FN NANO Aqua in wastewater treatment plants and wastewater treatment

(Photocatalysis in the EU is classified as one of the emerging Best Available Technologies for waste water and gas treatment).

1. Basic principle of operation

FN NANO Aqua is applied to water or surfaces (e.g. walls, ceiling, tanks) where there is access to light - preferably UV-A (365 nm).

Within the material of FN NANO coatings is a light activated photocatalytic surface that has a strong antimicrobial effect. This effect is of a physical quality of the coating. This mechanism is based on the use of special coating morphology, its mineral composition, and the use of a semiconductor phenomenon, in which light energy produces free electrons and electron holes on the porous microcrystals of the titanium dioxide semiconductor. This means microorganisms cannot build immunity against this material leading to a permanent long lasting microbial resistance. Additionally, this is a physical mechanism and not chemical which means its effectiveness is consistent and effect is inexhaustible as long as light is present.

The photocatalytic effect creates a highly oxidizing surface that burns sticky organic substances (pyrene, tar, etc.):

- decompose organic substances in water (biodegradable and resistant)

- destroy bacteria, viruses and fungi without the use of chemicals

- neutralize odours (e.g. hydrogen sulphide, ammonia, mercaptans)

- can help reduce BOD, COD, nitrogen, phosphorus and pharmaceutical residues

2. Method of application

a) Application to water (suspension)

- FN NANO Aqua can be added directly to water at certain stages of treatment, especially in tanks with lower solids suspensions.

- It can be used in secondary or tertiary treatment stages where the water is optically clearer - this allows light to penetrate and activate the technology.

b) Application on tank and technology surfaces

- FN NANO Aqua can also be applied to internal walls, ceilings and process parts (e.g. filters, channels, decanting equipment).

- Here it acts as a protective and self-cleaning layer that permanently cleans the surroundings, prevents biofilm overgrowth and reduces microbial load.

3. Examples of benefits in practice

- Reduction of odour from wastewater (especially hydrogen sulphide and ammonia) - effect without the need for chemistry.

- Increased hygiene and biosecurity in the WWTP area - reduction of pathogen transmission to the surroundings.

- Promotion of biological treatment - degradation of resistant substances that are not easily degraded by conventional bacteria.

- Limiting the growth of cyanobacteria and algae in treated water before discharge.

- Possibility of regeneration and maintenance without downtime - the technology is passive and works all the time as long as it has access to light.

4. Advantage over conventional chemistry

- No toxic substances are added - no risk of water contamination.

- Does not affect biological processes (unlike chlorine, peroxide, ozone).

- It is cheap to operate - just light and FN NANO layer.

- It has long term effectiveness because it does not wear out.

5. Options in practice

- Small municipal WWTPs: improving runoff quality and reducing odour without investing in complex technology.

- Municipal WWTPs: promoting tertiary treatment, reducing residual pharmaceuticals and microbial load.

- Industrial wastewater: oxidation of organic pollutants and increasing the efficiency of treatment plants.

Summary

FN NANO Aqua offers a revolutionary, ecological, passive and economical way to support wastewater treatment. It is an ideal complement to existing WWTPs - increasing treatment efficiency, eliminating odours, while not interfering with biological processes. In the future, it can be an important tool in the modernization and greening of water management.

Model proposal for a specific application of FN NANO Aqua in an industrial wastewater treatment plant (WWTP), including the application method, expected effects and technical notes. I have chosen a model scenario that can be easily adapted for a specific industry (e.g. food, chemical, pharmaceutical or textile plant).

Model application of FN NANO Aqua in an industrial wastewater treatment plant

1. Application objective

- Increase in treatment efficiency (especially at the end of the line - tertiary stage)

- Removal of odours in the plant (especially hydrogen sulphide, ammonia, VOCs)

- Reduction of microbial load in the treated water

- Decomposition of residues of pharmaceuticals, pesticides, phenols, detergents, etc.

- Ecological support without chemicals

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2. Technical parameters of the operation

- Flow rate: e.g. 100 m³/day

- Industrial source: food industry (water containing organic residues, grease, protein, nitrogen)

- Line: mechanical pre-treatment → biological treatment (aerobic) → dosing tank → retention tank → discharge to the recipient

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3. Design of FN NANO Aqua application

A) Active suspension in water - application to retention tank

- Addition of FN NANO Aqua (e.g. at a concentration of 1:500 to 1:1000 as required)

- Provision of UV-A lighting (artificial or daylight, underwater or overhead LED UV-A modules can be used)

- Continuous mixing of water (e.g. Effect: decomposition of organic residues, reduction of COD, BOD, odours and microbial load

B) FN NANO coating on surfaces of technologies and tanks

- Application of a coating layer (FN NANO 3 or specially treated FN Aqua) on:

- Tank and canal walls

- Surfaces above the settling tank

- Interior areas of the technology where light can enter

- Lighting: installation of UV-A reflectors above exposed surfaces

- Effect: permanent cleaning, elimination of biofilm, odour

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4. Expected results

Parameter Change (indicative)

Odour (hydrogen sulphide, NH_3) Reduction of 80-100%

COD, BOD Reduction of 10-30%

Coliform bacteria Reduction of >90%

Pharmaceutical residues Significant reduction (detectable)

Cyanobacteria, moulds Suppression of occurrence

Chemical consumption Possibility of reduction (e.g. coagulants, deodorants)

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5. Benefits for operators

- Reduced costs for chemicals, deodorants, biofilm maintenance

- Improved final water quality, which can be important for emission limits

- Increased hygienic safety for staff and the surrounding area

- Low operating costs (virtually zero after installation)

- Independence of pollution type - works on a wide range of substances

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6. Possible additions

- Monitoring: it is recommended to measure COD, BOD, microbial content and odour components before and after implementation

- Long-term efficiency: the technology does not wear out, just need to maintain light access

- Safety: the FN NANO Aqua is non-toxic, certified and approved for application in aquatic environments

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7. Note on operation

Should there be little light in a retention or drainage tank, simple LED UV-A panels with minimal power consumption (e.g. 20-50 W) can be deployed to allow activation of photocatalysis even at night or indoors. When installed on tank surfaces, a minimum of 6 hours of daylight is recommended.
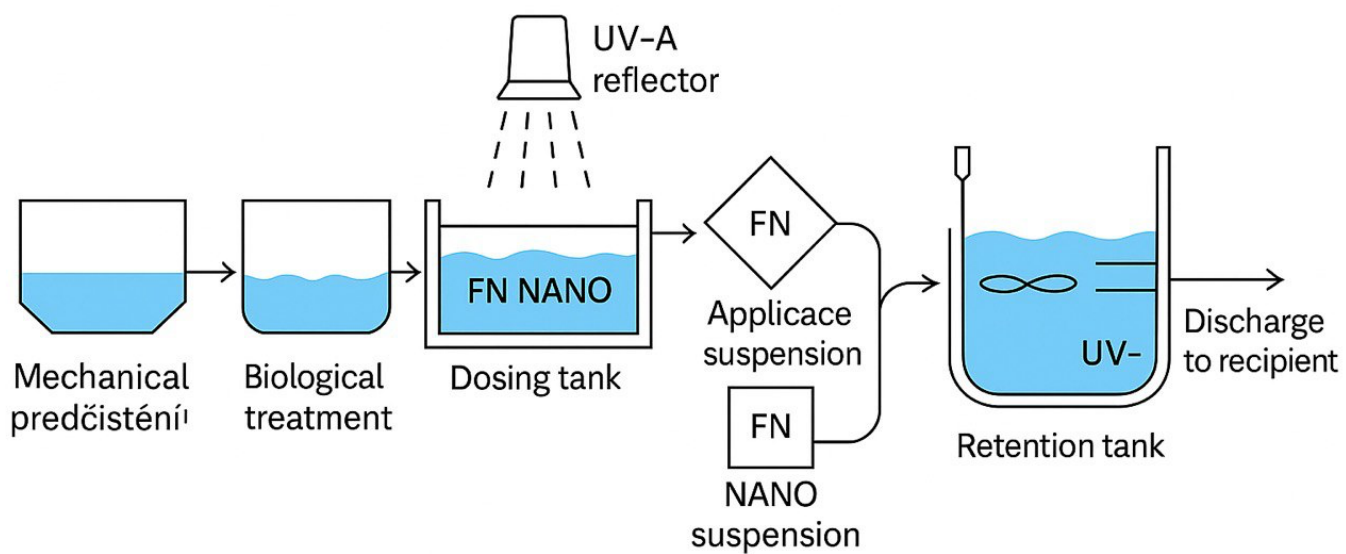
Application of FN NANO Aqua in Industrial WTTP