DWCP: Water Calculations in CP Soapmaking

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What does DWCP mean?

DWCP stands for discounted water cold process. The word *discounted*, as used here, refers to the practice of using less water than traditionally called for in CP.

What are the advantages to using less water?

- Soap gets hard faster and is easier to handle.

- Soap is ready to use sooner, but allowing it to dry for a few weeks still makes for milder, longer-lasting soap.

- Bars shrink less because they lose less water weight, so their final weight is closer to weight at cut. Look at the weight lost over two months by the following two soaps, both made on May 11. The oils were exactly the same for both soaps; the only difference was the amount of water used.

  1. Batch with 40% lye solution

     May 12: 157.3 g / 5.55 oz

     June 17: 147.5 g / 5.20 oz

     July 16: 144.5 g / 5.10 oz

     Loss in 2 months: 8.1%

  2. Batch with 27% lye solution*

     May 12: 159.8 g / 5.64 oz

     June 17: 137.0 g / 4.83 oz

     July 16: 132.3 g / 4.67 oz

     Loss in 2 months: 17.2%

  I label my soaps as weighing 5 ounces. With a 40% solution, I can cut the soaps at 5.5 ounces and know they'll still weigh over 5 ounces after a good cure period.

Won't using less water cause problems?

Water is used in soapmaking primarily as a carrier for the lye. All of the lye should be dissolved ("in solution") in order to combine efficiently with the oils and form soap.

How much water is needed to do this? For the simple purpose of combining lye and oils, the answer is surprisingly little. Lye is more soluble than most of us realize: At 68°F (20°C), water can dissolve more than its own weight in sodium hydroxide. I do not suggest, however, that you use more lye than water in your soapmaking!

Using some extra water helps by slowing down the process and giving us a bit more time to work. Using excessive water, however, makes for soft soap that requires more time in the mold and on the curing shelves.

Some people have the idea that DWCP will make for harsher soap, thinking that a stronger lye solution means more lye. This is completely untrue, of course. The solution is stronger because you use less water, not more lye.

*Calculated using the MMS calculator, full recommended water.

What about disadvantages?

- Some fragrances accelerate trace more dramatically in DWCP.

    - Most essential oils work well with reduced water. The exceptions are the spices, which tend to accelerate and heat up in CP in general.

    - Fragrance oils vary greatly and require individual testing. Soap discussion boards are great sources of information about which oils behave themselves and which need special handling such as more water, lower temperatures, etc.

Besides using less water ...

DWCP is also about:

1. Calculating water based on lye, not oils.

2. Calculating water to produce the desired *solution strength*.

What is solution strength?

Solution strength refers to the percentage of lye in lye water.

To figure the strength of your lye solution, divide the weight of the lye by the total weight of lye and water. For example, say you have 20 ounces of lye in 46 ounces of water:

- 20 + 46 = 66 ounces total weight

- 20 / 66 = .303

That's 30.3% lye, meaning you have a 30.3% solution.

You can use this formula on your formulas/recipes to figure the solution strength you're using now. That will give you a number to start with when figuring your water the DWCP way.

So what's the ideal solution strength?

The answer, of course, is that there isn't an ideal number that will work for every soapmaker for every batch. Many factors -- fragrances, solid fats and butters, higher temperatures, additives like honey and milk -- can accelerate trace and may require weaker solutions. Your experience and comfort level as a soapmaker are also important.

If you want to reduce the amount of water you use, start decreasing gradually and track your results, taking lots of notes. By experimenting, you will learn which of your soaps work well with stronger solutions and which need more water. Conditions or ingredients that cause problems for one soapmaker don't always cause problems for another, and the only way to determine the best solution strength for you is through testing.

Why calculate water based on lye?

Most calculators figure water based on the weight of the oils used, which can result in widely varying solution strengths.

Here are two sample batches that show how solution strengths vary when water is based on oils rather than lye. Both use 6 ounces of water per pound of oils.

1. Castile soap using 100% olive oil and a 5% lye discount
    100 ounces olive oil
    12.87 ounces lye
    38 ounces water
    Solution strength: 25.3%

2. Fisherman's soap using 100% coconut oil and a 5% lye discount
    100 ounces coconut oil
    17.47 ounces lye
    38 ounces water
    Solution strength: 31.5%

Olive oil requires much less lye than coconut oil, but this difference isn't considered when figuring water based on oil weight. The result is a very weak lye solution for the castile soap.

Let's look at it another way: Since water can dissolve its own weight in lye, we need just under 13 ounces of water to dissolve the lye for the castile. If we use 38 ounces, we have almost three times as much water as needed. No wonder castile soap takes so long to cure!

Formulas for DWCP

First determine the lye needed for your soap, then use one of the following formulas to calculate the water needed.

1. Calculating water for any desired solution strength:

    lye / desired solution strength x (100 - desired solution strength) = water

    Example 1: 33% solution

    150 grams lye / 33 x (100 - 33) = 305 grams water

    150 grams lye / 33 x 67 = 305 grams water

    Example 2: 36% solution

    10 ounces lye / 36 x (100 - 36) = 17.8 water

    10 ounces lye / 36 x 64 = 17.8 ounces water

Formulas for DWCP, continued

2. Calculating water for commonly used solutions:

lye weight x 2.33 = water for a 30% solution
lye weight x 2.23 = water for a 31% solution
lye weight x 2.13 = water for a 32% solution
lye weight x 2.03 = water for a 33% solution
lye weight x 2.00 = water for a 33.33% solution
lye weight x 1.94 = water for a 34% solution
lye weight x 1.86 = water for a 35% solution
lye weight x 1.78 = water for a 36% solution
lye weight x 1.70 = water for a 37% solution
lye weight x 1.63 = water for a 38% solution
lye weight x 1.56 = water for a 39% solution
lye weight x 1.50 = water for a 40% solution
lye weight x 1.44 = water for a 41% solution
lye weight x 1.38 = water for a 42% solution
lye weight x 1.33 = water for a 43% solution
lye weight x 1.27 = water for a 44% solution
lye weight x 1.22 = water for a 45% solution
lye weight x 1.17 = water for a 46% solution
lye weight x 1.13 = water for a 47% solution
lye weight x 1.08 = water for a 48% solution
lye weight x 1.04 = water for a 49% solution
lye weight x 1.00 = water for a 50% solution

3. Calculating water online:

www.rivercitysoaps.com/dwcp

Free online calculators

http://rivercitysoaps.com/dwcp/watercalc.php
This is a simple calculator to figure how much water to add to lye for a specific solution strength. It is not a lye calculator.

http://www.soapcalc.net/calc/SoapCalcwp.asp
This calculator (formerly known as Sooz Calc) calculates water based on oil weight by default, but it will also calculate by lye solution strength if you check the "Lye Concentration" option.

http://thesage.com/calcs/lyecalc2.php
The Majestic Mountain Sage lye calculator is a good one for calculating lye; water is calculated on oil weight with no information about solution strength. You can use it to figure lye, then plug the lye weight into the River City water calculator or use one of the formulas listed on the previous pages.

http://www.brambleberry.com/Soap-Making-Lye-Calculator-W12.aspx
Bramble Berry's lye calculator also calculates water based on oil weight. Again, you can take the lye figure from the calculator and use a formula or the River City calculator to determine the water needed for a particular solution strength.

Learn more

For a thorough discussion of discounted water cold process soapmaking, see http://www.aquasapone.com.au/soapmaking/discountedcp.html.

One more thing: Proper terminology

Please do *not* say "I use a 30% water discount."

Why? Because it's confusing! A 30% discount from what?

Any of the following would have more meaning in a soapmaking discussion:

"I use a 30% lye solution."

"I use a 1-to-2.33 lye-to-water ratio."

"I use 1 part lye to 2.33 parts water."