Current World Environment Vol. **10**(Special Issue 1), 1024-1027 (2015)

To Study Optimization Of Phizical Features On Bandar Abbas City (Iran) Water Supply Network By Using Watergems Software

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http://dx.doi.org/10.12944/CWE.10.Special-Issue1.121

(Received: November, 2014; Accepted: April, 2015)

ABSTRACT

By using of WATER GEMS V:8i Software to make a simulation model of water supply network, and input data of Bandar Abbas GIS maps, and with considering proper executive and economic points to change many subordinate pipes, diameter till more than 300 mm to main network and to add many new branch to main network in midtown with high aggregation, and output proper calibration according to fact, the city was possessed a virtual standard water supply network (skeleton)

Key words: optimization, water supply, network, skeleton.

INTRODUCTION

Water supply network is intended to supply water to consumers. Water supply network systematically is divided to three parts.

a) Branch networks
b) Annular networks
c) Hashed networks

It is used both networks to water supply of cities practically because making structure of annular networks is very expensive and no commotions. In fact they are many annular and branch her works in hashed networks [1]. Unfortunately there are not any systematic design in Bandar Abbas water supply network. (Fig 1-1)

Estimated Consumption

Estimation of consuming amount According to Iran map climate co efficient, maximum coefficient is 1.5 to 1.8. Maximum consuming of water is suggested 1.5 per one hour, according to General Health Engineering administration of Agricultural Ministry:

For more than 10000 population, like Bandar Abbas city. With obtaining Bandar Abbas city population, consuming, velum water need might be estimated. If we get information on total Bandar Abbas city's population, we will he be able to calculate the water value that the city population needs to. For this purpose we need to get data and obtain information on population compression and distribution in present and future.

It should be calculated the city population in different process of network exploitation and from other hand, effective factors in. Per capita consuming and water consuming amount in each process for making a plan of water supply.

Essential factors in Bandar Abbas city physical plan design

A. Compression and distribution of population.
B. Population studies.
C. Plan periods.
D. population grow rate.
E. Investment Justification
F. Installations self-life

Method of diameter economic calculation

Method of diameter economic calculation in Bandar Abbas city pump pipeline preparation and installation in steady output of pump pipe lines has a reverse relation with energy cost to supply water pressure. Accordingly if pipeline diameter became shorter, the pressure will became lower, and to make more pressure, it needs to a pump with more power, and for more power it needs to more cost for consuming electricity power. If pipeline diameter increase, cost of pipeline preparation and installation will increase, ho were energy supply cost decreases. Therefore It could be selected the proper diameter of pipeline that total cost of preparation and installation, and energy cost be in minimum the selected diameter is called economic diameter.

We use hizen and Williams formula to calculate the economic diameter of pump pipelines and to calculate electro pump power we use:

$$p = \frac{VQH}{\text{h} * 1000} \quad \text{...(1)}$$

V= water specific gravity (n/m3)
Q = pump Out put (m3*s)
H= water pump height (m)
h = pump and electro pump total efficiency

The value of consuming present cost with using of annular present cost coefficients and present investment cost is, if benefit investment I percent and plan periodic in year:

$$P = \frac{A(1+i)^n - 1}{i(L+i)^n}$$

i: benefit investment (percent)
n: years of plan time
A: annular present cost
P: present cost value

According to above formula and necessary calculation on Bandar Abbas city, and comparison of present and design mood, a new skeleton was made (Refer to Fig.2).

Installations shelf life of plan, according to ambient condition, soil type, material quality, executive

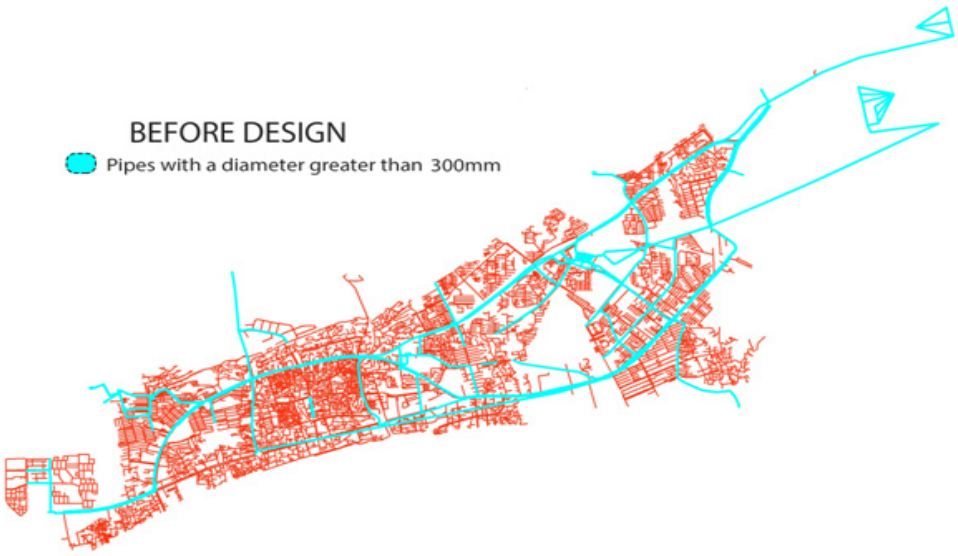

Fig. 1: pipes with a diameter greater than 300 mm old (before design)

circumstance, maintenance and exploitation & management is different.

Above mentioned condition is a standard to select the time and period of plan. The type of pipe lines are poly ethylene, cement asbestos, and in some cases, steel.

The operational life of these pipelines according to functional circumentance and shelf life is useable about 20 to 40 years. Maximum water velocity water distribution network is suggested 2 meter per second and in firefighting 2.5 meter per second Minimum velocity of water in distribution networks is suggested 0.3 m per second.

But in some times that the consuming is low and as well as. Maintaining the minimum pipe diameter, is suggested the minimum velocity. Often velocity is between 0.5-1.20 m per second, in transferring pipe lines, that that are in economic velocity.

Determine tank volume Method

Reservoirs are used for reserving the needed water to compensate the water pressure fluctuation and adjustment the pressure of network scum.

50. to 70 present of daily consuming maximum in end of plan period is suggested to effective volume of ground reservoir. Effective velum of air reservoirs that depends on local conditions and economic survey is determined by compression of pump house economically, pipelines and power supply system.

Effective volume of the reservoirs is estimated between 3 to 5 percent of maximum daily consuming in end of plan period.

It could be selected more volume for air reservoirs' to compensate hourly fluctuating consuming. According to Health Engineering publication and power Ministry standard and Jihad Agricultural Ministry, the volume of this type of reservoirs is 10 to 35 percent's of maximum daily consuming in end of plan period.

It can be a standard to determine volume the air reservoirs.

Volume of modified reservoirs of this network (Bandar Abbas) is according to above mentioned publication.

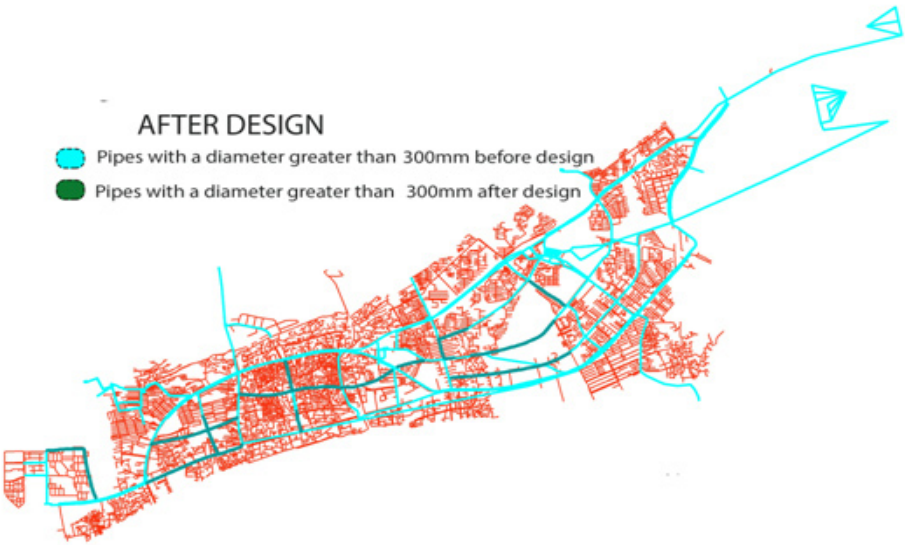

Fig. 2: Pipes with a diameter greater than 300 mm new (after design)

Table 1: 14 pumps are operated in the present network, the calculations and studies were performed according off - on time and even off pump in optimum mood.

Label	Elevation (m)	Pump Definition	Status (Initial)	Hydraulic Grade (Suction) (m)	Grade (Disch	Flow (Total) (L/s)	Pump Head (m)
PMP-1	7.59	7605-7616 (PMP-8122)	On	8.17	63.58	1041	55.42
PMP-2	7	7605-7615 (PMP-8123)	Off	8.19	63.45	0	0
PMP-3	7	7605-7599 (PMP-8124)	Off	8.19	63.33	0	0
PMP-4	7	7606-7617 (PMP-8127)	On	7.7	82.83	289	75.13
PMP-5	7	7606-7618 (PMP-8128)	On	7.7	81.97	292	74.27
PMP-6	7	7606-7619 (PMP-8129)	Off	7.71	78.63	0	0
PMP-7	7.35	7606-7620 (PMP-8130)	On	7.7	78.23	303	70.53
PMP-8	8.19	7606-7621 (PMP-8131)	On	7.7	77.2	306	69.49
PMP-9	8.94	7606-7622 (PMP-8132)	Off	7.71	73.66	0	0
PMP-10	55.62	Copy of 200-40-90kw	On	57.28	135.44	180	78.15
PMP-11	55.62	Copy of 200-40-90kw	On	57.28	135.44	180	78.15
PMP-12	55.62	Copy of 200-40-90kw	On	57.28	135.43	180	78.15
PMP-13	42	200-40-90kw	Off	44.5	74.31	0	0
PMP-14	42	200-40-90kw	Off	44.5	74.31	0	0

Limitation of the design
Limitation of pressure in the network.
Limitation of velocity.
Limitation of pipeline diameter.

PUMPS

In fact, 14 pumps are operated in the present network, the calculations and studies were performed according off - on time and even off pump in optimum mood.

CONCLUSION

According to calibration and new mood of the design, to make optimum on the water supply of Bandar Abbas city will have the advantages:

A. proper water supply skeleton, refer to Fig.2.

B. By increasing the pipe line diameters, energy cost will be decrease. (no.4)

C. with long life of present water supply network, all limitations were considered and applied.

This article has a suggestion to Bandar Abbas water and sewage co. to make pipelines diameter shorter to save Energy not waste and save the national it. Capital.

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