

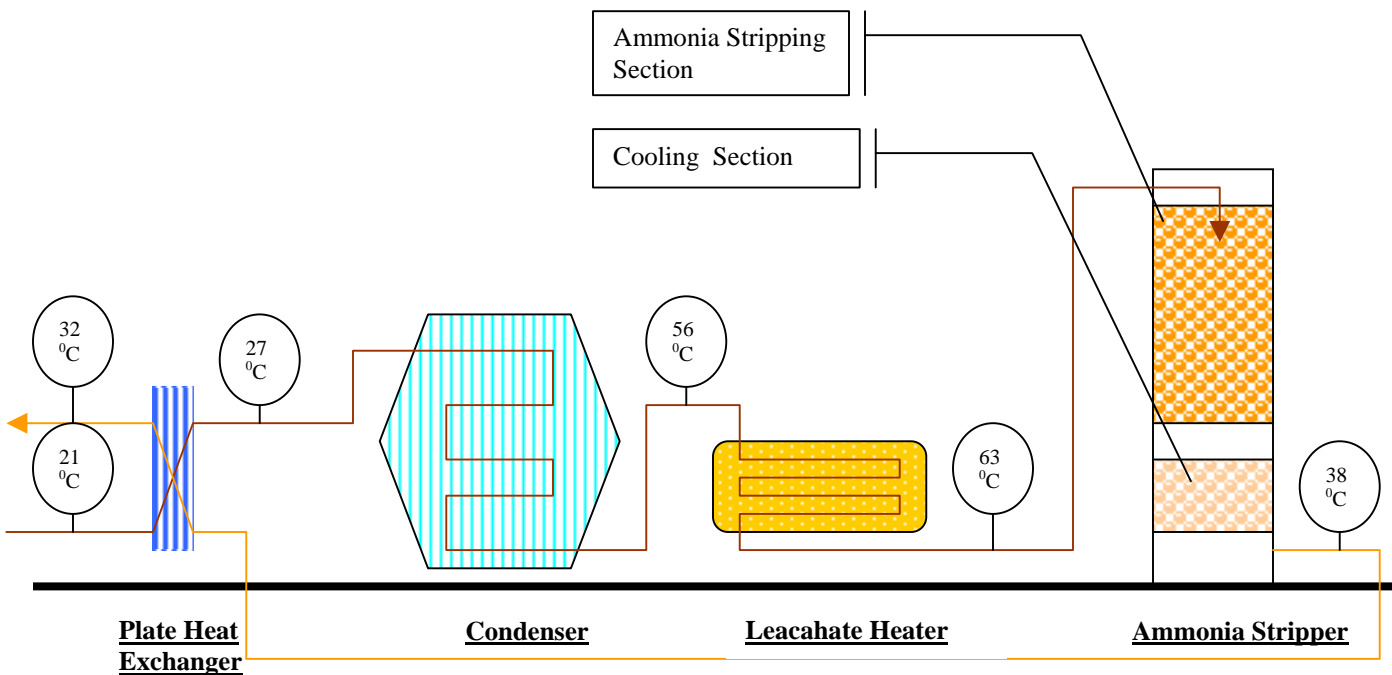
**Restoration of Tseung Kwan O Landfills**  
**Hardness tests on Leachate from the Leachate Treatment Plant LTP2 on 11 Dec 2003**

**Ordinary tests:**

		After buffer tank (~21°C)	After Condenser (from 27°C to 56°C)	After Stripper (the packing area) (from 63°C to 71°C)	After Cooling Section (the packing area) (from 71°C to 40°C)
Calcium (mg/l)		41	--	19	19
Magnesium (mg/l)		20	--	15	16
Carbonate, (mg CaCO3/L)		330	410	1,100	500
Bicarbonate, (mg CaCO3/L)		4,200	4,100	610	1,000

**Filtering tests for nuclei:**

Calcium (mg/l)		<1	--	300	54,000
Magnesium (mg/l)		1,900	--	3,100	16,000
Carbonate, (mg CaCO3/L)		<10	29,000	<10	330,000
Bicarbonate, (mg CaCO3/L)		45,000	<10	55,000	140,000



Tseung Kwan O Landfills have been fitted with HydroFLOW technology to minimise maintenance work on the Ammonia stripping tower and to maintain the heat exchangers efficiency.

The technology works on the principle of encouraging precipitation of dissolved solids by generating cluster of ions that acts as seed for suspended crystallisation of Calcium Carbonate in the form of individual calcite crystals.

There are various versions of Hydropath technology for different applications. We have used the HydroFLOW S units to treat our steam boilers enabling us to supply the boilers with untreated borehole water. HydroFLOW

C units have been used on the Ammonia stripping tower and on the heat exchangers. We are experimenting with AquaKLEAR a version of Hydropath technology designed to flocculate suspended material to reduce the leachate suspended material

The test data above clearly shows the effects of HydroFLOW technology.

In the Ordinary test the bicarbonate starts high and the carbonate is low after the buffer tank. This changes a little after the condenser. The reason for this is that, the test method dissolves any carbonate that has crystallised.

The filtering method removes the crystallized carbonate before the test and it clearly shows the effects of HydroFLOW. This test should be preferred over the ordinary test to clarify the effects of HydroFLOW technology.

The bicarbonate starts high and the carbonate is very low after the buffer tank.

This reverses after the condenser clearly demonstrating the effect of HydroFLOW on suspended precipitation. If this did not occur the carbonate would be deposited on the condenser and leachate heater.

After the stripper the carbonate is minimal as it is in the form of individual calcite crystals. The bicarbonate increases as a result of the calcite crystallisation process,  $\text{CO}_2$  is released and some is picked up from the air this generate carbonic acid that combine with carbonate crystals thus forming bicarbonate that is dissolved in the unsaturated water.

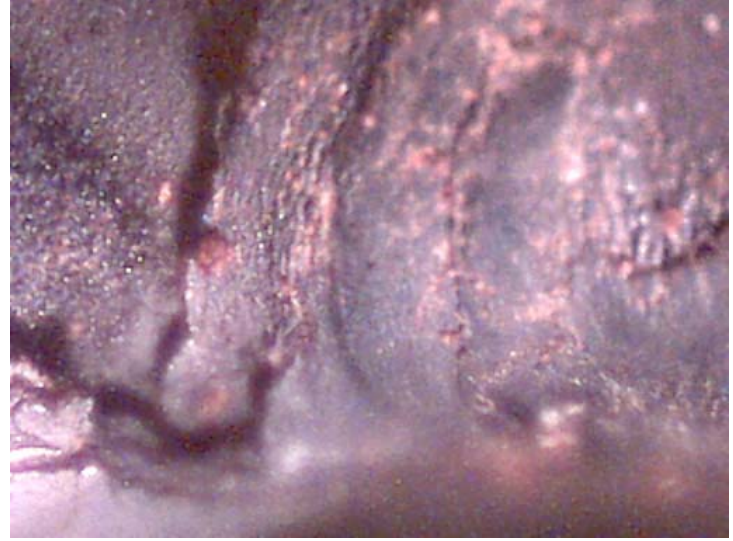
After the cooling the water is unsaturated and it dissolves more bicarbonate. The carbonate level is the highest as the result of the suspended calcite crystals.

After 80,000 cubic meter of leachate the stripping tower clearly still operational. At the 1<sup>st</sup> level the packing ware loose with a loose layer of individual calcite crystals loosely adhering to the packing.



A microscope enlargement clearly shows the individual calcite crystals.





Around the perimeter of the tower some packing exhibited deposits that are clearly not carbonate. It is like some low temperature melting material has settled on to the packing.



In the 2<sup>nd</sup> level, the packing were clear of crystals as all the loose crystals have been washed off.

An enlarged picture of the surface of the 2<sup>nd</sup> level packing shows the start of fragile formation of calcite crystals.

