2018 UPDATE

The Ultimate Guide To

CHOOSING A WATER SOFTENER

aquatell

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Foreword

When you spend every working day talking to people about water softeners, you learn a thing or two. Unknowingly, every customer phone call, email, conversation, question, complaint, and praise engrains itself on your brain. And after a decade, when you stop to think about it, you realize that you've amassed an incredible database of real-world water softener experiences.

So when Aquatell decided to write *The Ultimate Guide To Choosing A Water Softener,* it was surprisingly easy to sit down and list out all the stuff we had to cover for would-be softener buyers. When you eat, sleep, and breathe one topic, the things that are confusing and frustrating are glaringly obvious and every day you hone your ability to answer questions in ways that consumers can understand.

We know what it's like trying to buy something expensive that you don't quite understand - it kinda sucks. It's no fun putting blind trust in a salesperson and hoping for the best. We are consumers too and we know what that feels like. So we're truly excited to be able to leverage our experience - which is really the collective experiences of all of our customers - to help the next guy make a great decision.

We don't claim to be the planet's perfect, all-encompassing, final say on anything and everything to do with water softeners, but we're darn sure that we know the business of helping people find water softeners that will delight them.

We truly hope you find this guide useful in your quest for the perfect water softener. Enjoy!

Reid Thornley, B.Sc.
Master Water Specialist

Conclusions & Recommendations

You're busy, we're busy, even retired people are busy these days! So instead of plunking all the key conclusions at the end, we put them at the beginning! If something doesn't make sense, or you just want to learn more, we guarantee you'll find the detail you need in the chapters that follow.

Choosing a water softener boils down to two decisions: What Size & What Brand? Answer those two questions and you're ready to buy!

What Size Water Softener Should I Buy?

This is the most misunderstood and most confusing part of buying a softener. Understanding a few key concepts relieves the confusion and makes this step in your softener quest much easier to navigate:

- *You need to know your water hardness value in order to select the right softener. Grains Per Gallon is the industry-standard way to express this.*
- *Looking at water softener 'grains capacity' without understanding the Softener Efficiency Rating (SER) is a bad idea. You'll have no idea how much salt your softener will consume.*
- *Knowing the cubic feet of resin that your softener is built with is the only unbiased way to understand the 'size' of the softener you're getting.*
- *Make sure the Service Flow Rate (SFR) of the softener you buy can support the flow rate of your home.*
- *All of the 'softener sizing tools' on the internet fail to include softener efficiency.*
- *Don't worry about how many people live in your home, or how much water you use; instead, focus on the Softener Efficiency Rating (SER) and the rest takes care of itself.*

What Brand Water Softener Should I Buy?

Brands are confusing in the world of water softeners. Common water softener 'brands' like Fleck, Clack, and Autotrol don't make softeners at all, but rather make only one component of the softener. This makes it hard to know what you're getting. Keep these important elements in mind:

- *Buy professional-grade products. Cheap softeners you find in a big-box or general merchandise store just don't last, and aren't built to be easily repaired. Look for softeners built with Fleck, Autotrol, or Clack control valves.*
- *The control valve is the most important component of the softener build. Get a good one, but don't overbuy a control valve that has larger internal porting than your water-main diameter - it's a waste of money. Buy only metered systems, and look for a good warranty. Five years is good, seven years or more is excellent.*
- *Not all softener resin is created equal. 8% cross-linked resin is good, 10% cross-linked resin is excellent. Go for a higher cross-linked standard-mesh resin, rather than a lower cross-linked fine mesh resin. All resin is made in China or India now - trying to find a U.S. made resin is a wild goose chase.*
- *If you're looking for a full-service softener experience, call Culligan® or Kinetico®. But if you're capable of installing and/or maintaining the softener yourself, then you can find equivalent softener technology for much cheaper elsewhere.*

Buy From A Good Retailer

No matter how well you educate yourself as a consumer, at some point in the lifespan of your softener you'll likely rely on your retailer. You might need help troubleshooting an issue, getting a warranty part, or you might just have a question. Choosing the right softener is as much about choosing a good retailer as it is buying the right product:

- *Only buy from a retailer who has WQA Certified salespeople. These are folks who've put the time in to learn about what they sell, have passed the test, and have the softener community in their corner.*
- *Ask questions! Then, ask more questions! Putting a salesperson on the spot is the only way to see if they know what they're talking about.*
- *Look for a third party way to validate the retailer. Good examples are Better Business Bureau Reviews & Google Reviews (search the business name in Google Maps)*
- *These rules apply to both conventional and online retailers. Don't be too quick to judge a retailer solely on the way they choose to get the product into your hands.*

Intro To The Technicalities Of Water Softening

If you've come this far, it's because you know that knowledge is indeed power. We've dedicated a chapter to every important element of choosing the perfect softener. Here's what's on the menu:

Chapter 1: Capacity

Water softener 'grains capacity' is a term you'll see and hear everywhere. Learn what it means, and why it's a bad way to think about softener capacity. Of course, we'll teach you a better way to look at capacity and how you can use it to effectively compare one softener to another.

Chapter 2: Efficiency

Water softener efficiency - the amount of salt a softener uses - gets left out of the water softener conversation more often than not. It's a poorly understood concept by consumers and retailers alike. Learn all about water softener efficiency, and why it needs to be the technical spec you pay the most attention to. By the time you're done, you'll be able to teach most softener retailers a thing or two!

Chapter 3: Service Flow Rate

The water softening process isn't an instant one. The water you're trying to soften needs to spend enough time in the softener for the process to occur. This means every softener on the market has a max flow rate it can handle, and it's not the flow rate that's on the brochure. Intrigued? Learn more in this chapter.

Chapter 4: Putting It All Together To Choose the Right Sized Softener

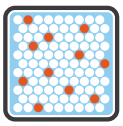
Learning is great, but you need to actually buy something, right? This chapter takes all of the previous learning and shows you how to apply it to buy the softener size that is right for you. Only now, you'll understand the recommendation, and won't have to take anybody's word for it!

Chapter 5: Brands

One of the keys to knowing what you're actually getting when you buy a water softener, is understanding what a *brand* means in this industry. What many consumers perceive to be water softener manufacturers (Fleck, Clack, Autotrol, as examples) only make components. So who makes the the rest of the softener, and who puts it all together? And how do I compare one softener to another? All great questions that we answer here.

Chapter 6: Control Valves

The Water Softener Control valve is the brain of your softener. It contains all of the moving parts and electronics and is the part of your softener that you interact with. Control valves have a variety of features and lengths of warranty. Choosing a softener built with the right control valve is an extremely important part of your water softener quest.



Chapter 7: Resin

Water Softener Resin is what makes the magic happen. It's the substance in the softening tank that grabs onto hardness minerals and keeps your water soft. There are different grades and different types, and for retailers looking to pad margins or keep costs down, it's a likely component to cut corners on. Learn what to look for in water softener resin.

CHAPTER 1:

Capacity

Sizing water softeners by grains capacity is misleading - the result is that consumers buy softeners that use way too much salt. For accuracy in sizing, only consider water softeners described by the volume of resin they're built with.

What Does Water Softener Capacity Mean?

Water softener capacity is the amount of hardness that a softener can remove before it must go through a regeneration cycle. As your home's water flows through the softener, the softening resin grabs onto hardness minerals, and releases sodium in exchange. This is why the process is technically known as ion-exchange. Eventually, the resin runs out of sodium to exchange for hardness and can no longer soften any more water.

The Wrong Way To Look At Softener Capacity

Water softeners don't come in small, medium, and large like many other products. Instead, the water softener industry has historically described water softener size in terms of *grains capacity.* But this is a misleading way to sell softeners.

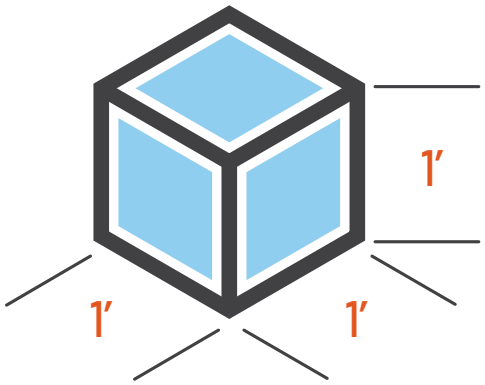
The problem is that the grains capacity of a water softener is not a fixed number. The grains capacity is proportional to the amount of salt that is used to regenerate the softener.

But before we dig into this, we need to know what a 'grain' actually is. A grain is a unit of weight. One grain equals about 65mg - about the same weight as a grain of wheat or barley, which is where it gets its name. The grains capacity of a water softener is the weight of hardness minerals the softener can remove before it needs to regenerate.

If you've done any browsing for water softeners online, or in stores, you've likely seen many softeners described by their *grains capacity*. Common sizes are 32,000 / 48,000 / 64,000 grain softeners. The 32,000 / 48,000 / 64,000 grain capacity values that are assigned to most water softeners are the *maximum theoretical capacities.* And the only way to even approach these capacity numbers in real life is to use *massive* amounts of salt in the regeneration of the softener. Consumers who buy water softeners only looking at the grains capacity are never made aware of this fact, and accidentally buy softeners that will forever operate in the least efficient manner possible.

Cubic Feet of Resin is King

The better way to look at water softener capacity - the *only* way, really, isn't in terms of *grains capacity* but instead in terms of *cubic feet of resin.* Grains capacity is an arbitrary value assigned to a softener not by engineers but by marketing departments. It's a number that is quite meaningless when looked at in isolation. A *real* number that describes how the softener is built is *cubic feet of resin.*



When a softener is constructed, a volume of water softener resin is added to the softening tank. This is the substance that actually does the softening. Softeners are typically built with 1.0 or 1.5 or 2.0 cubic feet of resin. There are larger and smaller systems, but these three sizes comprise 90% of what's sold in the residential market.

If we use a 1.0 cubic foot water softener as an example, we can very easily illustrate the difference between *grains capacity* and *cubic feet of resin.* As stated above, the amount of softening that any given volume of resin can accomplish depends on how much salt is used to regenerate the resin. Here's what one cubic foot of resin can do, based on different amounts of salt used to regenerate it:

6 pounds salt used = 20,000 grains softening capacity

9 pounds salt used = 25,000 grains softening capacity

18 pounds salt used = 32,000 grains softening capacity

This data has been around for as long as softeners have existed, but in a marketing meeting in some place in some point in history, somebody thought that 32,000 sounded much better than 20,000 or 25,000, and sounded a heck of a lot more understandable than 'built with 1.0 cubic foot

of resin'. The bigger the number, the better the softener, went the logic. And so the naming of softeners by their *grains capacity* was born. And everybody else in the industry followed suit.

But as you can see, *grains capacity* is a fluid and changeable number. For consumers, the *grains capacity* is a poor way to understand what you're actually buying. It's a number that's been arbitrarily assigned to the softener for marketing or advertising purposes, and doesn't give sufficient info to make an informed purchase decision. The only way to properly describe water softener capacity is to look at the ***volume of resin the softener is built with***. It's the only spec that relates to capacity that can't be manipulated by a marketing or advertising department. If a softener is built with 1.0 cubic feet of resin, well, that's what it's built with!

*But only using **cubic feet of resin** is problematic - it does nothing to describe the actual amount of softening that the softener can accomplish, and this is something you need to know.*

So, ladies and gentlemen, let me introduce to you the missing variable. Let me introduce the elusive technical spec that will allow you to understand how your softener will perform, and will allow you to easily and accurately compare one softener to another as you shop. It's called ***Softener Efficiency Rating*** or ***SER*** for short. SER used together with cubic feet of resin, is a foolproof way to understand how a softener is built, the amount of softening it can do, and how efficiently it will work.

CHAPTER 2:

Efficiency

Only buy a water softener from a retailer that is able to show you the Softener Efficiency Rating for the machine. Knowing only the Grains Capacity or Cubic Feet of Resin isn't sufficient for making an informed purchase. Look for water softeners with an efficiency of 3,333 to 5,000 grains per pound as these will save you massive amounts of salt over their lifespan.

What Is The Softener Efficiency Rating?

The Softener Efficiency Rating (SER) is the technical spec that tells you how much salt your softener will use. More precisely, it's the ratio of the grains of capacity that the softener can achieve, for the number of pounds of salt it took to achieve it. Knowing the SER, along with the advertised grains capacity, allows a water softener consumer to compare the long term total cost of ownership of one softener to another. It's the most important technical spec of the softener you're about to buy.

SER is the equivalent of the gas mileage on a car. You might love a car's top speed, horsepower, and fancy options, but if the fuel economy is lousy - the true long term cost of the vehicle will be much higher than anticipated.

The Incorrect Way Most Softeners Are Sold Today

You might be familiar with the way the vast majority of water softeners are described online, in big box stores, and by most water treatment retailers. It's the familiar 32,000 / 48,000 / 64,000 grain descriptions. These numbers are used to represent the amount of hardness that can be removed by the softener. The number is usually called *grains capacity*.

However, these numbers do nothing to tell us how the water softener is built, and most importantly, they tell us nothing about how *efficiently* the water softener will perform.

The grains capacity numbers that are seen in the vast majority of retail outlets fail to inform the consumer that these numbers can only be achieved using a massive amount of salt during regeneration.

The concept that is absent here, is that the amount of softening capacity that the softener can achieve is affected by the amount of salt that is used when the softener is regenerated. It's critical to understand this, so here it is again:

The grains capacity that a water softener achieves, depends on the amount of salt that is used when the water softener is regenerated.

So, looking at the capacity alone, without any information about how the softener achieved this capacity, leaves consumers with insufficient information to make an informed purchase.

A Detailed Explanation Of the 'Wrong Way'

Let's look at what is normally sold as a 32,000 grain softener. '32,000' describes the capacity but doesn't do anything to tell us the salt cost in achieving this capacity number. A more accurate way to describe this softener is by the volume of resin it was built with. In this example, the softener was built with 1.0 cubic feet of resin. Here's where things get interesting! A 1.0 cubic foot volume of resin can be regenerated with differing amounts of salt, to give differing amounts of grains capacity:

6 pounds salt = 20,000 grains

9 pounds salt = 25,000 grains

18 pounds salt = 32,000 grains

Do you see the problem yet with describing softeners only by their *grains capacity?* If you buy a "32,000 grain" softener that is built with 1.0 cubic foot of resin, the hidden secret is that the softener is going to use 18 pounds of salt to achieve this capacity. That's an enormous amount, especially when you consider that you could get 20,000 grains capacity for a measly 6 pounds of salt.

So, buying a 32,000 grain softener and expecting it to deliver 32,000 grains of capacity will obligate you to operate the softener in a *grossly* inefficient manner! That means much more salt to buy, lug home, and discharge to the environment.

Why Softeners Are Sold The 'Wrong Way'

So why do retailers sell softeners using these numbers? The answer is two-fold. First, softener manufacturers know that consumers like big numbers. The bigger the number, the better the product. And softener manufacturers are in competition with one another. So, why call your softener a '20,000' when you could call it a '32,000'. In the strictest sense, it's not incorrect to call a softener built with 1.0 cubic feet of resin, a '32,000 grain softener', but it is absolutely an incomplete story.

Grains Capacity is meaningless if the amount of salt used to achieve this capacity is unknown.

The second reason that softeners are usually sold by grains capacity alone, is good old-fashioned lack of knowledge. There just aren't that many softener retailers that understand these concepts well enough to confidently teach them to their customers. What salesperson wants to introduce a topic when they won't be able to answer all their customer's questions about it?

Use The Softener Efficiency Rating To Make a Great Decision

The Softener Efficiency Rating is always used with the grains capacity to give the complete picture of how your new softener will perform. Grains capacity is going to dictate how long your softener can go between regenerations. This is going to be a function of your water hardness and how much water your home uses. The SER is used as a way of understanding how efficiently this capacity is achieved.

Always look for a water softener that can achieve the desired grains capacity AND the maximum Softener Efficiency Rating. Ideally 5,000 grains per pound.

Using our 1.0 cubic foot softener as an example again, here are the grains capacities and Softener Efficiency Ratings at different salt levels.

3 pounds salt = 15,000 grains capacity (15,000 grains / 3 pounds = ***5,000*** grains per pound)

6 pounds salt = 20,000 grains capacity (20,000 grains / 6 pounds = ***3,333*** grains per pound)

9 pounds salt = 25,000 grains capacity (25,000 grains / 9 pounds = ***2,778*** grains per pound)

18 pounds salt = 32,000 grains capacity (32,000 grains / 18 pounds = ***1,778*** grains per pound)

The softener with an SER of 5,000 is almost three times as salt-efficient as the softener with an SER of 1,778. It just doesn't make sense to buy a system that's going to use way more salt than another.

Why Is This Important?

For lots of reasons! It's rewarding to understand what you're buying and why you're buying it. And it's empowering to have the technical understanding needed to understand what you see in the marketplace, and to make a confident decisions. Of course, the end goal is to get a softener with the minimum total cost of ownership and salt consumption is a big part of that equation. Here are some important reasons to buy a softener that uses as little salt as possible:

- *Cost savings over the lifespan of the softener*
- *Less salt to lug home from the store, and down to your softener*
- *The softener salt tank stays full longer - so you have to think about when to fill it much less often*
- *Less salt discharged to the environment which helps our waterways, plants, and animals*

Softener Efficiency Rating is the the single most important spec of the product you're going to buy. Don't buy a softener from a retailer who can't show you this critical information, and look for softeners with an SER of 3,333 to 5,000. The salt consumption of the machine, and its total cost of ownership can only be understood by obtaining this information.

CHAPTER 3:

Service Flow Rate

The water softening process isn't an instant one. The Service Flow Rate of a softener is the number of gallons per minute of perfectly softened water that a softener can produce. Buyer beware! The flow rates stated for most softeners are simply the max water flow that can be pushed through the softener, with no regard for whether that water has been fully softened or not!

What is Service Flow Rate?

The service flow rate for a water softener is simply the number of gallons per minute of perfectly softened water that a softener can produce. You see, water softening isn't an instant process. The water needs to be in contact with the softening resin long enough for the process to be completed. The flow rate that the softener must be able to handle is dictated by the home and in smaller part, by how many people live in the home.

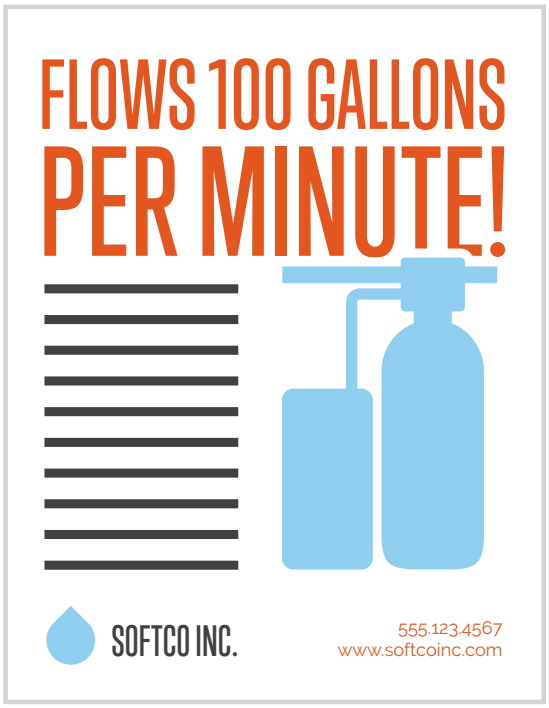
Larger homes, with more bathrooms, and more occupants will have a larger SFR requirement than smaller homes with fewer occupants and fewer bathrooms. Again, this concept revolves around the fact that the water you're trying to soften must reside inside the softener long enough for the softening process to happen. Water softener retailers will often show a flow rate for a softener they're selling.

Almost every time, the flow rate shown for a softener is the maximum flow rate that the water softener control valve can flow. This is not the flow rate at which the softener will actually soften the water!

Knowing how to determine the flow rate that the softener can actually *soften* is a pretty important step to making sure the softener you buy can properly service your home.

Softener Flow Rates Are Incorrectly Advertised

The flow rate that a water softener can handle - that is - the flow rate where it can produce perfectly soft water is a function of the amount of resin the softener is built with. Yet throughout the industry, water softener flow rates are described by the maximum flow rate that the water softener control valve can physically flow. Control valves are built to be used on softeners of various sizes, and most control valves used in residential softeners are also used in small industrial/commercial softeners. Not surprisingly, the max flow rate that a residential control valve can flow is very high - often in the 15 to 20 gallon per minute range. Many, many residential water softeners are sold showing this maximum control valve flow rate as the flow rate that the water softener can soften - and it's just plain wrong. The flow rate of water that can actually be softened has everything to do with the amount of resin the softener is built with, not the max flow rate of the control valve.



You're going to buy a water softener because you want soft water, right? So learn the proper way to determine Service Flow Rate, and end up with a softener that gets the job done.

How True Service Flow Rate Is Determined

The general rule of thumb, is that 1.0 cubic foot of softener resin will fully soften a flow rate of 5.0 gallons per minute as long as the water contains less than 30 grains per gallon (GPG) of hardness. Using that as the basis, the following chart shows the maximum flow rate that softeners of various sizes can fully soften:

Cubic Feet of Resin	Max Service Flow Rate (gpm)
0.75	3.75
1.0	5.0
1.5	7.5
2.0	10
3.0	15

What is important to remember about SFR is that it's the flow rate at which the softener will produce *perfectly soft water.* Exceeding the SFR doesn't mean your resulting water will be fully hard. In fact, exceeding the SFR by a small amount likely means that no more than 1 or 2 grains per gallon will make it through. This is still, by definition, 'soft water' - it's just not *perfectly* soft. That outcome is still acceptable in most applications.

So, the question is - what SFR does your home require? Here are three questions to ask yourself before attempting to answer this question:

1. *Is your water over 30 grains per gallon hard?*
2. *Do you have any water using appliances that are very sensitive to hardness - such as a boiler or tankless hot water heater?*
3. *Do you have any showers that have multiple heads or body sprayers (these are very demanding, often 5 - 8 gallons per minute by themselves)?*

If the answer to all of these questions is no, then you likely don't need a softener that needs to support any more than 5.0 gallons per minute. This would be a 1.0 cubic foot softener.

If the answer to any of these questions is yes, you'd likely benefit from a softener that is larger than 1.0 cubic foot to support a higher flow rate *or* to ensure perfectly soft water under all flow conditions.

A word of caution: there are very very few circumstances where it makes sense to use a softener smaller than 1.0 cubic foot in a residential application. The 3.75 gallon per minute SFR just isn't sufficient to run a home.

Again, the advertised flow rate for most softeners usually isn't the flow rate at which the machine will provide perfectly soft water. Use the number of cubic feet of resin the softener is built with to figure out the true flow rate. As long as your water is less than 30 grains hard, the rule of thumb is that a softener can provide 5 gallons per minute of flow, for every cubic foot of resin used in the build.

CHAPTER 4:

Putting It All Together To Choose Softener Size

Buy a water softener that has a great Softener Efficiency Rating to minimize salt use, and use the Service Flow Rate chart to determine the cubic feet of resin your ideal softener should be built with. Don't worry about finding a softener that will regenerate "once per week" - this is an outdated way of choosing a water softener size.

What To Focus On

Learning all about water softener theory is great, but you have a mission to complete - to buy a water softener! By combining a couple of key learnings you can arrive at the perfect softener size for your home and water conditions:

> *Buy a water softener that uses a minimal amount of salt to generate a maximum amount of capacity AND buy a softener that can handle the flow rate that your home demands.*

That's it! Don't worry about how many people live in your home, or how much water you use. And even your water hardness level is of less importance than these two key concepts, provided that it's not greater than 30 grains per gallon.

This flies in the face of the dozens of water softener sizing tools, equations, and calculators that you'll find online. Every single one of these asks you to input the number of people that live in your home, or your water use, your water hardness, and sometimes other details with the goal of finding, above all else, a softener that will regenerate *once per week*. Is this the end goal? To own a softener that will regenerate once per week? Or do you want a water softener that will always provide softened water to your home, and when it does regenerate, will do so by using a minimum amount of salt to achieve maximum softening capacity? The answer seems pretty obvious.

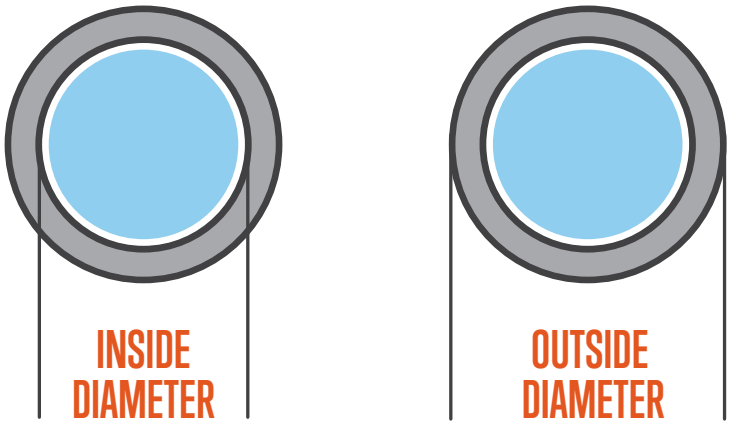
Choose Softener Size First By SER

SER is *Softener Efficiency Rating* and it's the ratio of the amount of softening capacity the softener generates, for the amount of salt it uses. It's expressed as grains / pound. The higher the number, the better. *3,333 is a good number but 5,000 is ideal.* For lots of softener manufacturers and retailers, this is a new way of thinking about softener sizing and you may have a tough time finding this information. But don't buy a softener unless the retailer can show you this very important spec. It has massive importance on the long term cost of ownership of the machine, as well as its environmental impact.

Choose Softener Size Secondly by SFR

SFR is *Service Flow Rate* and is the maximum flow rate that can be pushed through the softener so that it still delivers perfectly soft water. The simplest way figure out your max flow rate is to look at your water-main diameter. If you're in the city, the water-main is the line that comes out of your water meter. If you're rural and have your own water supply, the main line is the one that comes out of your pressure tank.

Residential plumbing is always named based on its inside diameter. There are three common residential main line diameters: ½", ¾", and 1". Remember, these refer to the inside diameter of the line. For instance, a copper pipe that is ¾" will actually measure closer to 1" on its outside diameter. Most plastic pipes will have the diameter printed on them.



The following chart shows the relationship between main water line diameter, water hardness, and the suggested size of softener in cubic feet. Remember, the suggestions made on this chart assume that you'll be choosing a softener with a Softener Efficiency Rating between 3,333 and 5,000:

Main Water Line Diameter	Hardness Over 30 Grains Per Gallon?	Suggested Softener Size (in cubic feet of resin)
½"	**either Y or N**	**1.0**
¾"	**N**	**1.0**
¾"	**Y**	**1.5**
1"	**N**	**1.5**
1"	**Y**	**2.0**

A Word About Iron

The only wildcard in all of this sizing is your water iron content. If you're on a city water supply it's not something you need to think about, but if you're on a rural water supply with substantial iron concentrations, your approach will need to be modified. For iron levels between zero and 2.0 ppm (same as mg/L), you can use the chart above. If your iron level is between 2.0 and 5.0 mg/L, go with a softener that is one step larger than what what the chart suggests. If your iron level is greater than 5.0 ppm you will likely need a dedicated iron filter, as the softener probably won't remove it all.

Removing iron with a softener can certainly be accomplished, but there are some very important things to keep in mind:

- *A softener will only remove 'clear water iron' (aka ferrous iron). If your water runs orange/brown directly from a running faucet (ferric iron) the softener won't be able to remove it*
- *For every 1 ppm of iron the softener needs to remove, there needs to be 8 grains per gallon of hardness in the water*
- *The removal of iron with a softener is dependent on many factors including pH, water temperature, dissolved oxygen concentration and others. Softeners will almost always remove 2ppm of iron, but beyond that it is hard to predict.*

The Myth Of The Once-Per-Week Softener Regeneration

Choosing the size of your softener so that it regenerates once per week, is like buying a car that has a really big gas tank. A gas tank so large that despite your car's crummy fuel efficiency you still only have to fill the tank once a week. That just doesn't make a lot of sense. Wouldn't focusing on the efficiency of the car, even if it had a much smaller gas tank, be a better way to buy?

So why are water softeners sold using the familiar "once per week regeneration" mantra? It's made to seem as if the primary goal in choosing the right-sized softener is to go seven days between regenerations. It's an outdated concept that likely has its origins in the early days of water softener technology:

The first water softeners required the owner to manually move a handle to take the softener through its regeneration stages. This was time-consuming, and the operator had to remember to do it. Once-per-week was likely adopted because it was easy to remember, and was an acceptable time commitment for the user.

When automation was introduced to softeners, it came in the way of a timer mechanism that would automatically take the softener through a regeneration based on a schedule. The once-per-week regeneration concept was inherited by these softeners from the previous generation. The second and current technology advance was the introduction of softeners that regenerate based on measured water use (aka 'metered' or 'on-demand' softeners). Any guesses? Yep - the once-per-week golden rule was of course passed along to these softeners also!

So remember, buy a softener first for its Softener Efficiency Rating, and then make sure that you select a machine that can handle the flow rate your home demands - the Service Flow Rate. A softener selected properly for both of these parameters, will consistently deliver perfectly soft water, and will operate in a highly efficient manner. Don't worry about 'the rest' of the parameters you'll see on many online selectors and tools - most use an outdated approach that ignores softener efficiency and makes things unnecessarily complicated.

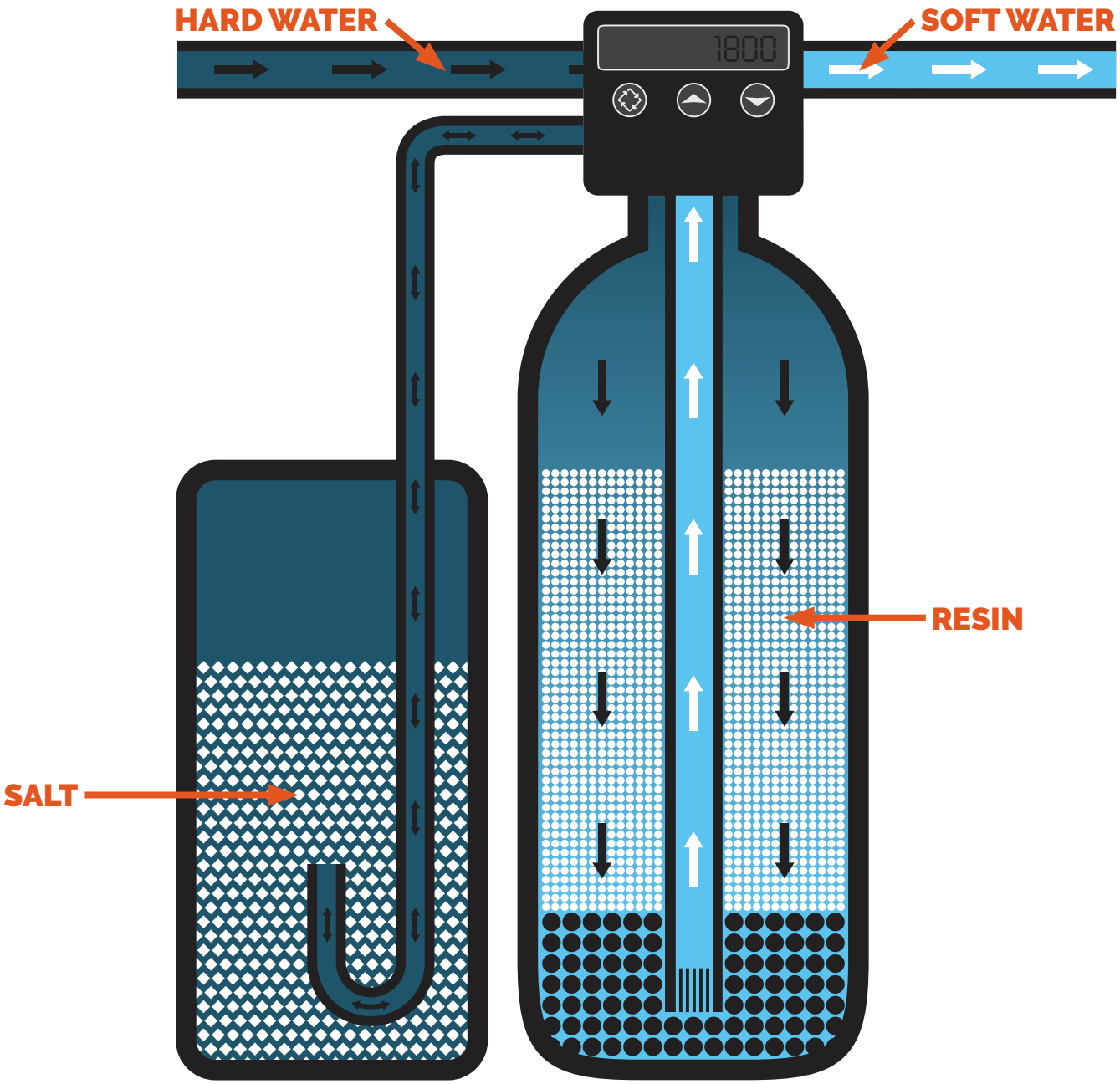
CHAPTER 5:

Brands

Don't buy a water softener by brand alone. Rather, buy it for the quality of the components used in the build. An unfortunate thing has happened in the industry - softeners are named by the control valve the softener uses. This makes it seem like the whole softener was built by the control valve manufacturer, and hides the fact that the rest of the important softener components can be of varying quality, and built by assemblers of differing skill level.

Confusion Around Water Softener Brand Names

The water softener industry has tended to name a water softener based on the control valve that's used in the build of the softener. Yes, the control valve is a critical component in the build, but naming the softener based on the control valve creates the impression that the control valve manufacturer built the entire softener. This is just plain incorrect. A finished water softener is a collection of components that all contribute to the proper functioning and quality of the machine:



When a softener is 'branded' by its control valve only, it hides the fact that the rest of the components used to make the softener can be different. Two softeners can end up sharing the exact same name even though the only component they share in common is the control valve. The rest of the softener components - the tanks, the resin, and the hardware, will all be of different origin and likely different quality. These other components - especially the resin - play a huge role in the performance and lifespan of the softener.

Different Manufacturers, Different Quality

Another unfortunate side effect of different softeners sharing the same name, is that it suggests that the softeners were made by the same company. This is a logical conclusion because it's how most other products work. You can be very confident that buying a box of Oreo Cookies means that your cookies were made in the Oreo factory. In fact, you can buy a box of Oreo Cookies in any store, and know where your cookies came from. So when two softeners share the same name - based on the control valve used - consumers assume that the whole softener originated from the same facility. But that's not true of water softeners. Two identically named softeners can be made in two completely different factories, by two different companies, using different components, and assembled with varying degrees of skill.

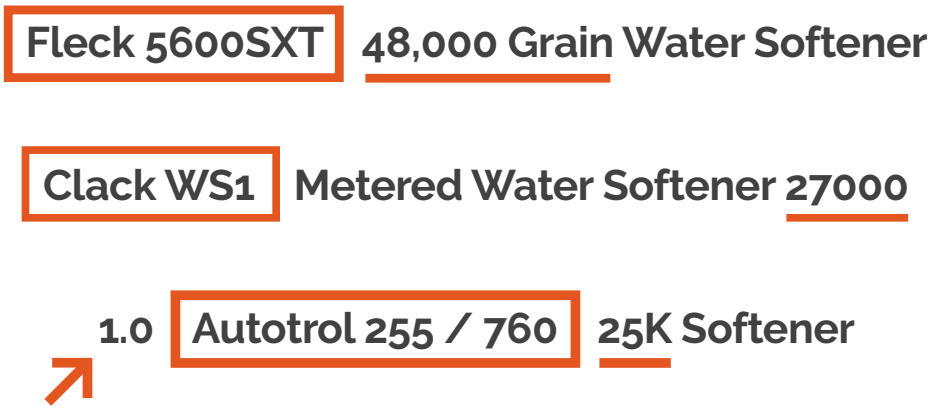
Water softener manufacturers vary greatly in the quality of components they use, the level of expertise they have in choosing compatible components, and their assembly skill

Components Are Key

So if the name or brand of a softener doesn't really tell us the whole story, then the only way to judge the quality of the softener you're buying, comes down to understanding the quality of the components used in the build. In the building of a water softener there are two main components that will dictate the performance, lifespan, and overall experience with the product - the *control valve* and the *resin.* We cover these two components in great detail in following chapters.

Deciphering Softener Brands

Sometimes an example is worth a thousand words. So here are a few real-life examples of softener brand names collected from the internet and a breakdown of what information the names actually provide to us:



The boxed info is the brand name and model of the control valve (Fleck / Clack / Autotrol). The underlined portions are the grains capacity that's attributed to the softener. These three examples show three different ways that grains capacity might be written. Keep in mind these grains capacities are grossly overstated (learn more about that in *Understanding Water Softener Capacity*). In the bottom example, the arrow points to the size of the resin bed in cubic feet - a valuable technical spec that is not typically shown in a softener name.

Again, the take home message here is that there's no such thing as a Fleck, Autotrol, or Clack water softener - these are only control valve manufacturers! To fully understand the quality of the product you're buying, ask questions and about the control valve, the resin, and the rest of the components, and make sure the softener has been built by someone who knows what they're doing.

CHAPTER 6:

Control Valves

Fleck, Clack, and Autotrol control valves offer the best value in the water softener industry. Rugged, long-lived, easy to use, and easy to repair. The majority of professional-grade softeners available for purchase in North America use one of the 'big three' for these and many other reasons.

What To Look For In a Control Valve

It's the brain of the operation and the single most important component in a water softener build. Together with the softener resin, it's the component that will dictate the long-term performance of your system, and your overall satisfaction with your softener. Look for softeners that are built with Fleck, Clack, or Autotrol control valves. These brands consistently deliver great value in even the most demanding applications. All three have been developed for the professional market- meaning they'll last a long time, are easy to install and use, and have a modular design to make repairs cheap and easy, when necessary.

There is a great deal of arguing among industry professionals as to which of these three brands is superior to the rest. And as some models are discontinued, and new models released, the race for 'best control valve' gets tighter, and the winner harder to judge. The bottom line is that all three brands are a cut above the rest. Picking a softener built with any of the three is a smart purchase. You really can't go wrong.

Your satisfaction with a Fleck, Clack, or Autotrol control valve is much more dependant on the expertise of the dealer you buy from to explain, service, and troubleshoot the product they sell you, rather than uncovering small advantages/ disadvantages between the three brands or models.

Unfortunately, industry professionals on many online forums, love to express their technical superiority over one another by diving deep into the details of water softener theory to arrive at their expert opinions. Their goal is as much to impress one another, as it is to assist consumers.

The bottom line is that a softener built with a Fleck, Clack, or Autotrol control valve is going to deliver years of great performance *provided that you buy your softener from a dealer who has an excellent understanding of the product they sell!* At some point in the lifespan of your machine,

you're going to rely on the dealer for their knowledge - in programming, troubleshooting, repair, etc. Your long term satisfaction has everything to do with how well your dealer can assist you. This is true of all dealer types both local and online.

So, how do you find out if your dealer knows their stuff? You educate yourself on the ins and outs of water softener control valves, and ask the tough questions. Here's the info you need to do this:

Consumer vs Professional Grade Products

When a product is developed by any company, the engineering department usually asks the marketing department a few questions. One of those questions is 'how long do you want it to last'? The result is that products have an 'engineered lifespan'. That is, they're designed to last a certain number of years. This is true of water softener control valves. There are control valves that are designed to last 5 years, and there are control valves that are designed to last 15 years. The lifespan of the product isn't an accident. The professional grade products are built with higher quality plastics, metals, and rubber gaskets. They are built with tighter tolerances, and perhaps the most important, but most overlooked difference, is that they are built with a ***modular*** design. That means they're designed to make repairs cheap and easy. If one component fails, you don't have to throw away the whole thing.

Consumer-grade products are usually cheaper but much shorter-lived than 'professional-grade' products and are usually difficult or impossible to repair

It takes more time, planning, and engineering resources to create a product that lasts. And components that last longer than others are more expensive too. As a general rule of thumb, any water softener you find at a general merchandise retailer is going to be a consumer grade product, while water softeners sold by pro's are going to be professional grade. There are online companies that offer well made professional grade systems too.

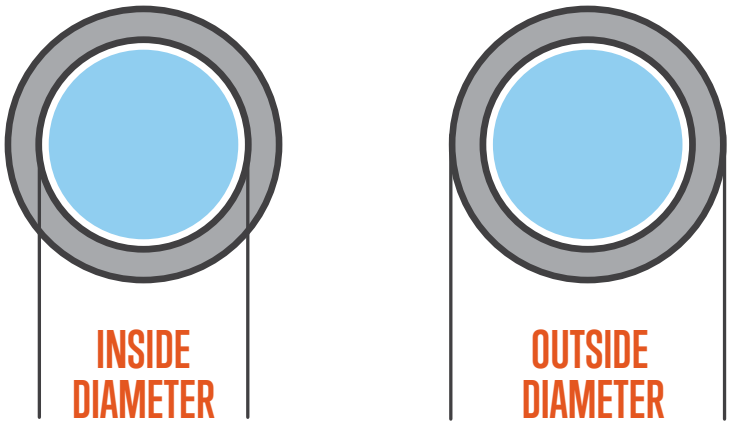
Control Valve Flow Rate

Every water softener control valve is rated for a maximum flow expressed in gallons per minute. This number represents the maximum amount of water you can expect to flow through the valve under normal water pressure conditions. Most retailers love to talk about this number because, well, it's a number, and it makes it easy to compare one control valve to another. The logic of course, is that if the flow rate is higher, it's a better control valve because it will flow more water to your home. *Wrong!*

In a properly constructed water softener, it's the water softener resin bed and your plumbing that will limit the flow rate through the system - not the control valve. So whether the control valve is capable of flowing 15 gallons per minute, or 25 gallons per minute matters very little, if the resin bed or plumbing will limit the flow to 12 gallons per minute. In fact, paying more for control valve because it can flow 25 gallons per minute is a waste of money in all but the rarest of residential applications.

A great general rule of thumb is to buy a softener that's equipped with a control valve that has the same *porting* as the diameter of your plumbing. Porting is the diameter of the pathways inside the control valve. All good-quality professional-grade control valves will have either ¾" or 1" internal pathways.

If the plumbing line where you're installing the softener is ¾", pick a softener with ¾" porting. For a ¾" water-main there's little sense in paying extra for a softener control valve that has 1" internal porting. You'll be paying for flow capacity you'll never use. Remember that residential plumbing is named for the *inside diameter.* So, if you're measuring your main water line, and it measures close to 1" on the outside, this is likely a ¾" line. Plumbing will often have the diameter written on the outside. Again, you're looking for the inside diameter.



Metered vs Time-Clock Systems

Water softeners must regenerate when the resin bed becomes saturated with hardness minerals. This is when the softener control valve initiates a flow of brine solution from the brine tank, and flushes it through the resin bed in the softening tank. This recharges the softener. But exactly when the softener performs this regeneration can be triggered in two different ways.

Metered control valves measure the amount of water you use, and trigger the regeneration when the water softener has used up all of its capacity. Metered systems are also called on-demand softeners. Time-Clock systems trigger the regeneration on a set day whether you've used up some, all, or none of the capacity of the system.

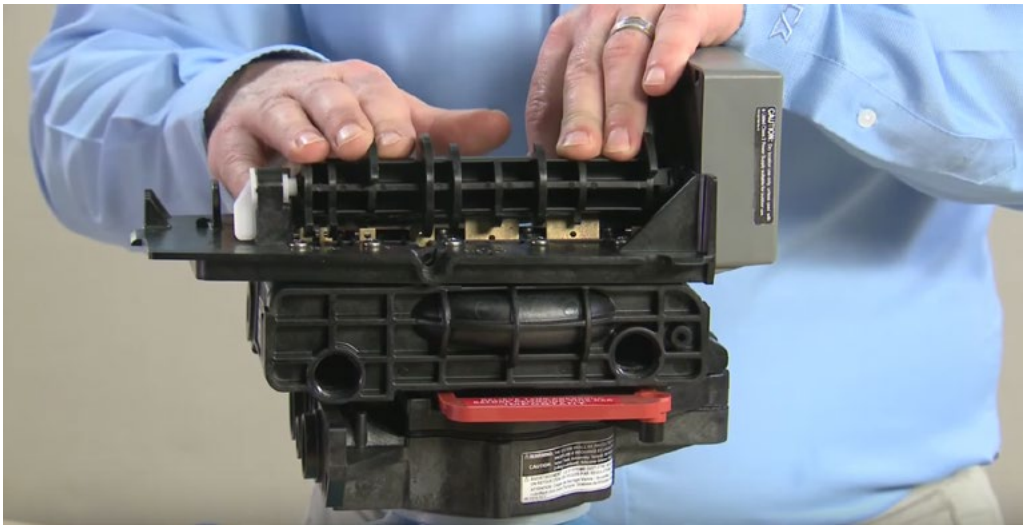
Time-Clock systems should never be used for residential water softening systems except in the rarest of circumstances. A metered system will do a far superior job in ensuring the home is always supplied with soft water, and will use far less salt than the time-clock systems.

Valve Mechanics

One of the most common questions we receive here at Aquatell is 'what is the difference between Autotrol and Fleck control valves?'. Since Autotrol uses a unique mechanical system, the question is really a question about how Autotrol valves are different from the rest of the control valves in the industry.

When a water softener regenerates, the control valve must change the way that water is routed through the softener. Fleck, Clack, and most other water softener control valves in the industry make these water flow routing changes by moving a piston from position to position. This piston has holes bored in it, and as the piston moves, these holes align with pathways in the control valve. Changing the piston from one position to another, opens one pathway and closes another.

An Autotrol valve is different. Each pathway in the control valve is opened or closed by a spring-loaded flapper valve. Part of the flapper valve sits inside the the body of the control valve, but one small tab protrudes from the top. To open and close each flapper valve at the correct time, a motor-driven cam is used. This cam has small tabs on it that align with the tabs from the flapper valves. As the cam turns, the tabs on the cam push on the tabs of the flapper valves and open or close them. The whole thing operates much like a wind-up music box.

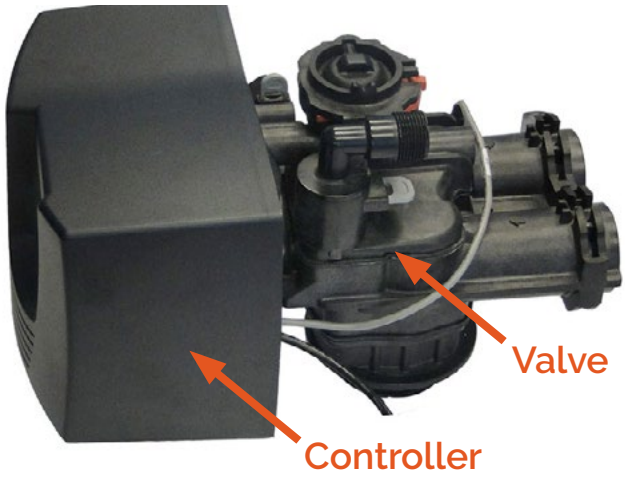


There are ongoing arguments as to which system is better. The arguments go on and on, but the evidence seems to suggest that neither system is particularly better than the other. Both designs are excellent and work very very well. You're much better to spend your time ensuring that you

buy the correct-sized softener, then you are to argue the advantages/disadvantages of Fleck vs Autotrol.

Valve Controllers

A control valve is really two parts in one. There is the valve, and there is the controller. The valve comprises all of the mechanical moving parts. The controller is the brain that coordinates all of the activities of the valve mechanism. The controller says 'go' and the the valve moves!



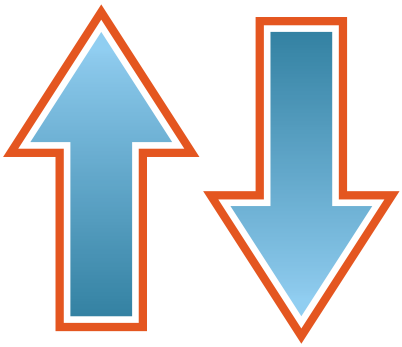
The controller is the part that the user interacts with. It's where the system is programmed, and where the softener shows important information about system performance. Until the 1980's, controllers were mechanical - users programmed the system by moving small pins into different holes and setting mechanical dials in different positions. In the 80's, digital controllers appeared on the scene. Digital controllers offered the huge advantage of a display where the user could see what they were entering. It made programming and troubleshooting much easier. But like many early electronic devices, the boards were prone to failure, and often needed to be replaced.

Digital controllers are now every bit as reliable as their older, mechanical counterparts. So there's really no reason at all to look at non-electronic controllers. The advantage they offer in ease-of-use and features makes them a no-brainer. And in the case of the board failure, manufacturers of control valves have made the replacement of the board very simple - usually taking a homeowner or professional less than 5 minutes.

In areas that are prone to electrical brownouts or blackouts, plug the softener into a surge suppressor to make sure the softener isn't damaged. This is true of both mechanical and digital controllers.

Upflow vs. Downflow Water Softeners

When a water softener regenerates, the brine solution is drawn from the brine tank, and pushed through the resin bed. The brine solution can be pushed through the resin bed from the top-down (downflow) or from the bottom-up (upflow).



All water softeners have traditionally been downflow. But in the last 20 years or so, it was proposed that pushing the brine from the bottom up would produce a more thorough regeneration. The idea was this: at the top of the water softener tank, there is a void space between the top of the resin bed, and the top of the tank. This is called the 'freeboard'. Engineers proposed that pushing the brine solution down from the top, caused dilution of the brine from the water in the freeboard, and the diluted brine wouldn't regenerate the softener as effectively as pushing the brine from the bottom up, where there is no dilution factor.

Upflow brining, it was proposed, would also create 'super-regenerated' resin at the bottom of the softening tank, since all of the brine solution would pass through this portion of the resin. When softeners are in service mode, the water to be softened flows from top down, so having this 'super-regenerated' resin at the bottom of the softening column was seen to be advantageous as a safeguard to hardness breakthrough.

The upflow brining concept showed promise in theory, but at the practical level showed little if any benefit in residential-sized systems. Upflow-brining water softeners likely have a small measurable advantage on the industrial/commercial scale, but very little if any measurable advantage in the residential market.

It's also worth considering that upflow-brining control valves use different internal components than downflow-brining control valves. Since upflow-brining softeners are much less common than downflow, it can be more difficult to find the parts needed to service or repair upflow systems.

It's our opinion that a high-quality downflow-brining softener is a smarter purchase than an upflow based system.

The Bypass & Plumbing Connectors

Only buy a water softener control valve that comes with a detachable bypass valve. The bypass is a set of on/off valves that sit between the control valve and your plumbing. The bypass is tremendously useful, as it allows you to route water *around* the softener.

This is useful if you need to use a large quantity of unsoftened water, such as filling a hot tub or a pool. But the bypass is also extremely useful when servicing the softener. To do this, the softener is put in bypass mode by turning the valves to the 'bypass' position. The softener is then detached from the bypass valve which remains attached to the household plumbing. The softener can now be serviced, while the bypass valve allows water to be supplied to the home.

Bypasses are available in metal and plastic versions. In the vast majority of residential applications, the plastic bypasses made by Fleck, Clack, and Autotrol are plenty durable. In a residential application the bypass will rarely be used, so it's not going to take much wear and tear. If the softener will be used in an application where it will be constantly put in and out of bypass mode, upgrading to a metal-bodied bypass might make sense.

Most bypass valves have options for the terminations that you will attach your household plumbing to. Whenever possible, choose connections that have the same diameter as your plumbing: if you've got ¾" plumbing, choose ¾" connections coming out of the bypass, as an example. Matching diameters will reduce your spend on plumbing fittings during installation.

Warranty

Fleck, Clack, and Autotrol have a 5-year warranty provided by the manufacturer. Control valves that have warranty lengths any shorter than this should be viewed with skepticism.

Warranty length is usually a great indicator of the manufacturer's confidence in how well their product will perform.

There are some new Asian-made products that are emerging in the North American marketplace. Some of these manufacturers are offering warranties longer than 5 years on their control valves, likely as a way to gain market share. Look at the track record of the product in the market in which you're buying. If the manufacturer hasn't been around as long as the warranty they're offering, it can be difficult to assess the value of the warranty length - even if it is quite long.

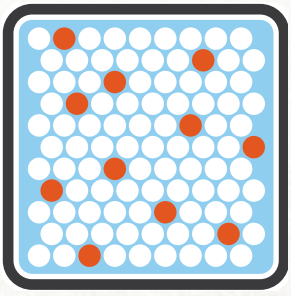
The value of a warranty is also a function of how easily warranty parts can be acquired. Fleck is king in this regard. Warranty parts for their softeners are available in pretty much every city or town, as Fleck retailers are pretty much everywhere. The use of Clack and Autotrol tends to be more regionalized - you may find some cities and towns where Clack or Autotrol is not well represented, and parts may be hard to come by. In worst-case scenarios, warranties can always be claimed directly with the manufacturer, but this can add unnecessary delay compared to sourcing the parts from a local dealer.

Fleck, Clack, and Autotrol control valves simply offer the best combination of features, reliability, repairability, and price available. Water softeners built with these control valves are usually 'set it and forget it' appliances, providing many, many years of trouble-free performance.

But remember, the performance of your softener isn't just about the control valve. The quality of the other components used - especially the resin - and the expertise of the softener assembler are both very important elements in the experience you'll have with the product.

CHAPTER 7:

Resin



Softener resin does the work of softening and is a very important component in a softener build. The quality of softener resin is described by 'cross-link percentage'. Softeners made with 8% resin are good. Softeners made with 10% resin are excellent, and wherever possible, buy a softener made with this stuff. Don't worry about where the resin is made as it won't impact the performance of the machine.

What It Is & Why It's Important

Second to the control valve, the resin that is used in a water softener is next most important component. There's a lot of confusion as to what water softener resin is, and how it works. So before we discuss the best kinds, let's learn a little more about what water softener resin does.

Water softener resin is an amber-coloured plastic. It's manufactured in very tiny spherical beads. A handful of softener resin feels much like sand. Each resin bead is made to have active sites within its structure. These active sites in the structure of the plastic are where the process of water softening takes place. Water softening is an *ion-exchange* process. This means that water is softened by exchanging hardness minerals of calcium and magnesium, for sodium ions. It's at the active sites of the softener resin that ***softening*** actually takes place.

Freshly regenerated water softener resin contains a sodium ion at each of the active sites in its structure. As hard water flows through the resin bed, the active sites grab onto calcium and magnesium compounds, and release sodium ions. Eventually all of the active sites on the resin become saturated with hardness minerals. At this point, concentrated brine (salt) solution is pushed through the resin bed. This causes the active sites to release the trapped hardness ions and leaves them recharged with sodium. The resin is now ready to soften again.

There are important differences in resin quality. Now that you understand what softener resin is and what it does, let's learn about the differences in resin.

Resin Hardness (aka Cross-Link Percentage)

Water softener resin is a type of plastic. Plastics are created by bonding many small particles together (monomers) to create larger chains (polymers). Plastics can be made harder or softer by controlling the number of bonds between the monomers. Creating many bonds between the monomers is called cross-linking. The amount of cross-linking in a plastic is expressed as a percentage. The higher the cross-link percentage, the harder the plastic. Resins with a higher cross-link percentage - harder resins - have a few advantages over resins with a lower cross-link percentage:

- *they have a slightly higher ion-exchange capacity - they can do a little more softening than a softer resin for the same amount of salt used*
- *they are more resistant to permanent chemical fouling from substances like iron or manganese making them better for rural applications*
- *they are more resistant to being broken down by chlorine in city-water applications and have a longer resulting lifespan*

The vast majority of water softeners are built with 8% cross-linked resin. 8% resin has been used because it offers good performance, for a good price. In a normal residential application, 8% cross link resin will likely breakdown and need replacing once over the lifespan of the softener. In

situations where there are very high chlorine concentrations, or a high amount of iron/manganese in the water, the resin may break down faster than this.

There are some softeners on the market that use resin with a cross-link percentage less than 8%. Steer clear of these softeners. These resins will break down far too quickly and cause unnecessary maintenance and costs for the owner.

Recently, the price of resins with cross-link percentages greater than 8% has come down. Where 10% cross-linked resin may have come at a 50% premium in the past, its current price makes it a very attractive upgrade in a softener.

10% cross-linked resin will likely last the full lifespan of the rest of the softener components and will do a better job softening than 8%.

Fine Mesh vs. Regular Mesh

'Mesh Size' is a common way to describe the physical dimensions of a product that is in a granular form. A 'mesh' is simply a screen that a product is able to be passed through. Different mesh sizes have different-sized openings so that only fine granules can pass through the finer mesh sizes, while larger granules can pass through the coarser. Most kinds of water softener resin are available as a 'fine mesh' or 'standard mesh' product.

Fine mesh resin has an advantage and a disadvantage over standard mesh resin. Fine mesh resin, because of it's smaller particle size, offers more surface area per unit volume. This means that for equal volumes of each, the fine mesh resin is capable of slightly more water softening than the standard product. However, this extra surface area comes at a cost. The finer particles of fine mesh resin are able to pack more tightly together in a softener tank, and can produce significantly higher pressure loss through the softener than a standard mesh resin would.

If the extra-capacity of a fine mesh product sounds appealing, it's our opinion that in most residential applications it's better to go with a standard mesh resin with a higher cross-link percentage. The higher cross-link percentage will give the extra bump in capacity you want without decreasing the pressure loss through the system. It will also make the softener last longer due to its resistance to iron, manganese, and chlorine.

Resin Country of Origin

Up until the 1980's all of the water softener resin used in residential softeners was made in North America. By the mid 2000's virtually all of the manufacturing of residential water softening resin had been moved offshore - to China and India. As recently as the last couple of years, there was one 'American Made' product that seemed to be the last of it's kind, but recent examination of the documentation for this product makes its origin murky - listing Pennsylvania, Romania, and China as its manufacturing location.

It's extremely unlikely that any water softener for sale in the North American market contains North American made resin any longer. It all comes from Asia now. *But don't worry about it!* The offshore made resins have been in the market for decades now - and the results are in. They work very well and the quality control is excellent. In short - they work just as well as the North American stuff ever did.

The key to identifying a good quality resin is much more about knowing what technical specs to look for, rather than finding a product made in a country of choice.

If the control valve is the brain of a softener, the resin is the heart. Buying a softener with a quality resin ensures that your softener operates efficiently, and significantly decreases the likelihood of resin fouling or breakdown. Cross-link percentage describes the quality of the resin. Buy a softener built with 10% cross-linked resin wherever possible.

When we wrote the **Ultimate Guide To Choosing A Water Softener** we were a little skeptical that people would take the time out of their busy lives to read a 47-page booklet on how to choose a softener.

How wrong we were! The response has been nothing short of overwhelming. We even had to remove our toll-free number from our website for a short time so we could catch our breath!

Reid Thornley, B.Sc. Master Water Specialist

Your Feedback Has Been So Valuable:

Publishing this guide has resulted in thousands of new interactions with people who simply want to buy the right softener. Through these conversations we've learned that we did lots of things right in The Guide, but it has also revealed the frustration that many of you are still experiencing on your softener-buying journey.

We've Got New Ways To Help

"I read your water softener guide and I understand the importance of knowing my water hardness and chemistry BUT..."

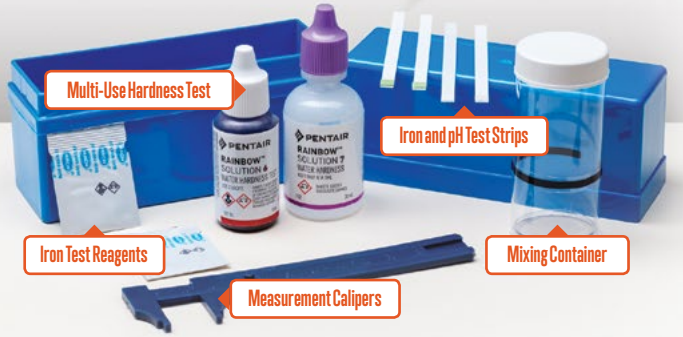
1. *I'm having trouble finding this info for my city water*
2. *I have my own water supply and lab tests are too expensive*
3. *I live too far away from a testing facility*

WE'VE GOT THE PERFECT SOLUTION
THE SOFTENER SELECTOR

PART ONE!

If you live in a city or town in Canada, we've compiled a pretty awesome listing of water hardness values. Go to the list here... and if your city or town is missing – just let us know and we can typically add it within 24 hours.

FIND YOUR CITY'S WATER HARDNESS! >

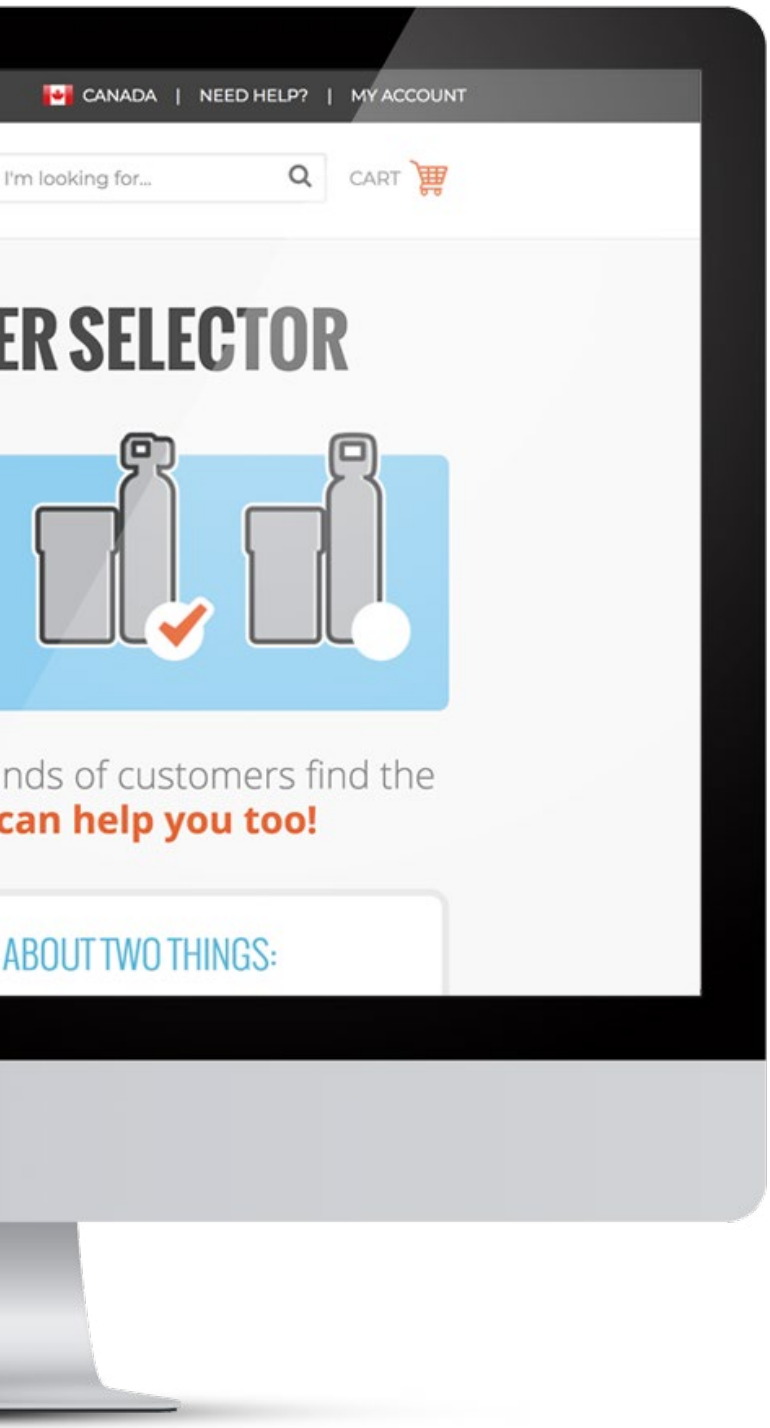


PART TWO!

Want to test your own water? Want it to be easy? How about free? There wasn't a test kit on the market dedicated to helping people buy a softener, so we made our own! It's accurate, it's easy, and it's free – sort of. It's called the Softener Prep Kit and we'll sell it to you, and then give you a coupon for it's full value, towards the purchase of a softener.

GET YOUR SOFTENER PREP KIT NOW! >

SOFTENER SELECTOR



An online selection tool you can trust!

For many of our faithful readers, it turns out that the Softener Guide created as many questions as it answered! You loved the educational value of the guide, but many of you were still left head-scratching over which softener was the best choice. The sheer volume of inquiry meant we needed a self-serve tool that helped you ***actually choose the softener you wanted to buy.*** So we threw caution to the wind and endeavoured to build an online tool that incorporated all the intricacies and technicalities of accurate softener selection. It's called the Aquatell Softener Selector - and it's awesome!

aquatell.ca/pages/water-softener-selector

A question from Reid:

When we first conceived of the idea of this guide, it was important to us that it was free from advertising and any "salesy" kind of stuff. When we decided to add this page to the guide we all agreed that it introduced a bit of a sales pitch for our Softener Prep Kit and the Softener Selector and this made us a little uncomfortable. We're pretty sure that one of the reasons that people have loved The Guide is because it presents the facts in a pretty unbiased manner and we didn't want to do anything to undermine that.

Have we blown it here? Does presenting these resources discredit or tarnish the rest of The Guide in any way? If you think it does, we want to know about it:

contact@aquatell.com

Our most sincere thank-you for taking the time to read The Ultimate Guide To Choosing A Water Softener! We hope you found it to be time well invested.

This is version 1.1 (updated Aug. 2018) and we sincerely value your input on changes we could make for upcoming releases. Please email any suggestions to:

contact@aquatell.com

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