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Preparation of a plan for modernizing the typified sewage plants in the Ukraine

- Summary -

by

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16. Abstract **The basic conditions existing in the target country were investigated to prepare a plan for modernizing the typified sewage plants in the Ukraine (capacity: 100,000 – 300,000 persons). An inventory of selected sewage plants allowed to provide generizable data on the condition relating to their construction and equipment, tech nological structure and functioning. The effects of the drainage systems on sewage treatment were assessed by considering individual sewerage systems. Recommen dations for the selection of biological sewage and sludge treatment processes were given and preferential variants for the rehabilitation of existing and building of new plants were prepared for the required modernization of sewage plants. The recom mendations take the actual condition of the plants, the available budget and the op erational conditions in the Ukraine into account. In view of setting realistic treatment targets it was possible to achieve an exemption from GOST and SNip standards by the Committee of Local Economy. Now, German (ATV) or EU standards may be ap plied. Suggestions on how to restore the individual treatment stages with regard to their priority and implementation, given operational conditions, are described. Infor mation on the overall plan and the preliminary investigations required, the proof of profitability and financing complete the investigation. The Committee of Local Econ omy, the Association of Independent Cities and Communities, the Technical Univer sity Rovno and various VODOKANAL enterprises are included in the project as multi pliers to spread and, if possible, apply the project results. The counselling project was concluded by presenting the project results in the framework of a symposium relating to local economy in the Ukraine and in Germany.**		
17. Keywords **Ukraine, typified sewage plants, modernization, sewage treatment**		
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1. Introduction

Insufficient sewage treatment is a central environmental problem in the Ukraine. The present consulting project gives advice relating to the reconstruction of urgently needed sewage plant capacities. Sewage plants for the connection of 100,000 to 300,000 inhabitants are considered. The local conditions and the legal, organizational and economic basic conditions in the Ukraine are paid special attention to. In dimensioning the plants additional actual data material from the KfW-project „Consulting of Ukrainian water suppliers, example: Rovno“ (current project, publication, in all probability, 07/05) were used, thus a linkage of the two projects as to the content and structure was established. For selecting appropriate treatment methods the state of the art as to being suited under Ukrainian conditions (implementing in the existent sewage plants, climatic conditions, hydraulic and pollution load, level of training of the sewage plant operators) was assessed.

2. Starting situation

The sewerage system and the sewage plants in the Ukraine are in a state of progressing physical ruin. Since their construction basis measures of maintenance and rehabilitation have not been taken. The biggest part of the municipal sewage discharged into receiving waters is not or not completely treated causing grave problems in obtaining drinking water (in the Ukraine predominantly from surface waters).

The sewerage system and the sewage plants of the Ukraine - as in other republics of the USSR - have been completely planned and built as standardized typical projects. The Ukrainian State Committee for Housing and Municipal Services has promised to exclude the present project from the effective GOST (Russian abbreviation for “state standard”) and SNiP (Russian abbreviation for “construction standards and regulations”) standards to allow an approach to German or EU standards.

3. Inventory of selected sewage plants

5 plants in Rovno, Krementchuk, Poltava, Luzk and Shitomir were investigated as examples**.** The data were acquired and assessed by means of a detailed check list and a photographic documentation. Further information was investigated in interviews with works managers, technologists and other leading staff of the VODOCANAL companies. From the data collected generalized information on the typified sewage plants was prepared.

The insufficient capacity of the sewage plants resulted, altogether, from the deficient quality of the equipment and their use not in conformity with the project and their incorrect installation. When visiting the plants failures of individual process stages were already to be detected visually. It may be proceeded from the fact that the actual treatment performance does not correspond to the legal standards; it is, however, tolerated by the authorities for lack of a foreseeable rehabilitation of the plants. As the treatment performance in conformity with the project and a permanent, perfect functioning cannot be attained owing to the bad structural and engineering condition, basic rehabilitation measures have to be taken in all sewage plants of this size.

4. Sewerage

Technical information on the sewerage was collected for the five cities studied. This was complicated by the insufficient documentation available in the VODOCANAL companies. Apart from using all available documentation and studies interviews were conducted with VODOCANAL staff, local planning engineers and lecturers of the Technical University Rovno. On this basis generizable data on the sewerage of Ukrainian cities (100,000-300,000 inhabitants) with regard to the combination with the sewage plants were prepared.

5. Modernization of the typified sewage plants in the Ukraine

In modernizing it is generally conceivable to modify the requirements to the treatment performance depending on the available financial funds (e.g. limited funds from the municipal budget without credit financing). Thus, also step-by-

step solutions are imaginable implementing for example nutrient elimination only at a later date. For improving the water quality in the Ukraine it will be more effective to gradually improve the operation of a bigger number of sewage plants than to modernize a few sewage plants with maximum treatment performance. Already in the past unrealistic treatment targets have proved to be counterproductive in the Ukraine.

5.1 Dimensioning of sewage plants

Reliable data on sewage quantities, daily curves and sewage characteristics are lacking; taking over the design data of the existing sewage plants will not be appropriate. The ATV standard A131 shall be used for planning, so that it will not be necessary to consider Ukrainian standards (SNiP/GOST) for dimensioning. Yet, Ukrainian standards are binding for the execution of plants (construction material, equipment etc.). The parameters contained in the EU Recommendation 91/271/ECE will be taken as outflow values. It is envisaged to use the existing sewage plant locations for modernizing sewage treatment. This will allow the unmodified use of the connection to the sewerage and, if necessary, the inclusion of existing structures of the sewage plants without buying new areas.

5.2 Structures and equipment

Modernizing the sewage plants requires comprehensive rehabilitation and construction measures, with the preservation of the individual plants deviating strongly from each other in spite of their typification. Thereby, in the individual case there will have to be decided whether it will be economical to rehabilitate structures or to build new ones. The large part of the building and assembly work may be carried out by Ukrainian companies (if necessary, with the supervision of work and assembly according to their specifications by German companies). Owing to their, in general, desolate state in all sewage plants machinery and equipment will have to be completely replaced. The large part of the equipment will have to be imported as in the Ukraine (and Russia) equipment

complying with the requirements will not be produced, disregarding rare exceptions.

5.3 Selection of treatment processes

Various methods of biological sewage and sludge treatment were assessed for their suitability under the given basic conditions. The final selection of the method will be made for the respective sewage plant based on the treatment requirements prescribed by the authorities.

5.4 Preferential variants

Preferential variants were prepared for various targets.

Rehabilitation variant 1 allows a basic improvement of sewage treatment (carbon degradation, if necessary, nitrification). In rehabilitation variant 2 existing tanks are converted into SBR reactors; this will allow in addition to an improved carbon degradation also a controlled nutrient elimination. In the construction variant the existing treatment stages will be completely replaced in operation by new equipment. For each variant options will allow the gradual extension of the performance.

Preferential variant	Costs	Measures
Rehabilitation variant 1	low	Construction of mechanical preliminary purification; new equipment of the activated sludge tank to reach a controlled aeration
Rehabilitation variant 2	medium	Construction of mechanical preliminary purification; rebuilding and equipping of existing tanks as SBR reactors
Construction variant	high	Complete new building of the sewage plant as continuous flow aeration or SBR plant

Proposals on the reconstruction of the individual treatment stages are presented and the requirements to the equipment are defined. Considering the

profitability, fixing of fees, behaviour of the consumer and implementation of management systems advice relating to implementation is given.

6. Presentation of the project results

The project results were presented in the framework of a symposium on municipal services held at the Technical University Rovno (30/09-01/10/04). Participants were representatives of the Ukrainian State Committee for Housing and Municipal Services, various VODOCANAL enterprises, the Association of Independent Cities and Communities of the Ukraine, the Technical University Rovno, Ukrainian planning and engineering offices and a Ukrainian bank. The presentation of the present project formed the central component of the symposium and was followed by the Ukrainian participants with great interest as the numerous questions and discussion papers following the report have shown. Reporting back and inquiries from the Ukrainian State Committee for Housing and Municipal Services, the Association of Independent Cities and Communities of the Ukraine and the planning offices give cause for the conclusion that appropriate multipliers for spreading and possibly using the results were found. The presentation was successfully repeated to further Ukrainian representatives of VODOCANAL companies staying in Germany for a contact visit to enterprises in Dresden on 05/10/04.

7. Prospects

Increasing inquiries by planning offices and VODOCANAL companies relating to equipment show that the urgently needed modernization of the Ukrainian water management and municipal services is slowly set in train. The Ukrainian State Committee for Housing and Municipal Services plans to make available comprehensive funds for the modernization of water management plants for 2005. It would be imaginable that thus at least an own share of the Ukrainian side of about 15 % of project finances will be ensured; the remaining funds will have to be raised on the international capital market. Exploratory talks on financing are held for modernizing individual sewage plants. The results of this

consultation project have been presented to the participating Ukrainian partners.

8. Note/contact

Detailed reports on all project phases are available which may be requested:

Title	**Priorities relating to the content**
	Annexes
1st interim report	Basis: sewage treatment in the Ukraine technical standardization basic legal conditions EU guidelines national strategy followed by the Ukraine
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2nd interim report	Inventory of selected sewage plants
	flow charts inventory in tabular form general representation photographic inventory (1 CD-ROM)
3rd interim report	Contribution of the sewerage to an improvement of sewage treatment: orientating analysis and assessment conception of the future dewatering
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4the interim report	Modernization of typified sewage plants: basic conditions recommendation for modernization of sewage disposal proposals for reconstruction of the treatment stages
	survey of variants for reconstruction (flow chart) preferential variants of modernization sewage plant Luzk, rehabilitation variant 1

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