

ENVIRONMENTAL PERFORMANCE INDICATORS IN AIR QUALITY MANAGEMENT PROCEDURE IN FERTILIZER PRODUCTION

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ABSTRACT

Petrokemija d.d. Fertilizer Company developed an environmental management system that was certified to ISO 14001 in November 2003. As part of the development of its environmental management system the company identified its significant environmental aspects and set environmental performance criteria (objectives and targets). As shown in this paper, Petrokemija established a set of indicators considering of which helps management of identified environmental aspects. The significant environmental aspects of fertilizer operation include emissions to air (e.g. ammonia, nitrogen oxides, sulfuric dioxide, fluorides as well as particles of raw material and finished products), emissions of substances in waste water (e.g. nitrogen and phosphorous compounds) and wastes. Petrokemija's environmental criteria are expressed in the company Environmental Policy. Examples of the criteria particularly linked to the use of indicators include commitments to:

- reduction of environmental pollution (emission reduction and better waste disposal) and environmental impacts resulting from fertilizer production
- pollution prevention
- resource saving
- continuous improvement of environmental performance.

In order to evaluate the results of technology changes, legal compliance, and overall environmental performance Petrokemija selected environmental condition indicators (e.g. concentrations of gas emissions in the air in the vicinity of the company, and operational performance indicators (e.g. emission factor) in measurable units. An internal report to the management (Management Review) informs them on the development of indicators and the extent to which objectives have been achieved. These indicators are also very useful managerial decision-making tool.

INTRODUCTION

Petrokemija d.d. is a manufacturer of fertilizers, carbon black, and bentonite clay-based products, also offering services in the field of development, designing, supervision, maintenance, calibration, quality control and consulting. Fertilizers, main products of the company are vitally important for the society, particularly for production of sufficient food for the growing population. However, fertilizer production processes have influence on the local, and to a certain extent also regional and global environmental pollution. The quality of products and services as well as customer satisfaction have always been Petrokemija's high priorities. Specific to the company complex is the vicinity of the residential area. Because of that the care about environment and neighbors were placed as priority activities, too.

The company has been certified as meeting the requirements of ISO 9001 and ISO 14001 [1] and the two management systems are integrated. The activities of systems implementation are presented in Table 1.

Year	A C T I V I T I E S	
	QUALITY MANAGEMENT SYSTEM (QMS)	ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)
1991	Managerial decision on ISO 9001 implementation.	System development and improvement as a part of quality management system.
1992-1995	System development and improvement.	
1995	System is certified to ISO 9002:1984	
1997	Managerial decision on ISO 9001:1994 implementation.	Team for environmental management system was formed.
1998	System is certified to ISO 9001:1994	Preliminary review of EMS. Managerial decision on ISO 14001:1996 implementation.
1999	The Quality and Environmental Policy is made public.	
2000	Managerial decision on ISO 9001:2000 implementation	ISO 14001 implementation
	1 st integrated internal audit of systems	
2001	Company reorganization	
	System is certified to ISO 9001:1994	
2003	System is certified to ISO 9001:2000	System is certified to ISO 14001.1996

Table 1. Activities of management systems implementation in Petrokemija

QUALITY AND ENVIRONMET POLICY

The environmental criteria of Petrokemija are expressed in the company Environmental Policy [2]. Examples of the criteria particularly linked to the use of indicators include commitments to:

- reduction of environmental pollution („...to manufacture high-quality products and reduce the pollution of environment.“)
- reduction of environmental impacts resulting from production processes („...least possible harmful impact on the environment“)
- pollution prevention („...and preventing environmental pollution...“)
- resource saving („...and rational in using all resources.“)
- continuous improvement of the environmental performance („...continually improving.... of preventing environmental pollution..“)
- operating in accordance with legal and other requirements(„...in compliance with legislation and regulations ...“).

As a company with implemented environmental management system, Petrokemija assesses its environmental performance against its environmental policy, objectives, targets and other environmental performance criteria.

ENVIRONMENTAL ASPECTS AND ENVIRONMENTAL PERFORMANCE INDICATORS

There is a List of Environmental Aspects for all Petrokemija's operations. According to the internal criteria, each organization unit of the company defines total significant level for each aspect and its specific part. The significant environmental aspects of fertilizer operations include:

- emissions to air (e.g. ammonia, nitrogen oxides, sulfuric dioxide, fluorides as well as particles of raw materials and finished products),
- emissions of substances in waste water and
- waste.

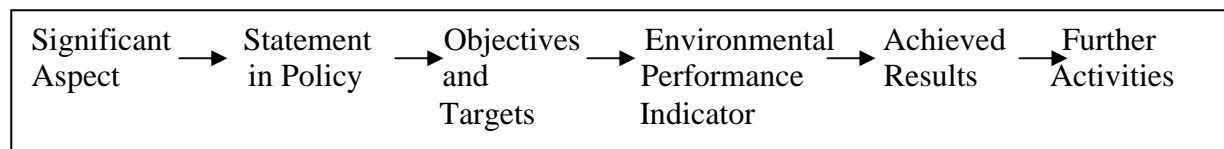
The aspects with significant impact to environment are given priority when defining environmental objectives and targets for improving environmental protection. Petrokemija established a set of indicators based on the guidance in ISO 14031 [3] and ISO/TR 14032 [4] considering of which helps management of identified environmental aspects. Examples of selected environmental performance indicators established in Petrokemija are shown in Table 2.

Category of Environmental Performance Indicators (EPIs)	Examples of Environmental Performance Indicators
Management Performance Indicators (MPIs)	-implementation of environmental management programs (e.g. number or percent of achieved objectives and targets) -degree of compliance with regulations or standards -costs (operational and capital) of environmental protection -number of environmental reports provided for the local community
Operational Performance Indicators (OPIs)	-quantity of water used per unit of product -quantity of energy used per unit of product -quantity of specific emissions to air per year or per unit of product -quantity and degree of water pollution -quantity of waste produced per year
Environmental Condition Indicators (ECIs)	-regional air quality (e.g. concentration of specific contaminant in ambient air at selected monitoring locations or category of air quality) -groundwater quality at the phosphogypsum disposal pond

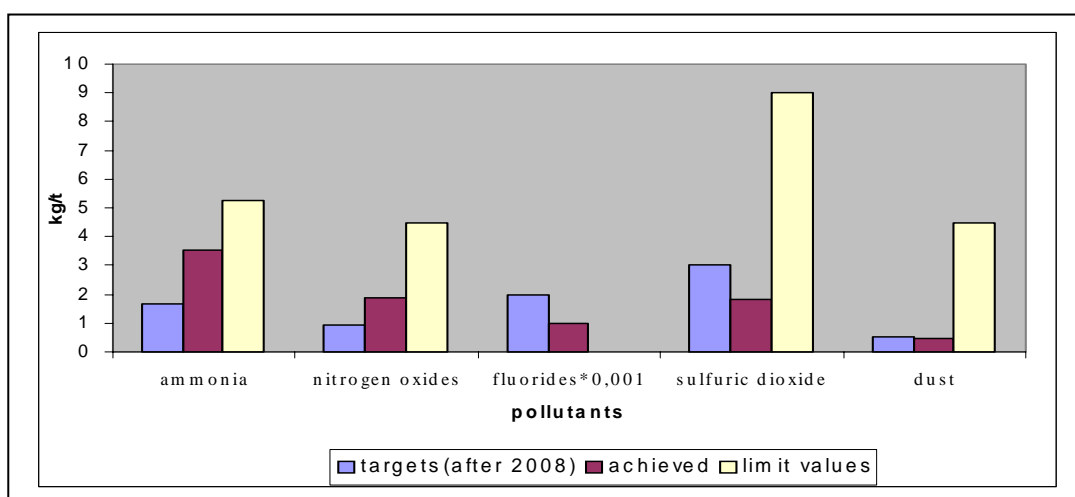
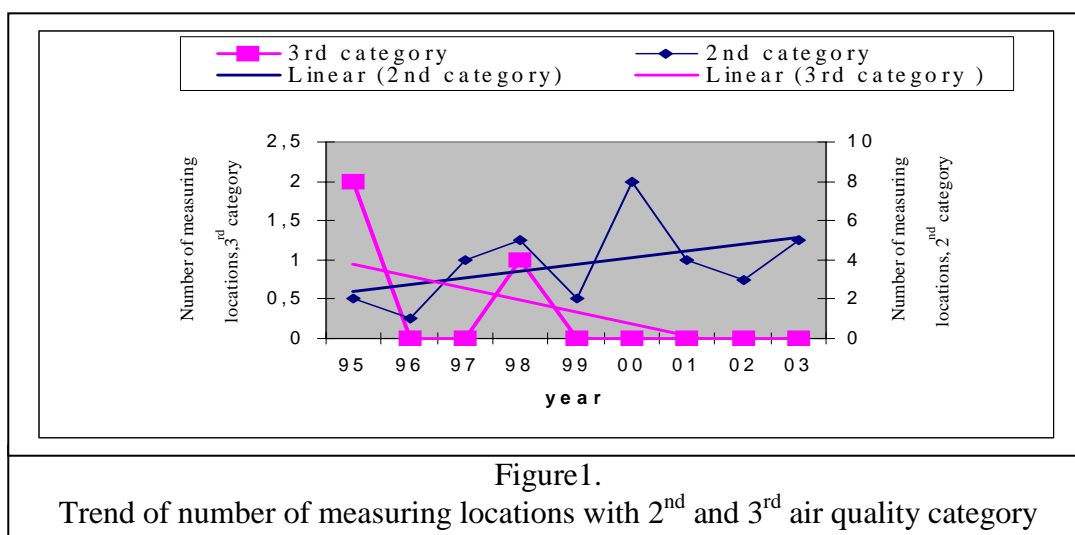
Table 2. Category and examples of Environmental Performance Indicators (EPIs) (incomplete)

ENVIRONMENTAL PERFORMANCE INDICATORS IN AIR QUALITY MANGEMENT IN FERTILIZER PRODUCTION

Petrokemija's management periodically reviews the efficiency and improvement of environmental management and identifies needs for change of any element of the system. The management review of EMS in the company is based on the model:



The data are collected and processed on a regular basis (e.g. semi-annually or annually) to provide inputs for calculated indicators. Evaluation of EMS relevant to air quality management in 2003 is shown in Table 3. Figures 1 and 2 are graphical presentations of selected indicators (ECI and OPI) from Table 3.



The selected indicators are very useful for both internal (e.g. management review) and external communication (e.g. benchmarking).

Statement in Policy	Objectives and Targets	Indicator description (Type)	Results	Status /Further activities
<i>The environmental management system is in compliance with ISO 14001:1996</i>	ISO 14001 Environmental Management System certified by a third party in 2003	Number of non conformances MPI	Petrokemija's EMS met all ISO 14001:1996 requirements	Achieved / Conducting corrective and preventive measures to improve EMS.
<i>..high quality product and services having least possible harmful impact on the environment..</i>	Local air quality improvement. Trend for number of locations with 3 rd and 2 nd air quality category : down 1 st category:clean 2 nd category:moderately polluted 3 rd category:excessively polluted	Number of locations with 3 rd air quality category. ECI	Number of location with 3 rd and 2 nd air quality category in 1995 to 2003 period: 1995. 2/2 1996. 0/1 1997. 0/4 1998. 1/5 1999. 0/2 2000. 0/9 2001. 0/4 2002. 0/2 2003. 0/5 (see Figure 1)	Acceptable/ Technological and technical improvement e.g. reconstruction of production plants, BAT etc.
<i>..We are ...preventing environment pollution by introducing and implementing measurable general and specific targets.</i>	Emission factors of specific pollutants of fertilizer production should be below limit values.	Emission factors i.e. quantity of emission per unit of product. OPI	(see Figure 2)	Achieved for limit values in force. But limits will become more stringent after 2008 and further improvements are needed.

Table 3. Model of the management review of EMS relevant to air quality management

CONCLUSION

The selected indicators (e.g. management performance indicators, operational performance indicators, and environmental condition indicators) have become an integral part of internal reporting and management reviewing in Petrokemija d.d. If they are presented in a suitable way they can clearly indicate developments in the organization. The indicators can also be used as basis for corrective action in areas with insufficient progress.

REFERENCES

1. ISO 14001:1996, Environmental management systems-Specification with guidance for use
2. Quality and Environment Policy, Petrokemija d.d., 2003.
3. ISO 14031:1999, Environmental management –Environmental performance evaluation-Guidelines
4. ISO/TR 14032:1999, Environmental management –Examples of environmental performance evaluation (EPE)