

Foreword

We have been engineering air system technology since 1972. We are the experts and industry leader. This happened as a result of our passion for air system bathing over more than three decades of constant innovation driven by our belief that air systems provide a more comprehensive massage in a bath than jetted water systems provide. While other manufacturers clung to water jetted systems (whirlpools) as their sole offerings, we were championing air as a superior massaging technology to anyone who would listen. We are not arrogant but instead zealots and shouting as loudly as we can about air system technologies so that bathers know what to ask before making a major purchase decision.

The fact is that not all air systems are equal and over the past two years the sudden explosion of air system offerings that are poorly engineered but supported by massive advertising budgets is overwhelming the consumer learning curve. We are but a small voice without the advertising budgets of the Titans of our industry and it is only through our comprehensive approach to educating people about what they need to know before choosing an air system bath that keeps us healthy. We believe that an educated consumer will choose to be our customer.

This article is a dissertation and written to help people understand air. It is very long and tells our story in detail. It is about bathing system technologies and acutely about our air system technology. It is placed in our website for the benefit of people who want to know everything they can before making a major purchase. It will answer 99% of all questions about air system technology and provide our thinking about alternate technologies. We know our business and in this dissertation you will find our passion for what we do.

The article is in sections. You can simply scroll down to a section heading and read about that subject or read the article in its entirety. You can print it and read it at leisure. We do this because we believe that if you read this dissertation and then study all of our competitors you will choose our product because the quality of our engineering and the massage characteristics created by our engineering represent the value you are seeking in a luxury massaging bath.

We simply believe that our technologies are far superior to all of our competitors. We also believe that no other manufacturer will choose to copy how we do what we do because it is too expensive to do it our way. They will instead continue to produce similar offerings that simply do not perform at the same high level our products do, but are less costly to make. We will discuss and compare our methods to other methods in this dissertation so that you are best informed and know what questions to ask as you decide on which company produces your dream massaging bath.

To truly understand the incredible advantage of our technologies you first must know about certification standards, acrylic manufacturing and about the fluid properties of air. With this information as background, we will then discuss specific air technologies noting our methods and those of our competitors. We conclude with our perspective of why you truly want to choose Acryline to satisfy your complete desire for a remarkable luxury massaging bath.

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Certification standards

Manufacturing certification standards require all baths must slope gently toward the drain impression. If they did not then they would pool water and you would have to wipe your bath dry after every use. This could create a sanitation hazard. Every certified bath shape slopes to the drain impression.

Certification includes a standard with a minimum water retention threshold for every system bath (channel air, injection air and jetted water system) manufactured. All system baths must meet this standard in order to receive certification. If they do not they present an intolerable sanitation risk.

Certification requires every bath must meet a fire resistance and strength standard. In order to meet these standards Acrylic needs to be sprayed with fiberglass. Every acrylic bath is sprayed with fiberglass and while this is a mundane fact it is highly relevant to our story.

Acrylic bath manufacturing

Acrylic is an amazing form of plastic. It is a tough plastic whose color and composition remain consistent through its length, height and width. This makes it durable over time and great for use in a residential or commercial bathroom. You can easily repair scratches and maintain the original luster of the surface for decades with very little care.

It is strong and durable and can be formed into a remarkable number of shapes. However, once you take a sheet of flat acrylic, heat it up and then pull it into a shape it stretches and becomes somewhat fragile. To make it strong acrylic manufacturers laminate (spray or paint onto) the back side of the acrylic surface a fiberglass mix called FRP. This is a mix of fiberglass strands that are chopped into small pieces by a lamination gun and mixed with resins and polyester then shot onto the under or backside of the acrylic shape. The FRP contains a reactive chemical agent called styrene that causes the acrylic and FRP to tightly and permanently bond. This is basically how acrylic baths are made and important to understand because FRP is hairy.

Most people have never really looked at the underside of an acrylic bath but if they did they would see a very rough surface with significant variation and what appear to be imbedded hairs.

These are not hairs but are instead the fiberglass strands that are sprayed onto the acrylic creating this appearance. The hairy surface is an important part of our story.

The fiberglass backside of an acrylic bath presents a potential sanitation risk in most channel air technologies where hair, skin exfoliate and other material can cling to the imbedded fiberglass strands as the channel drains. We eliminate this risk in the way we make our channel while all other manufacturers ignore it. The method used by other manufacturers to create a channel also restricts their ability to provide the remarkably active massage that our channel technology delivers and while all of this is addressed in a later chapter on channel air technology, you first need to understand a little bit about the liquid properties of air in order to fully appreciate our technologies.

Fluid properties of air

Air is a gas or one of the two type of fluid; liquid being the other type. This is important to our story because fluids are subject to the laws of physics and in order to control them we must respect the characteristics of flow, pressure and balance when developing our air system technologies. A keen understanding and practical application of these laws allows us to create an extraordinary massage therapy bath.

We begin by recognizing that fluids flow best through smooth and straight corridors. Think of water flowing through a one inch diameter and straight length of pipe whose inner surface is smooth and now imagine water flowing through that same pipe but now with a corroded inner surface. Ask yourself which pipe will allow the most water to pass through? Obviously, the straight and smooth pipe will allow more water to pass through because there is less restriction to flow. Now imagine the pipe must bend around an angle and that you have enough pipe length to use a pipe bender to create an even and smooth bend. The now bent pipe has an inside surface that remains smooth and will allow flow. But what if the pipe was too short and you had to get an additional length and weld it? The welded pipe will create an internal seam that will impede flow. This is important to our story as our channel is like the pipe that has a consistently smooth interior surface and we are the only channel system bath company that can make this claim. Generous uninterrupted flow is very important to us.

But flow is not the only thing that is very important to us; pressure and balance are also very important. Pressure and balance are important to us because we want our system baths to have constant predictable pressure throughout the bath during operation that can be adjusted to achieve a varying yet precise massage therapy.

The easiest way to think of how we use the dynamics of pressure and balance in our baths is to think of a nearly analogous system we are all familiar with; a forced air heating or cooling system. If you try to heat or cool a structure you need a power source (furnace or air conditioner), a delivery system (air ducts) and a temperature control system (thermostat). You then need to arrange the parts so that you can control the temperature of rooms by controlling the power and optimally the distribution system as well. Usually this means the thermostat is mounted on an interior wall and it is attached to the power source and air ducts run from the output of the power source to the rooms of the structure. The least expensive method to accomplish this (in terms of the cost of the ducting), is to run one duct from the power source to

the room closest to the source and extend the duct from that room to the next closest room and so on until your single duct system runs from the source to all the rooms. The problem here is that by the time you get to the last of the rooms the heat or cooled air is not as hot or cool as it was when it first left the source. The first rooms are likely too hot or cold and the last rooms are not hot enough or cold enough. This result is either because the power source was too small and did not have enough pressure to get all over the house or the system was not balanced to deliver the pressure evenly throughout the house.

Three possible solutions exist: increase the power source; change or modify the ducting; or a combination of both. The ideal solution is determined in this analogy by determining what mix of power and distribution changes will result in the air temperature being delivered to all rooms at constant pressure and temperature; in other words balancing the system.

Power may be the problem, but it is not likely as the physics behind the problem suggest that there is simply too long a string of rooms to heat or cool and the first rooms are consuming the heat or air conditioning before the other rooms can benefit. The solution of increasing the power is then likely to result in the first rooms being unbearably hot or cold in order to get the last rooms to the desired temperature. The solution may lie in balancing the system so that the existing power source can evenly distribute the warmed or cooled air to each room. This is typically accomplished by running multiple ducts from the power source to individual rooms or to a series of ducts that run to only a few rooms or areas. In heating, ventilating and air conditioning this is referred to as a zoned system and is the preferred method so that balance can be achieved in temperature throughout a structure without having to build in oversize power units.

Balance and pressure concepts are important in understanding air system technologies as a well balanced technology results in a predictable and consistent massage therapy.

Channel air technology

Our channel technology is unique among all channel technologies. We use a hand fabrication process we first created over three decades ago in the early 1970's. Our competitors have either never figured out how to do what we alone do, or are unwilling to spend the time and money it demands to make a channel our way. Ours is the only channel technology on the market that can claim a smooth and continuous inner surface free from hairy FRP. These attributes of our channel add value in the force of the massage delivered by our baths and the cleanliness of the channel itself, but before we make our case for this statement we must first discuss the way others make their channels.

Other manufacturers make their channels using a preformed plastic like ABS. ABS or other preformed plastic channels are created in pieces and must be glued together to approximate the bath shape. This process makes a continuous and non-seamed channel impossible. They glue these preformed shapes together and then glue the assembly to the hairy FRP outer side walls of a bath. Once the glue dries, temporarily holding the ABS assembly in place, they coat the outside with FRP to permanently hold it in place. They then flip the bath over and drill holes from the inside of the bath through the acrylic and FRP wall into the channel air void. This results in the inside of their channel having glue seems and a hairy FRP surface on the inside of

the channel. The combination of glue seems and hairy surface impedes air flow and provides all sort of nooks and cranny's where hair, skin exfoliate, soapy residue and other matter resident in bath water can collect. This issue is further magnified as ABS is one of many plastics that do not adhere well to fiberglass (FRP). The potential problem this presents is that the ABS may separate (peel away) from the FRP backing that was used to spray over the assembly and make it secure. If it peels away, it happens inside the channel out of view creating internal pockets of space. These pockets can allow air, water and whatever is in the water to get trapped inside the channel reducing the efficiency of air flow and creating a potential sanitation hazard that nobody will ever see or know about until it is too late.

It is also difficult to mount an ABS channel consistently low along the perimeter of a bath. To do so would require the ABS to be glued to the bottom of the bath. In this configuration the resulting channel would retain water below the bath and fail to drain residual water. To compensate manufacturers angle the channel along the outer wall of the bath with the high end at the end where you recline and the low end near the drain. They do this is to ensure drainage and to meet the residual water standard. Unfortunately, this diminishes the vertical rise of the air through the bath water, which diminishes the ability of the technology to create active massaging water.

In summary, ABS or other preformed plastic channels can not be mounted consistently low in the bath well, have glue seems and hairy inner surfaces and are at risk of separating internally from the FRP used to hold them in place. As such this channel technology does not introduce air consistently low in the bath well during operation diminishing the massage capability and can trap or hold biodegradable matter creating a sanitation risk. It is a less expensive way of making a channel than we use but we simply can't accept the weaknesses inherent in the technology despite it being a far less costly method of production.

Our channels are designed and manufactured to maximize massage action and reduce sanitation risk. To accomplish this we go to great lengths utilizing our unique technology, which we developed more than thirty years ago and have been continually refining since. Each of our channels is made by hand and individually for every bath shape we make. Our process adds two hours of manufacturing time and additional material cost to each channel bath we make, but the investment yields a channel with superior sanitation and operating characteristics over any other technology available.

We start by making a unique channel mold for every bath shape we offer. This mold allows us to fabricate a glass smooth channel out of tightly woven fiberglass matte and specially formulated resins in a shape that precisely follows the shape of the bath itself. Each individual channel is continuous without abrupt turns or changes in dimension. After we have laminated the acrylic bath shape with FRP like everybody else, we pause and fix the hairy base. We prepare the hairy surfaces where our channel will be placed to be smooth by applying a tight weave fiberglass matting coated in special resins over the hairy surfaces of the bath where it dries to a smooth surface forming the inner portion of our channel corridor and where we will later attach the outer portion of our hand made channel. This process is similar to the way manufacturers of racing yachts finish their hulls. This prepared inner channel surface area includes the entire perimeter base of the bath and the corridor that runs up along the back of the bath shape and to the upper rim where we extend our channel. This upper channel is where the flow of air provides a heated surface for the upper back, neck and spine. We pause and let the prepared surfaces dry until they are glass smooth. We next tack glue our hand fabricated outer channel over the prepared inner channel smooth surface creating a continuous corridor that is

glass smooth throughout without any internal seams or abrupt turns. Once dry we apply our tightly woven matte coated in special resin over the assembly to seal the assembly into a continuous smooth corridor from the point of air entry at the head rest to the lowest point of the channel at the drain cavity itself. We don't worry about separation because the resin soaked matting we use is a form of fiberglass that melds to and bonds naturally with all original levels of fiberglass. We pause again to let the fully assembled channel dry. Once dry we laminate with FRP over the entire assembly for strength and then pause again to let the FRP dry. Once dry we add our unique base assembly and then send the unit to cut and trim where we flip the bath over and drill holes from the inside of the bath and into the channel to create air portals into the bath. The result is a continuous corridor of smooth fiberglass that allows for air to freely flow without providing any shelter for biodegradable matter and will not separate.

Over the past two years we have modified all fifty of our bath shapes and their respective channel molds to include our newest technology; True Drain (patent pending). Basically, we redesigned the drain impression making it slightly wider and deeper than a standard drain impression. This deeper and wider impression allowed us to extend our fiberglass channel below the bath well and directly to the side of the drain impression above the drain opening itself. True Drain (patent pending) allows moisture to exit our channel and go down the drain. This technology increases sanitation with zero negative impact on the capacity of our channel to deliver an extraordinary tissue massage.

Our channel is a continuous glass smooth corridor without any hairy FRP inner surfaces to retain debris or slow the flow of air. Since air is a liquid it flows best when unimpeded. The simple rule is that in creating an extraordinary massage experience in a channel bath you must be able to introduce volume of air at velocity as low in the bath well as possible giving it the maximum possible vertical distance to travel through the bath water. We call this the "Rule of the 3 V's", which stand for volume, velocity and vertical rise.

Massage in a channel air system bath is dependent upon moving the water into motion to create water currents in the bath. Basically, air wants desperately to get out of your bath water as soon as it enters. When you blow air into the bath water it immediately rises through the bath water to escape into the atmosphere of your bathroom. In moving through your bath water the air pushes the water in its path out of the way and into motion. The more air volume you can push through the bath water the more the water gets pushed into motion and it is the motion of the water and not the air moving through the water in a channel system bath that actually creates massage.

Our channel creates a stronger and broader range of massage than other channel technologies because our channel allows more air to be forced into the bath at a higher rate and lower in the bath. These attributes allow us to push more air through and into the bath with more distance being traveled by the air through the water as it escapes to the surface. This pushes more water into motion within the bath creating cascading currents of water throughout the bath well and it is these free flowing currents of water that perform an exceptional massage in our channel system.

Our channel technology provides a strong tissue massage at high blower motor operating ranges generating substantial force pressure of massaging water all over the body. As you reduce the volume and velocity of air you can temper this vigorous massage to an intermediate massage of cascading water current.

Our channel follows the slope of the bath well. It will drain by gravity alone just like the bath. It is fiberglass and will not delaminate. Because the channel follows the slope of the bath shape and ends at the drain cavity itself it dries sooner and more completely than other channels substantially reducing sanitation risk.

All of this effort adds two hours more time and more material to our process but the result is a superior channel that drains more efficiently, dries faster and produces a more active massage. It requires more effort, time and money but we know it delivers a superior massage and sanitation and believe this is what our bathers seek.

There is however a massage limitation with all channel system technologies in that they can not achieve a light tactile massage of the central nervous system. To create a tactile massage in an air bath the massage is delivered by air and not by cascading water currents. Channels use cascading water currents to massage and can't get the air into the center of the bath well in any significant volume due to the physical placement of the channel and because channels need significant air pressure to function.

Channels are always placed on the sides of a bath well and above the lowest plane of the bath well. We and a few other manufacturers who offer seated models also place the channel along the raised portion of the front of the seat where it crosses the bath well but by rule channels are placed along the perimeter sides and never below the lowest surface level of the bath well. If a channel was placed below the bath well it would retain water failing the residual water standard and become a sanitation risk. As a result channels are very limited in their ability to blow air bubbles into the center of the bath well and under the human torso where the bubbles can stimulate the central nervous system. It is physically impossible to blow the air bubbles underneath the human torso from the side of the bath and into the center of the bath in any significant volume in a channel system.

The second problem is that channels are huge air cavities and there is a balance that has to be maintained between the air pressure in the channel and the water pressure above it in order for the entire channel to be pressurized and operate. Basically, a channel must have sufficient air pressure to defeat the water pressure above it or it won't work. It has to be full of air throughout the entire channel void to push air out through the portals and into the bath water above it. If it does not have sufficient balanced pressure then the water pressure will be greater and part of or all of the channel will fill with water. As air pressure is reduced in a channel system the amount of air escaping through the bath water diminishes and what little air getting into the bath has very little force. This is evident in all channel systems at the lowest operating range of the blower. At low operating range the air escaping into the bath trickles out of the portals, runs up the bath wall and out into the atmosphere. At this point the channel system is creating very little water motion within the bath and little effective massage.

To achieve a tactile massage that caresses the central nervous system you need a well engineered injection air system so that you can place the injectors strategically and use the air bubbles themselves to deliver the massage.

Injection air technology

Injection air technology is radically different from channel air technology. All injection technology has greater restriction on the amount of air flow that can be introduced into the bath and this affects the type of massage delivered. Injection technology is best used for creating an energy producing tactile massage of the central nervous system and not for producing a tissue cleansing massage.

Injection technology, when properly used, will produce a very broad range of tactile or sensory massage in a bath from a very light tactile massage of the central nervous system to an intense bombardment of the central nervous system. This is possible because in injection technology the air bubbles themselves are performing the massage not water currents. At the highest level of air volume injection technology creates a cascade of air bubbles that bombard and flow all over the body surface. The result is a direct stimulation of the central nervous system at all air pressure levels and a light tissue massage at the highest air pressure levels. Injection technology does produce a water column motion that provides some tissue massage but simply can not create the force pressure of water that channel technology does due to the inherent flow restriction of injection technology. Basically, the size of the air chamber in injection technology before air is delivered into the bath is much smaller than a channel and this smaller chamber results in a reduced air flow. Less air moving through the water at volume means a less forceful water current in the bath. It is why the high end velocity of injection technology is incapable of generating the massaging water currents of channel technology.

Injection technology is superior to channel technology in stimulating the central nervous system but is inferior to channel technology in providing tissue massage. The two technologies have distinct massage footprints.

Below is a discussion of injection technology. We are providing this information because no two injection air systems are alike and depending upon the choices made by a manufacturer in designing their injection system, the massage characteristics will vary quite significantly.

Injection technology is all about balancing air pressure and distribution. It is remarkably like engineering a heating or cooling system and easy to understand if you think of it this way. Think of the blower motor as the power source and as you read the discussion below think of the manifold as an air plenum and the injector delivery hoses as air ducts.

Distribution is important to understand in order to determine how a design will function.

Basically, the injection technology ducting system begins at a manifold, which is a long cylindrical tube where the air is forced in one end from the blower motor (furnace) and distributed out through barbs that look like little nozzles extending from the cylinder. This device is similar to a plenum, which is attached to the side of a furnace and used to distribute heat to the ducts. Attached to the barbs are air tubes (like air ducts) that are then attached to injector housings placed around the perimeter and underside of the bath (like a vent in a room). This basic distribution design is common to all manufacturers who build injector systems and it is very similar to a heating system. And just like a heating system it can suffer from all of the same issues.

A poorly designed injection system can easily suffer from what we call “injector distribution anemia”. This is when the far end of the injector string suffers power loss as a result of stringing one injector housing to another and another and so on just like the far rooms where one duct runs from room - to room - to room, and so on. When this method is used the power source (blower motor) needs to generate greater air pressure to get all the injectors working as they are strung out like holiday lights throughout the bath. As you decrease air flow (power) the injectors farthest away begin to fail. This is “injector technology anemia” and results from an ill conceived design.

Injector technology anemia is treated at the manifold. Just like in our heating system analogy, the cure is to use a manifold that allows greater distribution by having more barbs (ducts).

This information about manifolds and housings is fundamentally valuable in understanding the differences between manufacturing injection technologies as different designs create very different massage characteristics.

When a manufacturer uses fewer barbs on their manifold the result is an injection system that operates within a center corridor of massage. The high end produces a relatively strong flood of air bubbles that will move some water into motion and provide an active tactile massage with some tissue massage. At the low end this design produces a massaging tactile bath at an intermediate level but not at an extreme low sensory tactile level. This is because it takes significant air pressure to ensure that all of the injectors are operational.

Manufacturers who use a manifold with many barbs are by definition balancing pressure output by stringing fewer injector housings together. The result is that they create a different massage range. The high end is as actually more vigorous because they can push more air through the design at the high end velocity of the blower motor since there are more openings in the manifold. The low end velocity can be adjusted far lower with a gentler action in the bath because they don't need as much pressure to get every injector to work. The range is greater and they can produce a massage ranging from a gentle tactile massage to a very active tactile massage with light tissue massage.

As you can see choices made by manufacturers about the number of barbs on the manifold result in different massage capabilities. We wish that this knowledge alone was sufficient to evaluate different injector technology designs but it is not. Manufacturers also make the choice to add or not add a valve at the point of entry into the bath (a valve inside the injector housing) that further changes the dynamics of the massage being offered.

The have a valve or not have a valve in the injector housing choice affects the type of massage, has serious cost (and price) implications and impacts the ever present sanitation concern.

If a manufacturer chooses to include valves in their design, the result will be greater restriction on air flow and greater control over the low end balance of air flow. Valves restrict the amount of air flow that is possible through the system by the design of the valve. But they also provide the manufacturer with a tool for balancing the air flow. Think of a duct without a room grate where the air is simply pushed into the room by the furnace. Now think of a duct with a grate that has a lever you can adjust to control the air flow into the room and you can readily see how a valve within the injector housing provides balancing attributes. Manufacturers who choose to add valves are interested in regulating or balancing the air flow for consistency throughout the

bath. They want a design that allows them to operate the blower at the lowest possible velocity or power and achieve a very light yet consistent flow of air throughout the bath.

The result is a different massage range. At maximum air velocity their injection system is not quite as active as an injection design without valves but still a rather vigorous tactile massage of the central nervous system and will produce small water columns that massage tissue. As they reduce air velocity they can take the velocity far lower than a system without valves and produce a consistent air pressure at each injector location providing an extremely gentle and soothing massage of the central nervous system. Their goal is a well balanced design that functions consistently throughout operation.

Valves cost money. Having a valve adds expense to injection system design that can be completely avoided by simply not having valves.

The valve no valve choice also has a sanitation component. An injection air system without a valve will allow water to flood back into the housing and air hoses feeding them. A valve on the other hand closes when there is no air pressure to open it and this stops water infiltration most of the time. Occasionally, a valve will allow water to seep into the system if matter such as a hair, grain of sand or skin exfoliate lodge between the valve and the injector housing. However, in all injector system cases (valve and no valve) the blower motor auto purge cycle will evacuate all moisture and matter after the bath. But the valve story does not stop here it continues with the choice of valve used.

The effect that valves have is they further restrict air flow within injection system technology. It takes more pressure to open them than it does to simply push air through an injector housing without a valve. This causes the injection system with a valve to have different capabilities than the injection system without a valve. Basically, if you string injector housings containing valves in a long serial string it would take more air pressure to get all of them working then it would for the same serial string of injectors without valves. However, if you limit the number of injector housings in a serial string and increase the number of barbs coming off the manifold to distribute the air more equitably among the injectors, the result is that you need less pressure to get the injector housings with valves to operate in balance. The important difference is the ability to balance the air pressure equally among the injector housings so that you can control the air flow throughout the entire bath.

Injection technology does not create the same active bath water that channel technology does due to air flow restriction. This means it can not produce the strong tissue massage of a channel system. But it always offers a lower low operating range than channel technology. This means it can provide a lighter tactile massage. Differences in choices of engineering from manufacturer to manufacturer will define the range of massage the system can deliver. This is important information to consider when evaluating injection system bath offerings but it is not the entire story as you also need to know about the distribution of the injector housings to truly evaluate the massage being offered.

Injectors, unlike channels, can be placed virtually anywhere in a bath. Placement is important. Since injectors can provide a gentler massage using air bubbles and not water in motion to stimulate the central nervous system you want to make certain the placement of the injectors will achieve that purpose. Here the core criteria are where the injectors are located and not how many injectors there are.

To fully appreciate this you need to understand a little bit about human physiology, specifically about the meridians of the central nervous system. You will find a discussion about this in our website under the primary heading Massage therapy and the subject heading Injection technology. We encourage you read it to appreciate why we place our injectors where they are.

In the meantime, suffice it to say that the meridians of the central nervous system are like the branches of a tree and the trunk of the tree is the human spinal column. The meridians branch out from the lower spinal column and run the underside of the buttocks, down the backside of the legs and to the feet. They branch from the central spine around the sides of the torso to the abdomen and chest. They branch out from the upper spine around the back and shoulders and run the underside length of the arm to the hand. They branch from the neck area all over the face and head.

With this branching imagery in mind consider how one might place the injectors in the bath to deliver massaging bubbles. As you think about this consider actual posture during a bath. Should injectors be placed where someone will be sitting, or along the bath walls, or where the back will be resting against the bath surface? Should there be a lot or a few and what would type of manifold in combination with injector design and valves should be used to deliver the air to the injectors? All of these questions help to illustrate that it is the placement of injectors combined with the choices about the delivery system design that matters in engineering and designing an injection air system bath.

So what is our injection system all about?

We engineer our injection technology for placement and air flow to precise specification for each bath shape we offer so that our injection air system deploys air bubbles in specific patterns throughout the bath to deliver a very low tactile massage of the meridians of the central nervous system from a very gentle stimulus of the central nervous system up to an intense tactile massage of the central nervous system that is combined with an intermediate tissue massage.

We engineer our system using a ten port manifold with ten separate air hoses running to one or two housings (never more than two in a row) each of which contains a positive spring valve in the fitting. This design allows us to finely tune the low end to a trickle of massaging bubbles throughout the bath well at equal distribution and increase the velocity of air to a point where the volume of air is intense bombarding the nervous system and moving the bath water into motion to achieve a light tissue massage. Our intent is to provide direct stimulation to the meridians of the central nervous system and increase respiration and blood flow.

Our baths are designed to support our objective. We offer more than fifty shape of bath but they share design fundamentals. A bath has to be attractive, comfortable and support our massage goals. This is done by adding multi-angled back rests, leg room and arm rests. When someone bathes they recline and don't sit as they do in a chair or lay down as they do in a bed. As such their posture is angled backwards with their knees raised. To be comfortable in this posture they need back support without the lower portion of the back support pressing against the lower back. They also need arm rests to relieve lower back pressure created when the arms dangle.

Our multi-angled back design includes a more severe angle at the lower level of the bath, which rises three to four inches from the base before angling further back. We call this our lumbar pocket. It allows us to relieve the lower spine by removing adverse pressure. It also allows us to place back injectors along this surface. Those injectors introduce massaging bubbles directly

onto the lumbar section of the spine and then run up the spine and along the upper neck and shoulder area. They also flood along the outer back, around the torso to the stomach and chest area and up along the torso to the armpit and along the underside of the arm, which is at rest along the arm rest. This design effectively targets the meridians of the central nervous system as they extend along the lower back, upper torso and arms with a flood of massaging bubbles.

Massaging the lower torso is accomplished by placement of injectors along the bottom of the bath and at the feet. We never place injectors where the buttock rests. This would be uncomfortable and useless. The placement pattern we use along the bottom of the bath follows the arch of the lower side of the legs that are bent at the knee. At the far end we place injectors along the lower wall that massage the underside of the feet. This placement design floods the meridians of the central nervous system with massaging bubbles as the meridians extend along the lower torso from just past the buttock along the underside of the legs and to the underside of the feet.

Unlike our channel system technology that uses water in motion to massage, our injection technology uses air bubbles to massage. This is accomplished by restricting the air flow that is delivered to the bath and placing the injectors themselves so that the air they introduce into the bath trace the meridians of the central nervous system. By limiting the number of injectors in a serial array to no more than two and using a ten port manifold we are able to regulate and balance the flow of air precisely to all injectors equally and decrease the low end velocity without losing functionality at any injector. This is important to achieve a very gentle tactile massage that mimics the light hand tracing of a professional massage therapist. At the same time the highest volume of air produces an extreme massage of the meridians by bombarding the meridians with an intense flood of massaging bubbles while at the same time producing a light tissue massage.

Blower motors

Blower motors are also an important part of our massage story. For us they are not simply devices that blow air at velocity with heat and purge the system after a bath. To us, blower motors are an important tool in massage.

We engineer our channel system to provide a strong to intermediate tissue massage using water in motion to massage. We engineer our injection technology for placement and air flow relative to each bath shape we offer to deliver a massage that ranges from a gentle all over tactile massage of the meridians of the central nervous system up to an aggressive tactile massage of the central nervous system combined with an intermediate tissue massage. We use our blower motor technology to assist in these efforts.

Basically a blower motor is like a hairdryer on steroids with a larger engine and heating element. The key difference between a blower motor and a hairdryer is that blower motors are controlled by microcomputer chips in an air system bath. These tiny processors regulate the blower function providing velocity settings, wave and pulse modes, heat cycle control, on/off function and purge cycles. These are the basic functions of the microprocessors of nearly all blower motors and there are a handful of blower manufacturers supplying the entire system bath manufacturing industry.

For most bath manufacturers the blower motor is a utility purchase focused on basic functions and sanitation. It provides the functions described above and is mainly seen as the center piece of air system sanitation due to the automatic purge cycles that exhaust residual moisture from air systems. We don't share this limited vision of the blower motor value.

We co-developed with our blower supply partner an ability to tune our blower motor velocity range for each bath shape and each system we make. We recognize that each bath size, shape and system creates unique operating dynamics. To maximize these unique characteristics requires an ability to tune the blower motor with a precise high volume and low volume air velocity for each set of unique characteristics. We know that purchasing a blower motor with a fixed high and low operating range will only work well for a narrow range of baths. Outside of that narrow range, a preset velocity will diminish the optimum massage, can cause excessive noise and cause the heating element to work incorrectly on some baths and system configurations.

A fixed high end range causes problems associated with noise and heating element function. For smaller dimension bath shapes the high end of the range will be too high causing the air to encounter physical resistance against flow as the channel and/or injection system engineering is smaller and shorter than in a larger shape and you simply can't push as much air through a smaller system. At the high end of the preset range the blower motor is straining to push the air through the system and this causes air pressure to back up within the system. This is readily apparent as the pitch of the motor changes and begins to whine loudly. It is like holding a flat surface against a hairdryer and not letting the air to flow out. As the air backs up into the motor so does the heated air. This adds to the problem of a preset high range as it causes the internal heating element to overload causing the heating element to shut itself down during operation. The result is that the massage value is diminished since the blower is excessively noisy without the benefit of a more active bath water and the bather can't regulate the heat as desired.

The high end fixed range problems are more pronounced in an injection system. Because injection technology is more restricted than channel technology it will not allow as much air to be pushed through it. Consequently, you can not set the high end range of the blower in an injection system as high as you can for a channel system in the same bath, because the restricted air flow quickly creates back pressure in the injection system causing the whining and heat cycle failure we described above. This requires that the blower motor high end range in the same size bath for an injection system be lower than the setting for channel system in the same bath.

The low end range of the blower motor is also critical to regulate. Here, once again, the preset range is only appropriate for a small percentage of bath shapes and highly sensitive to the technology (channel or injection) being applied.

In a channel system very low pressure will result in air slowly bubbling out of the portals and into the bath water then running right along the side of the bath well and out into the atmosphere above the bath without pushing any appreciable water into motion along the journey. The result is an anemic bath without any real massage value. In many cases we have seen channels in the market that cease to function in parts of the channel because the water pressure above the portals is greater than the air pressure that is being pushed into the channel. They are dysfunctional and show a lack of understanding and care by the manufacturer.

The opposite is true for the low end in injection technology since injection technology restricts air flow. Our technology furthers restricts air flow by placing a positive check valve within the injector housing. This intentional restriction of air flow when combined with the superior balance of our design allows us to tune the low end range of our injection air system blower much lower than our channel system blower in the same bath to achieve a remarkably well balanced air flow delivering a gentle low end tactile massage throughout the bath well without losing any function.

Basically, a preset velocity range in a blower motor causes all sort of dysfunctional problems in air system baths depending upon the size, shape and system characteristics of each bath. This is why we tune the top and bottom range air velocity of each blower motor to each bath shape and further to the specific air system technology, channel or injection, we produce. This ensures that the high end of the range for the particular bath will provide the maximum aggressive massage possible within the bath without excessive noise and with heat control fully vested with the bather. Conversely, it ensures that at the low end of the range in our channel system that the entire channel is pressurized and introduces enough air to move the bath water into motion to produce a tissue massage and that in our injection system it delivers a remarkably gentle tactile massage to the meridians of the central nervous system.

Not all blower motors are equal. Our motors perform all the functions commonly available but are also individually tuned to massage. There is not a single component of our system that we overlook in our mission to deliver the best massage available in a bath.

“The Ultimate Bathing Experience®”

This registered statement represents what we believe to be the finest most comprehensive massaging bath system on the planet. We pioneered the combination of channel and injection air systems in a single bath in the late 1990's. Back then we offered both channel and injection air systems separately, or jetted water (whirlpool) systems, or combination jetted water and air systems. We introduced our Ultimate System (combined air technology system) because we thought it offered the massage range people really wanted. It proved very popular and we were curious as to why. So we asked folks who were bathing in the Ultimate System about their experience. What they told us was that the massage was exceptional and better than they expected. They told us that the range of massage was fantastic and that they felt great after they had bathed. They told us about how they could pick the massage they wanted depending upon how they felt physically and/or how they felt emotionally. They told us that their whole family looked forward to bathing even the males!

We realized then that the system we introduced was doing what we thought it would and providing people with a massage that was the closest to a human massage available in the comfort and security of a personal bathroom.

That learning experience resulted in our dedicating all of our energy, time and resources to the constant development of our air system bathing products. We ceased making jetted water baths as they had become a distraction and interfered with our ambition. We decided then that our core mission was to devote ourselves to the constant refinement of the finest massage system bath available to humankind. It is what drives us.

You have learned about channel and injection systems and specifically about our technologies. When you combine our technologies in a single bath you radically broaden the range of massage you can achieve over either of the technologies separately. The Ultimate System bath high end is higher than either the channel or injection system alone creating a massage that is at once a strong tissue massage and a vigorous stimulation of the meridians of the central nervous system. The lowest end of the Ultimate System reverts to using the injection system alone and provides a very gentle tactile stimulation of the meridians of the central nervous system. The possibilities within that extraordinary range are amazing and completely at your discretion and control. Our dual air technology is "The Ultimate Bathing Experience"®.

Bases

When buying a house you always want to be certain that it is built upon a solid foundation. We believe this is true for baths as well and developed a unique base foundation to support our baths and the people bathing in them.

Most baths are actually set into mortar (concrete) that is poured below them before the bath is set in place. Still others use a flexible plastic pan to protect the system components of the bath, which is set into the mortar. Our base does not use mortar and all of our baths stand on their own steel feet. Our baths are thick. If you cut through them you will find multiple layers of material from the acrylic inner surface, that is backed with a layer of FRP (fiberglass, resin, polyester), then our channel if a channel system, then more FRP, then a slice of MDF (medium density fiberboard), with another layer of FRP encasing the MDF over which is a powder coated steel frame and a final coat of FRP. At the ends of the powder coated steel frames are cadmium steel legs with anchoring flanges. Underneath our baths there is no mortar just a remarkably strong steel and fiberglass foundation that is anchored to the existing flooring. This design will hold up to 2000 pounds of weight and it is impossible to put that many humans and water in a bath. This foundation design ensures the bath will remain solid and immovable throughout its thirty year warranty.

Conclusion

We are air bath zealots whose passion is unyielding and whose baths are built for life. We take extraordinary care to build baths and air systems that deliver exceptional massage, are easy to maintain and install and will provide our bathers with a personal bathing masseuse who can meet their evolving needs for decades. We want you, your family, friends, guests and the new owners of your house, should you sell your home, to enjoy the healthy benefits that are a result of regularly using our air system baths. Your complete satisfaction in our system baths is our goal.

Thank you for choosing Acryline®.