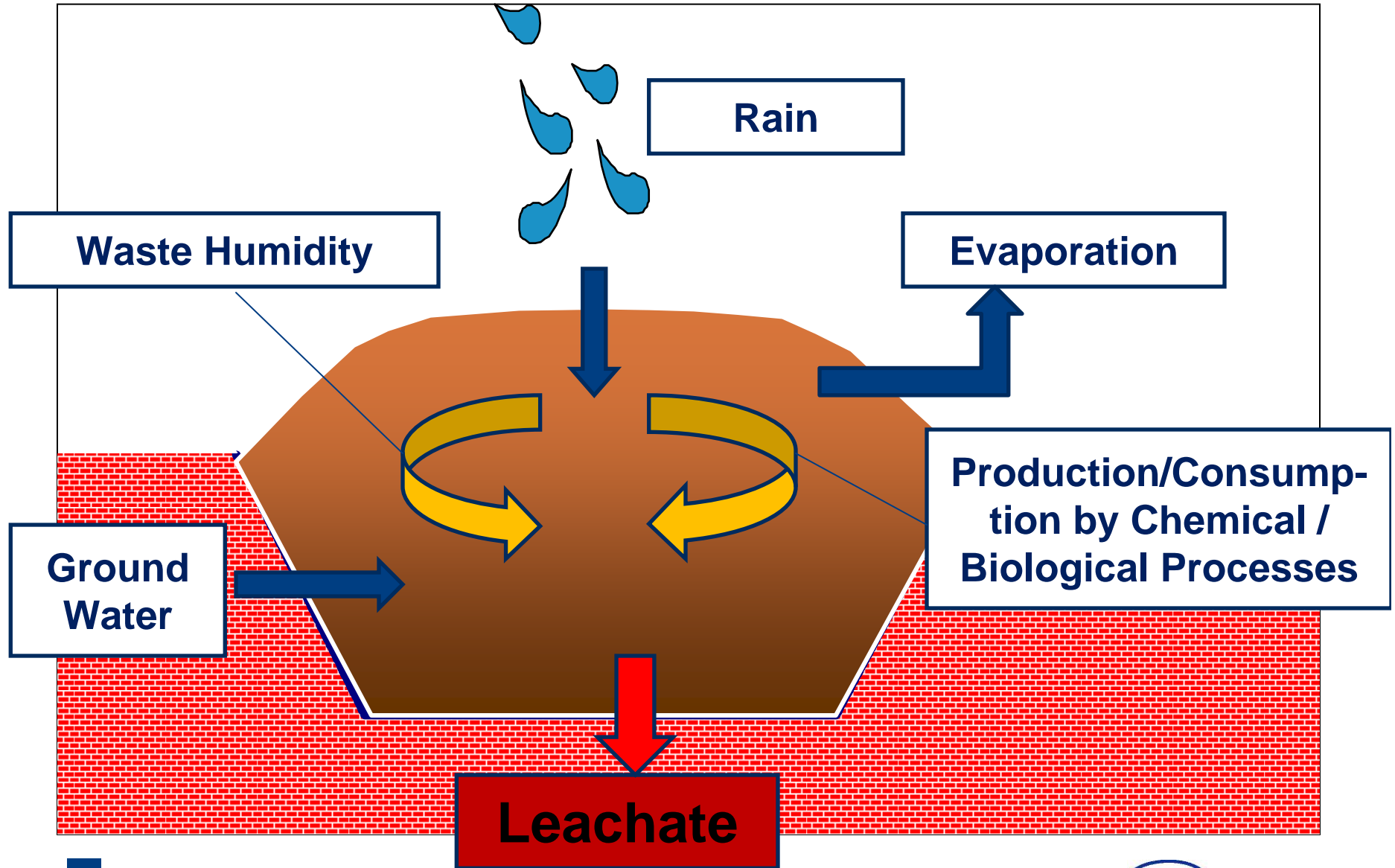
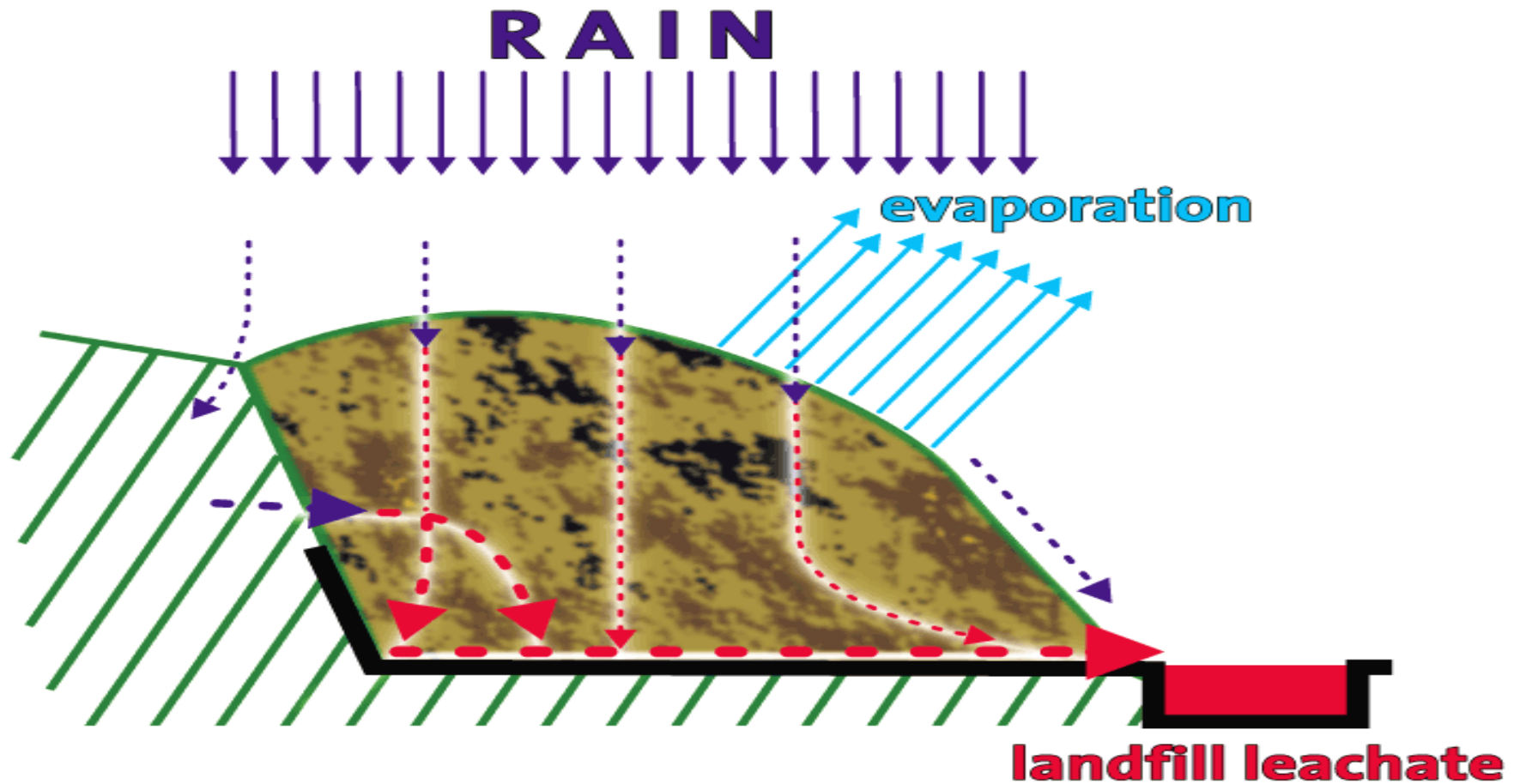


**Why has
Reverse Osmosis
become the
State-of-the-art-technology
for treating leachate
from landfills across Europe?**

Leachate Formation in Landfills

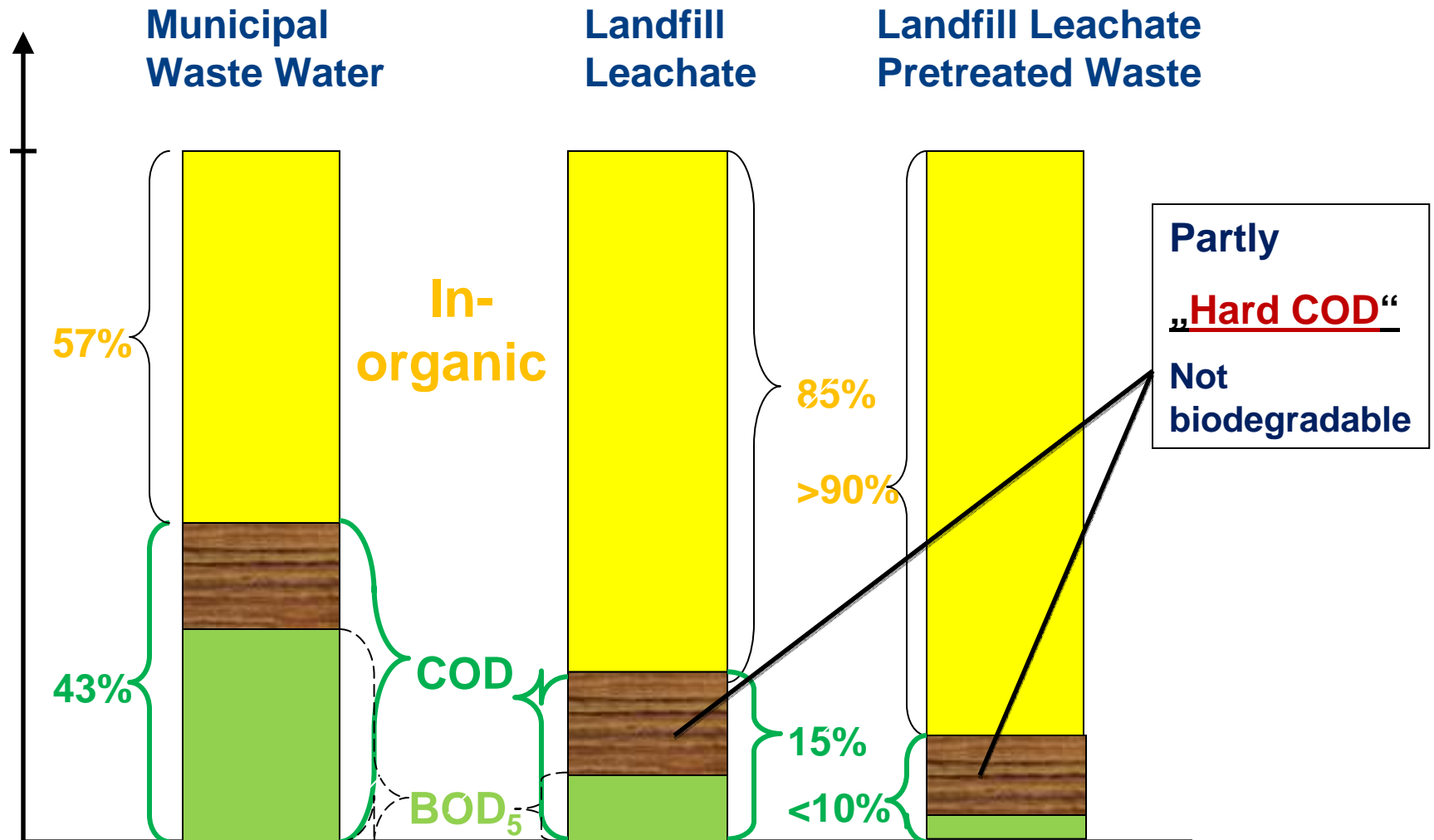


Why Treatment of Landfill Leachate ?



“Landfill leachate is liquid poison!”

Rough Mass Balance for components dissolved in Leachate



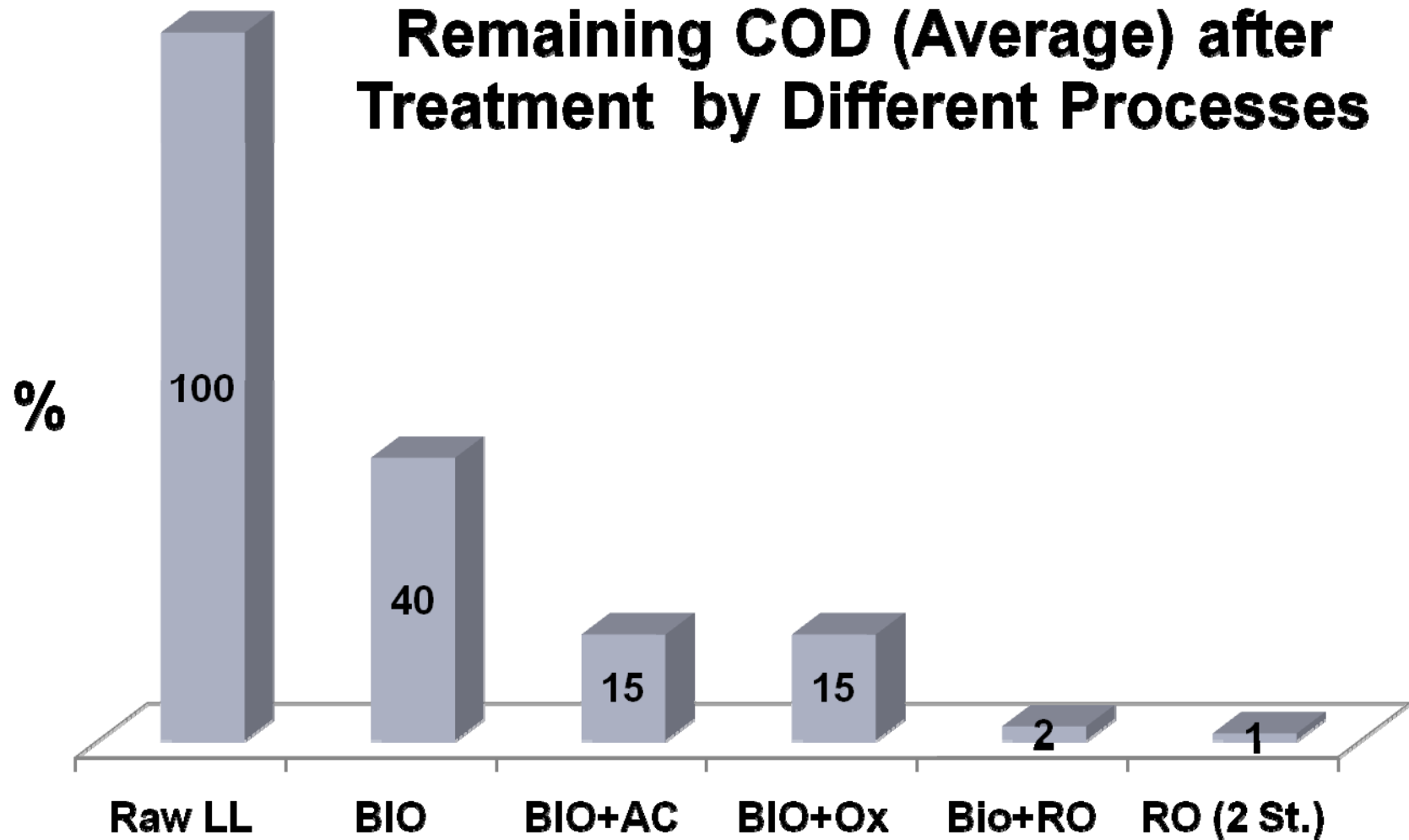
Performance of Processes for Treatment of LL

	COD	N NH ₄ ⁻	AOX	H. Metals	Advantages	Disadvantages
Adsorption at Activated Carbon	+	-	+	-	Easy Handling, Re-generation possible	Big Qnty of Waste for Disposal / Regeneration
Biological Process	○	+	○	-	Suitable as First Treatment Step	Limited Performance, Sludge Disposal required
Chemical Oxidat.	+	○	+	○	Small Qnty of residues	High Energy Demand
Evaporation/ Drying	○	○	○	+	Process suitable for further processing of concentrated liquids	Very high Energy Demand, product for disposal, Material problems
Flocculation/ Settling	○	-	○	+	Easy handling	Poor Performance, chemicals required, high sludge quantity
Rembrane Process (Reverse Osmosis)	+	+	+	+	Best Quality of Purified Water High Availability	Disposal/Infiltration of Residual Leachate (concentrate) necessary
Stripping	○	+	○	-	Usable Product (Ammonia)	Limited Application, Treatm. of Exhaust Gas required

Characteristics of RO for LL Treatment

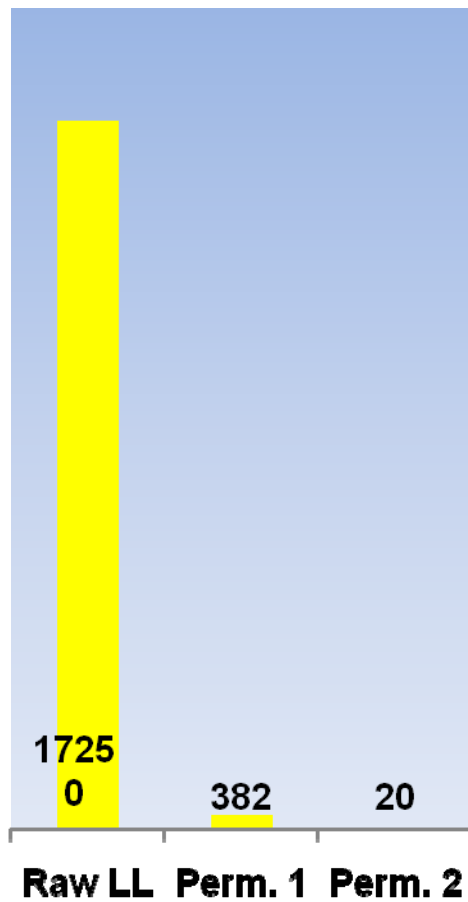
- Best Quality of Product Water (Permeate)
- Small Footprint
- Reliable at variations of Quantity and Quality
- Switch-ON / Switch-OFF Operation possible
- Plug & Play Installation
- Treated LL (Permeate) is utilizable
- Modular Construction with high Flexibility

Product Water Quality of some Treatment Processes

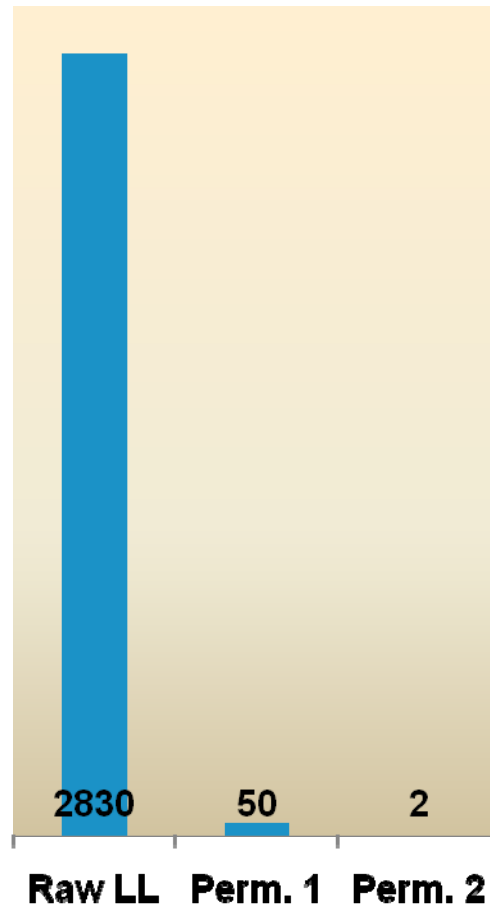


Product Water Quality after RO (1 / 2 stages)

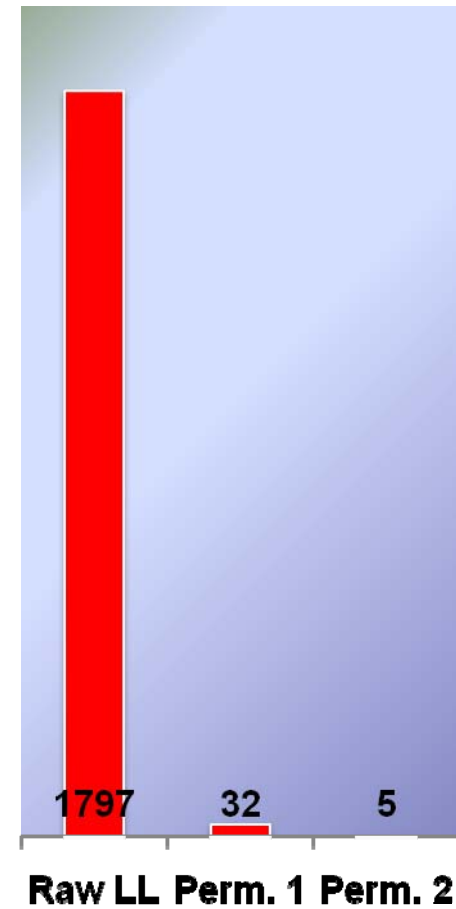
El. Conductivity ($\mu\text{S}/\text{cm}$)



Chloride Concent. (mg/l)



COD (mg/l)



Footprint of Treatment Plants for LL

Biological Treatm. Plant for 4 m³/h (100 m³/d)

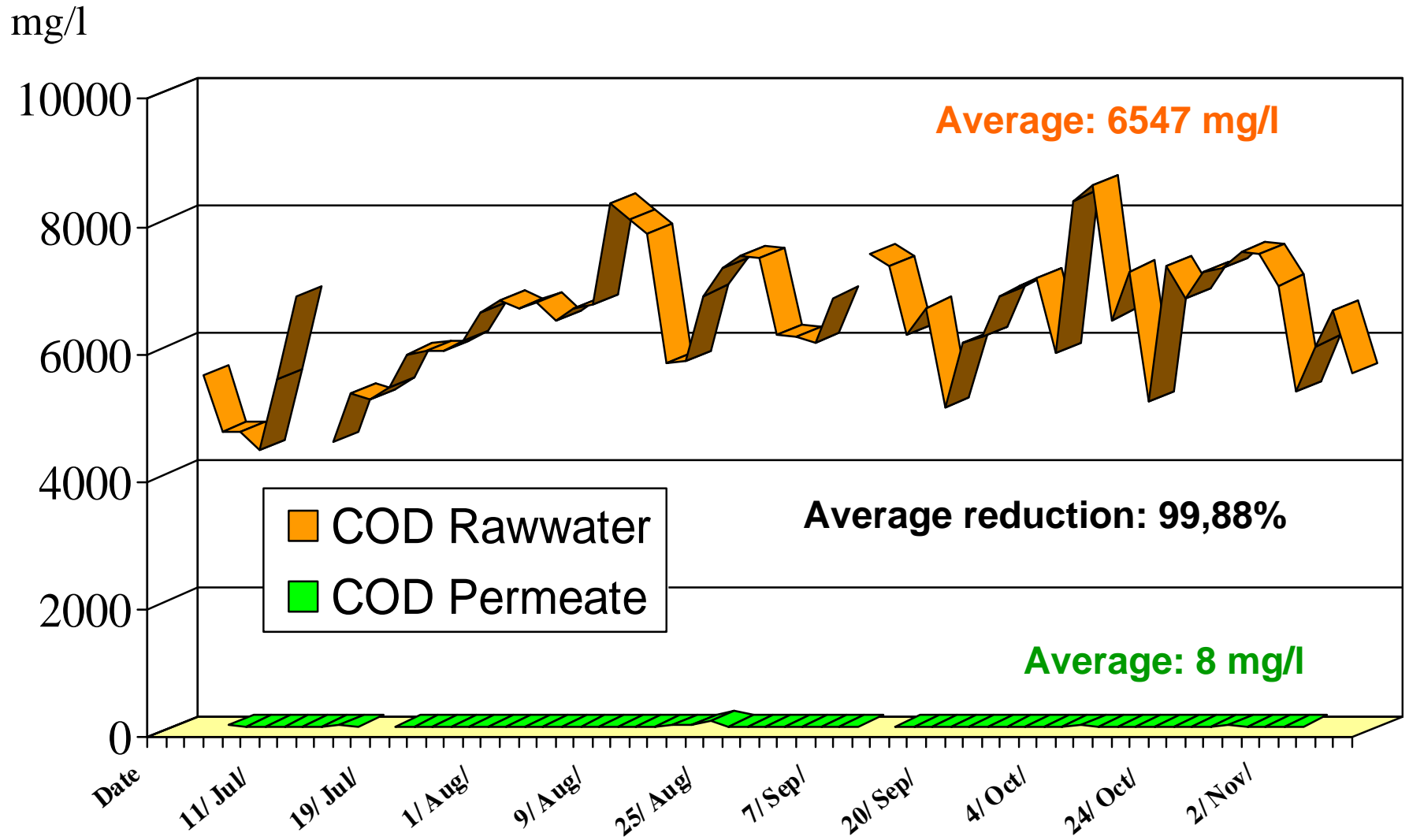


Footprint of Treatment Plants for LL

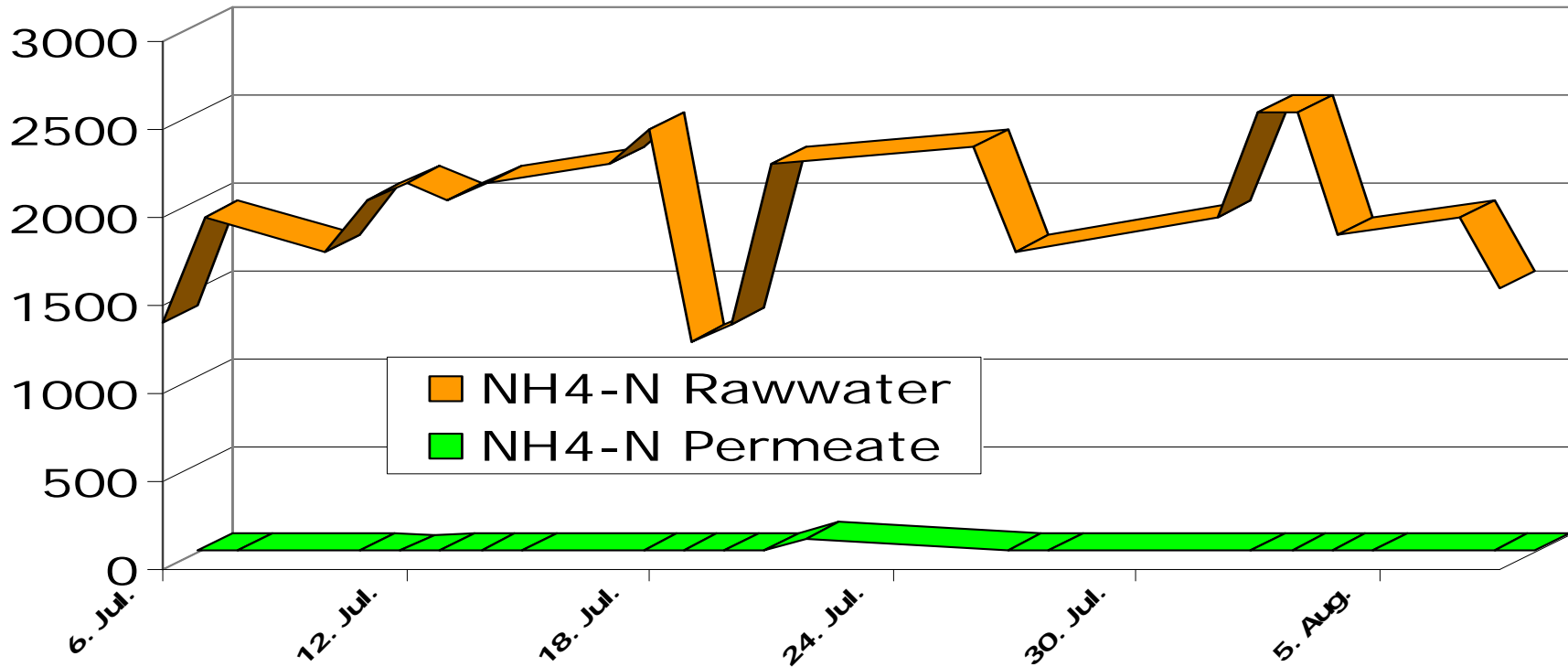
RO – Treatment Plant for 4 m³/h (100 m³/d)



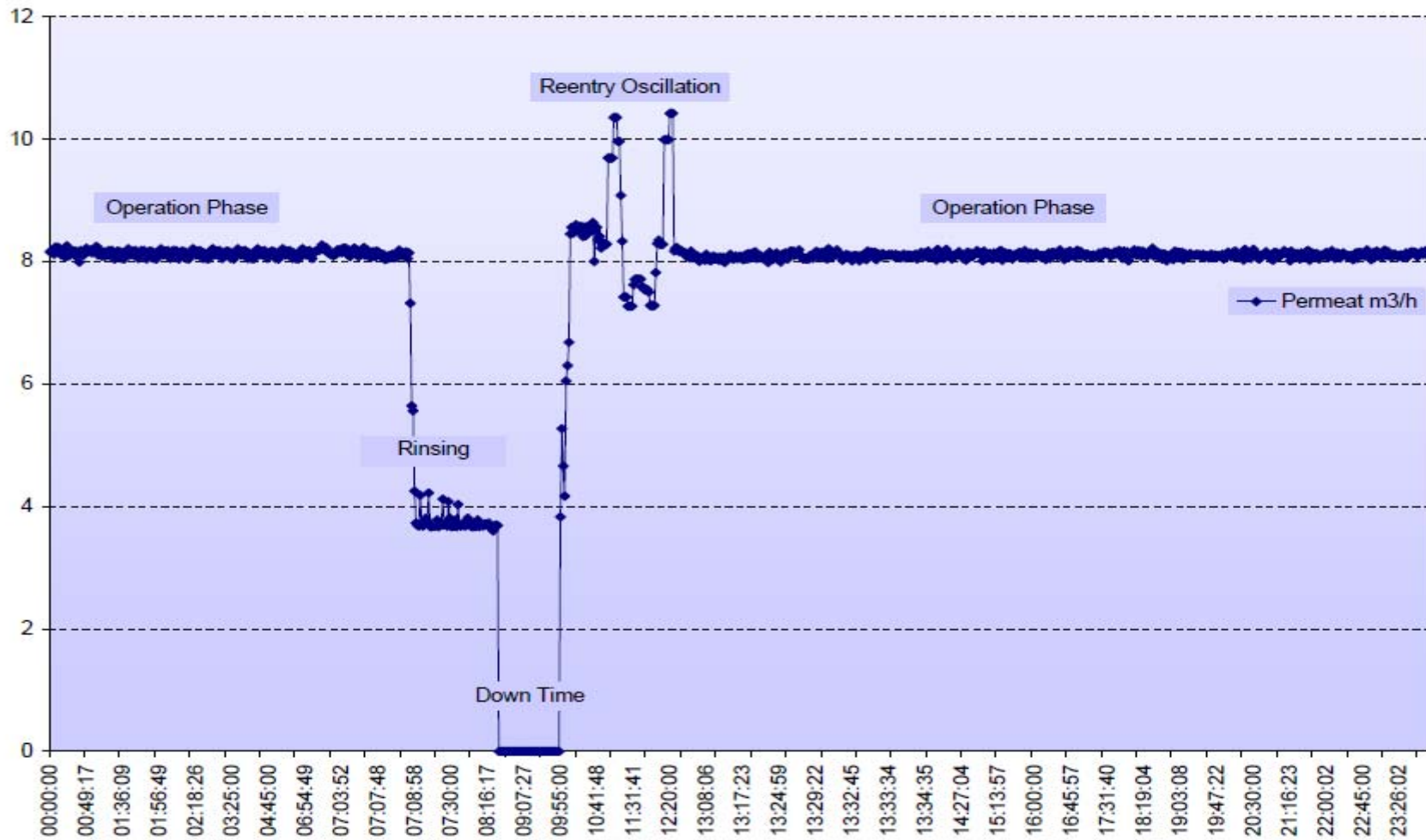
Indifferent to Variations in LL Composition: COD Removal



Indifferent to Variations in LL Composition: Ammonia Removal



Switch OFF /Switch ON - Operation



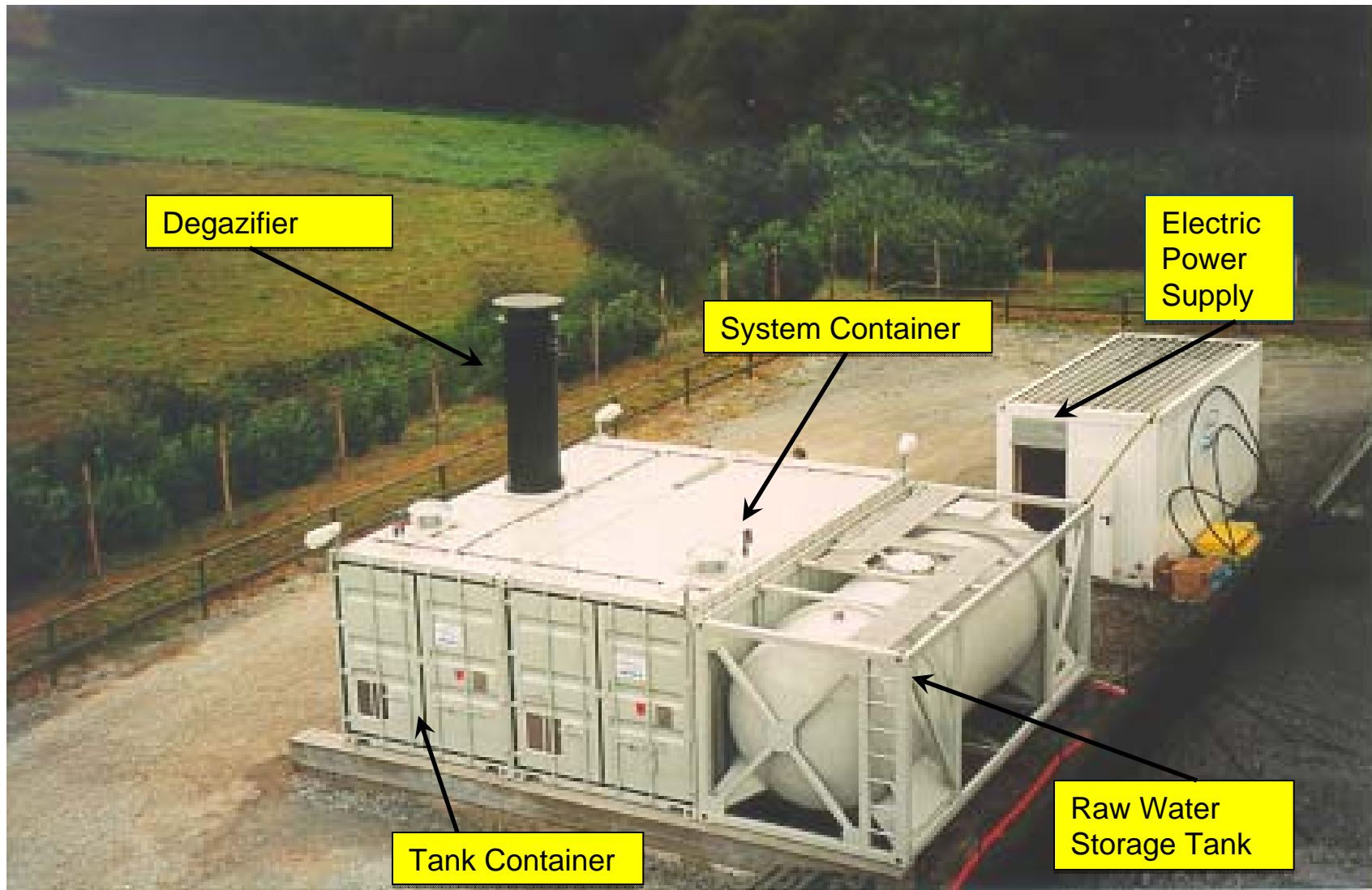
“ Plug and Play”: Containerized Mobile Installations

$Q_d = 90 \text{ m}^3/\text{day}$



$Q_d = 30 \text{ m}^3/\text{day}$

“ Plug and Play”: Modular System Elements



Products of LL Treatment

Utilization / Disposal of Products

Process	Bio / Bio + AC	Reverse Osmosis
Treated LL	<p>To Sewer (aftertreatment)</p> <p>No Utilization</p>	<p>Direct Discharge to Nature</p> <p><u>Utilization:</u> Irrigation Process Water</p>
Residues	<p>Sludge to Landfill</p> <p>Spent AC to external Disposal / Regeneration</p>	<p>Concentrate to Landfill or external Disposal</p>

Products of LL Treatment: Water Management by RO

