Managing the Rate of Leaks and Breaks in the Old Water Networks

Presentation

By

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1. Introduction

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In Water Networks, a major maintenance expenses go for repairing leaks and breaks.

during the maintenance of the leaks & breaks, the water service will be interrupted and the customers will not be satisfied

Implementing water demand and pressure management:

- Can help to minimize the breaks and leaks maintenance costs.
- Also it can help to maintain pump efficiency and save water & energy.

1. Introduction

By 2002 KAHRAMAA as a first step started to study or put a plan for studying proposals to replace a complete water networks in areas where the networks were installed before 1983.

But since it is not possible to finish the study and to start such big replacement projects before 2005

KAHRAMAA decided to do something to reduce the leaks and breaks in the old network in order to reduce Maintenances costs, reduce customers complaints, and to keep good reputation

1. Introduction

KAHRAMAA successfully achieved its target of reducing leaks and breaks in the old network by the year 2004-2005 after which the replacement projects started.

This process took three years from 2002 to 2005 to achieve the goal followed by one more steps taken from the year 2010 to 2011 .

The process can be summarized into five steps on time basis..

2. Objectives

Implement water demand/pressure management by

- Optimizing the upstream and downstream of the network
- And also following an advanced pump operating technique which will minimize the rate of breaks and leaks in the network.

3. Information About Us

Operate and Maintain all Water Networks Pipelines and Facilities system outside the boundary of Desalination Plants.

The Water Network System consist of the following:

1- Transmission mains: Length: 720 km
Diameter: 600 mm – 1600 mm

2- Water reservoirs + Storage Tanks:
Total Number : 85 + 11
Total Capacity: 443 MIG

3. Information About Us

3- Pumping Stations: Total Number: 29

4- Rising Mains and Distribution Mains:

Total Length: 5,670 km

5- Network Appurtenance: (Valves, Hydrants, Air Valves):

Total Number: 51,100

(35,500 Valves + 14,000 Fire Hydrants + 1,600 Airvalves)

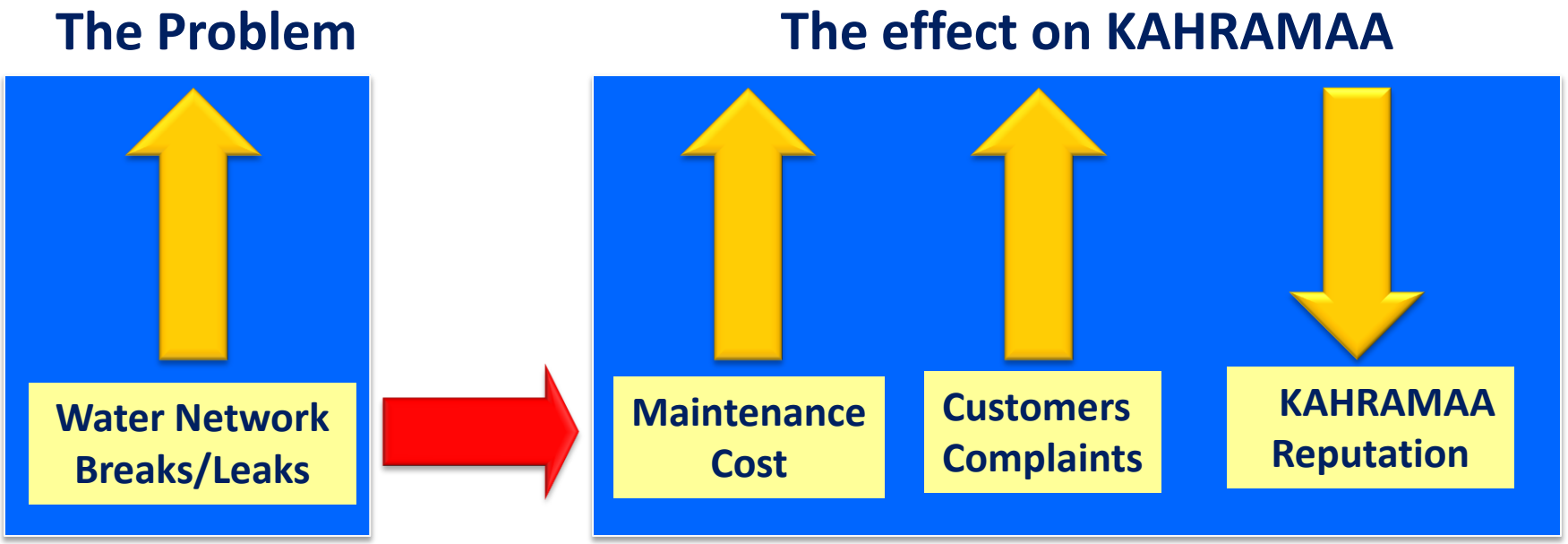
6- Service connections:

Total Number: 230,400

7- Tanker Filling Stations (TFS):

Total Number: 14

4. The problem of Leaks & breaks



5. Pipelines of Kahramaa water network

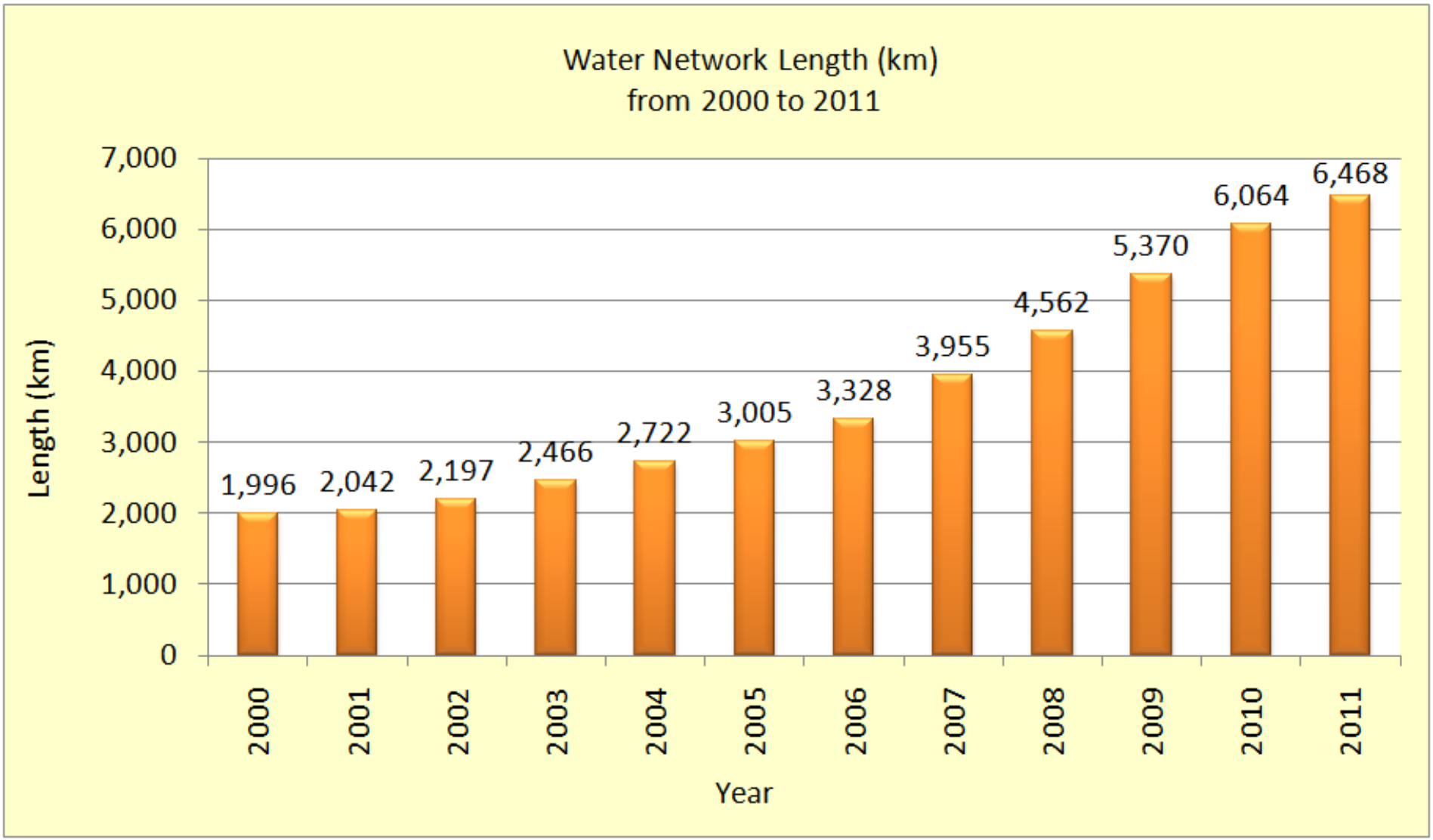


Figure 1: Length of water network in Qatar from the year 2000 to 2011

6. Steps taken to reduce leaks & breaks and the results

Step-1 (2002 - 2003):

Slightly reduced the pressure in particular portions of the networks by throttling the feeder pipes.

We tried to maintain maximum 1 bar pressure

Figure 2: Average Daily Leaks & breaks for the years **2003 to 2004**

6. Steps taken to reduce leaks & breaks and the results

Step-2 (2003 - 2004):

Giving proper training, for the Operators of water reservoirs pumping stations, in the professional way of starting and stopping of the pumps complying with manufacturer recommendation.

This was done by implementing particular pump procedure of start up & shut down (starting/stopping of the pumping) without causing hammering in the old water networks.

6. Steps taken to reduce leaks & breaks and the results

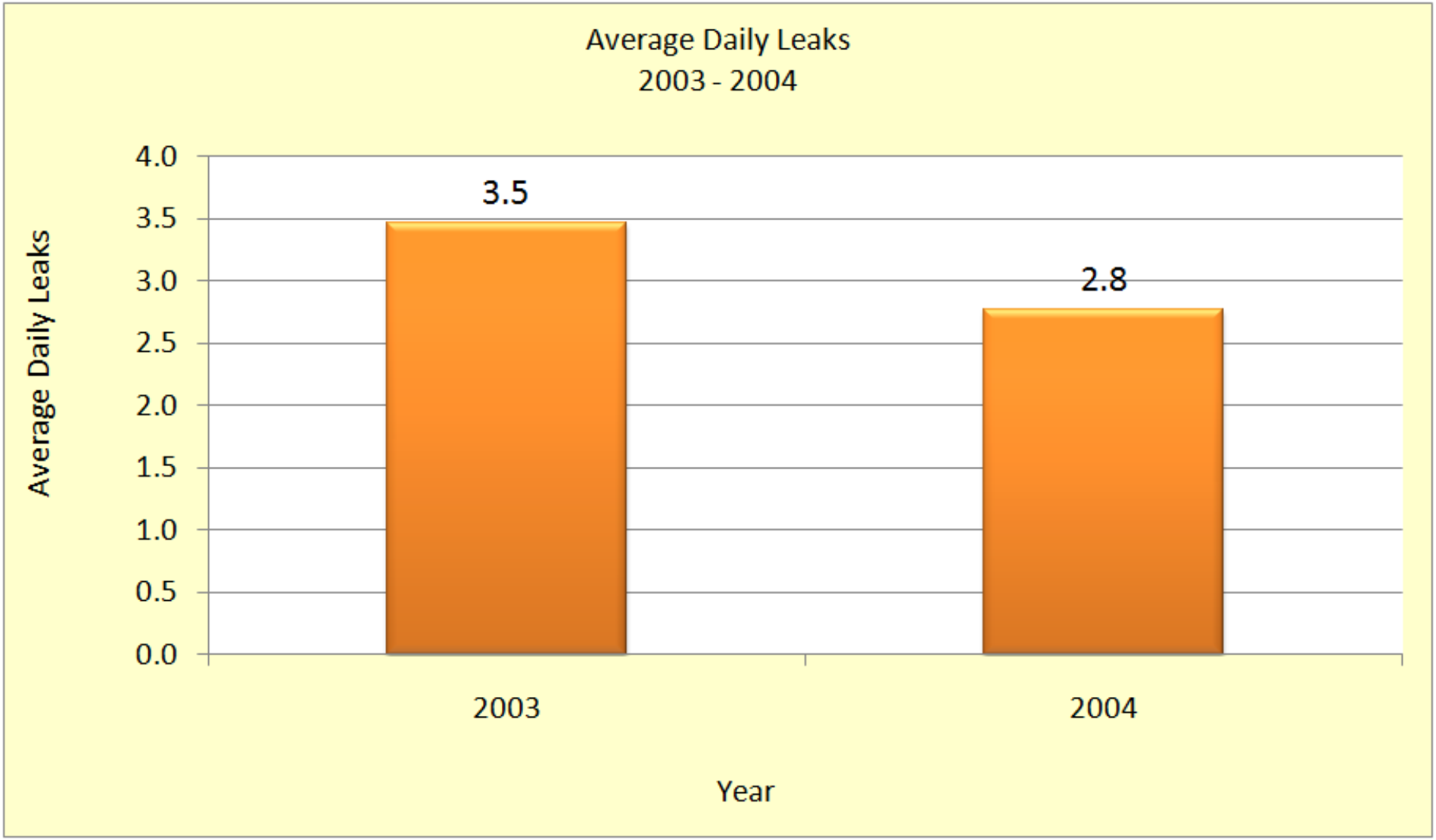


Figure 2: Average Daily Leaks & breaks for the years 2003 to 2004

6. Steps taken to reduce leaks & breaks and the results

Step-3 (2004 - 2005):

Reduce the pressure for the whole water networks to the minimum possible pressure that is adequate to customers. This was done as follows:

1. From our past experience we know that for most customers a pressure of 0.5 bar is sufficient.

2. We started awareness to inform and announce to customers through KAHRAMAA call centre and through other Medias.

3. We started applying the pressure reduction in each water zone & DMA separately, one after one considering the higher ground elevation areas and bottleneck locations.

6. Steps taken to reduce leaks & breaks and the results

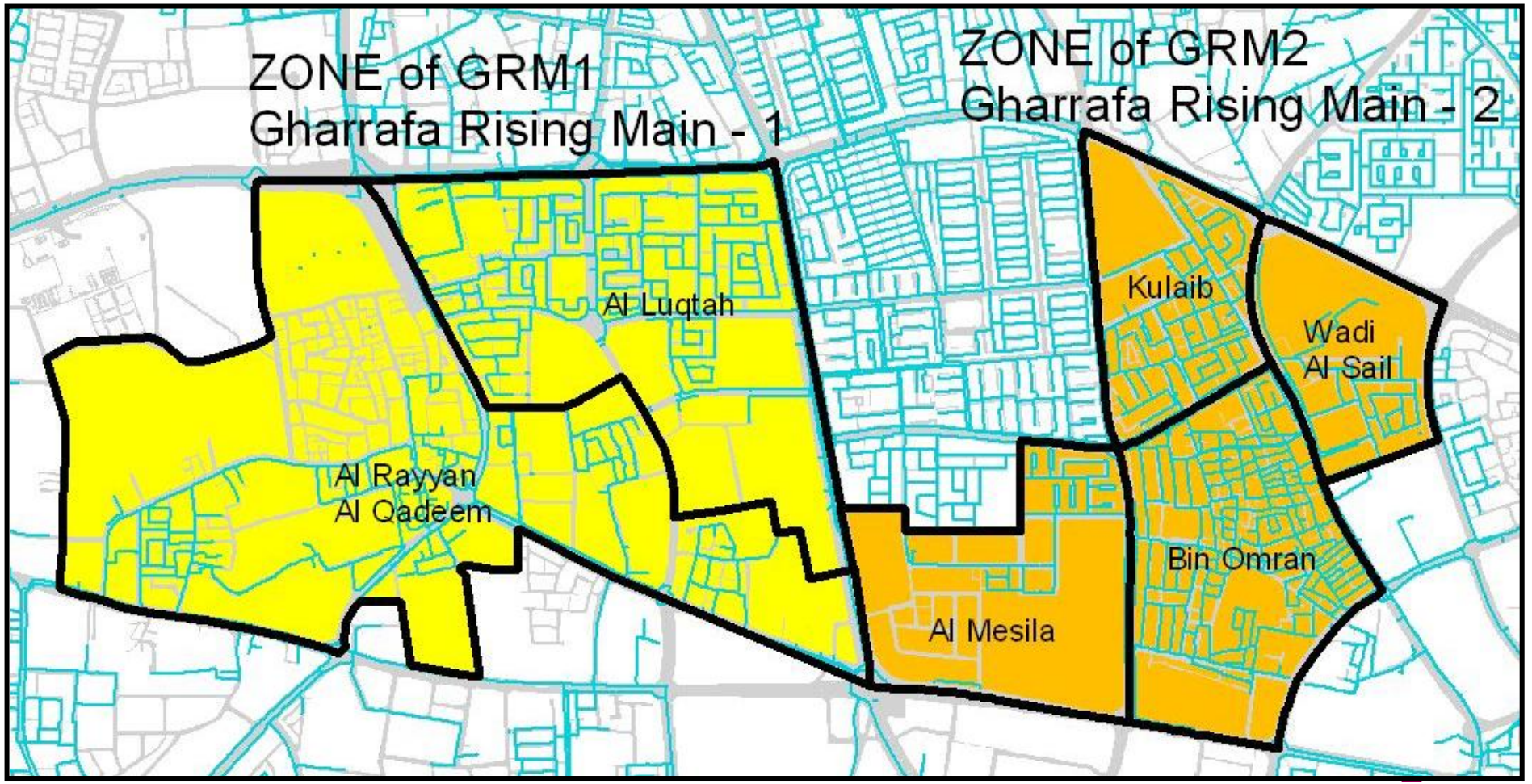


Figure 3: Map showing Water Zones and Water Districts under the Gharrafa Reservoir Pumping Stations.

6. Steps taken to reduce leaks & breaks and the results

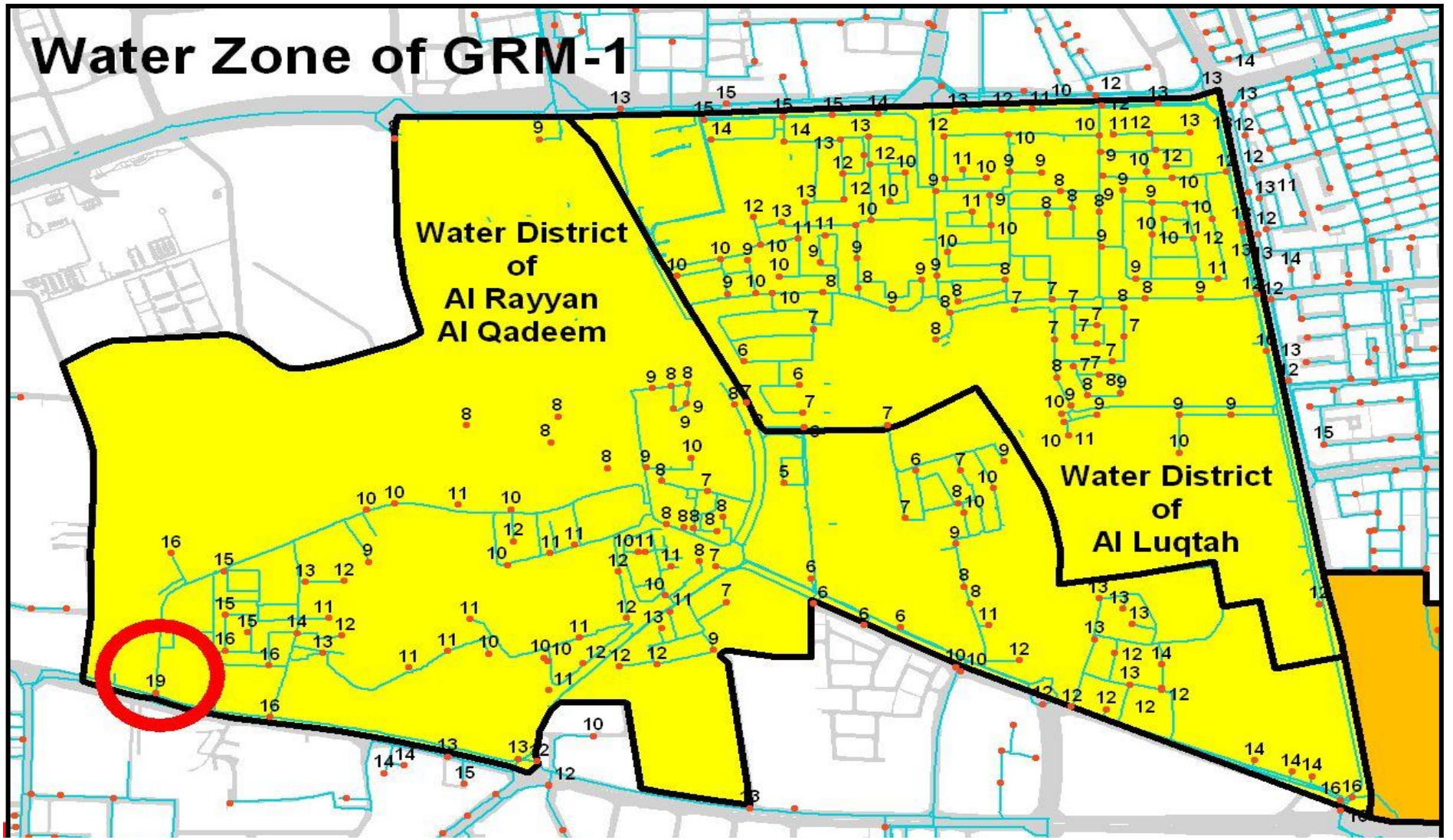


Figure 4: Map showing Elevations of water network above see level for the Water Zone of GRM-1

6. Steps taken to reduce leaks & breaks and the results

The way we managed the reduction of the pressure in a particular zone is as follows:

1. We manually monitored the pressure at the weakest pressure points in each zone during the peak demand times and minimum demand times
2. For the weakest pressure point (reference point) we try to keep the pressure very near to the minimum acceptable (which is 0.5 bar) the whole period of pumping hours.
3. For fixed speed drive pumps we control the pressure from upstream by throttling/controlling the delivery valve of the Rising Main of that water zone until getting the required pressure
4. Sometimes to balance the pressure in the zone we have to throttle individual pipelines feeding some districts in that zone.

6. Steps taken to reduce leaks & breaks and the results

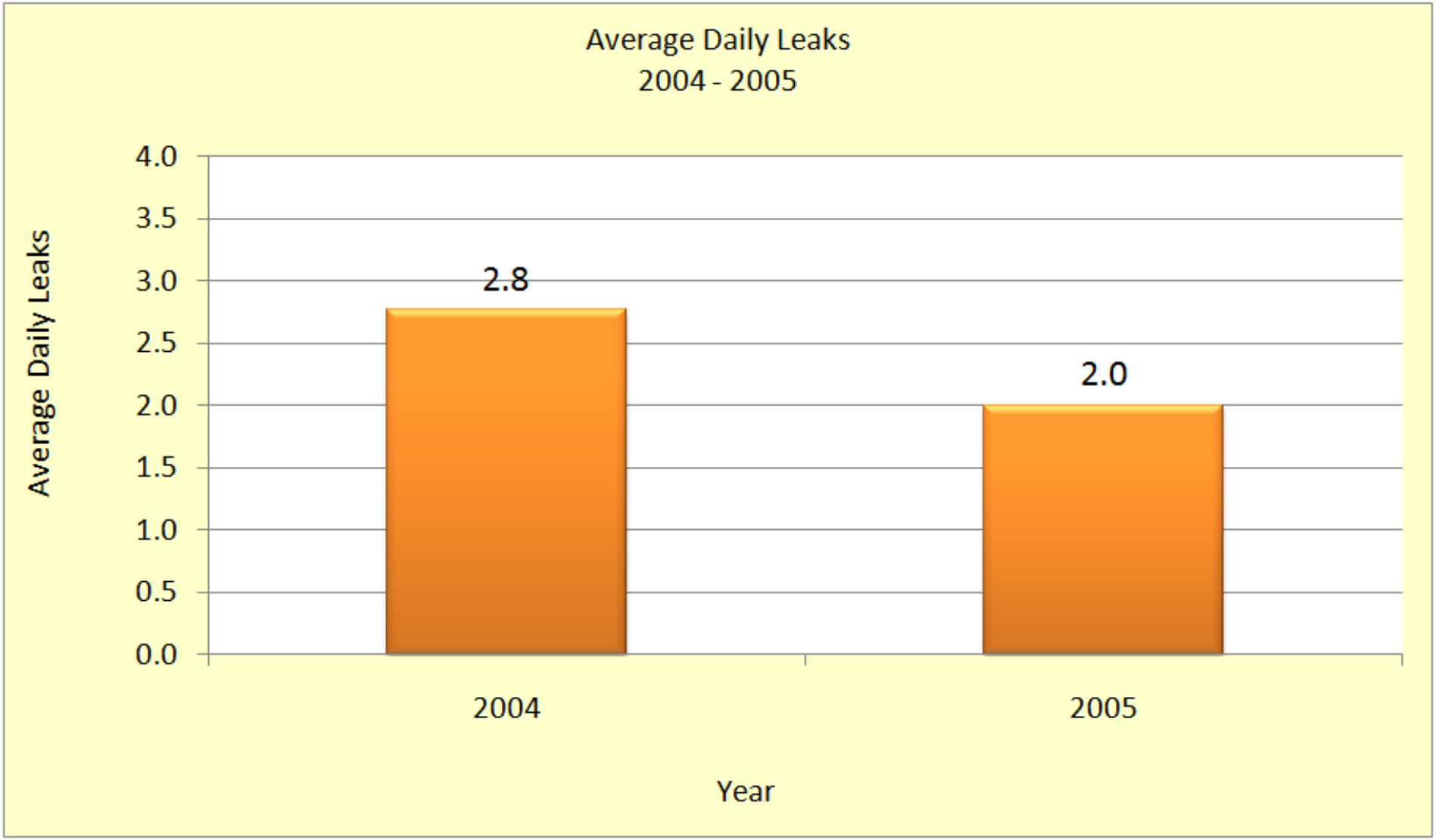


Figure 5: Average Daily Leaks & breaks for the year 2004 to 2005

6. Steps taken to reduce leaks & breaks and the results

Step-4 (2005 - 2010):

With the continuous monitoring of the pressure at the upstream and downstream the number of leaks were reduced further

6. Steps taken to reduce leaks & breaks and the results

Step-5 (2010 - 2011):

Implemented new reliable automatic control technique for water pumps operation that assured a constant network pressure at the minimum accepted pressure point in the network all the time.

Moreover the pumps started to always running within the designed operating range as per the manufacturer's recommendations to maintain pump efficiency

6. Steps taken to reduce leaks & breaks and the results

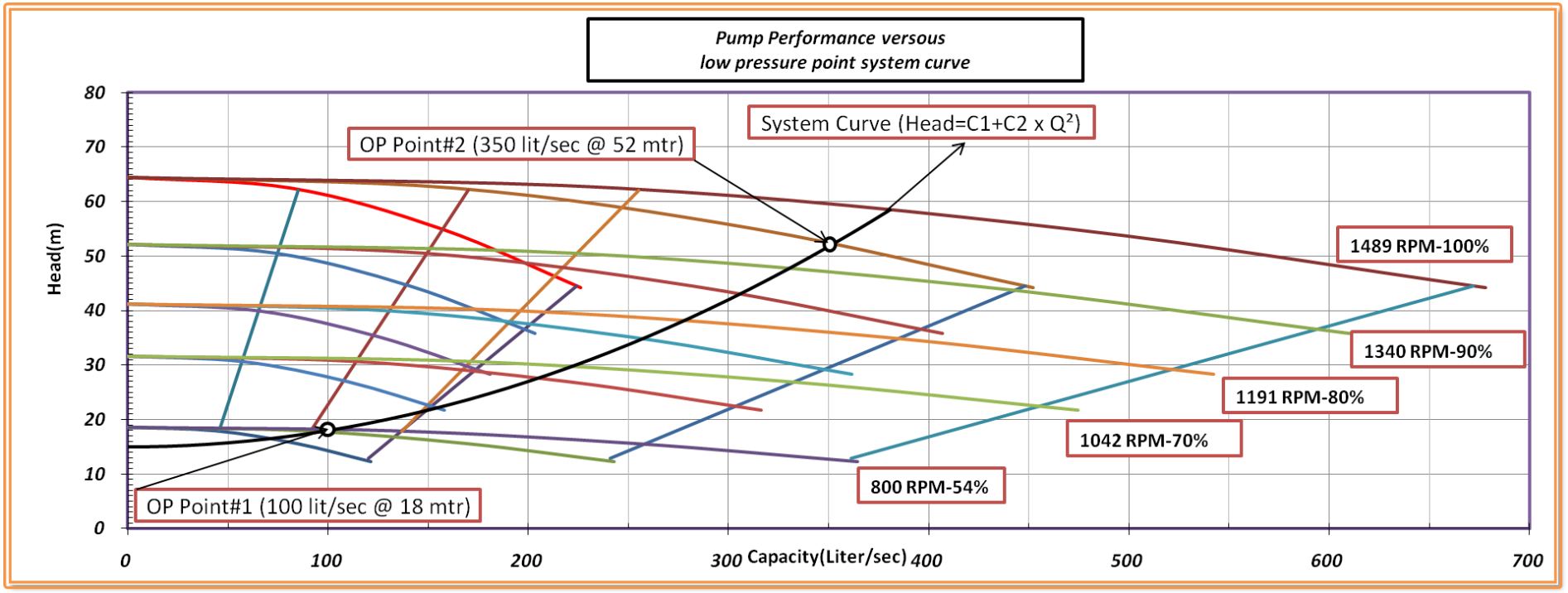


Figure 6: Pump curve vs. System Curve.

6. Steps taken to reduce leaks & breaks and the results

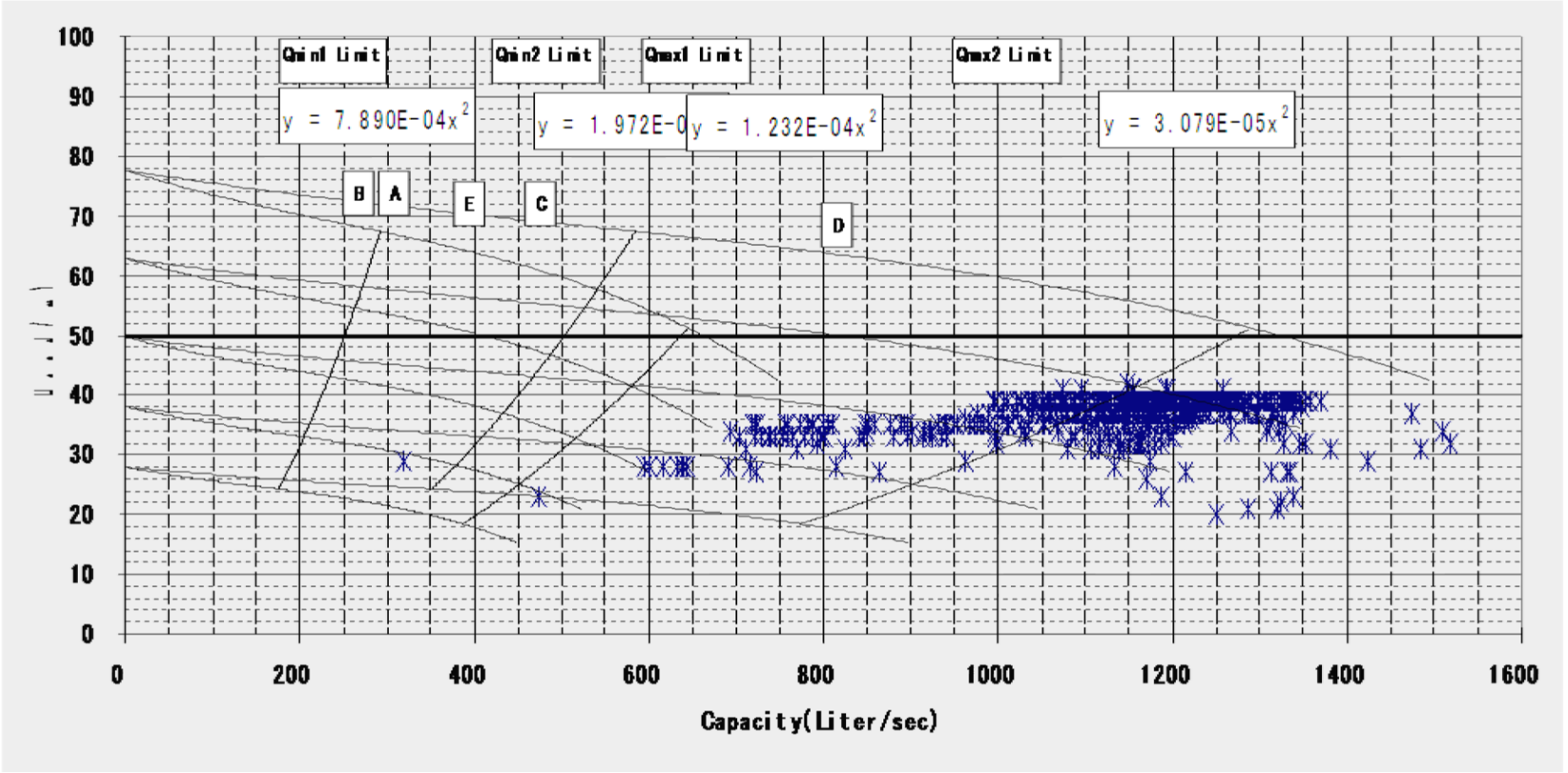


Figure 7: Operating Points before the new operation technique.

6. Steps taken to reduce leaks & breaks and the results

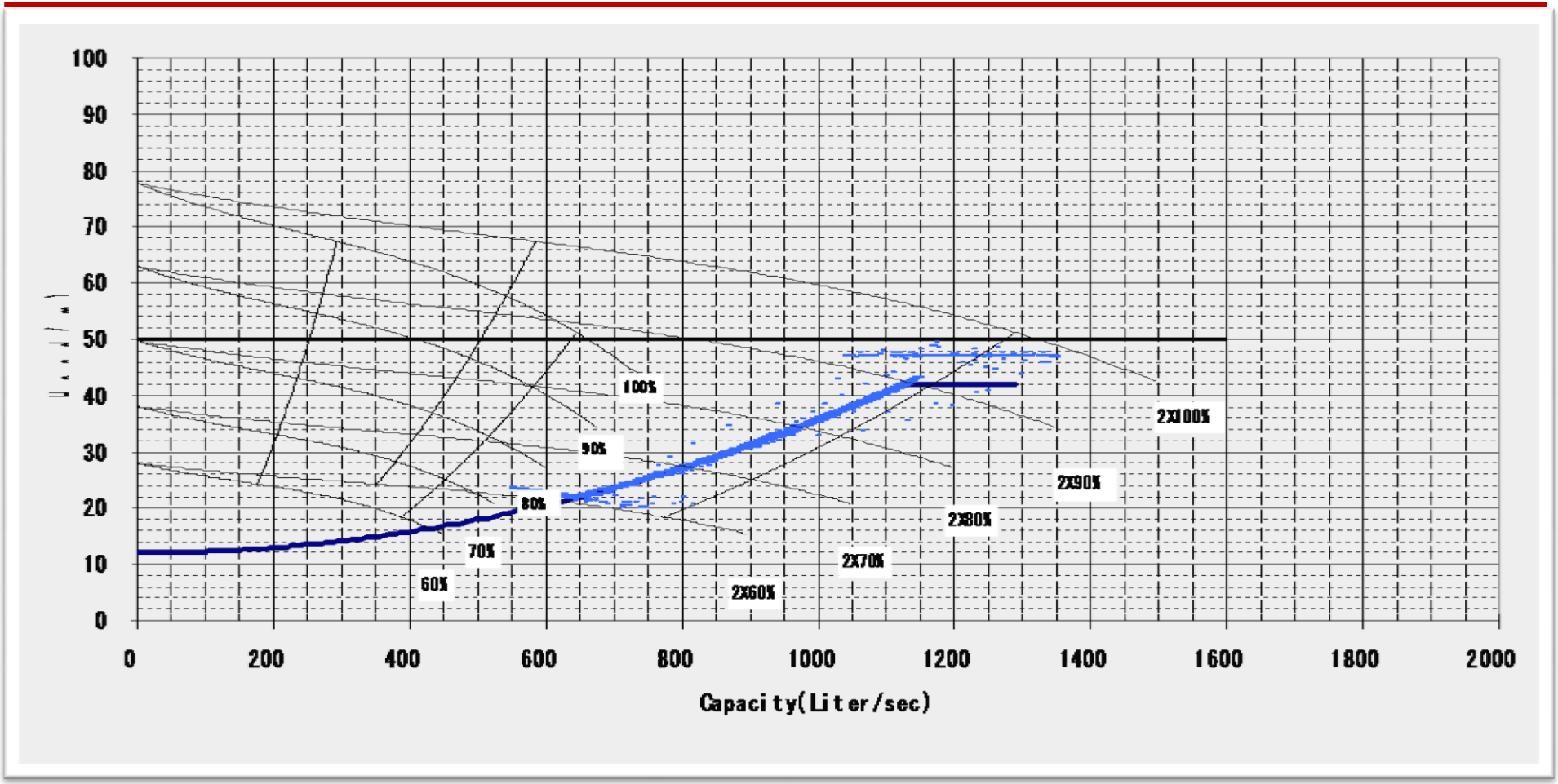


Figure 8: Operating Points After the new operation technique.

7. Analyzing the leaks & breaks data from 2001 to 2011

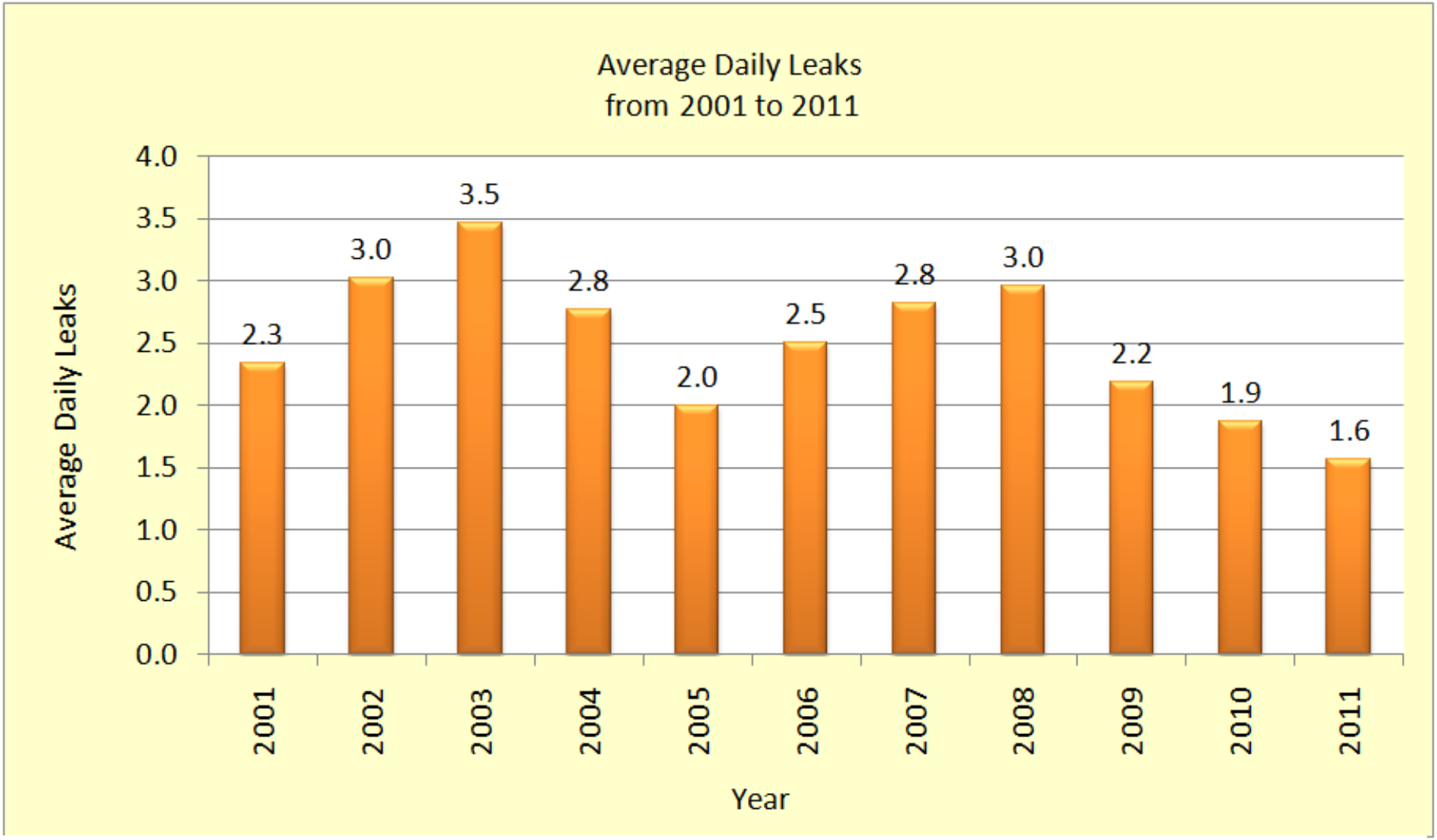


Figure 9: Average Daily Leaks & breaks for the years 2001 to 2011

8. Key Performance Indicator (KPI) for Water Networks Leaks & breaks

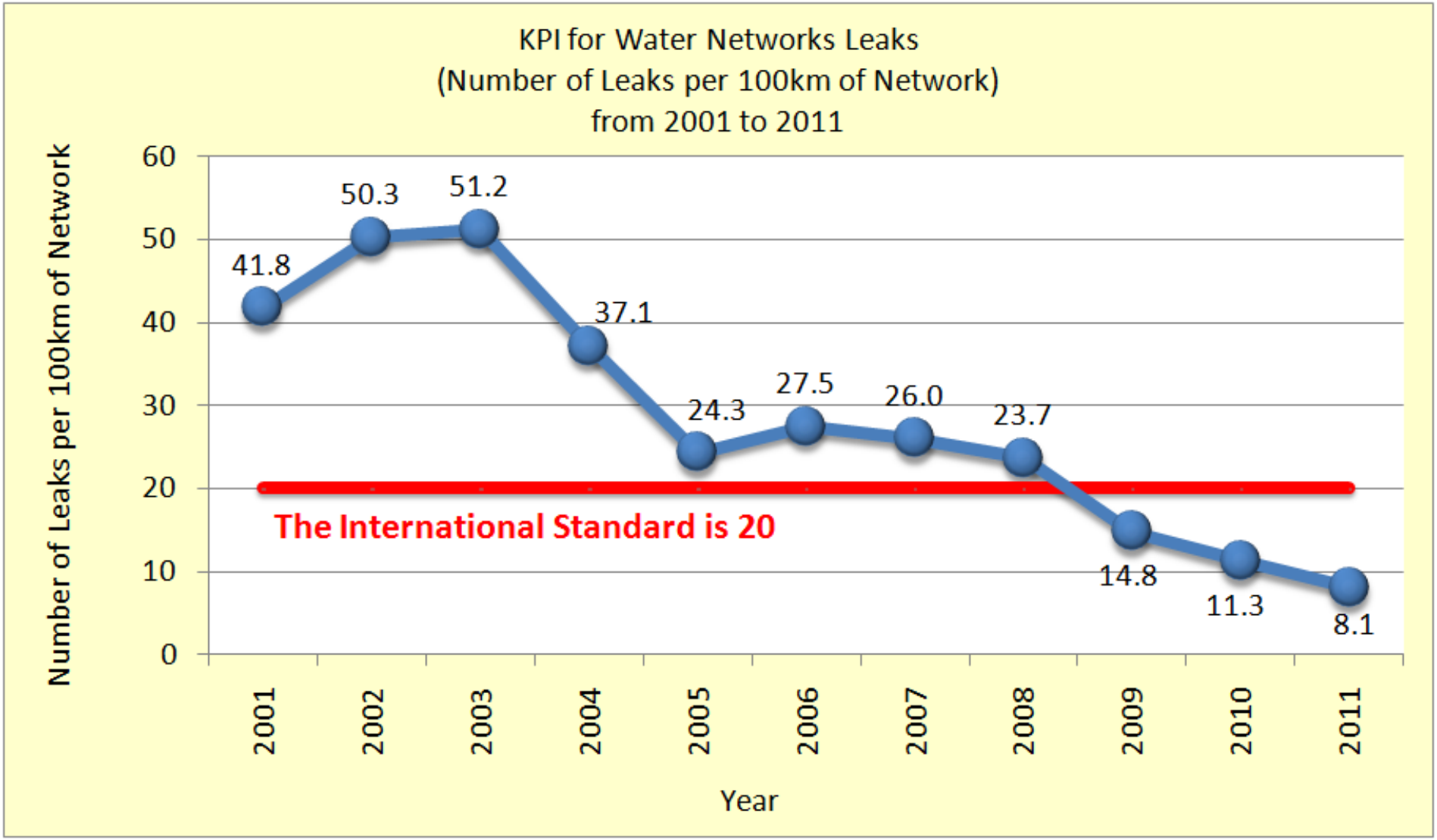


Figure 10: Comparing KAHRAMAA KPI of Networks Leaks & breaks with the International Standard from 2001-2011

8. Key Performance Indicator (KPI) for Water Networks Leaks & breaks

Conclusions from the above chart:

- KAHRAMAA achieved the target of implementing water demand management that minimized the rate of breaks and leaks in the network.
- Achieving international standards KPI and benchmarking to other utility.
- The solution was efficient and cost effective.
- For the last 10 years we never increased any maintenance attending staff.
- Maintained optimum pump efficiency.
- Reduced Power consumption for pumps.
- Saved a lot of spare parts.

9. Conclusion

KAHRAMMA achieved good result on decreasing the daily average leaks & breaks from the years 2003 to 2011. And will continue improving.

Thank you