Biological Treatment only works when:

> the COD/BOD relation is 3/2 or better, means higher content of BOD.
This means the BOD content must be minimum 66% of the COD - better higher.
The residaual 33% is hard COD which is not biological degradable. So this part should be as low as possible.

But as leachate is never constant, when higher COD concentrations are in the leachate,
the residual COD, means the hard and non-biodegradable COD will leave the biological system into the river without any biodegradation!

Hard COD is very difficult to biodegradade with Biomass.
That is why it is called "hard" COD.

Biological Treatment only works when:

> the conductivity is lower than 20 mS.
It also work when conductivity is higher, but then it is a question of what salts are in the leachate.
Normally heavy metals but also higher concentraitons in NH4 will already inhibit the biomass.
The higher the salt concentrations are -> the lower is the biological acitivity.
The reason is that the higher salt concentration inhibits the biomass.

Example:
Our system in Tunesia is designed as follows:
Chemical-physical treatment, followed by MBR with Ceramic (Membralox) UF membranes, followed by DT.

Normally a bioreactor has its 10-15 g/l MLSS after 4 weeks development time for the bacteria. This is for good biodegradable Waste Water.
But in the Tunesian system, which is running since 6 months at 30-35 mSiemens/cm leachate,
only 2 g/l MLSS has been developped after the last 6 months and the biological performance is therewith limited.
Most of the COD/BOD reduction is caused by the chemical-physical treatment, but the Bioreactor does not really reduce COD and BOD because of the inhibited biomass by the high salt concentration.,
Therewith finally the RO has to do the main work, as the bioreactor is doing its job just for 20%.

So for leachate with very low salt concentrations, and with high BOD compared to COD a biological system works.
But with increasing salt concentration, the biological system becomes ineffecient.

System Combinations like Biological treatment followed by Activated Carbon are commen.
But here the activated carbon has to do the final polishing.
The lower the activity in the bioreactor the more adsorption is necessary via the Activated Carbon.
And therewith the Activated Carbon is faster contaminated and needs to be renegereated faster....

Regeneration of activated Carbon needs energy and a second filling that the system can continue to work.

We have one system installed in Aachen, where they normally use Biological Treatment with activated Carbon.
But this system always has trouble, so that since years they have rented a system from PALL.
Now they want to buy an RO as the water problems are still the same and they can not solve them with their traditional system.

So Biological Treatment only works under limited and controlled conditions - DT always works - independent on COD/BOD relation and independent on salt concentrations.

The next point is: Why always Bio with NF??
The NF will still let some ions pass and you need more or less the same membrane surface! There RO is much better, as all possible ions will be rejected.
And in both cases you have concentrate, which needs to be discharged , further treated, reinjected, incinerated or whatever!"
Please find some slides with arguments attached: