

INVESTIGATION 13: WATER LOSS DROP BY DROP

Objective

- To estimate household water loss from common leaks.
- To extrapolate water loss to the surrounding community.

Introduction

Leaks in water lines waste an extremely valuable and diminishing resource. New York City's Department of Environmental Protection estimates that leaks make up about 10% of the water demand of the city. Since 2000, New York City has examined 31 million feet (5871 miles) of the 33.6 million feet (6364 miles) of water mains and eliminated 89 million gallons per day in leaks. Boston Water and Sewer Commission surveyed 819 miles of its 1182 miles of water distribution mains and fixed 427 leaks out of 444 leaks found, saving 7.16 million gallons of water per day.

Water losses in the developing world are more severe. In Iran in 1997, for example, 30% of the 3.8 billion m³ (1 trillion gallons) of treated water for the public was lost. This loss took place in a desert community with a population growing at an annual rate of 1.75%.

It might seem that with such large-scale losses in distribution systems, little domestic leaks are of little consequence. This exercise will show that when minor events occur often and long enough, they result in large effects.

Problem Information

- 1) Determine the number of people living in your community (city).
- 2) Determine the number of people living in your county.
- 3) Assume the average household size is four people, and that there are approximately five water sources (faucets and toilets) in each household.
- 4) Assume that two of the faucets leak at the rate of 1 drop/sec.

Calculations – Always show your set-up, work, and units.

- 1) Calculate the volume of water lost by each household annually. Here are some useful conversion factors. Explain any other assumptions you make.
 $20 \text{ drops} = 1 \text{ mL}$ $3.78 \text{ L} = 1 \text{ gal}$ $1 \text{ gal} = 0.133 \text{ ft}^3$
- 2) What is the total loss in your community (city)?
- 3) What is the total loss in your county?
- 4) What percent of the total water consumption does your community loss represent? Typical Floridians use 175 gallons of water per day, on average. The national average is closer to 100 gal/day.
- 5) Make an analogy to illustrate how much such a water loss really amounts to. The analogy should be an indication of the total volume.
- 6) Describe 10 actions you could take in your own home to conserve water. Estimate what percent of your total household water consumption your savings represent.