INDUSTRIAL WASTEWATER CADASTER AND EFFECTS ON THE CENTRAL WASTE-WATER TREATMENT CONCEPT FOR THE CITY OF ADANA/TURKEY

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1. Introduction

Adana, with an actual population of more than 1 million inhabitants being the fourth largest city of the Republic of Turkey and located on the Eastern Mediterranean Coast, is well known as a highly industrialised area, especially regarding cotton culture and the corresponding textile and vegetable oil processing industry.

Within the framework of the **Adana Wastewater Feasibility Study** - financed by the German Financing Agency "Kreditanstalt für Wiederaufbau (KfW)" and finalised early 1994 - the requirement for correct consideration of industrial wastewater discharges has led to the need for detailed investigation of the industrial sector.

Due to financial restrictions an **Amendment Study**, financed by the European Investment Bank (EIB), has been carried out in 1996 in order to investigate alternative solutions especially related to the concept of two separate wastewater treatment plants, one for Adana West and one for Adana East. Within this amendment study the industrial wastewater situation has been revised and significant improvements have been observed.

2. General Approach

According to the two main objectives of the study in respect of the industrial wastewater management, namely
- to investigate the industrial wastewater situation of the city of Adana, and
- to define an appropriate concept for future industrial wastewater management

the following two subchapters will describe the applied general approach.

2.1 Industrial Wastewater Cadaster

The elaboration of the industrial wastewater cadaster has been subdivided into the following five phases:

Phase I: Data Collection
The main objective of the data collection is to register all relevant industries within the project area.
This comprises the collection of all relevant information about these industries available at public authorities and institutions related to the industrial sector and the corresponding water and wastewater quality control.

Phase II: Preliminary Evaluation
The main objective of the preliminary evaluation is to elaborate a priority list on the basis of the data collected within the first phase. Since this evaluation is based on data obtained from authorities and institutions, as well as on literature pollution key values, this step is called preliminary evaluation as it has to be verified by means of the results of the following phases and finally results in the final evaluation.

Phase III: Inspection of preselected Industries
The main objective of the inspection of individual industries is to verify the results obtained within the framework of the preliminary evaluation, by means of a detailed examination of preselected individual companies. The inspection of these companies has been carried out on the basis of a detailed questionnaire.

Phase IV: Industrial Wastewater Analysis Programme
The main objective of the industrial wastewater analysis programme is to verify the specific industrial waste-water quality by means of on-site and laboratory analysis. Furthermore, the analysis campaign forms the initial step for the implementation of a long-term industrial effluent monitoring programme.

Phase V: Final Evaluation
The main objective of the final evaluation is to identify and characterise the most important individual industrial water pollutants as well as to obtain a general overview of the total industrial wastewater situation in terms of wastewater quantities and specific pollution loads.

2.2 Industrial Wastewater Management Concept

On the basis of the results of the above described industrial wastewater cadaster the future concept for industrial wastewater management, i.e. collection, treatment and continuous control of industrial effluents has been elaborated.

Main factors for the definition of the appropriate industrial wastewater management concept have been:
- the location of large water polluting industries
- the potential discharge of toxic pollutants
- the technical capacity of the industries to operate and supervise on-site treatment facilities
- the technical capacity and advantages of centralised industrial effluent control

3. Study Results

3.1 Industrial Wastewater Cadaster

The most important purposes of the implementation of the industrial wastewater cadaster are:
- the identification of the most relevant industrial sectors
- the identification of the highest polluting individual industries
- the determination of the corresponding wastewater amounts and pollution loads
- the local distribution of these wastewater amounts and pollution loads

The main results of this cadaster related to the total industrial sector of the city of Adana are shown in the table below:

TABLE 1: Wastewater Quantities and Pollution Loads of different Industrial Sectors

No.	Industrial Sector	No. of Industries		No. of Employees		Wastewater Quantity		BOD-Load		COD-Load	
		-	%	-	%	m3/d	%	kg BOD/d	%	kg COD/d	%
1	Textile Manufacturing Industry	123	21.0	21,819	43.8	58,406	54.3	17,993	54.7	69,762	58.0
2	Raw Cotton Processing Industry	39	6.6	1,362	2.7	210	0.2	21	0.1	50	0.1
3	Vegetable Oil and Soap Industry	30	5.1	8,812	17.7	25,296	23.5	8,415	25.6	35,564	29.6
4	Metal Industry	162	27.6	6,442	12.9	3,835	3.6	440	1.3	950	0.8
5	Chemical Industry	35	6.0	1,303	2.6	3,577	3.3	423	1.3	895	0.7
6	Food Industry	46	7.8	3,363	6.7	9,332	8.7	5,468	16.6	12,543	10.4
7	Wood Processing Industry	59	10.1	1,149	2.3	115	0.1	23	0.1	46	0.0
8	Soil Products Processing Industry	81	13.8	4,079	8.2	5,330	5.0	48	0.1	391	0.3
9	Others	12	2.0	1,539	3.1	1,429	1.3	71	0.2	143	0.1
	TOTAL	**587**	**100**	**49,868**	**100**	**107,530**	**100**	**32,902**	**100**	**120,344**	**100**

The three most important industrial sectors in Adana are
- the textile industry
- the vegetable oil and soap manufacturing industry
- the food industry

Another essential result of this cadaster has been the fact, that out of the nearly 600 individual industries the identified most important 18 individual industries represent the following percentages in terms of wastewater amount and pollution loads:
- total industrial wastewater amount: 57.2 %
- total industrial wastewater BOD-load: 62.3 %
- total industrial wastewater COD-load: 65.5 %
- total industrial wastewater Suspended Solids load: 65.9 %
- total industrial wastewater oil & grease load: 77.0 %

The local distribution of industrial wastewater discharges and pollution loads is shown in the figure below:

FIGURE 1: Location, Wastewater Quantities and Pollution Loads of different Discharge Groups
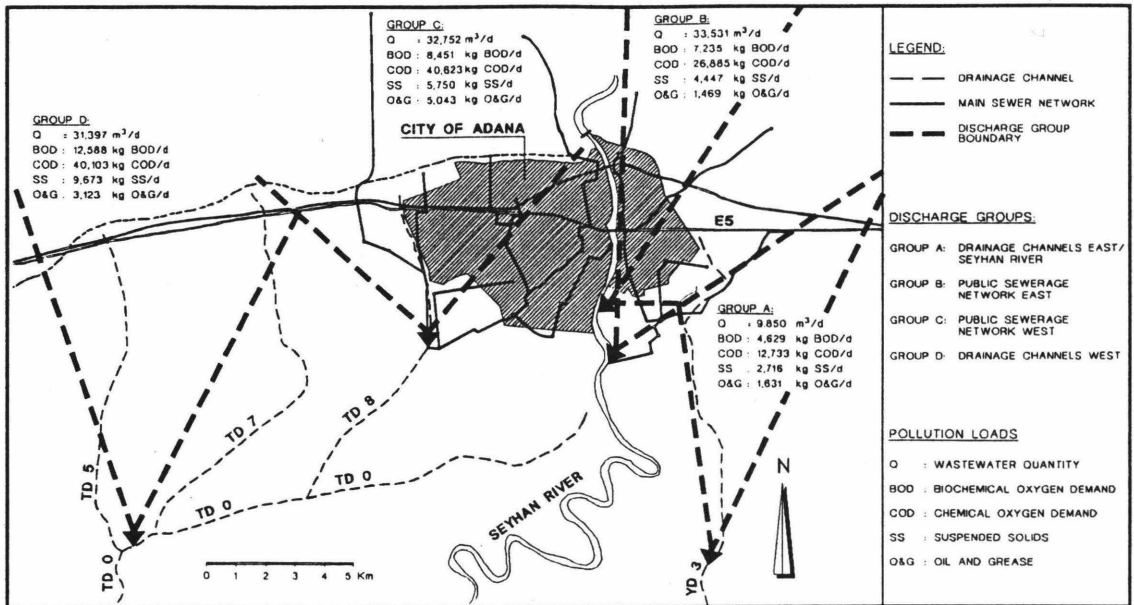
3.2 Industrial Wastewater Management Concept

Based on the general findings of the above described industrial wastewater cadaster the initial concept for future industrial wastewater management in 1994 has envisaged the connection of all major industries to one central wastewater treatment plant of the city of Adana.

The amendment study carried out in 1996 in order to investigate alternative more cost-efficient but environmentally sustainable solutions led to the concept of two separate wastewater treatment plants, one for Adana West and one for Adana East. Within this amendment study the industrial wastewater situation has been revised and the following significant development has been observed.

Since 1994 the Turkish Ministry of Environment forces all industries to comply with the national wastewater discharge standards. Comprehensive efforts in encouraging industries to implement individual on-site wastewater treatment facilities have led to significant improvements of the industrial wastewater situation.

These efforts resulted in the initialisation of necessary investigation, design and construction activities for the implementation of individual industrial wastewater treatment plants with a certain number of plants already put in operation in the years 1995 and 1996.

This significant development in the industrial sector has led to essential cost savings for the overall wastewater treatment concept mainly due to the fact that the hydraulic and the pollution load of industrial effluents to be connected to the public wastewater treatment plants could be reduced by approx. 40 to 45 % thus resulting in a reduction of the loads of the two wastewater treatment plants of approx. 20 to 25 %.

4. Conclusion

The implementation of an industrial wastewater cadaster has been proven to be a highly efficient instrument to meet the specific requirements of industrial wastewater control.

One of the most important results of the industrial wastewater cadaster for the city of Adana has been the fact, that out of a total number of nearly 600 industries registered only a limited number of approx. 20 individual industries represent about 60 to 70 % of the industrial wastewater amount and specific industrial wastewater pollution loads of the total industrial sector.

Referring to the general industrial wastewater management concept this case shows, that - initiated and encouraged by the legal authorities' side and with motivation on the industries' side - significant efforts can be undertaken in a relatively short time period in order to drastically reduce industrial water pollution and at the same time to minimise investment and operation costs for central wastewater treatment facilities.

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