrupt cells. As the sludge passes through the MP-EDW, up to 99% of microorganisms, pathogens, and bacteria are destroyed, leading to sludge hygienization, reduced biological activity, odor elimination, and increased possibilities for further use of the material (for certain sludges, the output can be used as fish feed, etc.).



In contrast to mechanical dewatering, the MP-EDW does not put mechanical pressure on the material. The belt and drum serve purely as transportation mechanism and simultaneously function as electrodes, to which electrical voltage is applied. All moisture loss is achieved through electrophoresis and electroosmosis, driven by the passage of electric current.

Inlet DS	12-25 %
Outlet DS	40-60 %
Electrical conductivity of sludge	2 000 - 13 000 $\mu\text{S}/\text{cm}$
Solids capture rate	95-97 %
El. Energy per 1 liter of removed water	0.45 kWh guaranteed, typical 0.25kWh
Cake temperature at outlet	60-80 °C

For example

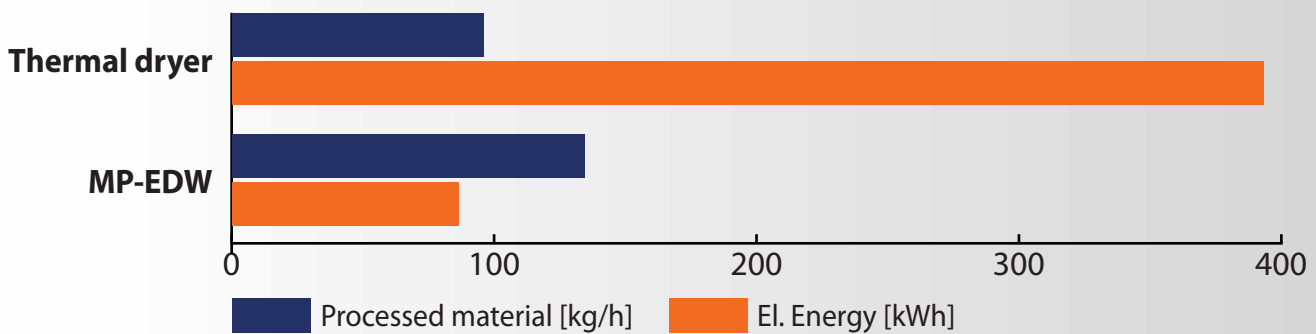
When DS increases from 18% after mechanical dewatering to 50% after electroosmotic dewatering with the MP-EDW, the volume is reduced by 64%. For instance, 400 kg of cake resulting from mechanical dewatering will weigh only 144 kg after electroosmotic dewatering. This secondary dewatering step typically requires 70 kWh of electrical energy and can be handled by the MP-EDW-1000 model. To dry the same quantity of sludge cake in a thermal dryer to a final dry matter content of 90%, 320 kWh of energy would be necessary, which is 4.5 times the energy required for the MP-EDW.

Inlet DS [%]	Outlet DS [%]	Volume reduction [%]
15	40	63
	47	68
	55	73
18	40	55
	47	62
	55	67
20	40	50
	47	57
	55	64
23	40	43
	47	51
	55	58

Comparison

	MP-EDW	THERMAL DRYER
Operating principle	Elektroosmosis & electrophoresis	Water evaporation
Material processing time	3 minutes	Hours
Startup time	2 minutes	Hours
Cake volume reduction	Up to 60%	Up to 85%
Initial investment difference	25% X	X
Space requirements	9 m ² +	100 m ² +
Installation price	Low - Plug & Play	High
Maintenance	Minimal	High
Greenhouse gas production	Minimal	High
Increase in ambient temperature	None	Significant
Odor production	None	High
Dust production	None	High

Energy consumption



Parameters

Model	Inlet cake capacity [kg/h]	Power [kW]	Belt width [mm]	Dimensions [L x W x H mm]	Weight [kg]	Rinse water consumption [l/min]	Compressed air consumption @ 5 bar [l/min]
MP-EDW-500	200 - 250	30 - 60	500	2760 x 1640 x 2630	3 400	12	5
MP-EDW-1000	400 - 500	70 - 100	1000	2760 x 2060 x 2630	5 500	20	5
MP-EDW-2000	800 - 1000	120 - 160	2000	3060 x 3060 x 2630	7 500	38	5
MP-EDW-3000	1200 - 1500	180 - 220	3000	3060 x 4065 x 2730	10 500	50	5

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