EVALUATION OF WATER SUPPLY SYSTEM AND ITS IMPORTANCE IN ENERGY MANAGEMENT - THE EXPERIENCE OF JACIARA – MT

Eng. Neyde Ferreira Leão, neydeleao@yahoo.com.br
Eng. Edson dos Santos, edsonsantos_eng@yahoo.com.br
Engearte Consultoria, Projetos e Obras

Prof. Dr. Marcelo Mendes Vieira, mmendes@ufmt.br
Eng. Mecânica / ICAT / Universidade Federal de Mato Grosso - UFMT

Abstract. *This work refers the study on the operation of the Water Supply System in the city of Jaciara – MT, and also to analyze alternatives to improve the service to customers and reduce operational and administrative costs. Thus the work has focused on energy management in sanitation system and the integration of energy efficiency policy with the policy of control and loss reduction. It was propose a methodology this study and so realized a diagnostic of the operation of water supply system and to obtain a systemic view of the whole process. Thus, a data collection has been carried out in the operational supply units based in the legislation "Resolução 456/2000 – ANEEL" and it was mapped the altitude of the system of Supply and of Consumption. Finally, it was proposed several tasks of the administrative profile, operational and investments to improve the water supply system. This tasks will lead to minor costs and the increase in the quality of the supply services of the population.*

Keywords: *energy management, energy efficiency, water supply system, control and loss reduction.*

1. INTRODUCTION

The consumption of energy in the sector of water supply comes acquiring importance each bigger time. Mainly this topic has been very important when it comes to rational application energy in water pumping systems (Oliveira Filho *et al*., 2004). In 2008, the consumption of energy in the sector was approximately of 11,78 billion kWh, it is three percent of the invoiced total consumption of electric energy equal to 392,76 Twh (Perrone, 2010). The consumption of energy in the sector of water supply comes acquiring importance each bigger time. In 2008, the consumption of energy in the sector was approximately of 11,78 billion kWh, it is three percent of the invoiced total consumption of electric energy equal to 392,76 Twh (Perrone, 2010). Actually, in Brazilian water supply companies, the costs for electricity are 40%, approximately and this reduces the investment capacity of the system. Usually, the most expensive cost in these companies is the wages of the workers, in second, is the energy cost and, at last from spending chemicals. Therefore in some systems, the electricity costs of water pump systems can be the more expensive of all.

According Tsutiya (2001), the significant current cost of electric power in the sanitation sector is removing the subsidies, which was granted in electricity tariffs for public services of water supply and sanitation. There is also the increase of energy tariffs above inflation rates and the introduction of the ICMS - Tax on Circulation of Products and Services, which in early 1989 was 17% and since 1990 has increased to 18% on the total bill, and this represents 20.4% increase on the supply of energy. By June 1968, was granted a subsidy of 80% in electricity tariffs. This discount has been gradually reduced, reaching 15% since 1990, and has remained in this index, as Tab.1 shows in third and fourth classification.

Table 1. Discounts in function the kinds of consumers (Portaria DNAEE No 466/97)

Classification	*Electric Voltage*	*Discount (%)*
Agricultural cooperative	high tension	50
Others agricultural consumers	high tension	10
Water supply and sanitation	high tension	15
Water supply and sanitation	low tension	15

In the past, the investments did not justify because of the great subsidies and there were not projects in water distribution, reservation and pump systems. Miranda (2005) mentions that the estimated total costs to reduce lost water and actions of energy efficiency in Brazil are R$ 16.4 billions of Real and, the payback these actions is of 1.7 kWh/year, that is equivalence to R$ 2.7 billions of Real per year. Basically, it is possible to conclude that the investments itself pay in six year.

In Mato Grosso, with the extinction of SANEMAT (state company responsible for sanitation) in 1997, the responsibility of the systems were returned to cities, which had no adequate infrastructure (technical personal and resources) to operate them efficiently. Approximately 90% of cities of Mato Grosso are small and a population less than 20,000 inhabitants, whose current administrative structure undertake the appropriate management of municipal sanitation services.

The study presented in this work refers the case of the Jaciara city, located in Mato Grosso State, Brazil. It is located at latitude 15 ° 57' 55" south and longitude 54 ° 58' 06" West, with an altitude of 367 meters. Its population in 2005 was 26,930 inhabitants, according to IBGE (Brazilian Institute of Geography and Statistics). It is the principal city of the Region of the São Lourenço River Valley. The municipal water supply of Jaciara-MT during the year 2007, the involvement of expenditure on electricity in operating expenses accounted for 64.83% of invoicing (SNIS – MCidades, 2007). According to data from SNIS/2007 - MCidades, in Jaciara the consumption per capita of population was 234.04 l / person / day and the average in Brazil during the same period was 150 l / person / day. Thus the rate of losses in distribution and billing accounted for 66.25% of all revenues. Therefore , this paper has the objective to present the used method to carry out data of the water supply systems and to adopt actions to decrease costs in the energy consumption and water losses.

2. METHODOLOGY

The Brazilian government has adopted several actions to achieve savings in energy consumption, for example, in 1985, was initialized the PROCEL - Energy Waste Combat Program (Saidel *et al.*, 2000). And in 1996, ANEEL - National Electric Energy Agency was created and is the principal government agency that regulates the supply and consumption of electricity in the country. Not to compromise the energy reserves in order to obtain the security of the electricity supply, ANEEL regulates tariffs through the seasonality and time of consumption through contracts of the consumers, prescribed in the Regulation 456 (ANEEL, 2000). Because of those tariffs, it is important the consumers to survey data of the energy consumed by the system of water and to seek alternatives to escalation of the operating hours of the pumping system in order to save this rate. Moreover, it is possible also can review the contracts and to adjust the use of electricity of each equipment or station water supply in the contract.

In this work, a technical assessment of the supply system it is necessary to evaluate whether the equipment specifications are suitable for use due of demand. In addition, proposals will be made operational system to minimize waste and improve efficiency.

2.1. Data Collection of the Water Supply Units

Leão (2007) proposes a worksheet to fill the data needed for this type of analysis. As seen in Fig. 1, the worksheet presents the following informations:

- contract number;
- local;
- tariff kind;
- days;
- Consumption of electric energy (kWh and R$): Active in off-peak (“fora de ponta”) and in peak load or on-peak, (“ponta”), Reactive in off-peak (“fora de ponta”) and peak load or on-peak, (“ponta”) and, the consumer surplus in off-peak (“ultrapassada”);
- in “Demanda” or Demand, it is indicated the contracted electric power in kilowatt (kW) in the same conditions of the comsumption, i.e.: Active in off-peak and on-peak, Reactive in off-peak and on-peak and, the consumer surplus in on-peak;
- then is seen “$cos\ \theta$”, ome warning (“aviso”), emergency charge (“encargos de capacidade emergencial”), lighting (“iluminação”) and others (“outros”). Also the tax are presented: Cofins, ICMS and PIS. If there is a difference between the bill and the spreadsheet, the column "diferença" indicate. Once input the pumped volume it is possible to obtain the ratio between the electric consumption and the flow (kWh/m^3).

CONTRACT NUMBER	LOCAL	TYPE OF TARIFF	DAYS	CONSUMPTION											
				ACTIVE				REACTIVE				PLUS		EXCEED ON-PEAK	
				OFF-PEAK		ON-PEAK		OFF-PEAK		ON-PEAK		ON-PEAK			
				INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR
				kWh	R$	kWh	R$	kvarh	R$	kvarh	R$	kWh	R$	kWh	R$

…

DEMAND															
ACTIVE												REACTIVE			
CONTRACTED Off-PEAK		CONTRACTED ON-PEAK		REGISTERED OFF-PEAK	REGISTERED ON-PEAK	INVOICED OFF-PEAK		OVER				EXCEED			
								OFF-PEAK		ON-PEAK		OFF-PEAK		ON-PEAK	
INVOICED	VALOR	INVOICED	VALOR	INVOICED	INVOICED	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR
kW	R$	kW	R$	kW	kW	kWh	R$	kW	R$	kW	R$	kvarh	R$	kvarh	R$

…

POWER FACTOR		Emergency Capacity Charge	ILLUMINATION	OUTHERS	TAX			CALCULATED VALOR	AMOUNT	DIFERENCE	PRODUCED WATER	CONSUMPT. ESPECIFIC	SPECIFIC AMOUNT
REGISTERED	WARNING				COFINS	PIS	ICMS						
COS Ø		R$	R$	R$	R$	R$	R$	R$	R$	R$	m³	kW/m2	R$/m³

Figure 1. Worksheet used to evaluate the consumed energy, the contracted demand, taxes in predetermined period (Leão, 2007).

2.2. Analysis System

It is very important to obtain informations about whole system and, therefore, will be performed the following tasks:

a) Release of data from January/2005;

b) Diagnosis of the operating units with the data collection units in operation: the extracted water surface, Water Treatment Plant and wells water (flow, level static and dynamic) and electromechanical equipments;

c) Photo report of units and the tests Pitometry;

d) Assessment of water supply system, from a strategic vision for energy efficiency and operational improvements:

- d1) Technical register of the current system (distribution, pipes, reservoirs, operational units) ;
- d2) Reports of operation time of wells water, extracted water surface and pressure pumps, from the January/2009 up to August/2010;
- d3) Reports of control pressure pumps;
- d4) Carry out of leak pipes through registered order service ;
- d5) Tests Pitometry at various points of the distribution system;
- d6) Measurement of flow rates and pressures of the pumps from wells water, extracted water surface and horizontal pressure pumps;
- d7) Simulation of the system in the computer program EPANET as Viegas (2002).

The system has five water supply unit that are:

- a) extracted water surface of Cachoeirinha river. It is lower of the city and its altitude is of 270 m;
- b) PT-01 well water with altitude of 369m;
- c) PT-02, altitude of 397 m;
- d) PT-03, altitude of 369 m, and;
- e) PT-04, altitude of 400 m.

Furthermore, the system also has a capacity of reservation in operation of 1,260 cubic meters. There are a reservoir of 240 m³ with altitude of 369 meters, located in the DAE - Department of Water and Wastewater that is central region of the city and, one of 1,000 cubic meters located in the PT-04 and, one 20 cubic meters located adjacent to the PT-02. The PT-02 and PT-04 wells water are neighbors and are situated in higher region of the city.

3. OBSERVATIONS AND OBTAINED RESULTS

This paper shows the data collection from 2009 of four units of water supply: extraction of Cachoeirinha river and the wells water PT-01, PT-02, PT-03 and PT-04. All water sources units are in the urban perimeter and the obtained informations are indicated in Fig. 2. It is possible to verify any observations:

- the consumption of 29,381 kWh at on-peak hours, which represented an annual cost of the largest R$ 38,489.11. For comparison, the cost of energy at on-peak hour is R$1.53 / kWh and at off-peak hours the cost is R$0.22/kWh;

- the consumption of reactive kvarh 5488 at off-peak hours and 206 kvarh at on-peak hours;
- in period, the Demand registered of 2613.95 kW is higher than the contracted demand of 2562.00 kW;
- the Demand exceeded of 302.90 kW represented a cost of R$ 15,120.76. For example, if to change the current demand of 70 kW unit PT03 to 82 kW. Thus the expenses will reduce to R$ 12,724.76 / year. The current demand is insufficient for current needs;
- the whole system exceeded the Demand with 302.90 kW. In this case, this corresponds to R$ 15,120.76 because the energy costs R$ 49.92 per kWh;
- there is a reactive demand of 5.19 kW.

CONTRATO NÚMERO	LOCAL	TARIFA TIPO	DAYS	CONSUMPTION											
				ACTIVE				REACTIVE				PLUS		EXCEED ON-PEAK	
				OFF-PEAK		ON-PEAK		OFF-PEAK		ON-PEAK		ON-PEAK			
				INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR
				kWh	R$	kWh	R$	kvarh	R$	kvarh	R$	kWh	R$	kWh	R$
	TEST	BLUE													
	TEST	ORANGE													
680354	INTAKE	CONVEN		230.960	73.825,18	-	-	-	-	-	-				
690813	PT -01	GREEN		257.074	35.220,72	3.576,00	3.536,82	1.445	203,98	78	77,32				
680346	PT -02	GREEN		465.903	65.445,38	7.617,00	7.585,42	-	-	1	0,94				
680362	PT -03	GREEN		637.649	89.469,00	16.162,00	15.991,18	3.930	609,86	86	87,11				
680338	PT -04	GB CM		201.382	28.270,56	2.026	2.031,40	113	12,94	41	40,51				
TOTAL CONSUMPTION				**1.792.968**	**292.230,84**	**29.381**	**29.144,82**	**5.488**	**826,79**	**206**	**205,87**				

CONTRATO NÚMERO	LOCAL	TARIFA TIPO	DAYS	DEMAND													
				ACTIVE								REACTIVE					
				CONTRACTED ON-PEAK		REGISTERED OFF-PEAK	REGISTERED	INVOICED OFF-PEAK		EXCEED OFF-PEAK		EXCEED					
												OFF-PEAK		ON-PEAK			
				INVOICED	VALOR	INVOICED	QUANT	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR	INVOICED	VALOR		
				kW	R$	kW	kW	KWh	R$	kW	R$	kvarh	R$	kvarh	R$		
	TEST	BLUE															
	TEST	ORANGE															
680354	INTAKE	CONVEN		0	-	0,00				0,00	-	0,00	-				
690813	PT -01	GREEN		630,00	6.385,18	659,83		641,45	6.501,23	27,32	832,51	0,00	-				
680346	PT -02	GREEN		696,00	7.057,98	755,50		736,50	7.468,86	19,00	577,04	0,00	-				
680362	PT -03	GREEN		840,00	8.518,25	1086,56		840,00	8.518,25	249,41	7.589,89	5,19	52,72				
680338	PT -04	GB CM		396,00	4.015,75	349,36		396,00	4.015,75	7,17	217,39	0,00	-				
TOTAL CONSUMPTION				**2.562,00**	**25.977,15**	**2.851,25**		**2.613,95**	**26.504,09**	**302,90**	**9.216,83**	**5,19**	**52,72**				

CONTRATO NÚMERO	LOCAL	TARIFA TIPO	DAYS	POWER FACTOR		Emergency Capacity Charge	ILLUMINATION	OTHERS	TAX			CALCULATED VALOR	AMOUNT
				REGISTERED	WARNING				COFINS	PIS	ICMS		
				COS Ø		R$	R$	R$	R$	R$	R$	R$	R$
	TEST	BLUE											
	TEST	ORANGE											
680354	INTAKE	CONVEN				-	347,25	224,44	5.223,84	1.145,13	34.368,80	115.134,64	115.134,55
690813	PT -01	GREEN				-	258,09	64.337,82	3.227,42	711,99	21.519,63	136.427,53	136.427,54
680346	PT -02	GREEN				-	347,25	440,59	5.721,62	1.257,80	37.738,51	126.583,41	126.583,38
680362	PT -03	GREEN				-	347,25	338,15	8.724,28	1.916,17	56.968,42	190.612,27	190.612,31
680338	PT -04	GB CM				-	347,25	181,52	2.433,30	535,26	15.752,61	53.838,49	53.838,51
TOTAL CONSUMPTION						-	**1.647,09**	**65.522,52**	**25.330,46**	**5.566,35**	**166.347,97**	**622.596,34**	**622.596,29**

Figure 2. Indication of data monitoring consumption and energy demand of the Water Supply System in 2009.

4. PROPOSALS FOR ACTION

4.1. Extraction of Cachoeirinha River Unit

It is proposed the changing of the contract pricing, because, the capture surface located in Cachoeirinha River currently works with the conventional tariff, the cost is higher than the rate horosazonal green. The Tab. 2 presents the evaluation of the functioning by charging conventional (B3 group and A4 group) and by charging hourly-seasonal (A4 group).

Table 2 – Simulation about the tariffs applied in Water Surface Supply (Cachoeirinha River).

MONTH	CONSUMED ENERGY kWh	INVOICED DEMAND kWh	CONVENTIONAL B3			CONVENTIONAL A4			GREEN HORO SEASONAL		
			CONSUMPTION R$	DEMAND R$	TOTAL R$	CONSUMPTION R$	DEMAND R$	TOTAL R$	CONSUMPTION R$	DEMAND R$	TOTAL R$
			0,505	0,00		0,240	53,38		0,225	16,4	
JAN	13.280,00	80,00	6.706,40	0,00	**6.706,40**	3.187,20	4.270,40	**7.457,60**	2.988,00	1.312,00	**4.300,00**
FEV	12.000,00	80,00	6.060,00	0,00	**6.060,00**	2.880,00	4.270,40	**7.150,40**	2.700,00	1.312,00	**4.012,00**
MAR	10.080,00	80,00	5.090,40	0,00	**5.090,40**	2.419,20	4.270,40	**6.689,60**	2.268,00	1.312,00	**3.580,00**
ABR	13.360,00	80,00	6.746,80	0,00	**6.746,80**	3.206,40	4.270,40	**7.476,80**	3.006,00	1.312,00	**4.318,00**
MAI	11.840,00	80,00	5.979,20	0,00	**5.979,20**	2.841,60	4.270,40	**7.112,00**	2.664,00	1.312,00	**3.976,00**
JUN	13.760,00	80,00	6.948,80	0,00	**6.948,80**	3.302,40	4.270,40	**7.572,80**	3.096,00	1.312,00	**4.408,00**
JUL	21.360,00	80,00	10.786,80	0,00	**10.786,80**	5.126,40	4.270,40	**9.396,80**	4.806,00	1.312,00	**6.118,00**
AGO	34.640,00	80,00	17.493,20	0,00	**17.493,20**	8.313,60	4.270,40	**12.584,00**	7.794,00	1.312,00	**9.106,00**
SET	37.840,00	80,00	19.109,20	0,00	**19.109,20**	9.081,60	4.270,40	**13.352,00**	8.514,00	1.312,00	**9.826,00**
OUT	24.960,00	80,00	12.604,80	0,00	**12.604,80**	5.990,40	4.270,40	**10.260,80**	5.616,00	1.312,00	**6.928,00**
NOV	20.000,00	80,00	10.100,00	0,00	**10.100,00**	4.800,00	4.270,40	**9.070,40**	4.500,00	1.312,00	**5.812,00**
DEZ	17.840,00	80,00	9.009,20	0,00	**9.009,20**	4.281,60	4.270,40	**8.552,00**	4.014,00	1.312,00	**5.326,00**
					116.634,80			**106.675,20**			**67.710,00**

As seen in Tab. 2, the group change from B3 to A4, with a changing of tariff class of conventional hourly-seasonal green tariff, with the installation of suitable equipment to the flow, the reduction in the cost of electricity is estimated approximately R$ 50,000.00 per year.

With the technical assessment of wells water in operation, there is the possibility of expanding the flow of the same in 80 m^3/h and, thus it is possible to disable the surface extraction, because the increased volume could to supply the demand served by extracting Cachoeirinha River. Otherwise, the increase in the capacity of the pumps also would request an increase of electric power in the engines of about 30 kW. If possible, these last action would result in real savings of energy and cost reduction, equivalent to R$ 83,000.00 per year, approximately, as shown in Tab. 3.

Table 3 – Simulation about the tariffs applied in Water Surface Supply (Cachoeirinha River).

Current Situation with Operation of the SE05 Unit	*Energy*	*Amount (R$)*
- Consumption in 2009:	230960 kWh	116,000.00
Forecasting with Deactivation SE05 Unit	*Energy*	*Amount (R$)*
- Consumption of electricity per year:	115200 kWh	25,344.00
- Energy demand:	480 kW	7,680.00
- Total:	-	33,024.00
Saving:	-	82,976.00

4.2. Disabling the pumping of ETA – Water Treatment Station

The reservoirs ETA are situated at altitudes favorable to the city's total supply. In virtue of this, it would be necessary to use two sets of daily pumping horizontal BH1Aand BH1B beside the reservoir and that repression of the reservoir to the distribution network, i. e. with this system configuration, it is not taken advantage of the potential gravity of these differences heights. Thus there is a electrical energy consumption of the unit PT-01 that could be eliminated. The gravity water supply system has the advantage of better regulation of pressure on the network. In the system of direct supply by the pump, the network pressure tends to rise inversely proportional to the demand, increasing the incidence of rupture of the pipes and, therefore losses. The informations about the repair pipe and the evidence of high pressure recorded by Pitometry corroborate for this fact.

The Tab.4 shows the economies by turning off the pumping sets BH1A and BH1B. As can be seen in the table, with the deactivation of the pumping promote a reduction in the amount of electrical energy estimated to R$ 40,000.00 per year.

Table 4 - Results of the simulation with deactivation of BH1A and BH1B pumps.

Current Situation of the SE01 Unit with Pumping	*Energy*	*Amount (R$)*
- Consumption in 2009:	360000 kWh	113,500.00
Forecasting with Deactivation of the Pumping	*Energy*	*Amount (R$)*
- Consumption of electricity per year:	160000 kWh	35,200.00
- Energy demand (27kW x 12 months):	324 kW	(324 kW x R$16) 5,184.00
- Total:	-	40,384.00

4.3. Disabling the pump pumping of PT-02

In designing the current system of pumping of the well PT-02 is installed and working daily the BH02 horizontal pump assembly, beside the reservoir to RA-02 that represses distribution network and pumps into RA04 reservoir of PT-04. Indeed, this configuration requires two pumps: one is submerged into water well and a horizontal pumping to pumps in distribution network, and thus has greater electrical energy consumption. With the correct sizing of pipes RA-04 reservoir, all water captured by well PT-02 could be pumped to the RA-04 reservoir of PT-04. Therefore, could eliminate the RA-02 reservoir and BH02 pumping assembly together, reducing energy consumption. As can be seen in Tab. 5, the disabling of pumping assembly reduces the amount of electricity at approximately R$ 35,000.00 per year.

Table 5 - Results of the simulation with deactivation BH02.

Current Situation of the SE02 Unit with BH02 Pumping	*Energy*	*Amount (R$)*
- Consumption in 2009:	476500 kWh	126,500.00
Forecasting with Deactivation of the Pumping	*Energy*	*Amount (R$)*
- Consumption of electricity per year:	144000 kWh	31,680.00
- Energy demand (19kW x 12 months):	228 kW	(228 kW x R$16) 3,648.00
- Total:	-	35,328.00

4.4. Specific Consumption, Efficiency and Enhancement of Equipments

The pumping assembly was acquired but does not policy to use equipments with high performance. Thus a study more detailed with selection and design of the pumps and electrical motor will promote a expressive decreasing of the energy consumption to release the same task. This fact was corroborated with measured flow, pressures and electrical consumption in pumping assembly.

The submerged pumps of DAE was installed into water well with 100 meters of deep and have retention valves near to their. When the pumps are turning off, there is a big impact of pressure in the pipe because the sudden closing of valves and this damages the assembly pumping and others devices linked to pipes. The proposal suggests that will be installed electronic starter devices which have resources of acceleration and deceleration of electrical motor rotation during starting and turning off motor. Then it will minimize the problems and will reduce the energy costs, repairs and maintenance of pumping assembly.

A framework (Tab. 6) is presented below with resume of principals actions. In the first column there are the item and the denomination, to beside was indicated the situation or current problem. After, is showed thew proposal action, procedures to action, involved costs and, finally, is indicated the promoted economy at troubleshooting. The annual amount of electrical energy was of R$580,698.71, in 2009. The implantation of actions will implicate in the estimated reduction of R$ 210,000.00 per year which represents 36.2% of the total.

Table 6 – Framework of proposals to Water Supply Systems of Jaciara-MT.

ACTUAL CONDITION				PROPOSAL CONDITIONS			
ITEM		ACTUAL	IMPLICATION	ACTION	PROCEDURES	COST R$	RESULTS
1	HOURLY–SEASONAL	The pumping system running at on-peak	Payment for consumption at on-peak hours with rate eight times higher. With this, the cost of energy raised (R$ 40,000.00 in 2009)	Stoppage of pumping at on-peak with reservation	Operate off-peak hours to maintain a high level in the reservoirs to stop during the three on-peak	No cost of deployment because this considerates the capacity of the reservoirs	Reduction in the costs of electrical energy. The amount of reduction is R$ 40,000.00 per year
2	EFFICIENCY OF PUMPS	The pumping equipment are old, obsolete and low income	Greater consumption of electricity for the same production of water. The specific cost of water / electricity raises	Replacement of pumping by other high-performance equipments	Acquisition and installation of new pumps	120,000.00	Reduction of approximately 10% in energy consumption, ie. 190,000 kWh or R$ 40,000.00 per year
3	REACTIVE ENERGY	Reactive power consumption due to their low Power Factor (PF) of 6000 kWar in 2009	Payment of the reactive energy that do not be used	To correct the power factor by installing bank of capacitors for their units.	Purchase and installation of capacitors in the units with PF below 0.92	1,200.00	Reduction in consumption and cost of electricity of approx. R$ 1,200.00 annually
4	CONTRACTED DEMAND	The consumer unit SE03 of PT03 has a contracted demand lower than required	Payment of the exceeded demand is three times the value of contracted demand (the amount paid in 2009 was R$ 12,480.00)]	Change the value of contracted demand of 70 kW to 82 kW.	To change the contract with the electricity supply company	No cost	Reduction in energy costs of approx. R$ 10,000.00 annually
5	TARIFFS	The tariff classification in SE05 (capture) is the group B3 with conventional tariff	Payment rate higher than the hourly-seasonal rating (the amount paid over in 2009 was approx. R$ 50,000.00)	To change the group contract for the B3 conventional group to A4 horosazonal green group	To build new standard entry to group A4 and modify the contract	5.000,00	Reduction in cost of electricity of approx. R$ 50,000.00 annually
6	DISABLING OF UPTAKE OF RIVER	30% of the water pumped into the uptake of the Cachoeirinha River is thrown into the wastewater, for lack of ETA capability.	Applicated High cost of electric in water that did not supplied.	To disable the capture of the Cachoeirinha River and increase the flow of the water well (PT03)	Purchase and install new pumping for new flow (280m3/h)	50,000.00	Reduction in energy costs of approx. R$ 83,000.00 annually
7	DISABLING PUMP OF THE ETA	Although there is a reservoir, water is pumped to the piping located under of the ETA reservoir.	High cost with electric energy, because they should use gravity to supply (cost in 2009 was R$ 40,000.00)	Turn off the pressure pumps for the pipe	Check the connections on the pipe of reservoirs, to turn off the pumps and to suit theirs.		Reduction in energy costs of approx. R$ 40,000.00 annuallyl
8	DISABLING PUMP OF THE WELL PT-02	The uptake in PT02 well submersible is made by pump and the water is storaged in reservoir. After, the water is pressed to piping distribuition by a horizontal pump.	There is a high cost with electric energy. The same submerged pump should repress to the reservoir RA04 (cost in 2009 to R $ 35,000.00)	To increase the capacity of the BS02 pump to supply the RA04 reservoir. Thus it is possible to disable the BH02 bomb	Purchase and install new pumping and eductor pipe to new height gauge.	28.000,00	Reduction in energy costs of approx. R$ 35,000.00 annuallyl

5. CONCLUSION

This study demonstrates the importance of energy management system of water supply in an company, because it is viewed that the expansion of production do not solve problems of supplying. It is necessary evaluate the system from a systemic view of the whole process, which leads to integrate policy of energy management with the management policy of reducing water losses in the system. We can not carry out the assessment in view also the modernization of equipment only, without checking the functioning of the system as a whole (collection, processing, distribution, reservation, maintenance and management) All processes are dependent. With the difficulty of this still release funds for investment in the sanitation sector for small municipalities, it becomes more urgent the search for the optimization of the system to enable cost reduction and thus increase the capacity of investment own resources.

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5. RESPONSIBILITY NOTICE