

## BENEFITS OF LEACHATE RECIRCULATION

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Leachate is a dark smelly liquid that comes out of anaerobic heaps of decomposable waste. When it flows on land or enters nearby open wells it kills off vegetation and makes the water unfit for irrigation or any domestic use, let alone potable. It is extremely difficult to treat in conventional wastewater treatment plants.

Leachate has a COD (Chemical Oxygen Demand) of 25,000-40,000 vs 250 allowed in the MSW Rules for treated leachate, which means it consumes all the oxygen in the soil or water. It is about as salty as seawater, having TDS (Total Dissolved Solids) of 30,000 – 75,000, vs 2100 allowed.

But leachate contains a large number of microbes suitable for decomposing biodegradable wastes. The Colombo compost plant found it a far better inoculant than any commercial bioculture they tried. So when added to large anaerobic heaps, either scientifically engineered lined landfills in the west or open dumps in India, it speeds up decomposition, heats up the heap and releases methane faster. This makes the landfill or heap volume decrease faster than without injection of leachate. So beginning in 1970s, it is now standard practice for landfill management in about 70% of landfills abroad.

Spraying, drip-irrigating or injecting leachate from the bottom of a waste heap into the top of it is called Leachate Recirculation.

An added benefit is that the heat of the heap evaporates quite a bit of the injected leachate. This can be seen as “steam” coming out of turned windrows or when heaps of old waste are moved. So leachate recirculation actually reduces the cost of waste needing transport and treatment abroad. In India Leachate Recirculation can drastically reduce the volume of leachate flowing untreated into surface waters and groundwater.

This can be done in three ways :

Spraying the surface is not recommended as it creates intense odours and cannot penetrate deep into waste;

Drip irrigation via perforated horizontal pipes, which need to be laid in place during heaping of the waste, with a porous trench of gravel around the pipes for dispersal;

Vertical injection into old heaps of historic waste where Leachate recirculation has not been pre-planned.

This must be adopted in India. A beginning can be made with large landfills like Bangalore's Mandur or Mavalipura, where fresh waste addition is stopped.

Holes can be made about 10 meters apart on the top of the heaps. They can be made with crowbars or rock-drills about 1-2 meters deep. Leachate can be injected into these holes with a perforated pipe, entering initially by gravity rather than high pressure.

As these landfills have several soil layers with less porosity than the mixed waste between them, the amount that can be absorbed by gravity feed alone will be known only by trial and error. Initially quite a lot of collected leachate can be pumped into these holes as the waste will not be very moist. This can considerably reduce the volume of existing leachate lying in collection ponds or evaporation ponds, at negligible cost and great environmental benefit.

Leachate will continuously come flowing out of the old heaps in small to medium trickles. The volume of this leachate that can be absorbed during repeat injections into the same or preferably new holes will slowly decrease as the interior gets more and more moist. Again intelligent trial and error is needed. The heap must not get waterlogged or the slopes may start to slip.

Regular visual monitoring of the heap is necessary. One must watch for 'seeps' or wet patches or leaks and trickles on the slopes of the waste heap. If these are observed, leachate injection must be stopped for a while in that area. Also watch for cracks in the slope which could predict landslips. One must also monitor the flow rate of leachate coming out of the heap, at the beginning of the exercise and periodically. This is easily done by permanently keeping a simple V-Notch tinplate in the outlet stream(s).

Quarterly analysis of at least COD and TDS of the outflowing leachate will provide useful insights into what is going on within the heap. If any specific pollutants like heavy metals are present in high amounts initially, these can also be regularly analysed for.

These recommendations are made after discussions with India's most experienced landfill design firm with almost two decades of experience. Such firms can be invited to visit the trials landfills about 1-2 months after trials begin, to discuss the way forward.

### **USE OF LEACHATE IN FRESH WASTE WINDROWS**

Leachate addition to wind-rows of fresh waste is also very strongly recommended, both to introduce decomposing microbes into the heaps and speed up decomposition, but also to immediately consume all leachate as it is formed, leaving none requiring treatment. It will also hugely save on the requirement for precious fresh groundwater.

Under covered conditions, not much additional leachate will be produced during rains. Even then, though addition of water may not be called for, some leachate recirculation onto later heaps can reduce leachate volumes and speed up the composting process.