

Water Losses in Maputo Water Supply System

An Overview of the Strategic Plan for Leakage Reduction

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Summary

This paper presents a preliminary overview of the strategic plan for leakage reduction in the Water Supply System, in Maputo, Mozambique, a city with about 1.200.000 people and 40 % network estimated coverage. Diagnosis of the water losses according to the actual database and prognostic of mitigation measures to reduce the leakage are discussed. Some intervention measures were already considered, taking into account the local conditions and other aspects.

In average, the total losses estimated currently in the system, in the main system from the Intake Station at the Water Treatment Plant that supplies the study area are ciphered in 60 %. The final task of the shares in course is to define measures that allow reaching, in short and medium term, levels of losses that point out in average values in the order of 20 to 30 %.

Given the diagnosis characteristics responsible for the origin of the losses, the global losses of water in the system must be faced as a multi-sector and multidimensional problem.

The analysis will enclose the whole system, from the Water Treatment Plant to the branch of connection of each customer, including the alignment for each individual and collective flow meter. It will be able to enter, for comparative effect and for the decurrently ones, the values of water consumption registered by totalises counting, that will be placed in the entrance of each apartment house installation.

With this data and by using the Performance Indicators given by the IWA model, the water losses existing in the system will be determined and as well optimised the interventions measures necessary to reduce the impact of losses on the management of the system.

In the calculations, special attention goes to particular means of Performance Indicators, taking in to account the singular characteristics of the study area. The study seeks to answer the following questions:

- How is possible to have a real evaluation of the water losses with values based in uncertain and estimated data's?
- How is possible to define efficient measures to reduce the leakage in an unknown network?
- How is possible to guarantee goals and objectives in a not well-known network implanted mostly in per urban areas?

- How the IWA Performance Indicators can really give a reasonable interpretation in a system where mostly of the data's are unknown, uncertain and estimated?

Introduction

Mozambique is located in the Southeastern Zone of the African Continent, in front of the Madagascar Island, from which is separated by the Indian Ocean. It is characterized by a wet to dry tropical climate, with annual average temperature between 22 and 24° C and average precipitation of 1200 mm each year.

The water supply services, with more than 128 companies of small, medium and big dimension that up to 1999 were integrally managed by the State, comes to be, gradual and partially concession to private companies, through temporary contracts, in form of delegated management and/or technique assistance. The finally task is to endow the companies with abilities that allows to guaranty their sustainability, which, is strongly conditioned by the improvement of better levels on the performance services of the system, in the case, with particular attention to the reduction of the leakage and the actual water losses in the most part of the systems.

“Grande Maputo” is the owner of the biggest water supply system in Mozambique. In this system, important part of the intake water is lost in the Water Treatment Plant (WTP) and along the Main Pipes Transmission System (MPTS), including the pipes installed to transport the water to the final consumers, assuming an significant portion, neither in the investment costs, neither in the burden on the system exploration, reducing significantly the economic yield and the viability of its exploration.

Context

The study is fit to the leak detection and water losses reduction project taking out in the “Grande Maputo” Water Supply System, in the scope of the leasing contract between Águas de Moçambique (AdeM), in the quality of operator, and, Fundo de Investimentos e Património de Abastecimento de Água (FIPAG), in the quality of assignor.

Characterization of the Departure Situation

Goals

The main objective of the departure characterization is to quantify the water losses in the supplying system, through a water balance, where, it is compared the volumes of water allegedly supplied for the system and the volumes of water supposedly consumed by the customers. In the subsequent phases, the quality of data register will be improved as well as the identification of the origins and causes of the total water losses.

The attainment of the used information demanded an exhaustive and accurate analysis of the actual working conditions of the supplying system and its way of exploration.

Database

General

In order to make a sector analysis of the existing losses, the system was divided in two areas of analysis: MPTS and Distribution Network. For initial analyses in the network, a pilot zone was defined, to survey the strategy and methodology of

intervention measures that will be applied in the whole distribution network system (DNS).

Main Pipes Transmission System

The data of MPTS are related to the volumes of water produced in the WTP and distributed by each Distribution Centre (DC) (Picture 1), the general characteristics of the MPTS (Picture 2) and the values of the average pressures in the considered MPTS alignments.

➤ Volumes of Produced and Distributed Water

The data refers to the registered values of the produced water in the WTP and distributed by each DC during the year of 2006. From these data and with the installation of the flow and pressure meters in each one of the measurement points, it is expected to initiate a set of interventional measures that lead to the reduction of the existing physical losses.

Quadric 1: Water Production and Distribution [AdeM Reports]

WATER PRODUCTION AND DISTRIBUTION - 2006		
Produced Water - (m3)		
Umbeluzi WTP	Abstracted Water	67.739.508
	Treated/Produced Water	63.861.300
Distributed Water - (m3)		
Matola - DC	High Zone - NW	7.799.200
	Low Zone - NW	2.549.720
Machava - DC	NW	4.805.000
Chamanculo - DC	NW	7.470.000
Maxaquene - DC	High Zone - NW	10.515.000
	Low Zone - NW	2.479.800
Alto-Maé - DC	High Zone - NW	1.689.300
	Low Zone - NW	876.220
High Zone Distribution	Tanks	92.375
Connectios to the Main Pipes T S	NW	5.269.391

➤ General Characteristics of the Main Pipe Transmission System

Quadric 2: Resume of the Main Pipes Transmission System Data's [AdeM Reports]

MAIN PIPE TRANSMISSION SYSTEM			
ID	Diameter (mm)	Length (Km)	Pipe Material
ETA - CD Chamanculo	800	27,0	Reinforced Concrete/Steel
	1000	27,0	Cast Iron
Connection to Boane DC	150	3,5	Asbestocement
	200	4,0	PVC
Connection to Matola DC	1000	0,1	Cast Iron
Connection to Machava DC	800	4,5	Reinforced Concrete
CD Chamanculo - CD Maxaquene I	800	6,2 (3,5 + 2,7)	Reinforced Concrete/Steel
Connection to Maxaquene II DC	400	0,5	Steel
Connection to Alto-Maé DC	400	0,25	Steel
CD Chamanculo - CD Laulane	800	7,5	Cast Iron

➤ Average value of pressure in the Main Pipes Transmission System
The average value of pressure in the MPTS is about 8 Bars.

Pilot Zone

The data of the PZ are related to the volumes of water supplied from the Alto-Maé DC (Table 1), to the volumes of water billed and/or consumed by the customers in legal contractual situation (Table 2), to the existing pressures in different points defined in a first phase of study (Figure 1), to the number of interventional rupture recorded in the area supplied by the Alto-Maé DC (Figure 2) and to the general characteristics of the identified pipes (Table 3).

The area is supplied from the Alto-Maé DC, by a circular reservoir, embedded, with useful capacity of 4.600 m³. The esteemed total volume of water supplied from the transmission system of the Alto-Maé DC is 8.400 m³/day, with a 24-hour of continuous supplying.

From the total volume of supplied consumption to 474 customers, it's esteemed that about 44 % is for domestic consumption, 32 % for commercial and industrial consumption, 23 % for commerce and services consumption and the remains 1 % for general public consumption.

In physiographic terms, this area can be characterized as of medium population density, when compared to the other singular areas of the Maputo city,

➤ Volumes of Water Supplied to the Pilot Zone from the Alto-Maé DC

The presented volumes were gotten from the registers of the Alto-Maé DC, during 2006, and recorded in the reports produced by AdeM. From these values, it is expected to have reference on the total volume supplied for consumption in the PZ, through which, it will be possible, even so in not yet conclusive way, to know the amount of water allegedly consumed in the PZ. The final accuracies of these values will be made after the installations of the flow meter in the pipe that supplies the PZ, from the Alto-Maé DC.

Table 1: Volumes of Water Distributed to the Pilot Zone (2006) [AdeM Reports]

Day	Volume (m3)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
2		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
3		2.640	2.640	2.640	2.640	2.640	2.640	1.870	2.640	2.640	2.640	2.640
4		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
5		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
6		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	1.320
7		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.090
8		2.640	2.640	2.640	2.640	2.640	2.640	2.640	1.870	2.640	2.640	2.600
9		2.640	2.640	2.640	2.640	2.640	2.640	2.640	0	2.640	2.640	2.640
10		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.530	2.640	2.640	2.640
11		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
12		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
13		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
14		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
15		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	1.760	2.640
16		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
17		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
18		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
19		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
20		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
21		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
22		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
23		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
24		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
25		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
26		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
27		2.640	2.640	1.760	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
28		2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.420	2.640	2.640
29			2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
30			2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640	2.640
31			2.640		2.640		2.640	2.640		2.640		2.640
Total	2.640	73.920	81.840	78.320	81.840	79.200	81.070	81.840	75.680	81.620	78.320	79.930

➤ Billed and/or consumed Values of Water in the Pilot Zone

The presented volumes were gotten by the AdeM Commercial Board registers during 2006, for the set of customers register in the PZ database. Although a clear plurality regarding the existing bill conditions does not exist, it is expected through these values, to have a minimum reference on the real volumes of water consumption, for the customers entered in the PZ during the considered period. With these values it will be possible, in comparison with the DC supplied volumes, to determine, the existing water losses in the PZ. In this phase, the error is relatively coarse.

Table 2: Volumes of Billed and Consumed Water in the Pilot Zone (2006) [AdeM Reports]

Billed and Consumed Water - PZ - 2006														
Items	Consumption	Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Legal Consumers (nr.)	Total	450	450	450	450	450	450	450	450	450	450	450	450	450
	Domest.	343	343	343	343	343	343	343	343	343	343	343	343	343
	Com/Serv.	73	73	73	73	73	73	73	73	73	73	73	73	73
	Indu/Com.	31	31	31	31	31	31	31	31	31	31	31	31	31
	General/Pub	3	3	3	3	3	3	3	3	3	3	3	3	3
Illegal Consumers (nr.)	Total	24	24	24	24	24	24	24	24	24	24	24	24	24
	Domest.	14	14	14	14	14	14	14	14	14	14	14	14	14
	Com/Serv.	10	10	10	10	10	10	10	10	10	10	10	10	10
	Indu/Com.	0	0	0	0	0	0	0	0	0	0	0	0	0
	General/Pub	0	0	0	0	0	0	0	0	0	0	0	0	0
Billed Metered Consumption (m3)	Total	9.034	9.531	10.194	14.281	13.774	12.090	10.046	13.066	11.252	12.516	13.955	10.982	140.721
	Domest.	4.230	4.574	4.244	4.853	4.954	5.754	4.284	5.039	4.949	5.419	5.480	4.592	
	Com/Serv.	1.735	1.620	3.371	1.879	3.159	3.235	2.610	3.060	2.451	1.979	2.332	2.410	
	Indu/Com.	2.968	3.260	2.469	7.185	5.661	3.101	3.152	4.920	3.852	5.118	6.143	3.980	
	General/Pub	101	77	110	364	0	0	0	47	0	0	0	0	
Billed Unmetered Consumption (m3)	Total	4.891	4.514	4.837	4.049	4.275	4.384	3.471	4.224	4.244	4.045	3.877	4.296	51.107
	Domest.	2.565	2.540	2.476	2.241	2.230	2.531	2.086	2.112	1.983	1.933	2.122	2.059	
	Com/Serv.	1511	1.053	1.507	952	1.181	1.173	900	1.479	1.462	1.259	1.195	1.271	
	Indu/Com.	815	921	854	763	768	577	485	633	760	814	517	743	
	General/Pub	0	0	0	93	96	103	0	0	39	39	43	223	
Unbilled Metered Consumption (m3)	Total	0	0	0	0	0	0	0	0	0	0	0	0	0
	Domest.													
	Com/Serv.													
	Indu/Com.													
	General/Pub													
Unbilled Unmetered Consumption (m3)	Total	0	0	0	0	0	0	0	0	0	0	0	0	0
	Domest.													
	Com/Serv.													
	Indu/Com.													
	General/Pub													
Total Distributed Water		2.640	73.920	81.840	78.320	81.840	79.200	81.070	81.840	75.680	81.620	78.320	79.930	876.220
Total Billed Consumption		13.925	14.045	15.031	18.330	18.049	16.474	13.517	17.290	15.496	16.561	17.832	15.278	191.828
Tot. Minimum Illegal Estimated Consumption		390	390	390	390	390	390	390	390	390	390	390	390	4.680

➤ Values of Pressure Register in the Pilot Zone

In the first phase, in order to have a minimum reference on the existing pressures in different points chosen in the PZ DNS, pressure values were recorded. These values will be used for evaluation of the hydraulic working conditions on the PZ network.

A total of 7 distinct points were recorded, with registers for two reference periods, namely in the morning and the afternoon periods respectively. The period for recordings was defined to supposedly make registers in the hours of bigger consumption and therefore of bigger request of the network, which is equivalent to the deficit or less favorable period in terms of pressures.

From these values, it is expected to diagnosis in the first analysis, the network working conditions, from which, it can be able to define ways of intervention for the regularization of the system, including the possible mapping errors of the pipes and the valves positioning. This proceedings, will be use to define measurements and corrective interventions, that will allow and improve the quality of the services regarding the water distribution system in the PZ area. The final task is to reduce the existing water losses.

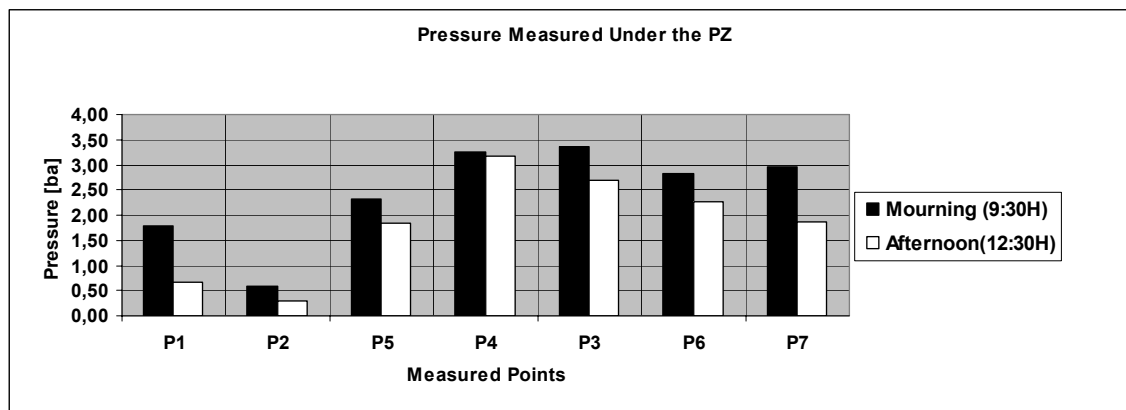


Figure 1: Values of Register Pressure in the Pilot Zone

➤ Number of Crack Interventional Corrections in the Pilot Zone Network

The quantification of the rupture interventions in the PZ DNS was made on the basis of the recorded data carried through registers of the Technical Board of AdeM. Through these registers, it is expected to have a preliminary diagnosis on the relative vulnerability of specific alignments on the DNS. With these values and the other referring data regarding the characteristics of the installed pipes, namely the diameter's, the materials and eventually, when possible, the referencing of the age of the pipes, will be evaluate the necessary interventional measures for rehabilitation of these alignments. These interventional measures will create conditions that propitiate the reduction of the existing physical losses in the ZP.

The presented data doesn't give the real location of the rupture points during the registry, as a consequence of the type of register used by the AdeM. The register does not mention the section where the rupture occurred. In this context, the registers are presented only in function of Street or Avenue where it had been verified and not in function of the coordinates of the respective sections of rupture requested for intervention, as it would be recommendable. Having in consideration the necessary mapping of these data, in the future, the register of the points of rupture will have to be recorded in GIS maps.

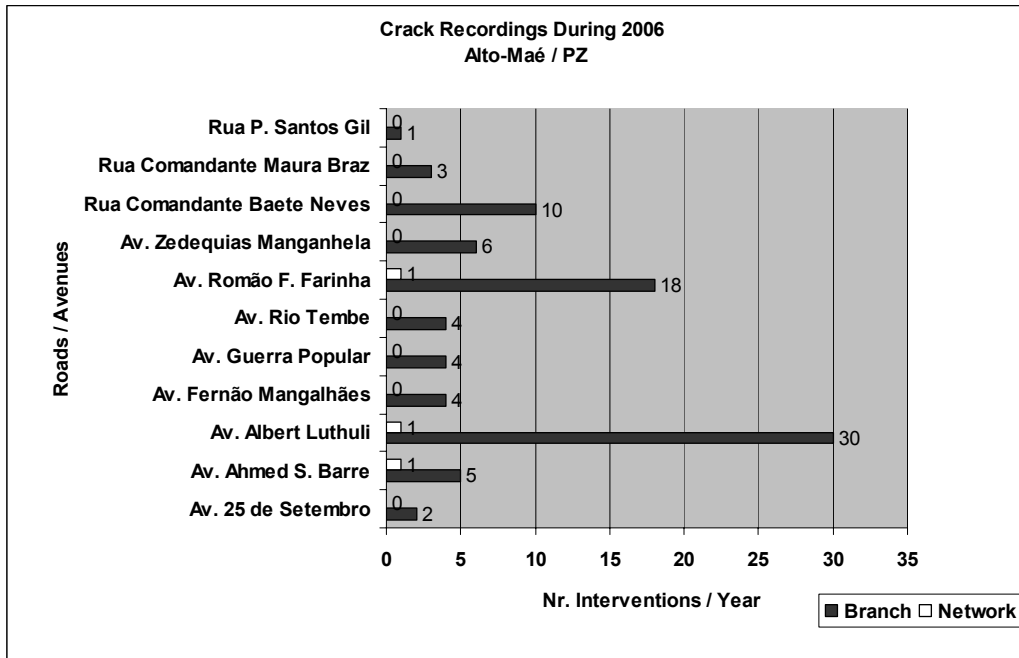


Figure 2: Annual register of Rupture Interventions in the Alto-Maé DNS in 2006.

➤ General Characteristics of the Pipes in the Pilot Zone

The network of the ZP is composed by a set of equipment, to detach the system of pipes with diameters of dimensions between 50 and 450 mm, a set of valves with different utilities. Some of the valves are operational and others are damage.

In the distribution network, it's esteemed that it has an approached total length of 12.630 m, considering the total length of the primary, secondary and tertiary net.

Table 4: Characteristics of the pipes in the Pilot Zone [AdeM Reports]

PipeID	Material	Diameter (mm)	Length (m)	C_Y	C_X
D00676 D00681	Steel	100	141,60	7128193,646	456486,220
D04170 D04181	Steel	100	0,06	7128374,745	456189,995
	100 Total		141,66		
D06639 D06643	Steel	150	353,66	0,000	0,000
D06639 D06642	Steel	150	427,42	0,000	0,000
	150 Total		781,07		
D04181 D04201	Steel	400	10,47	7128379,460	456192,280
D04171 D04201	Steel	400	268,53	7128504,630	456253,875
	400 Total		279,01		
D00681 D00682	Asbestos Cement	100	79,02	7128267,145	456448,747
D04182 D04184	Asbestos Cement	100	84,49	7128435,375	456206,120
D00711 D00715	Asbestos Cement	100	32,76	7127772,913	456768,765
D00712 D00715	Asbestos Cement	100	35,39	7127790,845	456739,792
D00672 D04201	Asbestos Cement	100	564,50	7128224,204	456427,142
D04210 D04211	Asbestos Cement	100	25,04	7127611,570	456505,355
D04212 D04213	Asbestos Cement	100	33,88	7127590,925	456547,990
D00742 D04213	Asbestos Cement	100	35,76	7127595,836	456571,400
D04214 D04215	Asbestos Cement	100	71,99	7127597,045	456574,675
D00722 D04215	Asbestos Cement	100	16,90	7127622,845	456600,383
D00647 D04230	Asbestos Cement	100	140,73	7128146,252	456699,314
D04161 D04230	Asbestos Cement	100	10,99	7128079,755	456664,600
D00666 D05200	Asbestos Cement	100	1,32	7127963,674	456827,736
	100 Total		1132,76		

Preliminary Water Balance Methodology

Main Pipes Transmission System

In the present phase, the evaluation of the water losses in the MPTS was made through the comparison between the volumes of water register as supplied water from the WTP and the volumes supplied by each one of the DC, to the network. With the comparison of these values, the volume of water loss in the MPTS was determined. In the next future, will be defined interventional measurements and goals to reduce the water lost in the MPTS.

Pilot Zone

The analysis of the data of water losses in the PZ was made on the basis of the comparison between the volumes allegedly supplied by the Alto-Maé DC and the billed and/or consumed volumes of the whole customers that belong to the PZ DNS area.

Preliminary Results

The presented values are the results of the entered data for the water balance in the MPTS and in the PZ Network Distribution System.

Main Pipes Transmission System

Quadric 3: Water Balance

Home Annual System Input Volume 63.861.300 m ³ /year Error Margin [+/-]: 0,0%	Authorized Consumption 43.546.006 m ³ /year Error Margin [+/-]: 0,0%	Billed Authorized Consumption 43.546.006 m ³ /year	Billed Metered Consumption 43.546.006 m ³ /year	Revenue Water 43.546.006 m ³ /year
			Billed Unmetered Consumption 0 m ³ /year	
	Water Losses 20.315.294 m ³ /year Error Margin [+/-]: 0,0%	Unbilled Authorized Consumption 0 m ³ /year Error Margin [+/-]: 0,0%	Unbilled Metered Consumption 0 m ³ /year Error Margin [+/-]: 0,0%	Non-Revenue Water 20.315.294 m ³ /year Error Margin [+/-]: 0,0%
			Unbilled Unmetered Consumption 0 m ³ /year Error Margin [+/-]: 0,0%	
		Commercial Losses 0 m ³ /year Error Margin [+/-]: 0,0%	Unauthorized Consumption 0 m ³ /year Error Margin [+/-]: 0,0%	
			Customer Meter Inaccuracies and Data Handling Errors 0 m ³ /year Error Margin [+/-]: 0,0%	
	Physical Losses 20.315.294 m ³ /year Error Margin [+/-]: 0,0%			

Pilot Zone

Quadric 4: Water Balance

Home Annual System Input Volume 876.220 m ³ /year Error Margin [+/-]: 0,0%	Authorized Consumption 191.828 m ³ /year Error Margin [+/-]: 0,0%	Billed Authorized Consumption 191.828 m ³ /year	Billed Metered Consumption 140.721 m ³ /year	Revenue Water 191.828 m ³ /year
			Billed Unmetered Consumption 51.107 m ³ /year	
	Water Losses 684.392 m ³ /year Error Margin [+/-]: 0,0%	Unbilled Authorized Consumption 0 m ³ /year Error Margin [+/-]: 0,0%	Unbilled Metered Consumption 0 m ³ /year	Non-Revenue Water 684.392 m ³ /year Error Margin [+/-]: 0,0%
			Unbilled Unmetered Consumption 0 m ³ /year Error Margin [+/-]: 0,0%	
		Commercial Losses 4.680 m ³ /year Error Margin [+/-]: 0,0%	Unauthorized Consumption 4.680 m ³ /year Error Margin [+/-]: 0,0%	
			Customer Meter Inaccuracies and Data Handling Errors 0 m ³ /year Error Margin [+/-]: 0,0%	
	Physical Losses 679.712 m ³ /year Error Margin [+/-]: 0,0%			

Preliminary Diagnosis

Main Pipes Transmission System

➤ Water Balance

The total volume produced and supplied from the WTP of Umbeluzi in 2006 was 63.861.300 m³, which corresponds to the Annual System Input Volume.

The total volume distributed by the DC in the same period of analysis, including the volume supplied to the Auto-Tanks and the connections along the MPTS, totalizes

43.546.006 m³, which corresponds to the Total Authorized Consumption. For this case, it also corresponds to the Billed Water Volume.

In this way, the volume of water lost in the MPTS (WTP and DC) in this period, that corresponds to the Physical Losses was 20.315.294 m³.

➤ Performance Indicators

For this preliminary phase of analysis, the significant Performance Indicators are:

○ Level of Service

The water supply in the MPTS was made 24 hours per day with an average pressure of 8 bars.

○ Physical Losses Performance Indicators

For the case of the MPTS, the evaluation of the losses was made regarding the length of the pipes. In this way, the volume of water losses for each meter of the MPTS is 23.19 m³/hour.

○ Financial Performance Indicators

The Total Volume of Water Losses corresponds to 32 % of the Volume of Water Entered in the System.

Pilot Zone

➤ Water Balance

The total volume of water distributed by the Alto-Maé DC to the PZ in 2006 was of 876.220 m³, which corresponds to the Annual System Input Volume. In the same period, the Total Volume of Authorized Consumption in the PZ was 191.828 m³.

About 4.680 m³ of water was esteem as volume used by clandestine consumption (illegal connections). This value, in the Water Balance, corresponds to the Commercial Losses.

The total water loss entered for the same period was 684.392 m³, of which 4,680 m³ correspond to the Commercial Losses and 679,712 m³ correspond to the Physical Losses.

➤ Performance Indicators

For this preliminary phase on the analysis, the significant Performance Indicators are:

○ Level of service

The water supply to the PZ was made 24 hours per day, with an average pressure of 21.4 m. In relation to the pressure, the average value in the morning was 32.1 m and in the afternoon was 10.7 m.

○ Physical Losses Performance Indicators

The losses entered on average of branch connections, admitting that they are equal to the number of customers, correspond to 3,929 l/day.

The analysis of the loss in relation to the linear length does not have to be considered therefore, the density of connections by the length of pipes gotten was 38 Connections/km, greater than 20 Connections/km, the recommendable value of minimum Connections/km to consideration of this variable in the calculation of the referred Indicator.

○ Commercial Losses Performance Indicators

The commercial loss corresponds to the illegal consumption through clandestine connections. This value corresponds to 2 % of Authorized Billed Consumption, which means, of the Volume of Billed Water.

○ Financial Performance

The Total Volume of Water Losses corresponds to 78 % of the Volume of Water Entered in the System.

Preliminary Conclusions and Recommendations

General

Given the uncertainty of the used values in the calculation model, resultant from the current inexistence of conditions that allow the real measurement of the volumes of produced, transported and consumed water in the MPTS and the PZ, the value of losses presented can't be considered as real, once is not yet possible, in relatively conclusive way, to make a honest balance of the physical losses that really occur in this system.

Associated to the previous point, the comparison between the value of losses gotten with the model and the average value of losses assumed as existing in the system, fixed in about 60 %, induct to doubts in relation to the accurately of the used database for the model calculation. This point is supported given that, the physical-structure characteristics of the PZ with influence in the occurrence of physical and commercial losses, namely, the possibility of existence of clandestine connections among others factors, when compared to other singular zones of the system, would have to propitiate an less value of losses than the assumed average value as existing in all the system.

The implementation of a plan for reduction of water losses is urgent, taking in to account the implications of the losses in the performance levels and profitability of the Company.

To sure that the defined strategy and methodology of execution adopted by the AdeM request the desired effect, it is necessary that the shares to carry through have an enough reliable level. This faith ness will have to be guaranteed by the availability of qualified human resources, by the persistence of the technician in the performance of the set requested services, and, in absolute, by the administration investment politics that create functional objective conditions that become the leakage detection and losses reduction, an immediate priority of the AdeM.

7, 2 Main Pipes Transmission System

➤ Conclusions

Given the uncertainty of the used values for the database in the determination of the level of existing losses in the MPTS, including the deficit knowledge on the installation conditions of the main pipes and the existence of illegal connections along the transmission alignments, it's not yet possible, in a conclusive way, to make a honest balance of the physical losses that really occur in this system.

➤ Recommendations:

The installation of flow and pressure meters is urgent in all the points defined for such, in order to make possible the beginning of the survey of values wove will support the strategy to use for the reduction of existing losses.

7.3 Pilot Zone

➤ Conclusions:

Given the inefficient used database for the determination of the level of existing losses in the distribution net that supplies the PZ, including the deficit knowledge on the installation conditions of the main pipes and the existing number of illegal connections in the installed net, it's not yet possible, in a conclusive way, to make a honest balance of the physical losses that really occur in this system.

➤ Recommendations:

It urges the implementation of shares that make possible the survey of a accurate database, that allows to the determination of the necessary variables to calculate the values of commercial and physical losses that occur in the PZ net, among which, the survey of the values of pressure in different points of the net and the exhausting survey of the number of customers beneficiaries of the net, including the working conditions of the installed accountants.