

E.8 Waste Streams and Contaminants

Waste stream compounds	Potential hazard	Treatment techniques
CaCl ₂	High level of dissolved salts in waterways can cause the destruction of vegetation due to high chloride ion concentration.	No treatment is required for this stream as long as CaCl ₂ is not considered for commercialization. CaCl ₂ is non-toxic and can either be disposed of via burial or placed in a landfill. Additionally, a more expensive method such as evaporation to dryness can be used.
Waste water stream with trace amounts of insoluble solid	One of the main sources of waste water is the distillation. The environmental impact depends on the purity of the raw materials and on the absorption capacity of the aquatic environment in which the waste water is released. Additionally, heavy metals can be present in the main raw materials and eventually be released with suspended solids in waste waters from distillation. The other source of waste water comes from the brine purifications and is brine with suspended precipitated CaCO ₃ and Mg(OH) ₂ .	To manage the emissions in water a total dispersion can be done which ensures that the solid material is assimilated with the natural sediments of similar composition. Another technique is deposit/dispersion which is used when there is no suitable environmental medium to allow for total dispersion. This method involves the separation of liquid and solid phases. The liquid phase is discharged to a local watercourse with or without pH adjustment. With the solids, either an underground deposition can be done, or they can be settled in ponds. Finally, there is a liquid effluent discharge option as well as the option to recover and re-use by-products from the waste water. This last method is not viable because it requires a large amount of energy.
Solid waste (Sludge)	Insoluble compounds are more troublesome than liquid solutions because they accumulate on the waterways where they are discharged	A technique that can be used is split precipitation which reduces the amount of insoluble solids in brine purification. A solution to reduce the amount of solid waste within the system is to use almost pure limestone (with minimal heavy metal and MgCO ₃ content).

Thermal pollution	<p>Because the Solvay process is very exothermic, very large amounts of heat are liberated into the environment and waterways. Extreme heat in waterways can cause the death of aquatic organisms.</p>	<p>Water from nearby lakes, rivers or the ocean can be added to cool down the waste. Another solution could be using expensive heat diffusers.</p>
Dust	<p>The production of dust can cause allergies and respiratory problems for the people working in the Solvay plant or nearby, as well as potential dust explosions.</p> <p>The Air Quality Standards Regulations 2010 require that concentrations of PM in the UK must not exceed:</p> <ul style="list-style-type: none"> • An annual average of 40 $\mu\text{g}/\text{m}^3$ for PM10; • A 24-hour average of 50 $\mu\text{g}/\text{m}^3$ more than 35 times in a single year for PM10; • An annual average of 25 $\mu\text{g}/\text{m}^3$ for PM2.5. 	<p>This can be addressed by improving truck loading facilities or upgrading dust suppression systems in the plant. Eye protection should also be worn by all employees in the plant.</p>