

Green, green Chicago River



In Chicago, as in many cities, there is a St. Patrick's Day parade on March 17th. But in Chicago the parade has an extra highlight, green. For 40 + years the local plumbers union has been dyeing the Chicago River green during the hours of the parade. How do they do that?

Evidently there is a dye that is used by plumbers to locate leaks in pipes and the color of the dye is very close to the emerald green that is associated with Ireland.

It must take an awful lot of dye to color a river. I wonder how much dye it takes.

I did some research. The dye that the plumbers use is visible at 1 PPM. PPM is a concentration unit called parts per million (PPM). Visible at 1 PPM means that the color of the product is visible in clear water at one part dye to a million parts water. Then there is an increased level of dyeing called a strong visual concentration. For the plumbers dye that value is 1 part dye to only 10,000 parts water. I imagine that this is the level of concentration the plumbers hope to achieve when they dye the river.

1. Can you figure out the equivalent PPM that 1 part dye to 10,000 parts water represents?
2. The main stem of the Chicago River is about 1.4 miles long, on average 20 feet deep, and about 200 feet wide. I wonder what the volume of that water is in cubic feet? Please show your work.

But my dye ratios don't deal with cubic feet of water but with gallons. I found on the Internet that 1 cubic foot of water contains about 7.48 gallons.

3. Calculate how many gallons of water are in this section of the Chicago River.

4. Set up a ratio that compares the amount of dye needed to create a strong visual concentration level in the river's volume with the known amount of dye needed to make a strong visual concentration level in only 10,000 gallons of water.

But there's another way to dispense this dye. As a powder you get more bang from your quantity of dye powder. This is measured in pounds of dye. As a general rule, 1-pound of powdered dye will provide a strong visual concentration in 120,000 gallons of water.

5. Calculate how much powder you might need to create a strong visual concentration in the number of gallons of water we calculated for the main stem of the Chicago River.

I read that the plumbers have figured out how much dye to use in the river by trial and error. At first they used 100 pounds of dye and the river stayed green for a week. (The river is normally a murky green color.) Now the plumbers just use 40 pounds of dye. The powder is actually orange when it goes into the water and it turns green when it mixes with the water.

6. My answer didn't come out to that number. What could I have done wrong in my calculations?

Sources:

<http://www.chicagostpatsparade.com/river-dye.html>
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