memflow
water technology

ENVIRO NOW®

"The Oil and Process Water Specialists"

The BRINEX™ system

The modular BRINEX™ system is a solar, waste heat and wind powered accelerated evaporator. It uses a small amount of electricity to recirculate the liquid to be evaporated and this can be from solar PV panels or the mains supply. The BRINEX™ system readily evaporates waste brine, process water or trade waste. Most modules are open cubes 4x4x4m. Feed water is preheated in a solar heater or with waste heat and is discharged in properly sized streams and droplets from self-cleaning nozzles at the top of each module. The water is evaporated by airflow that passes through the falling streams. Concentrate is collected at the base of the unit where the EC is measured and transferred by pumps, controlled by the PLC, to the next stage. Because of the advanced computer system, the nozzle design and controlled droplet sizes, there is little misting or drift. By combining natural wind evaporation with falling streams the BRINEX™ system provides a low energy, small footprint solution that requires minimal ancillary or civil works.
The considerable number of streams increases the surface area and evaporation capacity.

The infrastructure for the BRINEX™ system includes:

- Advanced PLC computer control system
- Shallow concrete or poly lined evaporation tank below each BRINEX™ evaporator module
- Sensors measure EC/TDS, pH, flows, air and water temperature, air humidity, wind speed
- Pumps to circulate the fluids
- Dosing system prevents organic fouling
- Storage tanks which allow for wet weather operation
- Crystallisation ponds for removal of various substances and salts such as dolomite, gypsum, magnesite, glauberite, halite, bloedite, or any metals or compounds
- Simple tensioned PVC roofing can be installed over the system in areas of high rainfall

Advantages of the BRINEX™ system include:

- Low energy use, pumping is required to distribute the water (could be supplied via solar power)
- The system is fully automated and all temperatures, flows and concentrations are comprehensively monitored and controlled by a high-level PLC and pumps which can be off-site
- Compact footprint (4 times smaller than an equivalent capacity evaporation lagoon)
- The system is demountable and can be dismantled for transport and relocation
- There are no "sail" materials to clog up with scaling and crusting
- Spray drift is minimal
- Modular design allows for ready addition of extra evaporation capacity.

Design Considerations:

- Simple steel or stainless-steel construction (able to be dismantled yet withstand strong wind)
- Footprint extrapolated from observed evaporation rates from system trials at RMIT and further research conducted by Memflow
- The overall volume of waste to be disposed is reduced as the waste stream is concentrated further
- To recover salts from the waste the crystalliser tank steps are required

Summary:
The circumstances in which it would be most favourable to use the BRINEX™ system include where there is:

- Reasonable net evaporation
- Expensive land or no space available for ponds
- A geotechnical unsuitable site
- Expensive or unavailable energy sources
- Flexibility in the amount evaporated month-to-month
- Legislation prevents use of evaporative ponds

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Studies conducted by RMIT University and by others indicate that BRINEX™ can increase the evaporation process by a factor of ten or more over an evaporation pond (Colorado School of Mines, 2009). With preheating of the feed stream, that factor can be as high as 15 or 20 more times.

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Features

BRINEX™ Frame:	A 316-stainless steel 4x4x4m frame fixed to four concrete plinths.
Civil Works	Trenching for cables and plumbing. Excavation for collection tank and ground levelled for overspray collection pad. Four concrete footings poured for the BRINEX™ cube.
Distribution Manifold	The waste solution distribution manifold and associated piping is made of stainless steel, schedule 80 PVC and polyethylene pipe. The distribution manifold incorporates many specially sized distribution orifices/nozzles.
Sensors	TDS, pH, flowrate, temperature, non-resettable meters.
Pumps	Submersible circulation pump/s 316 stainless steel, with VFD/VSD.
Electrical Cabinet	Contained within the shed (see below) the IP65 Cabinet Contains all 380v and 220v electrical connections, circuit breakers, contactors, relays and fuses, mimic panel and switches Allen-Bradly PLC, and 24v power supply. This will be of sufficient size, and located to suit the later full-scale installation.
Plant Shed	A small lockable shed mounted on a concrete pad contains an IP65 Electrical Cabinet, computer, internet connection modem or LAN cable, service material, service logbook, dosing pump and tank.
Collection Tanks	One in-ground collection tank, comprising a polyethylene liner over geofabric in a 12x12m and 0.5m deep pit. An apron extends outwards each side to catch any overspray.
Anti-drift control	The system automatically prevents or reduces fine droplet drift
Spray Apron	Concrete or bitumen or polyethylene over geofabric overspray apron collects overspray and returns it to the BRINEX™ undertank.
Heat Exchanger	A 316 Stainless steel parallel pipe coil transfers waste heat from owner's plant to the feed solution in the BRINEX™ undertank.
Computer Controller	Computer Controller monitors temperature, pressures, TDS, pH, levels, flow rates, air temperature, humidity and wind speed to control the variable speed feed pump/s. This ensures that the plant is operating at maximum efficiency for any meteorological conditions.
Instrumentation and Sensors	Sensors provide real-time data to the Controller: temperature, fluid flow rate, TDS, pH, fluid levels, moisture sensing,
Dosing	A tank and dosing pump prevents the growth of bacteria and other organisms, and reduces the risk of blockages and prevents any odours.
Self-Cleaning	The Plant has an automatic nozzle-cleaning cycle that ensures that fluid distribution nozzles remain unblocked, ensuring efficiency.
Product Tank	A polyethylene buffer tank installed on a levelled sand base is sited nearby to receive and store evaporated sludge product.
Web Connection	The computer is connected via Wi-Fi, wireless modem or LAN cable to the internet
Weather Station	Collects meteorological data such as wind speed and direction, air pressure, air temperature, rainfall, humidity and dew point. These data are collated and matched to the BRINEX™ Pilot Plant performance on a regular basis.
MARCs	The plant is monitored and fully controlled and reprogrammable by us through our MARCS system (Monitoring and Remote-Control System) via the web. Our Service Technicians receive an SMS and email in the event of any fault or out-of-condition alarm. The nominated Manager/s can also monitor performance online.
Reports	The nominated Manager/s receives weekly emails containing performance reports.

Performance

Performance depends on the local meteorological conditions, the type of waste fluid being evaporated, the amount of usable waste heat and solar radiation. A single 4x4x4m module could evaporate from 6,000Litres per day (Lpd) to 35,000Lpd. We need to complete a full evaporation calculation for each installation.

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