CONTINUOUS MONITORING OF WASTEWATER TREATMENT PLANTS BASED ON AN ENVIRONMENTAL MANAGEMENT SCHEME

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M. Nieto, R. Irusta, D. Hidalgo
M. Gómez, L. Martínez, C. Casado,
Y. Núñez & Poncela
Environmental Division

Environmental Technology

- Solar photocatalysis in gas and liquid phase.
- Advanced Oxidation Processes (POA´s).
- Advanced treatment of effluents and polluting emissions.
- Development of advances composites.
- Use of natural stone waste products.
- Valuation of waste and sub-products.
- Chemical recycling of plastics.
- Ecodesign.
- Life Cycle Assessment.
- Environmental Risk.

Environmental Management

Environmental Division
Head of Division: Rubén Irusta Mata

📞 +34 983 14 38 03  
📞 +34 983 54 65 21  
✉️ mannie@cartif.es
I. Environmental Management Scheme (EMS).

- Key elements of an EMS applied in a WWTP.

III. Environmental Aspects.

IV. Advantages of the establishment of an EMS in a Wastewater Treatment Plant (WWTP).

V. Conclusions.
Water is an environmental, social and economic asset and which needs to be managed with the objective of conserving a common resource in the interests of the community at large.

The inappropriate management of a WWTP is worse than no management in most cases, and this is the main problem that can create significant obstacles in the safe reuse of the treated wastewater.

An easy way to prevent the mentioned problem is a continuous and regular monitoring of the operation of the WWTP, implementing an Environmental Management Scheme.
Development of guidelines for setting and regular review of internal targets or programs for continuous environmental improvement in the Mediterranean Wastewater Treatment Plant (WWTP).

Development of Tools and Guidelines for the Promotion of the Sustainable Urban Wastewater Treatment and Reuse in the Agricultural Production in the Mediterranean Countries. MEDAWARE PROJECT
Continuous Monitoring of WWTP based on an EMS

ENVIRONMENTAL MANAGEMENT SCHEME (EMS)
The term “Environmental Management” refers to all actions that contribute to:

- **Fulfilling** the environmental legislation requirements.
- **Improving** the environmental protection.
- **Reducing** the organization impacts on the environment.
- **Controlling** the processes and the activities that generate them.

The main purpose of an EMS is to determine what elements the organizations should consider in environmental protection.

An EMS is appropriate for all kinds of organizations of different sizes in both, public and private sectors.
THE INTERNATIONAL STANDARD ISO 14001:2004
The International Standard ISO 14001:2004:

- Helps organizations to manage the environmental aspects of their operations while always working towards Continuous Improvement.
- Is structured following the Deming Cycle of the Total Quality Management.
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**ISO 14001:2004 Requirements**

**PLAN**

4.2 ENVIRONMENTAL POLICY

4.3 PLANNING
- 4.3.1 Environmental aspects
- 4.3.2 Legal & other requirements
- 4.3.3 Objectives & targets, and programs

**DO**

4.4 IMPLEMENTATION AND OPERATION
- 4.4.1 Resources, roles, responsibility & authority.
- 4.4.2 Training, awareness & competence
- 4.4.3 Communication
- 4.4.4 Documentation
- 4.4.5 Control of documents
- 4.4.6 Operational control
- 4.4.7 Emergency Preparedness & Response

**CHECK**

4.5 CHECKING AND CORRECTIVE ACTION
- 4.5.1 Monitoring & measurement
- 4.5.2 Evaluation of compliance
- 4.5.3 Non-conformance, corrective action & preventive action
- 4.5.4 Control of records
- 4.5.5 Internal audit

**ACTIONS**

4.6 MANAGEMENT REVIEW
4.2 Environmental Policy

The Environmental Policy commitments are:
- Continuous Improvement.
- Pollution prevention.
- Compliance with relevant laws and regulations.

4.3.1 Environmental Aspects

The International Standard ISO 14001 requires a procedure that:
- Identifies the environmental aspects.
- Provides a methodology to determine the significance.
- Keeps the information up to date.
4.3.3 Objectives & Targets

The purpose is:
- To help the SSWWT to translate its environmental goals into specific actions that can be measured.
- To avoid or minimize the environmental impacts.

4.3.3 Environmental Management Program

The Environmental Management Program is a set of detailed plans and programs explaining how the objectives & targets will be accomplished:
- WHO?
- HOW?
- WHEN?
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Key elements of an EMS applied in a WWTP

4.4.7 Emergency preparedness and response

This EMS requirement is a procedure to identify potential emergency situations and accidents that could produce environmental impacts and how the system will respond to them.

4.5.1 Monitoring and Measurement

Monitoring and measurement enable a WWTP to:

- Evaluate environmental performance.
- Analyse root causes of problems.
- Assess compliance with legal requirements.
- Identify areas requiring corrective actions.
- Improve performance and increase efficiency.
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Key elements of an EMS applied in a WWTP

Other EMS requirements

- Legal & other requirements.
- Resources, roles, responsibility and authority.
- Training, awareness and competence.
- Communication.
- Documentation.
- Control of documents.
- Operational control.
- Evaluation of compliance.
- Non-conformance, corrective and preventive action.
- Control of records.
- ....
ENVIRONMENTAL ASPECTS
Reviewing all the activities and treatments of the WWTP that present an environmental risk, to determine the source and the specific activities that produce or could produce environmental impacts

(*) Unit operations in a typical municipal WWTP.
The following items should be considered during the identification and evaluation of environmental aspects:

- Potential spills.
- Emissions.
- Generation and management of all kind of waste.
- Soil pollution.
- Use of natural resources.
- Use of substances or dangerous products.
- Smells, noises.
- ...
Besides, irregular situations should be kept in mind:

- Accidental spills and leaks.
- Explosions.
- Fire.
- Accidental emissions (out of control).
- Demolitions: torrential rains and winds.
- Electric, mechanical damages.
- ...
Those aspects that produce or could produce important environmental impacts will be considered as “Significant Environmental Aspects”.

The environmental assessment should cover different aspects:

- **Environmental:** Considering the intensity, the severity, and the probability of occurrence of the impacts.

- **Business:** Considering the legal responsibility related to the environmental impacts, the difficulty of elimination, the costs, the effects on other activities, the stakeholders, the public image of the organization, etc.
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Environmental Aspects & Impacts in a typical WWTP

ENVIRONMENTAL ASPECTS

- Odours generated by screening, grit removal, primary treatment, etc..
- Construction activities
  - The use of operating equipment such as pumps and air blowers, etc..
- Birds, Insects and other animals can infest WWTP equipment
- WWTP located near commercial and residential areas
- Overflow or bypassing of wastewater
  - Wastewater discharge to watercourses
  - Pollution of receiving water courses

ENVIRONMENTAL IMPACTS

- Degradation of air quality
  - Odour Nuisance
- Noise
- Sanitation problems
  - Noise
- Visual aesthetic
- Reduction of water quality
  - Degradation of surface and groundwater
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Environmental Aspects & Impacts in a typical WWTP

**ENVIRONMENTAL ASPECTS**
- Water stress
- Insufficient water allocation
- Inadequate sludge disposal
- Sludge from WWTP or wastewater pumping stations and collection systems
- Energy consumption
- Solid waste

**ENVIRONMENTAL IMPACTS**
- Depletion of water supply
- Degradation of soil quality
  - Land contamination
- Depletion of natural resources
AVOIDANCE AND MINIMIZATION MEASURES TO TAKE IN A WWTP
Continuous Monitoring of WWTP based on an EMS

Avoidance & Minimization Measures to take in a WWTP

**ENVIRONMENTAL IMPACT**

Degradation of air quality
Odour nuisance

**AVOIDANCE AND MINIMIZATION MEASURES**

- Install of inspection and control equipment
- Monitor atmospheric conditions
- Safe working systems and emergency measures
- Chemical and biological Inhibitors
- Operational procedures
- Vegetation
- Odour treatment (tank covers, biofilters, chemical scrubbers, etc.)
- Prevailing wind direction

- Mitigate noisy equipment
- Notably air handling
- High-speed pumps
- Compressors
- Engine driven generators
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**Avoidance & Minimization Measures to take in a WWTP**

**Environmental Impact**
- Sanitation problems and Noise
- Visual aesthetic
- Reduction of water quality
- Degradation of surface and groundwater

**Avoidance and Minimization Measures**
- Wires, screens, or other barriers
- Herbicides and soil sterility
- Buffer zones
- Wastewater treatments more efficient
- Adequate wastewater treatments to the water characteristics
- Adequate pre-treatment of industrial wastewater
- Efficient monitoring and enforcement
- Intercept discharges
- Environmental management pollution control
- Impermeable layer that allows solid waste to be collected for subsequent treatment
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Avoidance & Minimization Measures to take in a WWTP

ENVIRONMENTAL IMPACT

- Depletion of water supply
- Degradation of soil quality
- Land contamination

AVOIDANCE AND MINIMIZATION MEASURES

- Install standby equipment at pumping stations
- Use dual power supply system
- Sludge should be tested to ensure compliance with agricultural standards
- Dispose of sludge at sanitary landfills
- Timely clean-up and transportation in covered containers
ADVANTAGES OF THE ESTABLISMENT OF AN EMS IN A WWTP
Advantages of the establishment of an EMS in a WWTP

There are important arguments in favour of implementing an EMS in to the general management of the WWTP:

- **Optimisation** of resource consumption.
- **Greater knowledge**, improvement and control of the activities and services developed in the WWTP, that leads to an increase of the efficiency.
- **Motivation** of the employees to participate in the improvement of the WWTP and their involvement in obtaining satisfactory results.
- **Improvement** of the image and social recognition of the WWTP.
Advantages of the establishment of an EMS in a WWTP

- **Identification and evaluation** of the WWTP environmental impacts and comparison with the legal requirements. This allows the WWTP:
  - To anticipate to the market demands.
  - To achieve resources savings.
  - To reduce costs.
  - To implement continuous improvement.

- **Establishment** of the bases of an effective Management Scheme in the WWTPs.
CONCLUSIONS
The implementation of an effective EMS in a WWTP allows to:

- **Identify** the environmental aspects that would arise from the past, existing or planned activities and services.
- **Determine** the significant environmental aspects.
- **Set appropriate avoidance and minimization measures** of the environmental impacts.

The appropriate management of a WWTP, by implementing an EMS, is a way to guarantee an effective Wastewater Treatment.
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CARTIF Foundation
Boecillo Technology Park, 205
Boecillo (Valladolid)-SPAIN
www.cartif.es
+34 983 14 38 03
+34 983 54 65 21
mannie@cartif.es