

Guide to Quality Mixing

With comprehensive mixing instructions for H.R. Simon X-Ray Chemicals

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Introduction and Overview

The purpose of this guide is to introduce new employees and re-introduce current employees to proper x-ray chemical mixing guidelines. We'll explore most facets of the mixing environment starting safety and health issues and cleanliness which are the building blocks of the foundation of the rest of your quality relationship with your products.

Before thinking about mixing anything, think about safety. READ YOUR MATERIAL SAFETY DATA SHEETS (MSDS) FIRST. The MSDS will provide you with knowledge about the product you are using. If there are any special dangers to be aware of, you'll find them in your MSDS. For example, did you know that Kodak's developer part B is combustible? Did you know that an excellent cleaner is bleach, but if you use it around x-ray chemicals it could kill you? If you read your MSDS, on these products, you would know those particular and unusual dangers. In addition to special and unusual dangers, your MSDS will tell you what personal protective equipment (PPE) is recommended for use while using a product. If certain PPE is recommended, use it and don't take shortcuts.

Create and maintain a safe working environment. Remember that you are working with liquid products. When you spill any liquid in small quantity, immediately absorb it with stay-dry or another absorbent material. Be cautious about electrical cords around your working area as they can short and become a shock hazard near liquids. Never use bleach as a cleaner in your workplace. Bleach and fixer react and become a potentially deadly cloud of chlorine gas. Keep your mixing area free of debris and trash as they can become trip hazards. NEVER CLIMB INTO YOUR TANKS as this is extremely hazardous and illegal without proper training and permits.

When dealing with chemicals, arm yourself with knowledge and don't fall into the trap getting too familiar with them. Don't take them for granted. Always keep a respectful relationship with the chemicals that you are using and follow all written guidelines for storage, transportation, handling,

and use.

If you've read this you should now be in the proper frame of mind to work with x-ray chemicals. We don't want to scare you; we do want to make you intimately aware of the potential hazards of the job you are doing at all times. Most x-ray chemicals are relatively harmless and most have no potential lasting effects with over exposure. All x-ray chemicals can be used safely with proper handling and respect.

Cleanliness and procedure are the core of quality

Quality mixing starts with clean equipment, including tanks, hoses, filter housings, valves, and packaging materials. The following section will explain what it means to be clean regarding x-ray chemical mixing. We will also detail pitfalls in cleanliness and certain quality issues that can arise from not properly maintaining a clean working environment.

Contamination is the monster lurking in the dark; a hidden and sometimes mysterious event that everyone should be aware of and should fear. Unless you take every precaution practical and necessary, contamination could happen to one of your products, destroying it and ending up in your accounts causing the nightmare that unfortunately we have had to help some of our customers through. Contamination risks can be minimized through education, simple quality control methods, and common sense.

First, contamination in our industry is most often the mixing of developer and fixer (cross-product contamination). This is simple and can mostly be eliminated with good old fashioned common sense. An example of cross-product contamination is: after mixing fixer, you did not rinse out your tank and then you made developer. Or, you forgot to change your filter after draining your tank and some of the liquid was left in the filter and the filter housing. Or, you forgot to drain your hoses completely and then flush them with water. Or, you did not rinse out your jugs completely and you use the same color jug for developer and fixer. Mostly cross-product contamination can be eliminated by a

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series of checks and safety measures.

Use the following as a list of simple checks and hints for good production procedures that will help to alleviate the risk of contamination:

1. Always remember to wash out your tanks, filters, pumps, and hoses before making another product and between each batch of similar products.
2. Use color coded jugs and make sure that everyone in your facility knows for example that developer is in red jugs and fixer is in blue jugs.
3. In addition to color coded jugs, use color coded labels that are clearly marked with either a "D" or an "F" indicating developer or fixer and securely attach them to your jugs.
4. If you mix more than one type of developer, or more than one manufacturer's developer, it is a good idea to use different color jugs for each product.
5. Use the same person for mixing every batch. The most experienced person will be less likely to make a mistake. Never add one part and then walk away to attend something else as when you come back to mixing, you may not remember where you left off.
6. Always save your used packaging supplies and then count them when the batch is done to make sure you have added all of the correct parts and not more or less than what is required.

Contamination can also happen from mixing the parts of your products in the incorrect sequence. Mixing instructions must be followed perfectly. For example, when mixing "HS Powder 200" developer from H.R. Simon, which is packaged in four parts, if you add your part 3 before adding your part 2, your developer will deteriorate and turn black within hours or minutes. Another example is if you added

your "Automatic 300" fixer part B prior to adding your part A, you will make tank full of milky white mush (aluminum hydroxide) that is very difficult to clean from your tank and would most likely require several hours work. Both of the above problems cannot be corrected and in both instances you will have lost hundreds of dollars simply by not following the proper mixing procedure and thusly contaminating your product.

Sometimes contamination can come from your efforts to be clean – cleaning liquids such as bleach, Fantastic, WD-40, and most other industrial cleaners and lubricants are contaminants that will destroy developer and fixer, and could possibly create very serious harm to the people in the immediate area. An effort to do right can be very wrong. If you decide to clean around your mixing area and use bleach, you could combine bleach and ammonia (which is a main ingredient in fixer) and create a DEADLY cloud of chlorine gas. Other types of cleaners can cause contamination with many different results. We recommend only using water to clean. If you wash your working area often, water will be all that is necessary to clean. If something stronger is needed, we manufacture a cleaner specifically for cleaning and degreasing our equipment that will also work. If you do use a safe cleaner, remember that your cleaner will contaminate your products unless you use enough water to rinse off your cleaner.

Hidden and little known contaminants can pop up from seemingly nowhere but can slowly degrade the quality of your product. For example, if you use stainless-steel tanks to mix (which we will suggest later in this guide), and then use "scotch-brite" or any other abrasive material to clean your tanks, you will wear down your stainless steel finish and the result will be that you will leach nickel, chromium, and other heavy metal contaminants into your products. Most developers and fixers are designed to withstand the presence of some metals, but too much metal can destroy and precipitate the chemicals in your products. You should only clean your tanks with water. If you have been cleaning your tanks improperly, don't panic. This degradation of your stainless steel tanks can take years and possibly a decade or more before it becomes a problem. If you are

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worried about this possibility, send us a sample of a batch and we will test it for the presence of metals.

Simple preventative maintenance can help eliminate contamination points. We recommend the use of PVC pipes for your incoming supply of mixing water. If you use copper water pipes, check for corrosion on the inside of the pipes. This corrosion could introduce metals into your water before mixing and this metal can harm your product. If you have pipe hangers that are not made of stainless steel or plastic, and they rust, you could run the risk of iron laden drips of water contaminating your products. In most cases, the two above examples of metal contamination will not severely contaminate your products, but will slightly effect the performance of them. Nevertheless, they are contamination and should be corrected.

Establish and document procedures. If you follow the same procedures for cleaning and mixing every time you will make consistent products. Even if you are making a mistake like adding too little water, or some other minor mistake, if you make that same mistake every time you mix, you will most likely end up with a consistent product. Routine and consistency are very important in making a product with which your customers will not have problems.

Storage and Handling

There are many different laws and regulations which dictate how materials can be stored and how they can be transported. The following section is a guide as to the proper procedure for quality product. If the laws that govern you indicate that you should do something contrary to what is indicated here, follow the law.

The first rule is: keep your material safety data sheets on hand at all times. Even though you may not have hazardous products according to the department of transportation (DOT), they may be hazardous according to the Occupational Safety and Health Administration (OSHA). Regardless, by United States law, material safety data sheets must be made available to all employees under OSHA's "right-to-know" which mandates that every em-

ployee has the right to know the hazards of any material or chemical with which they are working. If there is an accident, your material safety data sheets can be the first step towards help. They also will tell you of particular storage and transportation hazards or concerns.

Heat can hurt. Most x-ray chemicals will degrade if stored for a period of time in temperatures above 95 degrees Fahrenheit. Heat would be a concern if you are located in areas when normal environmental temperatures are above 90 degrees. Even in 90 degree heat, trucks, trailers, and warehouses can heat significantly above that, creating a poor storage or transportation condition. H.R. Simon makes no product which is considered combustible, but one major competitor does. Their product can burn above 104 degrees F. Transportation for a few days in a hot trailer will most likely not harm your product, but don't store your products in sunlit areas or hot trailers. If your warehouse reaches 90 degrees or more on the floor, chances are that up by the ceiling, the temperature is much higher. Air-conditioned warehouses are not necessary in most areas of the United States, but are definitely indicated in hot climates.

Cold can also hurt. H.R. Simon has designed our products to be able to withstand cold temperatures and even freezing. Although we don't guarantee the quality of the product after it has been frozen, ninety-nine percent of the time H.R. Simon's frozen chemicals will go back into solution without problems when warmed. Most concentrated x-ray chemicals will not freeze until the temperature of the chemicals is below 25 degrees F. Ready-to-use or "dilute" x-ray chemicals will freeze like water but still should go back into solution when warmed. We recommend a warmed storage area for cold climates to eliminate the one percent possibility that frozen products will not go back into solution when warmed and therefore be destroyed.

If you have hazardous materials in your building, follow the law in your area as to identifying your building. In most areas, fire departments require that your building will be labeled with the appropriate hazards in the event of a disaster. To give your local fire department a map of your building is a good idea whether required or not. If you have

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products for which water is contraindicated for use as extinguishing media, it is a good idea to keep that product in the same place in your warehouse at all times and to let your local fire department know exactly where that product is. If you need further help with storage laws and regulations, contact your local fire department, or regulating agency.

Quality Raw Materials

Quality finished goods start with only quality raw materials. Just as we use only quality raw materials from reputable companies, so should you use only quality chemicals from companies whose reputations are for quality product. It would be easy to save a buck or two by changing to cheaper chemicals, but the problems you would be exposing yourself to are never worth the amount you'll save; especially when you consider that your end product is an integral part of diagnosing often life-threatening illnesses.

Mixing Systems

There exist many different ways of mixing x-ray chemicals. These different methods can be as different as mixing 5 gallons at a time to mixing 600 gallons at a time. Obviously the requirements of mixing systems are dramatically different depending on the volume that you are mixing. The different methods mostly fall into two categories: mixing small quantities in a chemical mixing station, and mixing large quantities in a bulk mixing tank. This guide will mostly deal with what is known as "bulk" mixing.

Understanding Specific Gravity

To understand the principles of mixing you must first understand the meaning of "specific gravity," and its relevance to mixing procedures. Specific gravity refers to the weight (or density) of a liquid (or solid) in relation to the weight (or density) of water. Water has a specific gravity of 1.000. Some oils are lighter than water and could have a specific gravity of .90. X-ray chemicals have a specific gravity of around 1.080 (at 59 F.) and are therefore heavier or more dense than water. In reference to x-ray chemicals, when you measure specific gravity,

you are determining if you have enough water in your mix or if you need more. The following can be applicable to mixing x-ray chemicals, especially in a chemical mixing station, and is an oversimplification of specific gravity: a cork is less dense than water and therefore floats; a rock is more dense than water and therefore sinks.

For a further more detailed explanation of specific gravity, please see H.R. Simon's *Quality Assurance Manual*.

Mixing in a Chemical Mixing Station by specific gravity

The easiest way to deliver and mix x-ray chemicals is to utilize an automatic chemical mixing station, or an "automixer." You use an automixer in much the same manner that you would use replenishment tanks. Automixers are really dual mixers in that they have separate mixing systems: one for developer and one for fixer. Both mixing systems work in an identical manner. There are several different specific gravity-type automixers on the market, all of which do basically the same thing in the same manner.

Since the automixer can mix both developer and fixer, they have two sides: a developer side and a fixer side. Automixers have one common electrical connection, but everything is separate from there. Automixers are designed to fit the bottles that you are using into "templates" so that you can't accidentally put developer parts on the fixer side and fixer parts on the developer side. You will remove the cap and place the bottle upside-down in the "template." (The bottles are sealed with a foil seal which prevents the bottle from leaking when turned upside down in addition to protecting the chemicals from exposure to air.) When inserted into the template upside-down, a knife mechanism uses the weight of the bottle to cut the foil seal and release the liquid in the bottle into the mixer.

When the chemical enters the water below from the bottle you just inserted into the template, (remember that water has a specific gravity of 1.000 and the concentrated solutions you are mixing are much heavier than that) the specific gravity of the resulting solution increases to a point

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where a specific gravity float-switch is lighter than the solution and begins to float. When the float-switch is boyant (floating) an electrical connection is made in the switch which opens a solenoid valve allowing water to flow into the mixture. As the water enters the mixture, the solution gets lighter and lighter (closer to 1.0) until the float-switch no longer has the ability to float. The float-switch sinks which breaks the electrical connection in the switch and returns the solenoid valve to its resting state which is normally closed, shutting off flow of water.

The float-switch is the key to accurate mixing. Each float-switch is custom made by the mixer manufacturer and most are made to be adjusted over a wide range of gravities. Most x-ray chemicals are designed to be mixed to have a working strength specific gravity of 1.075 and 1.085. In addition, at the proper specific gravity most x-ray chemicals are designed to mix to exactly five gallons. So, by measuring specific gravity with a calibrated specific gravity float, you will be mixing accurately to five gallons if the formula was designed for five gallons.

The above process is extremely easy, and except for placing the bottles on the mixer, the process is all automatic and can be very clean. In addition, automatic chemical mixers help to reduce the odors often associated with x-ray chemicals which makes for a more pleasant and potentially healthier working environment.

There are some negative features to using an automixer. Automixers are not always one hundred percent accurate. In most cases you wont see extreme variations from mix to mix, but the accuracy of automixers is dependant on incoming water pressure variability, and incoming water temperature. Water pressure which varies widely from time to time can affect the way the chemicals are mixed by affecting the motion of the specific gravity float-switch.

Variable incoming water temperature will affect the specific gravity of the mixture itself. As temperature increases, molecules expand causing the solution to lose density or become lighter. As temperature decreases, molecules get closer

together which causes the density to increase or get heavier. Water temperature will not change rapidly from mix to mix, or even from day to day, but in more northern climates, water temperature can vary from 35 degrees F. in the winter to 70 degrees F. or higher in the summer. In theory, such a larger jump in temperature from one season to the next will cause the solutions to become heavier in the winter and lighter in the summer and the mixer should be calibrated twice per year as a result. Most mixers don't get calibrated after installation because the variability in chemical density as a result of incoming water temperature is not great enough to cause objections to film readability or processing quality. However, in some cases, you may find a heavier build-up of chemicals in the processor or even in the mixer during the winter months as a result of more densely mixed chemicals.

The biggest negative feature to using an automixer is really more of a hurdle than a negative feature: someone has to put the bottles on the automixer. X-ray departments often see this as causing more work when they are already overworked. It does take time to place the bottles on the automixer, but probably no more than 60 seconds. Once the x-ray department realizes that the work involved in using an automixer really is no work at all, they love to use them. Using an automixer means being able to store more concentrated chemicals which decreases the risk of running out of chemicals. In addition, because the chemicals are delivered in bottles sealed in boxes, delivery and storage is much neater and more convenient. In addition, the chemicals are delivered in the manner that the chemical manufacturer has specified and you can depend of quality chemical manufacturers to provide consistency from case to case and from batch to batch and from year to year. So, an automixer allows the x-ray department or facility the freedom from most mistakes and the freedom to have cleaner more pleasant working environment.

As a side note, H.R. Simon and Company recommends the use of an automixer and concentrated chemicals over the use of replenishment tanks and ready-to-use chemicals to both end-users for the reasons stated above, and distributors for reasons which can be discussed with your dealer support manager.

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Bulk mixing systems

A bulk mixing system means that the x-ray dealer buys concentrated x-ray chemicals in large containers and mixes them with water in a large 200 to 400 gallon tank. Bulk mixing also means delivering ready-to-use chemicals in reusable jugs. There are several different methods of bulk mixing and two different types of bulk chemicals.

By purchasing chemicals in bulk, dealers can deliver a product to the end user that has a much higher gross-profit than delivering in concentrated packages. More gross profit, when properly managed can mean more net profit. A higher gross profit can also allow you to be more competitive on your pricing to the end user. In recent years as pricing to the end user has declined more rapidly than pricing to the dealer, gross profit margins have eroded nationwide so that only the most well managed companies in densely populated areas when massive quantities of chemicals can be delivered in short periods of time will make money selling x-ray chemicals. Nonetheless, the trend in the industry for both small start-up companies and large established companies has been towards concentrated chemicals where delivering and mixing requires very little overhead and profit margins are much easier to identify and retain. At the time when this manual was written, about half of the chemicals nationwide are still being delivered in ready-to-use reusable jugs. The focus of this section will be on quality mixing systems for mixing ready-to-use x-ray chemicals in bulk.

The two types of chemicals are powder and liquid. There are few manufacturers who make a powder developer and only H.R. Simon and Company makes one that is mostly powder. No-one manufactures powder fixer any longer, and the trend in bulk developer has been towards liquid developer. Powder developers usually are made of at least four parts, one of which is liquid. H.R. Simon's HS Powder is made of three small cartons of powder and one 5 gallon pail of liquid chemical. The only advantage to mixing bulk powder developer instead of bulk liquid developer is that the cost of powder developer is usually 10-20% lower than liquid developer. The cost is lower because powder developers weight less than liquid developers and

can be shipped much cheaper than their liquid counterpart. Because the freight is cheaper, manufacturers lower the price of the developer to share in the freight savings.

Mixing powder developer is cumbersome and can be dirtier than mixing liquid developer. Most liquid developers consist of either two or three parts, all of which are liquid. Liquids are much easier to handle than powders and can be mixed with much less effort and mess. Until very recently the trend in the industry in bulk mixing was towards liquid developers. But as profit margins erode in the medical industry, some large manufacturers have made efforts to push their lower cost powder alternative which may have been outsourced to a smaller company. This trend is extremely dangerous to the dealer and the end user because they are buying a product which was made to be cheap by a company who is pushing it because it is cheaper and more profitable for them. The result is an inferior and less consistent product which will probably cause service and quality problems for both the end user and the dealer.

The most important part of mixing bulk x-ray chemicals is consistency. Mix one way, and only one way, every time using a chemical which you are sure can be mixed accurately everytime (preferably only H.R. Simon's products).

Methods of bulk mixing

There are two recommended methods of bulk mixing and one recommended only for experienced companies: mixing using side-impeller agitation, mixing using a recirculating pump system, and mixing using a top-down impeller. Mixing using side-impeller agitation is the best method and is the method which most quality manufacturers use in their plants. The use of a recirculating pump system works well too, but not for mixing powder chemicals, and also increases the risk of contamination.

Side-impeller agitation implies that you have a "propeller-like" agitator called an "impeller" going through the tank close to the bottom being driven by a motor on the outside of the tank. There is a bearing / seal system which keeps the liquid from

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leaking through the side of the tank. As the impeller spins, it pushes the liquid across the bottom of the tank and then up the opposite side, across the top of the tank, and then back down the side of the tank towards the impeller. See the

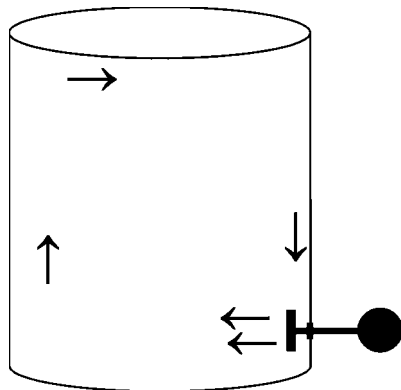
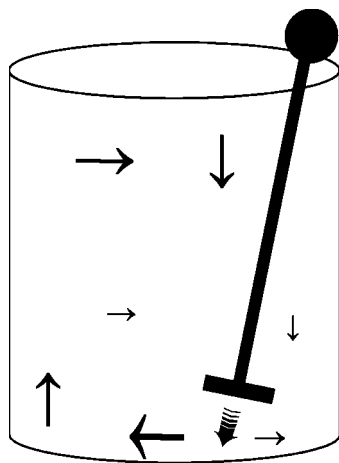


illustration to the left for a clear diagram of the motion of liquid in a side-impeller agitated tank. The motion of the liquid is very vigorous, yet not turbulent. This non-turbulent, smooth agitation

is very important as turbulence causes air to be introduced into the mix and will degrade the mixture more quickly.

Top-down impeller agitation implies that you have an impeller close to the bottom of the tank connected to a shaft



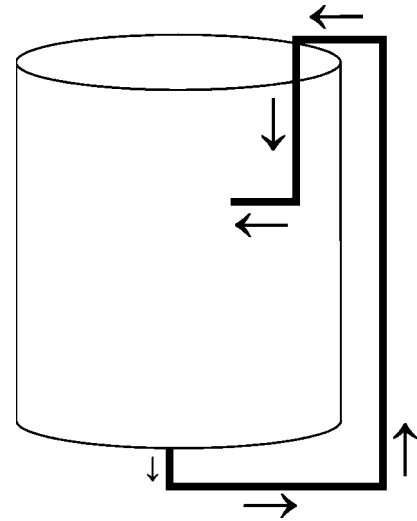
which is connected to a motor mounted at the top of the tank. This method is only recommended to experienced mixing personnel as the introduction of air into the mix is very likely and to keep this from happening requires a lot of practice.

The recirculation method of mixing is simply piping liquid from the bottom of the tank and putting it back in the top. See the illustration below for a more clear diagram of a recirculation mixing system. As you add chemicals to your tank, a pump removes the chemical from the bottom of the tank and then pipes it up the side of the tank, back over the top and down the inside of the tank. This method is perfectly acceptable except when using

powder chemicals as un-dissolved chemicals could clog the pump and pipes.

The recirculation method allows you to use a cheaper plastic tank instead of the expensive stainless steel.

A plastic tank costs about one tenth the price of a stainless tank of the same size. Top down impeller type agitation also could allow you to use a plastic tank. Side-impeller agitation requires you to use a stainless steel tank.



All of the above mixing systems will need a way to drain the tank when the mix is completed. This is done by adding an exit port with the use of a bulkhead fitting at the bottom of the tank. After the exit port, and before containers you will be filling, be sure to have a standard 10 micron filter. The filter will capture any debris that has fallen into the mix without your knowledge. Powder products are notorious for their inherent debris so when mixing with powder developers, a filter is a necessity. Do not use a filter with a micron rating above 10 microns as debris that is 10 microns and larger has the possibility of showing up on film which could cause a mis-diagnosis.

A Word (or two) of Advice

Mix one way and only one way. If your customers are satisfied with the product you are providing to them, don't change the way you do things.

Train at least two people to mix, but never let more than one do it at the same time. Never start a batch and let someone else finish. Miscommunication can happen very easily.

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Never start a batch and then go off to do something else to come back to it later. You might forget where you left off, or while you are not there someone might play games.

Save the used packaging materials, one batch at a time. When you are done mixing a batch, count your packaging materials to make certain that you have used all of the parts necessary and no extra parts. After you have counted your parts, throw them away or recycle them so that you will not count them accidentally after your next batch.

Use two different tanks and two different container filling systems: one for developer and one for fixer. This will reduce the risk of contamination.

Some manufacturers recommend using warm water with which to mix. We don't. Follow the manufacturer's instructions as using cold water can seriously affect the way certain chemicals mix. Using warm water can't hurt, but in most facilities is not necessary with H.R. Simon products.

Calibrate your tanks often. Because the shape of tanks can change, or they can get bumped, or swell, make sure you calibrate you tanks at least once per year.

After adding enough water to reach your desired level of fluids and before conducting any quality control, let your solutions mix for five minutes longer than you think you have to.

Simple in-house Quality Control

Quality control on batches of x-ray chemicals that you make is as simple as checking the specific gravity. For information on how to check the specific gravity, please see H.R. Simon's Quality Assurance manual. Because you are mixing to volume, and volume can change with temperature, always double check your specific gravity after the batch. Remove enough solution to fill your hydrometer and either warm it or cool it to 59 F. Never just place your hydrometer into your batch; you probably won't get an accurate reading.

Because the true test of whether or not you have

mixed correctly is to find the solution's specific gravity, you might be tempted to mix in your tank not using volume, but specific gravity. That method is not recommended because it requires you to fill your tank to about 10 gallons short of your desired volume and then slowly add water until your specific gravity equals your desired number. Much can go wrong with this method. It is slow and therefore can lead to the temptation to take shortcuts by not mixing long enough after adding water. If that were to happen, you would end up with "stratification." Stratification is layering of pocketing of different specific gravities within the same mixture. If that happens, you can very easily and most likely get an inaccurate specific gravity.

Always have two hydrometers. Keep one on a shelf in a safe place and use that one to calibrate, or check, the one you use regularly. Calibrate your hydrometer at least twice per year. Microscopic cracks and abrasions in the glass, which may be undetectable, can make the hydrometer vary from time-to-time.

Mistakes Happen – Some Can Be Corrected

Sometimes, even though you are extremely careful, things out of the ordinary (mistakes) can happen. The proper working atmosphere and attitude toward mistakes when mixing x-ray chemicals is very important. Mistakes are alright as long as you catch them before shipping or releasing any product. We strive to create a quality product and our personal pride or ego are second to our pride in the quality of the product we make.

Many people naturally fear mistakes and some have a tendency to not tell people or hide the fact that they have made a mistake. We train all of our employees that mistakes are alright if you find it, admit it, and help to correct it.

If you make a mistake, which you don't catch, or admit to, than you can kill people with that one mistake. If you make a mistake, and your solutions won't work the way they were designed to work, then you can shut an entire hospital down. How could you tell a man who had just been shot, "I'm sorry, but we can't x-ray you right now, so you'll

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have to wait." Or say to the woman receiving the barium enema, "I'm sorry, we have to do the procedure over again because the films are not readable." Or picture your mother, or wife receiving a mammogram and because the chemicals which you made were not perfect, the film is not as good as it could be, and the radiologist misses seeing a small tumor. The reality is: mistakes are very serious, only if they get out the door.

Normally you can catch these mistakes in your quality control. More rarely, you can catch these mistakes by noticing a change in color or even smell of the product you are making. If you notice anything odd, it is very important to investigate to find out why you have an oddity. Rely on your chemical vendor (again, who should be H.R. Simon and Company exclusively) to help you solve or catch problems. We have the experience that it takes and many times can help solve problems immediately over the phone. We might not be able to fix everything. Add a part B fixer to your batch prior to adding you part A fixer and you'll end up with three feet of white mud in the bottom of your tank. But, add a little extra water and we can help you fix that. Some mistakes can be corrected, some can't, and some shouldn't be. Rely on your chemical vendor to help you work through them.

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Detailed Mixing Instructions

The following section will describe detailed mixing instructions for specific H.R. Simon products. Note: following these instructions exactly, never try to mix less than or more than what has been recommended, and package what you have mixed immediately. Before mixing anything, read your material safety data sheets and follow all safety recommendations.

HS Powder 200 Developer

Parts

1. Flake in a box which weighs 35 lbs.
2. Granular white powder in a box which weighs 96 lbs.
3. Fluffy white powder in a box which weighs 65 lbs.
4. Liquid in a pail which is filled to five gallons.

Start with 150 gallons of water in your tank. Start agitation. Carefully and slowly add part 1. Do not let it drop all at once and cause splashing into your tank as part 1 is caustic potash in dry form and becomes extremely hazardous when contact is made with water. Wait ten minutes. Turn off your agitator and look for flakes of part 1 on the bottom of your tank. If you find none, proceed onto the next step. If you need to mix more, mix for ten minutes more and check for more part 1 on the bottom of the tank.

Turn your agitator back on. Slowly add part 2. Let mix for two minutes after part 2 has been totally added. Slowly add your part 3. Add part 4 and then add enough water to make 200 gallons. Check your specific gravity and count your packaging materials. Your specific gravity should be 1.080 at 59 F.

Chemblend Developer

Parts

1. Part A is 50 gallons in a returnable 55 gallon plastic drum.
2. Part B is Two 5 quart bottles in a box of orange colored liquid.
3. Part C is Two 1 gallon bottles in a box of clear or yellow liquid.

Start with 100 gallons of water in your tank. Start agitation. Using a clean pump, add part A. When the drum is mostly empty, wash it out and dump the rest into your tank. Add both bottles of part B. Add both bottles of part C. Add enough water to make 200 gallons. Let mix for 10 minutes. Check your specific gravity and count your packaging materials. Your specific gravity should be 1.080 at 59 F.

Chemblend CB2 Developer

Parts

1. Part A is 50 gallons in a returnable 55 gallon plastic drum.
2. Part B is one five gallon pail of yellow liquid.

Start with 100 gallons of water in your tank. Start agitation. Using a clean pump, add part A. When the drum is mostly empty, wash it out and dump the rest into your tank. Add the pail of part B. Wash the pail out and add the contents to your batch. Add enough water to make 200 gallons. Let mix for 10 minutes. Check your specific gravity and count your packaging materials. Your specific gravity should be 1.080 at 59 F.

Guide to Quality Mixing

With comprehensive mixing instructions for H.R. Simon X-Ray Chemicals



SEF 2 – Mammography developer

Parts

1. Part A is 50 gallons in a returnable 55 gallon plastic drum.
2. Part B is one five gallon pail of yellow liquid.

Start with 100 gallons of water in your tank. Start agitation. Using a clean pump, add part A. When the drum is mostly empty, wash it out and dump the rest into your tank. Add the pail of part B. Wash the pail out and add the contents to your batch. Add enough water to make 200 gallons. Let mix for 10 minutes. Check your specific gravity and count your packaging materials. Your specific gravity should be 1.080 at 59 F.

Let mix for 10 minutes. Check your specific gravity and count your packaging materials. Your specific gravity should be 1.080 at 59 F.

Chemblend "UltraClean" Fixer

Parts

1. Part 1 is 50 gallons in a returnable 55 gallon plastic drum.
2. Part 2 is one six gallon jug of hardener.

Start with 100 gallons of water in your tank. Start agitation. Using a clean pump, add part 1. When the drum is mostly empty, wash it out and dump the rest into your tank. Add the jug of part 2. Wash the pail out and add the contents to your batch. Add enough water to make 250 gallons. Let mix for 10 minutes. Check your specific gravity and count your packaging materials. Your specific gravity should be 1.080 at 59 F.

HS Automatic 300 Fixer

Parts

1. Part A is 55 gallons in a returnable 55 gallon plastic drum.
2. Part B is one six gallon jug of clear liquid.

Start with 200 gallons of water in your tank. Start agitation. Using a clean pump, add part A. When the drum is mostly empty, wash it out and dump the rest into your tank. Add the jug of part B. Wash the jug out and add the contents to your batch. Add enough water to make 300 gallons.

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A Final Note

Count on us. That's what we're here for. Should you have any questions, call your manufacturer (which, again, should only be H.R. Simon and Company). Seriously, there are several good sources for quality x-ray chemicals available in the world and there are many sources which are not. Before selecting a chemical vendor, speak to dealers already using those products for references. Then call us. For more than 45 years, our customers have come to know that they can depend on our quality and cannot get the same level of expertise and service even from one of the largest companies in the world.

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