



Digestate & Manure post treatment



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What is the challenge?

Worldwide population growth* has driven intensified livestock farming (especially bovine and swine farming) leading to effluent disposal issues and an increasing potential for local water pollution problems. And transportation of digestate/manure to nutrient poor regions is expensive.

High Chemical Oxygen Demand (COD) and high ammonium and/or potassium content in digestate and raw manure can accumulate in farming areas which in turn gives rise to an increasing need for treatment.

Processing of manure usually results in a “thick” and a “thin” fraction. The “thick” fraction is sold as fertilizer and/or used in production of biogas. The remaining “thin” waste water undergoes further treatment usually using Reverse Osmosis (RO) or a Membrane Bio Reactor (MBR). These methods are being used with limited success on a small scale, however, increasingly stricter local demands and poor water recovery may prevent a large roll out.

How Fujifilm solves these needs

Electro Dialysis (ED) is a matured technology used in the water, waste water and process water treatment industries for decades. It can be used as post treatment onto the RO and MBR techniques to create a compelling solution for nutrient and water recycling.

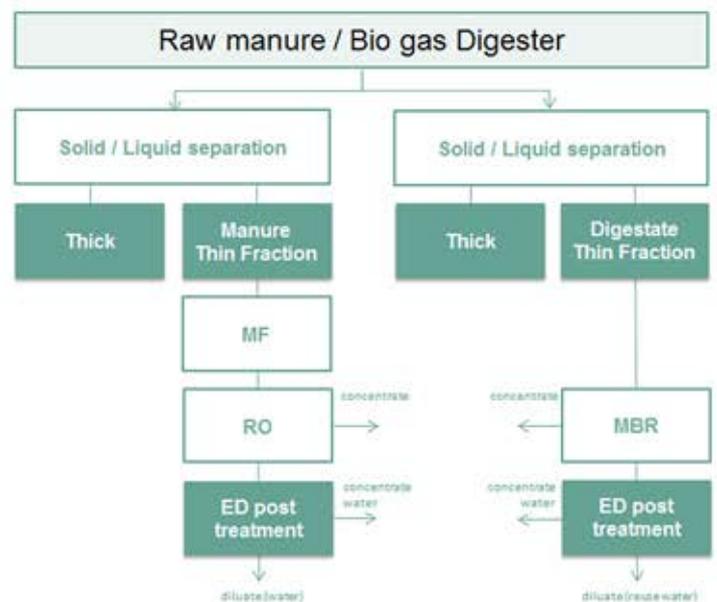
The main two advantages using ED are volume reduction and high water recovery of the thin fraction, resulting in lower cost of disposal, transport and storage.

ED process for manure post treatment (ammonia stripping)

- Reduce ammonium (NH₄⁺) < 5mg/l to meet local water discharge requirements
- Concentrate the “thin” fraction to reduce volume by 92 - 93 % to reduce storage / transport costs
- Reuse the concentrated “thin” fraction as liquid fertilizer for local farmland

ED process for digestate post treatment

- Reduce overall salinity (TDS) to meet local water discharge requirements
- Concentrate the “thin” fraction to reduce volume by 80 - 85 % to reduce storage / transport cost
- Reuse the concentrated “thin” fraction as liquid fertilizer for local farmland



Electro dialysis	Thin fraction manure	Thin fraction Digestate
Feed - in	conductivity : 0.2 – 0.7 mS/cm	conductivity : 24 mS/cm
	Ammonium (NH ₄ ⁺) : 45 mg/l	Potassium (K) : 4.000 mg/l
Concentrate - out	conductivity : 4 mS/cm	conductivity : 80 mS/cm
		Potassium (K) : 15.000 mg/l
Diluate - out	conductivity : 0.06 mS/cm	conductivity : 1 mS/cm
	Ammonium (NH ₄ ⁺) : <5 mg/l	Potassium (K) : 225 mg/l
Water recovery	> 90 %	> 80 %

Actual pilot data of two sites

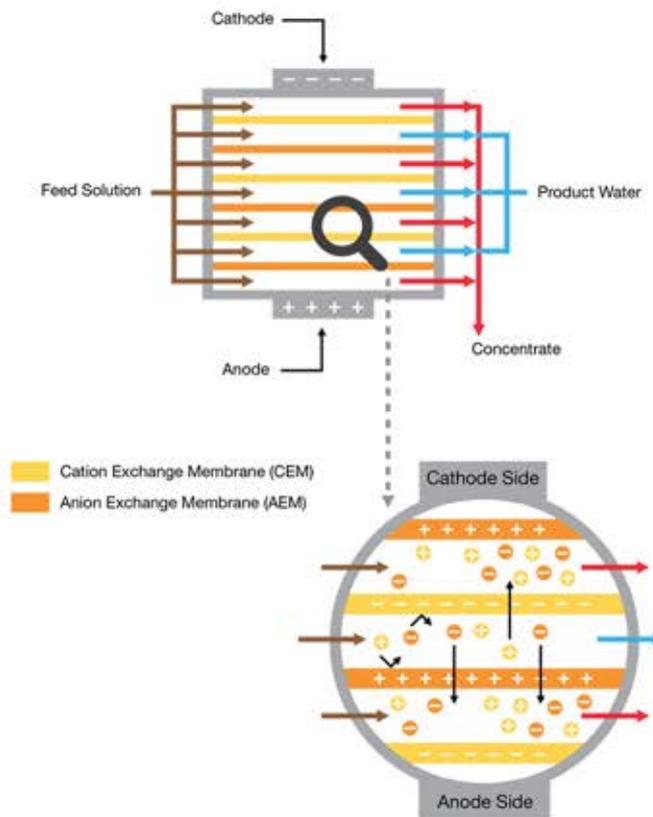


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Electro Dialysis (ED), how does it work?

Electro dialysis (ED) is a DC voltage-driven membrane process. An electrical potential is used to move salts through a ion exchange membrane, leaving fresh water behind as product water. Ion exchange membranes permit selective passage of either anions or cations. In a saline solution, dissolved ions such as sodium (+) and chloride (-) migrate to the opposite electrodes passing through selected membranes that either allow cations or anions to pass through.

Membranes are arranged in an alternate pattern, with anion-selective membrane followed by a cation-selective membrane. During this process, the salt content of the feed water channel is diluted, while concentrated solutions are formed in the adjacent channels. ED units consist of several hundred membrane pairs (anion + cation selective membranes bound together with electrodes), and is referred to as an ED stack.



What do we offer?

Fujifilm develops and supplies ion exchange membranes and ED stacks for various water treatment applications. For the manure & digestate treatment market, our ED stacks are typically supplied via local engineering companies and installing dealers who can supply integrated process solutions.



Electro Dialysis (ED) Stack portfolio ranging from 4 to 40m³/hr using Fujifilm membranes.



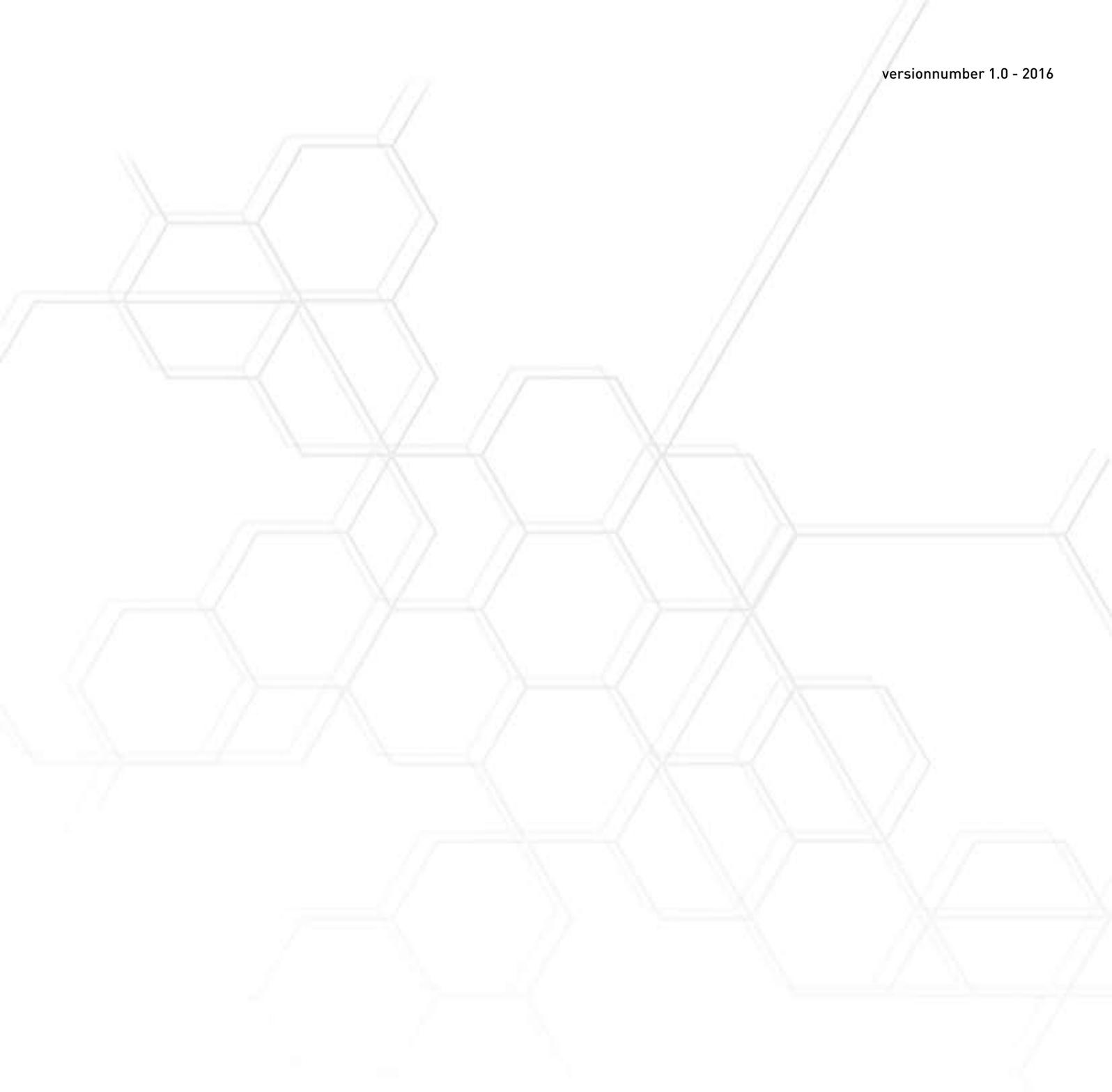
Example ED Pilot system

For more information: www.fujifilmmembranes.com



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