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A System Approach to Waste-water Cleaning Facilities Management

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Abstract:

Enterprises are therefore an integral part of the complex social, economic, environmental and other dynamic systems, which demand a varied perspective and inter-discipline debate. It is about from morepoints of view and interprofessional treating of administration mastery that results from co dependence of different systems of administration and therefore the entire hold of management. Water management as a entrepreneur objective of environment management will be the key component of competitive ability. Excessive consumption of water resources is consequently the result of non-systematic, non-entirely, non- interdisciplined, non- qualitative way of administration. Therefore the economic effects of water management are also the consequence of cognition about the meaning of co dependence and created collaboration to achieve the save, water friendly operation.

Key words: environment management, quality management, waste water management, sustainable environment, dialectic system

1 Introduction

In the last hundred years, the water (either drinking or fresh) demand meeting has increased by six times. There are already many countries in the world coping with a serious lack of water, in particular the drinking water. The (tremendous) growth in the number of inhabitants and the threat imposed by climate changes may result in an enormous world-wide water crisis unless the current wasting approach to water consumption is put an end to. Moreover, emissions of harmful substances into water - thus deteriorating its quality and minimising adequacy of the available water consumption sources – are one more strong reason that well prepared steps should finally be taken towards rational and economic use of water resources.
Slovenia is rich in waters though their distribution over the country is not even. Similarly as in the majority of European countries, in Slovenia, too, integrated water management is being introduced as foreseen by the adopted European General Water Guideline. The envisaged priority task is abatement of harmful effects on water, assurance of an adequate water quality as needed for humans and natural eco-systems and preservation of biotic versatility. An important role in appropriate water quality assurance is to be played by management both in public and private organisational systems. The same is expected also from individuals in households as well as anybody using water.
The role and significance of water supply is becoming ever more important in the competitive market. The task held by management is orientated towards changing the organisational structure, culture, processes and products in an attempt to manage water supply in an integral manner and by minimising costs. It is about a new approach in managing the organisation and natural resource planning in society.
The activities are not orientated only to technical-technological problems or just to participants as creators of treating with environment, but to the

whole proceeding. In a world where markets, products, technologies, competitors, regulations and even societies change rapidly, continuous innovation and have become important sources of sustainable competitive advantage. Because of co dependence is the management quality and treating with the environment directed to the quality of administration and leading, because the quality is the essence of organisational culture of creating collaboration. It is about more points of view and inter structural treating of mastery of administration, that results from co dependence of different systems of quality (not only technological treating) and that's why the whole measurement of management. At the same time, the aim is to reduce harmful substances into the environment, the enhancement of relations between organizational systems and social responsibility and thereby the associated standing in the wider social environment.

A number of conducted studies show the potential water savings that could be made and point to the fact that water management on behalf of the consumer will become an important factory in the strategy of individual enterprises. Therefore, a holistic approach is necessary. Due to the interdependence of the issue, the management and holistic planning of water supply is intrinsically linked to the quality of management and leadership.

The environment protection is consequently the result of non-systematic, non-entirely and non-interdisciplinaire, non- qualitative measurement to the planning and defining, that means in the content of administration. For this reason the care for environment, the change of relation to the environment also the consequence of knowledge about the meaning of co dependence and creative collaboration to achieve the safe, environment friendly operation. The experience of past was too much orientated only to the intensity of qualitative, specialized production, without consideration of influences on the environment and this does not enable the conditions for the ecological innovation. Only the whole, interstructural and different point of view operation of organisational system enables the treating of ecology and permanent development as an important component of all essential viewpoints in the administration. The water management is so the consequence of innovation's administration in sense of consideration of dialectic system of viewpoint.

2 Approach to water management

In efforts for the improvement of position on the purchaser's market the companies must also consider accordance of operation with valid environment protected prescriptions in field of water consument. The inclusion of enterprises in the international market, the care for reputation, that the enterprise profit with the environment protection and permanent development, places the politics of environment protection to the base of the professional politics. The environment protection and permanent development is so a basic component of the basic politics and it is confirmed by the highest administration agency. It is about the important decisions about the basic goals of operating and development. It is about the acceptance of basic principles values and rules. More than constraint of the state, the system is important, that is founded on the volunteer offer and creative cooperation. In the contemporary circumstances the creating of teams is getting most important for the creative cooperation, because they search the opportunities, solve the problems and in the end they take decisions.

The innovative operation is operation that, according to the production and all other its components is found on innovations. That's why the following characteristics indicate it:

- We should search constantly and everywhere the possible novelties! Only rare of them will become innovations, but without intended search, there will be even less of them, probably not enough.

- For this reason we should work as clever people and not as crazy people [2].

Just the water management become our every day's care and more and more numerous people care for the environment we live in.

Numerous case studies regarding the drafting and implementation of efficient water use measures point to the fact that enterprises and institutions approach them partially, attached from other potential measures, without a complex analysis of the entire issue of energy consumption and supply. Such a partial approach can lead to technically and economically inappropriate solutions. The foundation of a water efficiency program for an enterprise or an institution must therefore be a water audit, whereby the main component is represented by a proposal of an action plan with specified priorities, which provides

guidelines for the following issues in entrepreneurial or institutional organization:

- organizational changes
- or quality investment decisions.

The basic aim of the water audit is to increase the process efficiency or rather lower the loss of water. This is why we determine where in the system the water was used efficiently and where water losses were made on the basis of mass and water balances.
Possible measures, which the water audit can encompass, include the fields of organizational measures, reconstruction of existing installations and buildings, the use of modern equipment and techniques as well as the introduction of new technologies. In data acquisition, the quality of the cooperation between the conductor of the water audit and the expert team working for the entity requesting the audit is of vital importance. The authenticity of data is a key to the successful execution of a water audit. The presentation of a water audit is an event, whereby we are educating the customer, investor, business financier, the user and in fact all participants in the decision-making process with regard to efficient water use and investments. A presentation of a water audit is the first step to the implementation of organizational measures and establishment of favorable conditions for the implementation of investment proposals of the water audit.

3 Waste-water Management

Waste-water management is the last step in the chain of water management and economising. An important task with this respect is to be done by cleaning facilities. Either large (some sort of production units) or small (becoming indispensable for everyday usage), they are both of the same importance.
Decentralized wastewater management (DWM), as defined previously, involves the collection, treatment, disposal and/or reuse of wastewater from individual homes, clusters of homes, and isolated community and commercial facilities at or near the point of generation. [13]. There is not any integrated planning practised for installing individual minor cleaning facilities that would be part of a major cleaning system. As a rule, such facilities are not designed up to recognised or approved professional standards. Although most of the treatment units used in decentralized wastewater management systems require very little maintenance, they rarely receive any. As a result, many system failures have occurred. Also, because design standards vary so widely, many DWM systems are design and constructed inappropriately. In many instances there is no design at all. To allow for the rational development and use of DWM systems some management oversight is required. The purposeful management of DWM systems must be undertaken:

1. to overcame the stigma of failed onsite systems,
2. to obtain cost savings by using many recently developed technologies,
3. to allow for the development and testing of new technologies, and
4. to encourage the orderly development of unsewered areas in the context of sustainable environment. [13]

The function of DWM districts and agencies will vary, depending on the legal authority and enabling legislation under which the disctrict or agency was formed. Typical functions include the following:

- Inventory
- System design and installation
- Plan review and construction inspection
- Inspections
- Notification
- Certification
- Water quality monitoring
- Reporting
- Education [13]

An important role for any DWM district or agency is public education. When homeowners and tenants do not know how to care for their systems, expensive failures can result. When a septic tank fails, plumbing backs up, wastewater in the leachfield can be forced to the ground surface where its presence may cause a potential health hazard, and natural water bodies may become polluted. Ultimately, the homeowner may to install a new leachfield. Therefore, it makes good economic and environmental sense to take care of one"s septic system. On of the best ways to inform the public is through the development and issuance of homeowner"s guide in which the operation and maintenance of septic systems are discussed. A typical topic outline for a homeowner"s guide is presented in Table 1.

Typical outline for a homeowners" and users" guide for onsite wastewater disposal systems
WHY THIS GUIDE!
HOW A SEPTIC SYSTEM WORKS?
The Septic Tank
Additional Treatment Facilities
The Soil Absorption System
WHAT CAN GO WRONG?
Preparing your septic tank for inspection
Locating Your Septic Tank
Installation of Access Risers and Covers
Record the Location of Your Septic Tank
CLEANING YOUR SEPTIC TANK
Pumping Out Your Septic Tank
Frequency of Cleaning
OTHER MAITENANCE TIPS AND SUGGEESTIONS
Minimaze the Liquid Load
Minimaze the Solids Load
Don"t Use Septic Tank Additives
Keep Toxic Chemicals Out of Your System
Keep Heavy Vehicles Off Your System
If your Leachfield System Fails
Operation and Inspection of Leachfield
INSPECTING YOUR OWN TANK
RESOURCE GUIDE

Table 1: Typical outline for a homeowners" and users" guide for onsite wastewater disposal systems [12].

4. Water Treatment Methods

Water awareness should be followed by indoctrination about technological procedures and sequences run in a small cleaning facility. This will simplify negotiations with sellers or manufacturers of such facilities. The best solution would be hiring a professional that would participate in design and selection of a suitable cleaning facility. When analysing and designing the facility, it is recommended to examine the below table (Table 2).

Treatment level	**Description**
Preliminary	Removal of wastewater constituents such as rags, stick, floatables, grit, and grease that may cause maintenance or operational problems with the treatment operations, processes, and ancillary systems
Primary	Removal of a portion of the suspended solids and organic matter from the wastewater
Advanced primary	Enhanced removal of suspended solids and organic matter from the wastewater. Typically accomplished by chemical addition or filtration
Secondary	Removal of biodegradable organic matter (in solution or suspension) and suspended solids. Disinfection is also typically included in the definition of conventional secondary treatment
Secondary with nutrient removal	Removal of biodegradable organics, suspended solids, and nutrients (nitrogen, phosphorus, or both nitrogen and phosphorus)
Tertiary	Removal of residual suspended solids (after secondary treatment), usually by granular medium filtration or microscreens. Disinfection is also typically a part of tertiary treatment. Nutrient removal is often included in this definition
Advanced	Removal of dissolved and suspended materials remaining after normal biological treatment when required for various reuse applications

Table 2: Levels of wastewater treatment [12].

The analysis and design of wastewater management facilities to reduce or eliminate the constituents found in wastewater involves consideration of those factors and issues that will affect the sizing, performance, and reliability of these facilities, The initial stages of a project, starting with the facilities plan and coming through the conceptual and preliminary design phases, are considered to be crucial to the success of the overall analysis and design process. It is during these initial stages that design flowrates and constituent mass loadings are developed; process selection is made; the design criteria are developed, refined, and established; issuses related to risk assessment and process reliability are examined; and facility layouts are prepared. At the completion of preliminary design, the project is fully defined so that preparation of the detailed plans and specifications can proceed expeditiously. [13] Important factors and issues, typical to most projects include:

1. wastewater sources and flowrates,
2. wastewater constituent concentrations,
3. variations in wastewater flowrates and constituent concentrations,
4. statistical analysis of wastewater flowrates, constituent concentrations, and mass loading rates,
5. selection of design parameters for wastewater treatment plants,
6. selection of design parameters for septic tank effluent treatment systems, risk assessment,
7. reliability considerations in process selection and design
8. process design considerations [13].

Chapter	Title
1	Administrative provisions
2	Definitions
3	Organization and enforcement
4	Permits and inspection
5	Abatement
6	Design and construction standards: General
7	Variances to design standards
8	Waivers to design standards: Repair and replacement
9	Design standards: Conventional septic system
10	Design standards: Special systems
11	Design standards: Special systems – intermittent sand filter design
12	Design standards: Repair system – Bottomless sand filter
13	Subsurface soils and groundwater protection: general
14	Excavation permits and standards
15	Alterarion of parcel to meet site criteria
16	Wells and water systems
17	Swimming pools, spas, and hot tub permits and standards

Table 3: Typical outline for rules and regulations for wastewater management entity [12].

5 Approach to the Water Cleaning Facility Constructed at Slovenska Bistrica

Prior to the construction of the water cleaning facility, the water condition in the creek bed named Bistrica had been very critical as a result of a great amount of waste waters.
The serious water troubled state, foaming, smell of anaerobic metabolism products and extensive coverage of the creek bed bottom with green algea and threaded bacteria were characteristic for the water biotop/biotopa ?? of the Bistrica creek. The content of nitrates and ortho-phosphorus, too, indicated that the presence of communal sewage in the creek water was substantial.
The only possibility of changing this extremely critical state was to construct a well planned communal cleaning facility for the town of Slovenska Bistrica and to reconstruct a sewage system.
The concept undertaken for the sewage system planning complied with ATV standards. The basic principle was to build – for the rather great contribution area of the mixed sewage system – rain water containment basins equipped with attenuation plants with hydro-mechanical equipment, precisely controlled and deducting over the master collector on the cleaning facility only a double rainless outflow.
The platform for the beginning of the cleaning facility planning was to improve specifications of the Slovenian and EU standards.
Taking into account the number of inhabitants, public water consumption and water consumption in trade and industry as well as assessment of septic tank suspended solids, the biochemical load and hydraulic capacity of the cleaning facility was determined. Its cleaning sequences are as follows:

a. primary sequence - mechanical cleaning,
b. secondary sequence - biological cleaning with de-nitrification, i.e. removal of carbon compounds and nitrate,
c. tertiary sequence - de-nitrification and phosphorus removal.

The result was a sequence biological cleaning facility enabling aerobic mud stabilisation. The advantage of such facility is in its accurate process control and, moreover, in addition to its efficient overall nitrogen cleaning it also provides for efficient biological phosphorus cleaning.

The overall investment cost was 5,14 mio €. The project was co-financed by the European Union, non-returnable funds from the PHARE program, in the amount of 2,6 mio € (50 %).

Other funds were provided by:
- state taxes (environmental taxation) – 36,5 %),
- Ministry for Environment and Space (8,2 %) in
- community budget (5,3 %)

Now that the facility has been in trial-operation for a year we can say that its operation has reduced the environmental load, i.e. stressing the creek stream with waste-waters. The creek water quality has been substantially improved, reflecting itself in duck settling in the creek, and the creek self-cleaning capacity has increased, too.
Apart from the already noted positive effects on the environment, steps to be taken to assure optimal operation of the facility are:

a. Elimination of the hinterland/zalednih waters from the sewage system. Live waters dissolve waste communal water. This leads to reduced cleaning effect of the cleaning facility and increased cleaning cost
b. Continuous raising of awareness and indoctrination of the public about what may be kept and what should under no condition be kept

in the sewage system; the sewage system is absolutely not a public dustbin. Depositing the sewage into the system into which it does not belong, increases the cost of waste-water cleaning and sewage system maintenance.

c. Making the public aware of usefulness of directing meteoric waters into water streams instead into the public sewage system, whenever applicable.
d. Sanitation or closing down of septic tanks by providing direct connections with the public sewage system. Septic tanks are to be filled up ,or after having their sanitary condition improved, have their purpose altered to become meteoric water collectors (for garden watering). Organically enriched communal waste water contributes to the cleaning efficiency of the sewage cleaning facility, thus reducing the environmental taxation paid by water consumers for stressing the environment with waste waters..

6 Conclusion

Economic feasibility usually refers to the residents" or communities ability to pay. To be successful, the organization of the district or agency must be based on a sound economic assessment of the community and its economic circumstances. The whole treat of environment in the administration and leading of professional processes is inevitable condition for the preservation of natural balance in the environment. Punctual creativeness and direction are results of relationship managers have to the environment. In the coming years the relationship to the water management will be the key component of competitive ability. The role of leadership is so directed to the change of starting points of professional philosophy.[2].

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