Refinishing Equipment (REF01e)
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Module 1 - Spray Guns
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Learning Objectives
In this first module we'll talk about the various types, designs, and parts of spray guns. We'll also be discussing the importance of cleaning and keeping spray guns maintained. The module will conclude with how to setup a high volume low pressure (HVLP) spray gun.

Spray Gun Types
Spray guns used for refinishing may be different designs. Some of these are a high pressure, or HP, high volume low pressure, or HVLP, and reduced pressure, or RP.

An HP spray gun uses high pressure, low volume air. The inlet air pressures for an HP ranges from 70 to 90 pounds per square inch, or psi. This type of spray gun may also be referred to as conventional. HP spray guns are considered old technology.

An HVLP spray gun operates by a high volume and low pressure of air passing through the spray gun. The inlet air pressure is about 45 psi with an air cap pressure of 10 psi or less.

An RP spray gun uses a reduced inlet pressure of 32 psi that allows optimized high pressure to achieve transfer efficiency above 65%, even though the gun does not have 10 psi or less at the air cap. This type of spray gun is primarily used for high solid clearcoats, as it aids in the atomization and evaporation of solvents and reducers to allow for an improved transfer of material.

Low volume low pressure, or LVLP spray guns have limited use and availability.

The amount of air pressure that is produced by an air compressor is measured in psi. Cubic feet per minute, or cfm, is the volume of air delivered that is required for a tool to operate properly. Smaller air compressors may not be able to produce the high air volume required for HVLP spray guns. Most air tools used in a repair facility require less cfm than the tools used for refinishing. An example of this is a dual-action sander which may require only 3 cfm, whereas an HVLP spray gun requires upwards of 25 cfm.

Spray Gun Designs
Spray guns may be gravity or siphon feed.

Gravity feed spray guns operate by the paint cup being located above the spray gun body. Fluid will flow out of a gravity feed spray gun when there is no air pressure and the trigger is pulled. This is because material moves through the spray gun by gravitational force and not vacuum.
A siphon feed spray gun has the paint cup located below the spray gun body. The material is drawn out of the spray gun by vacuum created by the air cap. Atmospheric pressure inside the paint cup forces the material up through the spray gun body and out of the fluid needle.

Pressure feed spray guns, though common at one time in the industry for spraying refinish materials, are now typically used to apply chip-resistant coatings and corrosion protection materials. A pressure feed spray gun operates by pressurizing the cup which aides in allowing higher viscosity materials to be atomized.

**Transfer Efficiency Of An HVLP Spray Gun**

Transfer efficiency is the amount of material a spray gun can deposit on a surface. The material that is not on the intended surface is considered overspray.

An advantage of using an HVLP spray gun is that the use of lower pressures allows for more control of the material being sprayed. The transfer efficiency of an HVLP spray gun is typically 65% or better. This can be affected by many variables, including spray technique.

Several ways to increase transfer efficiency is to use the recommended spray gun setup for fluid needle, fluid nozzle and air cap selection. Another is by using a smaller spray pattern. This keeps the refinish material focused on the panel.

**Parts Of A Spray Gun**

Move the mouse over the various areas of the spray gun in order to identify the specific parts. The following screens will provide in depth descriptions of each of the parts.

**Air Caps**

An air cap has three air passages that direct air past the fluid needle. These passages are the center hole, auxiliary holes, and air horn holes.

The type of air cap may also affect the amount of fluid flow through the spray gun and the air pressure needed.

**Three Stages Of Atomization**

The passages within the air cap help achieve full atomization of refinish materials in three stages. During the first stage, a rush of air from the center hole creates a vacuum at the fluid tip. As air is directed across the fluid passages, a pressure difference occurs. This is due to the creation of a venturi or vacuum. The refinish material is pulled in by the vacuum and air turbulence starts to break up the refinish material.
The second stage takes the partially atomized refinish material and hits it by an air stream from the auxiliary holes. The refinish material is further atomized.

During the third stage, air from the air horn holes hits the atomized refinish material and causes it to form the spray pattern.

**Fluid Needle**
The fluid needle is opened and closed by the trigger. It is used to control the amount of fluid into the air stream. The opening between the nozzle seat and tip of the fluid needle valve determines the amount of fluid that can flow through.

**Fluid Nozzle**
The fluid nozzle works with the fluid needle valve to meter fluid into the air stream. It forms an internal seat for the fluid needle valve to shut off the fluid flow. The fluid nozzle has openings that determine the maximum amount of fluid that can be delivered. It also provides airflow to the air cap.

**Fluid Needles And Nozzles**
The fluid needles and fluid nozzles are matched to the spray gun and the material being sprayed. They cannot be interchanged with other needles and nozzles. Fluid needles and nozzles may be numerically identified. The larger the number, the larger the orifices. Larger numbers and diameter orifices are used to spray higher viscosity materials.

**Spray Gun Body**
The body of the spray gun attaches to the paint cup and houses many working parts. All of the air passages and fluid passages are machined through the body of the spray gun.

Most spray gun bodies are made out of aluminum.

HVLP spray guns have larger air passages machined through the spray gun body. This is to accommodate higher volumes of compressed air.

**Spray Gun Trigger**
The spray gun trigger has two steps. With the triggering of the first step, the air valves are opened, filling the chambers with compressed air. The second triggering pulls the fluid needle off of its seat which allows the refinish material to flow into the spray gun body.

**Paint Cup**
The paint cup is mounted to the spray gun body. It may be a disposable plastic with a built-in strainer. Most strainers for waterborne finishes are recommended to be 125 - 200 microns. Refer to the paint maker's technical data sheet to verify the correct strainer type to use.
Paint cups may also be metal, though it may be recommended to use a coated or plastic paint cup with certain materials, such as, etching primers and waterborne products, as they may cause damage to uncoated metal paint cups. Some refinish materials should not be left in a paint cup for extended periods of time.

**Fluid Control**
The fluid control adjustment affects two basic functions. The fluid control can be adjusted to change the amount of material released from the spray gun and used to adjust the atomization of the fluid exiting the spray gun.

The fluid control is located at the rear of a spray gun body. Adjustment of the fluid control needs to be made before the refinish technician begins applying any type of material. A fluid control set too light will cause poor hiding, and an adjustment that is too heavy may cause runs.

**Fan Adjustment**
Another important adjustment of the spray gun is the fan adjustment. The fan adjustment is used to control the size of the spray pattern. The fan adjustment can be adjusted to produce a spray pattern that is a small diameter circle or a long oblong pattern.

Along with changing the physical spray pattern, the fan adjustment can also affect the atomization of the material being sprayed.

**Spray Gun Cleaning**
Whether using solvent-borne or waterborne refinish materials, always clean the spray gun immediately after use with the paint maker's recommended solution. This will help ensure that the spray gun continues to operate properly and contaminants are not transferred to other refinishing jobs.

Items to keep in mind when it comes to cleaning a spray gun include not immersing and soaking in a bath of solvent. Allowing a spray gun to be soaked in solvent will cause excessive stripping of needed lubrication.

Use compressed air to dry the inside and outside of a spray gun that has been cleaned of waterborne materials.

A spray gun washer is a unique cleaning tool for the refinish technician. Spray gun washers use air-agitated solvent, whether it be for waterborne or solvent-borne refinish materials, to clean the guns. An enclosed spray gun washer operates similar to a dishwasher. They are fire rated and must be grounded to avoid sparks. Spray gun washers
are also generally pneumatically operated and must be assembled and used according to local building and fire codes.

Spray gun washer cleaning solvent is regulated by local volatile organic compound (VOC) regulations.

**Maintaining A Spray Gun**

When maintaining a spray gun, lubrication of moving parts will be necessary on a regular basis to help minimize wear and prolong the life of the spray gun. When lubricating a spray gun, use a lubricant that is designed to be used on spray guns, is compatible with refinish materials and will not contaminate the spray gun.

Do not use conventional oil, such as engine oil, transmission fluid, WD-40, spray or liquid silicone, Liquid Wrench, or air tool oil as these will cause defects in the refinish materials.

It is also important to be able to identify what parts wear out, how often they need replacement, and the availability of parts for the specific spray gun. It is also important to know if the spray gun needs to be returned to the manufacturer for repair, or if a rebuild kit is available, and what parts are included in the kit.

**Spray Gun Setup Overview**

When setting up an HVLP spray gun, adjust the inlet pressure to the spray gun maker’s recommendations, and measure the air cap pressure and adjust as necessary for proper airflow. Too much or too little airflow can cause problems when applying material. A special gauge or cap can be used for monitoring air pressure at the air cap.

Check the material or spray gun maker's setup charts for the proper fluid needle and nozzle. Click on the various links below to view several gun maker's setup charts.

**Adjusting Inlet Pressure At The Spray Gun**

When adjusting air pressure at the inlet of the spray gun, keep in mind that spray gun makers will state a specific inlet pressure at the base of the spray gun. The proper inlet air pressure will give 10 psi at the air cap with the fan control wide open. As the fan control is closed, the air cap pressure increases.

Air regulators adjust the air supply to pressures required by the spray gun maker and for other power tools. Begin adjusting the air pressure at the wall regulator and allow for pressure drops if long air hoses are being used. An air regulator on the spray gun should be used to make minor adjustments only. Ultimately, the pressure valve at the spray
gun should be used to measure inlet pressure. An air regulator maintains a constant air pressure and air volume.

A cheater valve restricts airflow and creates an unstable air pressure and air volume. Cheater valves should not be used with spray equipment.

**Testing For Fluid Distribution**
When testing for fluid distribution, begin with rotating the air cap so that the air horns, or ears, are straight up and down. This will produce a horizontal spray pattern. Hold the spray gun 8 - 10" from the surface and pull the trigger until the refinish material begins to run. The runs will be about the same length if all adjustments are correct.

If the sides sag more, the air pressure is too high or the fan adjustment knob is set too wide.

If the center sags more, there is not enough pattern air. Either turn out the fan adjustment knob, turn in the fluid control knob, or increase the air pressure.

**Problems That Spray Patterns Indicate**
To perform a quality refinish, the spray pattern needs to be uniform and equal. If the pattern is not uniform with the amount of material that is deposited, the finish will have a poor appearance.

A balanced spray pattern has an equal amount of material deposited in the spray pattern.

Improper patterns will show heavy or light spots in the pattern. A pattern that is depositing heavy on the top or the bottom indicates that material has dried around the outside of the air cap. The air cap will need to be removed, cleaned, and a new test pattern sprayed.

Two other types of spray pattern problems are crescent-shaped patterns, which are caused by a restricted air passage in the air cap horn, and figure 8 patterns which are caused by atomizing air pressure that is too high for the viscosity of the material being sprayed.

**Module Summary**
In this first module we talked about the various types, designs, and parts of spray guns. We also discussed the importance of cleaning and keeping spray guns maintained. The module concluded with how to set up an high volume low pressure (HVLP) spray gun.
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Learning Objectives
In this second module we will be discussing the type of compressed air that is required for refinishing and will conclude with how to use compressed air.

Compressed Air For Refinishing
Compressed air for refinishing needs to be a higher quality than that used for regular air tools.

Compressed air must be clean and dry and not contain any contaminants, such as water or oil vapor.

Compressed Air Filter Maintenance
To maintain quality compressed air at the spraybooth, the filters at or near the spraybooth must be purged or inspected on a regular basis, and accumulation of contaminants must be removed. Failure to maintain the filters can lead to paint defects.

Air Line Filters
Compressed air line filters that are placed inline of the main air supply are designed to trap and remove contaminants from the air supply, such as debris, water, and oil. Some examples of air line filters include filtered centrifugal separators, which remove bulk liquids from the compressed air; coalescing oil removal filters, which remove oil aerosols contained within the fresh air breathing system; and oil vapor adsorbing filters, which remove oil vapors and oil that are in the gaseous state. This is accomplished through two layers of activated charcoal.

Contaminated Spraying Air
Contaminated compressed spraying air may cause refinish material to not adhere to a surface and, depending on the type of contamination, fisheyes may occur.

When applying a finish to a surface there needs to be complete and solid adhesion. Failure to have proper adhesion may result in small to large sections of refinish material lifting or easily being removed from the surface.

Compressed Air Lines
There are many variables that may lead to pressure drops, including hose length, the type of regulators used, the size of quick-disconnects in the air lines, and using hoses smaller than 3/8 of an inch inside diameter.

Keep all hoses clean. This will help ensure that the air hoses last longer and help reduce dirt contamination in the finish.
Compressed Air Hose Safety
When working in the spraybooth or in the repair area, two separate air hoses should be used for each area. The air hoses used in the spraybooth should not be used in the shop and vice versa. Breathing air hoses should have different style quick-disconnects. This is so they can only attach to the breathing apparatus and nothing else.

Compressed Air Breathing Equipment
While working in a spray environment or with materials that produce hazardous vapors, the use of compressed air breathing equipment may be required. The two common types of compressed air breathing equipment are fresh air masks, which allow fresh air to be breathed and offer no protection to the facial skin, and fresh air hoods, which allow fresh air to be breathed and offer complete protection to the facial skin.

Grade D breathing air has requirements that must be met and maintained. An audible alarm must be heard in the spraybooth. Several requirements for grade D breathing air include no oil vapors, less than 10 parts per million (ppm) of carbon monoxide (CO) and less than 1,000 ppm of carbon dioxide (CO$_2$).

Module Summary
In this second module we discussed the type of compressed air that is required for refinishing and how to use compressed air.
Module 3 - Spray Environment
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Learning Objectives
In this third module we'll be discussing the types of spraybooths currently in use. We will also talk about the various adjustments that can be made within a spraybooth. Also covered are the different controls and settings of a spraybooth. The module concludes with how to maintain a spraybooth.

Prep Deck
Prep decks may be similar in appearance to that of a spraybooth. The difference being is that a prep deck typically has curtains and not solid walls. A prep deck may be heated and can be used to sand, apply refinish materials, or edge parts.

Prep decks may also be regulated by local rules and regulations.

Some local or national fire codes may regulate the types of functions that may be performed inside a prep deck.

Functions Of A Spraybooth
Spraybooths provide a clean spray environment, the ability to control the temperatures for spraying and baking, limited exposure to hazardous chemicals, color-corrected lighting for proper color matching, and fire protection.

Types Of Spraybooths
The three most popular types of spraybooths currently in use today include the downdraft, semi-downdraft, and crossdraft spraybooths.

Downdraft Spraybooth
A downdraft spraybooth is designed to control overspray removal and dust more effectively when compared to other types of spraybooths available today. Downdraft spraybooths operate by drawing air in from the ceiling and out through the floor. Some may have the ability to recirculate heated air. Recirculating heated air allows greater efficiency of the heating system.

Semi-Downdraft Spraybooth
A semi-downdraft spraybooth draws air into the spraybooth from vents above the doors and evacuates the air through the rear of the spraybooth.

This type of spraybooth controls dust. In the event that there is any debris in the spraybooth, instead of it being drawn from the roof of the vehicle to the floor, the debris is moved across the length of the vehicle, allowing more surface area for the debris to contact.
Crossdraft Spraybooth
A crossdraft spraybooth draws air into the spraybooth from filters in the doors and evacuates the air through filters in the rear corners of the spraybooth.

This type of spraybooth also controls dust. In the event that there is any debris in the spraybooth, the debris is moved across the length of the vehicle, allowing greater surface area for the debris to contact. The crossdraft spraybooth directs most of its airflow along the sides of the vehicle. This is because the exhaust filters are primarily located at the rear corners of the spraybooth.

Spraybooth Adjustments
Spraybooths have a variety of adjustments that can be made. These adjustments may include being set to a specific temperature, or increasing or decreasing the amount of air entering and exiting the spraybooth.

This allows adjustment to a specific temperature and pressure setting for specific type materials being sprayed.

Testing The Amount Of Airflow
To properly test the amount of air flowing through a spraybooth, the use of a Magnahelic or a manometer is required. A Magnahelic measures the pressure or vacuum in a spraybooth.

Too much pressure in the spraybooth is called “positive pressure.” This occurs when more air is entering the spraybooth than is exiting.

Too much vacuum in the spraybooth is called “negative pressure.” This occurs when more air is exiting the spraybooth than is entering.

Prep decks, like spraybooths, may be able to be balanced by watching the curtains. Too much pressure causes the curtains to push out. Too little pressure causes the curtains to draw into the prep deck.

Negative Air Pressure
Setting the spraybooth to create a vacuum or negative pressure may cause dirt to be drawn in from outside the spraybooth, or improper material transfer.

Positive Air Pressure
Positive pressure occurs when more air is entering the spraybooth than is exiting. Setting the spraybooth to create a positive pressure may cause the spraybooth to become pressurized. While this will prevent dirt from being drawn into the spraybooth, it will also
force refinish material into the shop environment. This happens by air pressure pushing against the spraybooth seals and gaskets.

When a spraybooth gets too much positive pressure, insufficient exiting airflow occurs causing overspray to not be adequately removed from the spraybooth.

**Causes Of Restricted Airflow**
Restricted airflow or movement through a spraybooth may indicate that there are dirty, restricted filters, the spraybooth baffles are not functioning properly, or that refinishing is being frequently performed in one area of the spraybooth.

**Spraybooth Filter Replacement**
Spraybooth filters require replacement at various intervals depending on the amount of hours the spraybooth filters have been exposed to paint and debris. The replacement of spraybooth filters is crucial because a spraybooth should not be balanced until after the filters have been replaced. Also, clean spraybooth filters aid in producing a quality refinish.

In some geographical areas, the buildup of debris on spraybooth filters may be considered a hazardous material and may require special disposal.

**Spraybooth Filter Replacement (cont’d)**
There are a variety of filters used in a downdraft spraybooth, including the intake filters, pre-filters, ceiling filters, in-floor filters, and recirculation filters.

**Spraybooth Cycles**
The three main cycles that a spraybooth uses are the spray cycle, purge cycle, and bake cycle. The spray cycle controls the spraybooth conditions while the technician is applying refinish materials. The purge cycle evacuates excess overspray and debris from the spraybooth before baking. The bake cycle aids in the drying and curing of the refinish material.

These cycles may be on a control panel that has to be reset every time a change occurs, or they may be able to be preprogrammed into the spraybooth control center for different types of materials.

**Spray Cycles**
The spray cycle used in a spraybooth allows the refinish technician to adjust and maintain proper spraybooth temperatures.

With the ability to manipulate the temperature at each stage a refinish material is applied, the refinish technician should be able to attain top quality results.
**Purge Cycles**
The purge cycle used in a spraybooth allows the refinish technician time between the spray cycle and the bake cycle to evacuate solvents, moisture, debris, and other contaminants within the spraybooth.

With the ability to manipulate this environment, the refinish technician should be able to attain top quality results.

**Bake Cycle**
The bake cycle, which follows the purge cycle, allows the refinish technician to accelerate the drying time of refinish materials.

Although the refinish technician has the ability to dry and cure refinish materials faster than just air drying, the technician still needs to realize that there are variables that can cause poor results if the paint maker’s guidelines are not followed.

Vehicles that use compressed natural gas should have the tanks removed before the vehicle is moved into a spraybooth. Compressed natural gas can cause explosions.

**Drying And Curing**
After refinish materials are applied, there are two processes that occur. First, there is drying, which is when the evaporation of solvents and liquids are removed from the material. Then, there is curing, which is when a chemical change occurs within the refinish material.

**Surface Thermometers**
Available surface temperature thermometers include magnetic and paper thermometers, which can be placed near the area being heated, and noncontact type thermometers, which can be used from a distance.

**Spraybooth Burner Efficiency**
Spraybooth burner efficiency has to do with the design of the spraybooth and the ability to recirculate heated air. Some spraybooths are designed to recirculate the heated air during the bake cycle. This keeps the burners from being overworked.

A spraybooth that is designed to constantly heat the outside air without reclaiming any of the heated air causes inefficient heating.

**Refinish Drying / Curing Equipment**
When drying or curing the applied finish, there are both portable and permanent drying and curing tools. Portable tools include infrared heaters (IR), which use a special type
of lamp to create the heating effect, and hand held multipliers, which are used with waterborne materials.

Permanent drying and curing tools may include venturi blowers, which are mounted on the spraybooth walls, or convection heat, which is heated air forced from the ceiling to the floor.

Click on the various tools in the photo for a demonstration video of each.

**Infrared (IR)**
Permanent and portable IR heating units operate by using short and medium wave lengths from the light spectrum.

These waves travel through the air heating only the solid object they contact. As the wavelengths penetrate the refinished surface, the entire film thickness is heated, thus aiding in the release of solvents and drying of the material.

**Venturi Blowers**
Unheated spraybooth air is blown through small venturi-style blowers. This type of blower directs air across the refinished surface, may be portable or permanently mounted in the spraybooth, and are used to remove the moisture from waterborne materials.

**Convection**
The convection heating system operates similar to that of an oven. There are burners located on the air intake of the spraybooth. Before the air enters the spraybooth, it is heated by the burners, and the warm air is directed across the vehicle.

**Cleaning A Spraybooth**
To ensure that a quality refinish is obtained, there are certain spraybooth cleaning procedures that need to be performed on a regular basis. These procedures include vacuuming the spraybooth floor, sandblasting the floor grates to remove excessive overspray, wiping down the door seals to prevent dirt from getting into the spraybooth, wiping down the walls to keep them white and free of debris, and applying spraybooth masking to the walls or applying booth wrap, also referred to as Dirt Trap by 3M, to the walls and floor of the spraybooth. This will help eliminate overspray from sticking to the spraybooth walls.

**Diagnosing Spraybooth Problems**
When a spraybooth does not operate properly, there are specialized diagnostic tools that may be used to determine the cause of the problem. These tools include a maintenance checklist, velometer, smoke generator, particle counter, and / or light meter.
Velometer
Velometers are used when there may be a concern about airflow problems within a spraybooth. These meters measure the amount of air flowing through the spraybooth.

Smoke Generator
Smoke generators are used to observe the amount and direction of airflow through a spraybooth. The technician uses the smoke generator to emit smoke around a vehicle positioned in a spraybooth to determine the path the smoke takes to the exhaust filters.

Particulate Counter
The main function of the particulate counter is to measure the amount of debris in the air, determine if the amount of debris is excessive, and help determine replacement intervals for the spraybooth filters.

Spraybooth Lighting
Spraybooth lighting has three important variables. These variables include color temperature, which is measured in Kelvin, color rendering index, or CRI, which should be 93 percent or higher, and candlepower, which should be between 5 and 10,000 foot candles.

Light Meter
While using a light meter, the technician should be able to determine the current color rendering index, or CRI of the spraybooth, which is how close to natural daylight the lighting is, and determine the current candlepower.

If any of these measurements show to be below the proper level, the glass lenses should be cleaned and the levels rechecked. If still incorrect, bulb replacement may be required.

Replacing Spraybooth Lighting
Spraybooth lights should be replaced on a regular schedule. Failure to replace spraybooth lights may cause problems, such as the bulbs changing color with age, bulbs burning out at various times during spraybooth operation and use, and poor color matches.

Module Summary
In this third module we discussed the types of spraybooths currently in use. We also talked about the various adjustments that can be made within a spraybooth. Also covered were the different controls and settings of a spraybooth. The module concluded with how to maintain a spraybooth.
Module 4 - Mixing Equipment
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**Learning Objectives**
In this final module we’ll be discussing mixing ratios, the differences between cotton and nylon strainers, and how and where mixing sticks and cups are used. This final module will conclude with disposing of excess refinish materials.

**Mixing Room**
The paint mixing room is designed to be self-ventilating, contain any spills that occur, meet local fire codes, be grounded to avoid sparks and explosions, and have explosion-proof wiring.

**Understanding Mixing Ratios**
Most products used for refinishing in the collision repair industry require mixing or reducing. Depending on the type of paint system there can be different mixing ratios used.

Some of the mixing ratios may include three to one, three to one to one, and one to one plus ten to twenty percent. A three to one ratio equals three parts to one part.

A three to one ratio is taking parts of two products and mixing them together. Examples of this include mixing three ounces of primer and one ounce of hardener, or mixing ten and one half ounces of primer and three and one half ounces of hardener. A three to one to one ratio equals three parts to one part to one part.

A three to one to one ratio is taking three products and mixing them together. Examples of this include mixing three ounces of primer and one ounce of hardener and one ounce of reducer, or mixing ten and one half ounces of primer and three and one half ounces of hardener with three and one half ounces of reducer.

A one to one plus ten to twenty percent ratio equals one part to one part plus ten to twenty percent of a part. A one to one plus ten to twenty percent ratio is taking equal parts of two products and mixing them together. Then by doing a math equation, figuring out from the mixed product how much of the mixed product is ten to twenty percent, then adding that ten to twenty percent quantity of the third product. Examples of this include mixing one ounce of paint and one ounce of reducer and then point one to point two ounces of atomizing agent, or mixing 15 ounces of paint and 15 ounces of reducer and then one point five to three ounces of an atomizing agent.

**Preparing Refinish Materials**
The tools that may be needed when mixing refinish materials include mixing ratio cups and sticks, a lint-free strainer, and a viscosity cup.
Mixing ratio cups and sticks are used for obtaining the proper blend of materials.

Lint-free strainers should be tested for resistance to solvents and water. Soak the strainer for a couple minutes in water and also in solvent. Debris could end up in the paint cup if there is any change to the strainer. Strainers also should have nylon mesh instead of cotton. This is because cotton has lint that can be deposited into the paint cup.

A viscosity cup is used to gauge how fast a material can pass through a given size orifice. This will then determine the type of spray gun setup that is needed.

**Mixing Ratio Cups**
Mixing ratio cups are used for mixing paint, reducer, and hardener. Mixing ratio cups may have graduated scales on the sides of the cup to aid in proper mixtures. Different mixing ratio cups may have a scale for mixing. They may also have parallel sides. The bottom of the mixing ratio cup should be perpendicular to the sides to help ensure proper mixing is attained, or a graduated scale for cups that have nonparallel sides.

**Mixing Sticks**
Mixing sticks are available from most paint makers. Paint makers that offer mixing sticks will have the appropriate mixing sticks to support their mixing formula requirements. There are certain guidelines that must be followed when using mixing sticks. Each paint maker has their own set of mixing sticks made especially for their ratios. The correct stick from the paint maker needs to be used. Place the stick in a container that has nontapered sides, and follow the appropriate scale exactly. Make sure to not set the mixing sticks at an angle.

**Viscosity Cups**
Viscosity cups are used to measure the rate of material flow. There are different types of viscosity cups, so be sure to use the correct cup for the application requirements. In some applications, different viscosity cups may be able to be interchanged.

**Used Paint, Solvent Containment, And Solvent Recyclers**
Used material containers are designed for holding small amounts of waste for a short period of time.

These containers may contain a double strainer for collecting material, or hold used material until placing into larger holding drums.

When using a used solvent container, it is a safe practice to use a system that has a cover and keeps fumes from escaping. If an uncovered container is used, the fumes can cause a fire and health hazard.
Solvent recyclers recycle used solvent to reduce excessive waste. They also have wiring that needs to meet local building and fire codes. Additionally, the wiring also needs to be explosion-proof.

**Module Summary**
This final module discussed mixing ratios, the differences between cotton and nylon strainers, how and where mixing sticks and cups are used. We concluded with the disposal of excess refinish materials.
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