COMPARISON OF ODOUR CONTROL METHODS

		Photoionisation		Activated Carbon Filtration		Biological treatment		Chemical scrubber	
PROCESS GOALS									
Odour elimination	Efficiency	3	Neutralox treats odour, as a complex mixture of compounds. Efficiency: > 99%	3	Âctivated Carbon treats odour, not single compounds, Efficiency > 99%	1	Treats odour rather than compounds but with only 85-90% efficiency	2	Scrubber treats rather single compounds only, Odour reduction not higher than 98%
Desinfection	Elimination of viruses, germs, spores …	3	UV-light disinfects the air	0	No disinfection possible	0	Biologycal systems rather produce germs, spares, moulds	1	Disinfection probably possible through massive input of chemicals
TREATMENT									
High odour concentrations	e.g. several 100.000 OU/m³	3	Experience with sludge dryers, sewage pumping stations, ATAD's, …	1	High conc. may be treated, however paid by frequent exchange of carbon material	1	Applicable for low and medium concentrations	2	Applicable for high conc. of single compounds rather than odour as a mixture.
Fluctuating concentrations	Varying loads	3	Works well on spikes through integrated catalyst buffer.	2	Works well on high fluctuations, however paid by frequent exchange of carbon.	1	Nature of biology makes fast adaptions impossible	2	Depends much on the efficiency of the applied control and dosing system
Raw-gas requirements	Temperature, humidity…	3	No requirements	2	85% relative humidity should not be exceeded	1	Mesophilic temperatures and 100% humidity required. handling of spikes limited	2	Different stages require certain environments.
Enviromental sustainability	Waste production	2	UV-lamps recycled by manufacturer, disposed catalyst material is harmless and little in amount	2	Disposed activated carbon may be harmless, but has to be disposed in great amounts	2	Produced wastewater must be treated in wwtp	1	Air pollution is converted into water pollution and passed over to wwtp

TECHNOLOGY									
Reliability	The more external recources and additives required, the less reliable a process is.	3	Only electricity required.	3	Only electricity required.	1	Process requires electricity, water, nutrients. Biology needs to be maintained.	2	Process depends on availabilty of different chemicals. Control and dosing systems need to be maintained.
Handling	Ease of process increases reliability and availability	3	Compact build-up based on modules. No pipes, pumps, storage containers etc. required.	2	Compact build-up based on modules. Amount of carbon required maybe high No pipes, pumps, storage containers etc. required.	2	Humidifier, scrubber etc. require pipes, pumps, storage tanks, adjustment, cleaning …	1	Different chemical stages require pipes, pumps, storage tanks, adjustment, cleaning, handling of hazardous chemicals
Availabilty	Adaption time, start-up time	3	No adaption necessary. 100% availability given at any time.	3	No adaption necessary. 100% availability given at any time based on frequent exchange of carbon	1	Long adaption time after operation interruptions, breakdowns etc., several weeks after start-up	2	Adaption to some extend possible. Availability of process depends on availabilty of supplements (water, chemicals, heater, carbon)
Efficiency		3	High efficiency proved by numerous references.	2	High efficiency has to be ensured by frequent exchange of carbon.	1	Typically, in the range of 85-90% Inherent biologycal odour remains	2	Efficiency high on single compound, not on odour
Flexibility	Regarding changing loads and changing air-flow rates	3	Air-flow rates adjustable changing load accepted. Maintenance does not require stopping the OCU.	2	air-flow rates adjustable, changing load accepted. Limitations regarding accepted humidity.	1	Biology requires rather constant conditions. No modular build-up possible. Maintenance may require stopping the process.	2	Air-flow rate adjustable, but no modular build-up possible. Maintenance may require stopping the process.
Supplements demand	Chemicals, nutrients, other	2	Only UV-lamps and catalyst material.	2	Activated carbon frequently required, especially for high concentrated odours.	2	Filter media, water, nutrients	1	Different and hazardous chemicals frequently required.
Maintenance and operation demand		3	Apart from changing consumables, extremly low maintenance and operation demand.	2	Low operation and maintenance demand, however, often exchange of carbon necessary	1	Biology needs constant maintenance and care	1	Very high control and maintenance demand

COSTS									
Investment		2	Medium high investment due to premium quality materials	3	Low investment cost technology	3	Low investment cost technology	3	Low investment cost technology
Consumables		2	UV-lamps and catalyst material required once per year	1	Activated Carbon required frequently in great amounts	2	Biofilter media, water, nutrients, sometimes chemicals	1	Chemicals, activated carbon, water. Chemicals required frequently in high amounts
Operation		3	Only electricity required	2	Only electricity required, High pressure loss increses electricity demand	2	High pressure loss causes high elecricity demand. Water supply required; effluent treatment required	1	Complex monitoring and dosing system, produced effluent causes additional costs
Personnel		3	Process does not require permanent monitoring or maintenance	1	Activated Carbon must be exchanged frequently (every several weeks)	2	Biofiltration required permanent monitoring and care	1	Scrubbing system requires permanent monitoring and care
Total costs	According to VDI 2067 (Comparison of all relevant costs of the odour control project)	2	Depending on application total costs comparable, decentralised approach and modular build-up may reduce total costs.	2	Depending on application total costs comparable, modular build-up may reduce total costs.	2	Peripheral equipment like, pipes, pumps, storage tanks. increase total costs. Huge footprint!	2	Peripheral equipment like, pipes, pumps, storage tanks. increase total costs.

To summarize the above: **all odour treatment methods have a place**:

- Low concentrated odours (in the ppb or low ppm range) combined with low flow rates, maybe handled well with carbon filters
- Medium concentrated odours (low ppm range) and off-gas conditions and environmental suitable for biological treatment may be handled well with biofilters, even large flow rates, if space is available
- Chemical scrubbers handle single components well and are often a good fit for industrial applications. For complex odour mixtures, combination with a polishing stage (e.g. carbon filter) would be required. High maintenance demand.
- Neutralox Photoionization is applied for low and high concentrated odours, at places where efficiency and reliability counts. Low maintenance demand.