



Spraying Systems Co.
Experts in Spray Technology

THREE SURPRISINGLY SIMPLE WAYS TO DRAMATICALLY REDUCE WATER USE

The biggest industrial water users in the U.S. are in the following manufacturing sectors: pulp/paper, primary metals, chemicals and food. While many of these manufacturers – along with those in other industries – have active and effective water conservation programs, additional actions are needed to counteract a growing global water crisis.

Manufacturers often focus on water treatment and reuse as a primary way to reduce water consumption. Beyond that, it becomes more challenging to reduce water use because of the potential impact on process or product quality. However, there are ways to save water that won't disrupt operations. In fact, some fairly small changes can be made to yield big reductions in water use. **Many manufacturers are unaware these opportunities exist or don't realize the magnitude of the potential savings – which can be millions of gallons annually.**



STRATEGY #1: RIGHT-SIZE SPRAY NOZZLES

You may be surprised to learn how much water flows through a single nozzle. So, let's take a quick look at the math:

The flow rate of a full cone spray nozzle* is:

- 2.8 gallons per minute at 20 psi
- 1,344 gallons per day (based on eight hours per day)
- 6,720 gallons per week (based on five days per week)
- 336,000 gallons per year (based on 50 weeks per year)

* 3/8" H FullJet®

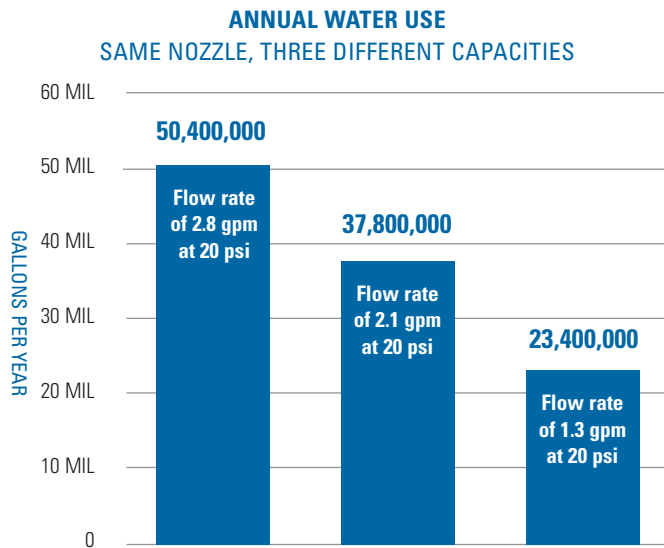
Most manufacturers use hundreds of nozzles in various operations – cleaning, coating, lubricating, moisturizing, cooling and more.

For this example, we'll assume 150 nozzles are in use in a cleaning operation.

$$336,000 \text{ GALLONS PER YEAR} \times 150 \text{ NOZZLES} = 50,400,000 \text{ GALLONS PER YEAR}$$

But what if nozzles with a lower flow rate could be used in that cleaning operation without compromising cleaning effectiveness?

- Using a slightly smaller capacity nozzle – a 2.1 gpm full cone nozzle spraying at 20 psi – **would reduce water use by 12,600,000 gallons per year**
- Using an even smaller capacity nozzle – 1.3 gpm at 20 psi – would reduce water use to 23,400,000 gallons per year, **a decrease of 27,000,000 gallons**



Based on 150 full cone spray nozzles spraying eight hours per day, five days per week, 50 weeks per year. 3/8" FullJet® nozzle used for the comparison.

If you're wondering if this is a realistic example, the answer is yes. When it comes to nozzle specification, there's a perception that having more flow is better than not having enough. So, people tend to size up just to be safe without realizing how much water may be wasted.

How do you know if you can use lower capacity nozzles? Consult with your nozzle supplier and arrange for testing. You can, of course, do some testing in your facility, but working with an expert will save time and validate results.

It is important to remember that reducing water use brings many additional benefits to your operations. If chemicals are being sprayed, your consumption rate will decrease. If you're using less water, you're pumping less water and saving energy. If you're heating the water, you'll save even more. And, of course, reduced water use means less wastewater. Reducing water use is just the tip of the iceberg. Some manufacturers find that saving millions of gallons of water also reduces operating costs by millions of dollars.



**STRATEGY #2:
REPLACE NOZZLES AT
THE FIRST SIGN OF WEAR**

Spray nozzles are precision components that will wear over time. When nozzles wear, the flow rate increases. Every drop sprayed that isn't needed is wasted water. Just like using a nozzle that has a higher flow rate than needed, the potential for water waste is staggering. Let's look at another example using the same full cone nozzle discussed earlier.

150 nozzles spraying at the proper flow rate (rated capacity): 50,400,000 gallons per year.

But if the flow rate increases just 10%, **5,040,000 gallons are wasted per year.**

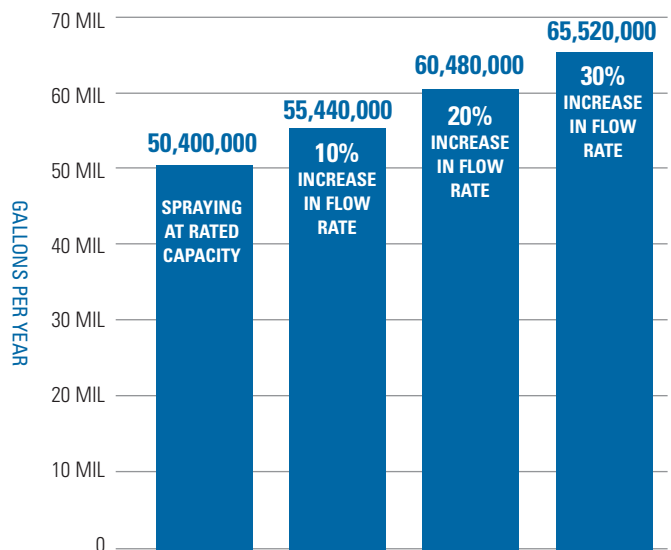
If flow rate increases by 20%, **10,080,000 gallons are wasted per year.**

If flow rate increases by 30%, **15,120,000 gallons are wasted per year.**

Wasting that much water means your water cost will increase (conservatively) by US\$105,840* per year. That figure does not include the extra energy for pumping or heating the water nor increased chemical use.

*Based on a cost of \$.007 per gallon of water.

WATER WASTE FROM USING WORN NOZZLES WITH INCREASED FLOW RATES*



* Based on 150 full cone spray nozzles at 2.8 gpm at 20 psi. Operating conditions: eight hours per day, five days per week, 50 weeks per year.



Replacing nozzles before wear occurs seems like an easy way to prevent wasting water. Unfortunately, that's easier said than done because detecting nozzle wear in the early stages is very challenging. A visual inspection of nozzles and the spray pattern won't reveal wear until it is significant. Chances are you won't be able to see it until nozzles are spraying dramatically over capacity. So, rather than rely on visual inspection, you'll need to pro-actively monitor nozzles for wear. Here's how to do that:

CHECK NOZZLE FLOW RATE

If using centrifugal pumps:

- Monitor flow meter readings to detect increases
- Or, collect and measure the spray from the nozzle for a given period at a specific pressure
- Then, compare these readings to the flow rates listed in the manufacturer's catalog or compare them to flow rate readings from new, unused nozzles

If using positive displacement pumps:

- Monitor the liquid line pressure for decreases – flow rate will remain constant

MONITOR SPRAY PRESSURE IN NOZZLE MANIFOLD

If using centrifugal pumps:

- Monitor for increases in liquid volume sprayed – spraying pressure likely to remain the same

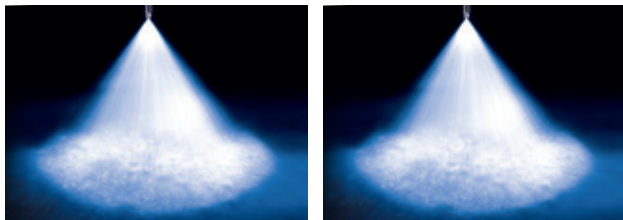
If using positive displacement pumps:

- Monitor pressure gauge for decreases in pressure – liquid volume sprayed likely to remain the same

VISUALLY CHECK THE SPRAY PATTERN

As wear increases, the spray pattern may look streaky. Look for heavier areas in the center and the edges of the pattern. Keep in mind, wear may be advanced before you can see it.

Consult with your nozzle manufacturer regarding wear detection and optimal replacement interval. Some manufacturers have specialized equipment and can determine wear rates based on your operating conditions. Nozzle replacement can then be scheduled at proper intervals to prevent water waste.



One of these nozzles is spraying 15% above capacity due to wear. However, the spray patterns look identical. Be sure to check for streaks in the pattern, but measuring flow rate and pressure is the best way to detect nozzle wear.



**STRATEGY #3:
AUTOMATE & OPTIMIZE CLEANING
OF TANKS, TOTES, VATS & MORE**



An easy way to reduce water use is to change how you clean tanks, mixers, blenders and other equipment in your plant. If workers are manually cleaning tanks or using the fill-and-drain method, automation offers an opportunity to save thousands or possibly millions of gallons of water per year. If automated equipment is already in use, get a second opinion. There may be new equipment available that can dramatically reduce water use.

How much you will save is dependent on your cleaning requirements and the number and size of tanks in your plant.

These examples provide insight on the magnitude of the savings.

- When an automated tank cleaner replaced workers with hoses cleaning two tanks on a biweekly basis, one producer **reduced water use by 54%**
- A processor using automated tank cleaning equipment to clean 14 large mixing vats was motivated to reduce water use, so expansion of its boiler room could be avoided. Changing to a more efficient, high-impact motor-driven tank cleaner **reduced water use by 1,200,000 gallons annually**

Just like strategies #1 and #2, saving water leads to other improvements in operating sustainability.

Reducing water use saves on the energy required for heating and pumping, decreases chemical use and wastewater.



Another important benefit of automated tank cleaning includes improvements in worker safety.

- Workers no longer need to enter tanks or climb ladders and other equipment for cleaning
- Exposure to hazardous cleaning chemicals and the risk of burns or inhalation of fumes are eliminated

Automating tank cleaning also provides a tremendous economic benefit. There is, of course, savings on water, chemicals, energy and wastewater treatment. The time savings associated with automated tank cleaning are substantial. Manufacturers report reductions in cleaning time up to 90%. This enables tanks to return to service more quickly, minimizing downtime. The result is increased throughput and production time, something most manufacturers consider invaluable.

SUMMARY

There may be overlooked opportunities in your plant to reduce water use. This paper presents just a few strategies that are easy to implement and can yield big results. For most manufacturers, reducing water use can be a gateway to reducing consumption of natural resources, improving worker safety, reducing operating costs and increasing production time. In short, reducing water use is good for the environment, worker safety and your bottom line.

For more information on operating more sustainably, visit spray.com/save



ABOUT SPRAYING SYSTEMS CO.

We help companies around the world reduce water, energy and material use, decrease waste, minimize environmental impact and improve worker safety. Let our spray technology advance your sustainability initiatives.



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