SPRAY POLYURETHANE FOAM ALLIANCE

SPFA-155

Low-Pressure Spray Foam Equipment Guidelines

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ABOUT SPRAY POLYURETHANE FOAM ALLIANCE (SPFA)

Founded in 1987, the Spray Polyurethane Foam Alliance (SPFA) is the voice, and educational and technical resource, for the spray polyurethane foam industry. A 501(c)6 trade association, the alliance is composed of contractors, manufacturers, and distributors of polyurethane foam, related equipment, and protective coatings; and who provide inspections, surface preparations, and other services. The organization supports the best practices and the growth of the industry through a number of core initiatives, which include educational programs and events, the SPFA Professional Installer Certification Program, technical literature and guidelines, legislative advocacy, research, and networking opportunities. For more information, please use the contact information and links provided in this document.

DISCLAIMER

This document was developed to aid building construction and design professionals in choosing spray-applied polyurethane foam systems. The information provided herein, based on current customs and practices of the trade, is offered in good faith, and believed to be true to the best of SPFA's knowledge and belief.

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DOCUMENT HISTORY

Date	Sections Modified	Description of Changes
February 2022	Initial Publication	

EQUIPMENT COMMITTEE

MISSION STATEMENT

1. Provide a wide range of technical information to the Spray Polyurethane Foam industry to help members select equipment that best suits customers' needs using input data for customers' Spray Foam applications.
2. Maintain current SPFA TechDocs SPFA-137 Spray Polyurethane Equipment Guidelines and SPFA-144 Coating Equipment Guidelines.
3. Develop new TechDocs and TechTips as needed.
4. Develop a new category with non-biased performance facts for low-pressure (under 1K) Spray Foam systems as they enter the market.
5. Identify, explore, develop, and communicate an understanding of technical issues related to Spray Foam processing equipment.
6. Provide a forum for SPF equipment and accessory suppliers and members who perform equipment maintenance services, troubleshooting, rebuilding and complete overhauls.
7. Develop guidelines for best-practices, safe and efficient design and maintenance of SPF equipment, rigs, and accessories.
8. Identify all types of spray guns, categorizing as appropriate into plastic/throw-away, air purge, mechanical purge, manually operated no air, and re-useable low-pressure guns.
9. Identify all types of available Proportioners.
10. Provide better data analysis of ancillary equipment used with and for the backup of Spray Foam equipment.
11. Analyze and evaluate air-respiratory types of Spray Foam equipment into low-pressure, high-pressure, and OGV mask types.

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PREFACE

The purpose of this guide is to assist those entering the SPF (spray polyurethane foam) business in the selection of application equipment. This guide discusses the equipment components necessary to spray-apply polyurethane foam as well as capacities and alternatives. This document applies to low-pressure SPF as defined in SPFA-119:

> ***SPF, LOW PRESSURE****: To be classified as low-pressure spray polyurethane foam, the A- and B-components must be delivered at a pressure under 250 psi, when measured coming out of the gun. The A and B materials are then mixed through a static mix element with air nucleation. Low pressure spray foam equipment exists where the end user can achieve outputs from 3 – 70 lbs. per minute depending upon the application and dispensing gun.*

INTRODUCTION

SPF is the reacted product of two components that are mixed and sprayed to a substrate. The two components are:

A-component Ingredient: Polymeric isocyanate (MDI)
Synonyms: ISO

Comments: The A-component will react with moisture in ambient or compressed air to form hard polymerized crystals or flakes. Therefore, equipment handling the A-component must be designed to exclude moisture.

B-component Ingredients: Polyols, blowing agents, catalysts, flame retardants, surfactants
Synonyms: Resin or R-component, polyol, or B-component

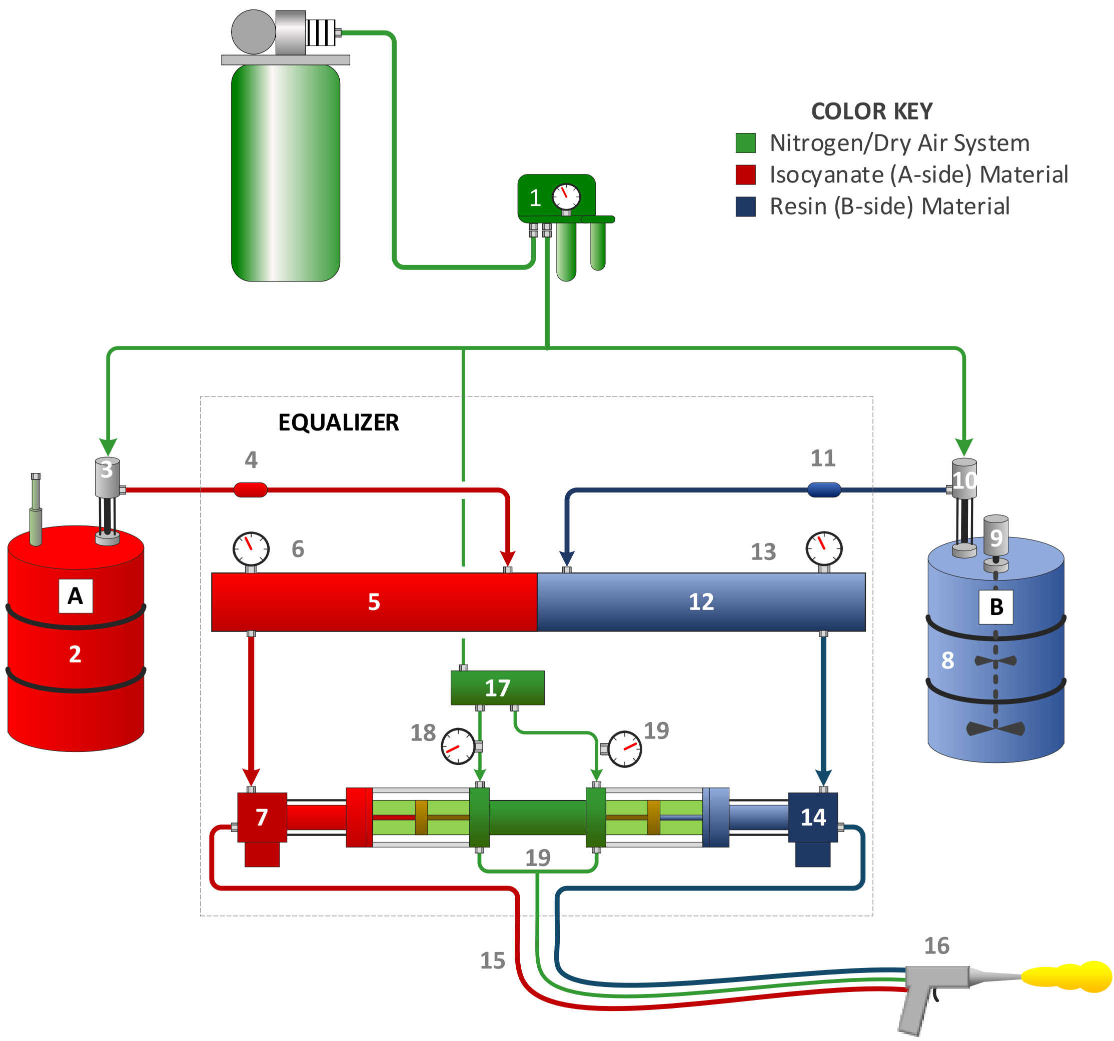
Comments: The blowing agent in the B-component may vaporize (boil) if the material becomes too hot before application.

To properly spray polyurethane foam, the application equipment must be capable of storing, pumping, heating, mixing, and spraying these two components at the material supplier's recommended temperature, viscosity, and material ratio.

In general, six equipment elements are necessary to apply SPF, as shown in the diagram of Figure 1:

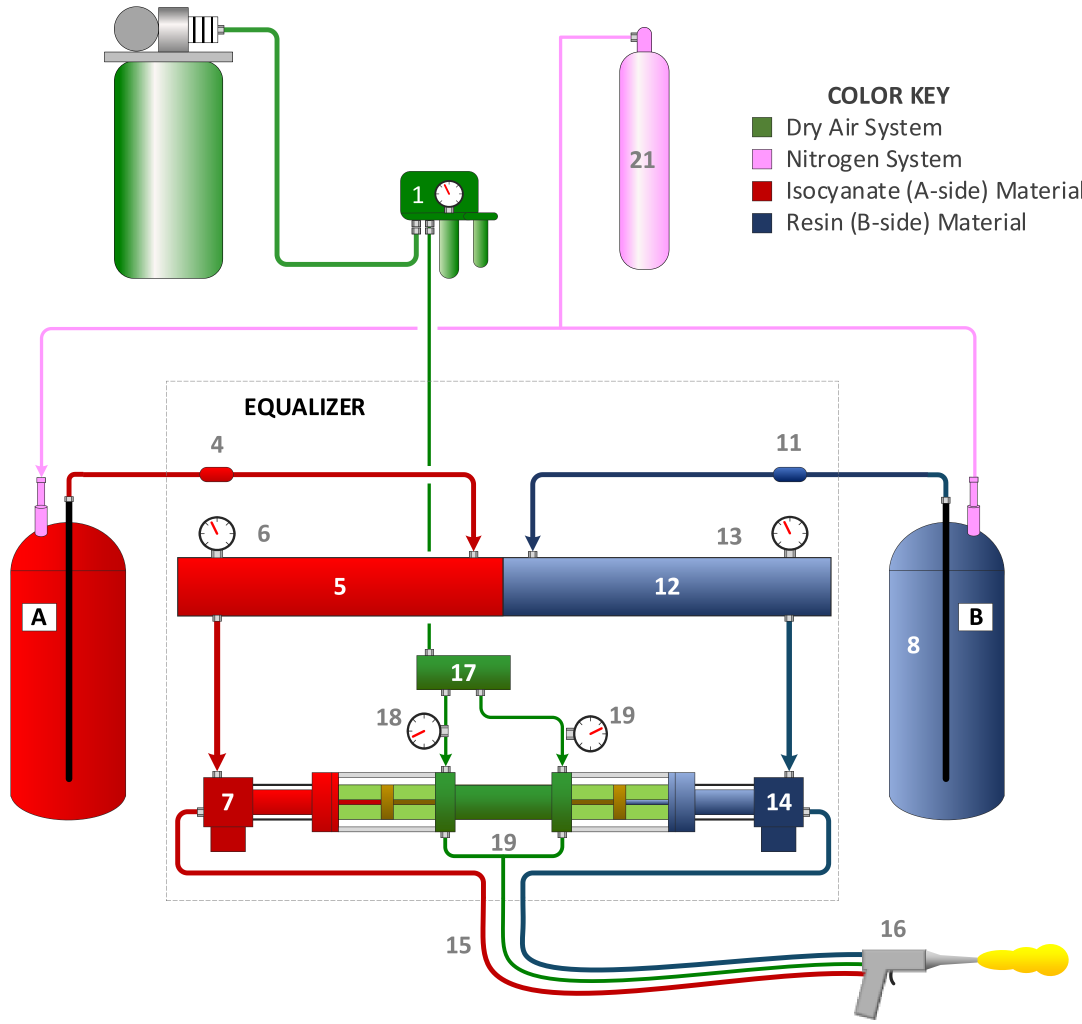
(1) Material storage and handling system
(2) Material delivery system (siphon, pressurized or pump)
(3) Drum mixing system - if agitation is required by manufacturer
(4) Proportioner pumping/heating system
(5) Material delivery in a heated hose system
(6) Plural component spray gun with static mixer and air nucleation

These elements will be discussed in detail in later sections.



1. Nitrogen/Dry Air System (90 psi)
2. Isocyanate Drum/Tote
3. Isocyanate Transfer Pump
4. Isocyanate Filter
5. Isocyanate Primary Heater
6. Isocyanate Output Pressure Gauge
7. Isocyanate Proportioning Pump
8. Resin Drum/Tote
9. Resin Drum Mixer
10. Resin Transfer Pump
11. Resin Filter
12. Resin Primary Heater
13. Resin Output Pressure Gauge
14. Resin Proportioning Pump
15. Dual Heated Hose
16. Spray Gun
17. Gas Manifold
18. Pressure Gauge - Isocyanate Pump
19. Pressure Gauge - Resin Pump
20. Gas Assist

Figure 1a: Typical low-pressure SPF equipment setup (drums)



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16. Spray Gun
17. Gas Manifold
18. Pressure Gauge - Isocyanate Pump
19. Pressure Gauge - Resin Pump
20. Gas Assist
21 Nitrogen System

Figure 1b: Typical low-pressure SPF equipment setup (pressurized tanks)

Most SPF applicators install their equipment in self-contained trucks or trailers. Auxiliary equipment (such as air compressors, coating spray equipment, and electrical generators) may be mounted in the same truck or trailer. Such a truck or trailer is commonly called a “foam rig.” Foam rigs are normally insulated and heated to keep the A- and B-components at their appropriate storage or feed temperatures.

OEMs (Original Equipment Manufacturers) install their equipment at a fixed location or shop. Whether mobile in a foam rig or fixed in a shop, equipment needs are similar.

It is critical to keep the A- and B-components separate until they reach the spray gun. It is also critical that equipment elements designed for one component never be used for the other. To do otherwise will result in plugged and blocked equipment, which will cause downtime and costly equipment repairs or replacement. Always plan and design your foam rig to minimize the opportunity to inadvertently misuse the equipment. Color coding your equipment components to match your polyurethane foam supplier’s color-coding system will help prevent mix-ups.

⚠ **CAUTION:** Spray polyurethane foam and coating application equipment operate at high pressures. Always relieve the pressure before disconnecting or servicing equipment components. Never exceed the pressure rating of equipment components.

LOW PRESSURE EQUIPMENT OUTPUT

Output varies on low pressure equipment. Equipment can utilize pressurized tanks or 55 gal drums.

Market	Typical Projects	Output Range
Residential and light commercial	Residential insulation, light commercial , air sealing,	From 7 lb – 14lbs./ min (1.36 kg/min – 6.35 kg/min
Residential, light commercial and SPF roofing	Residential insulation, light SPF roofing , air sealing, light commercial	Up to 20 lb/min (9.07 kg/min)
OEM	Boat floatation, spa insulation, specialty molding, manufactured housing, insulated consumer products, etc.	Up to 70 lb/ min (31.75 kg./min)

Once an output range is selected, choose your equipment to meet this requirement. It may be advantageous to select certain equipment elements oversized to allow for future expansion into other markets.

MATERIAL STORAGE SYSTEMS

The material storage system stores and conditions the A- and B-components. The storage system you use will depend on your material supply source and type of foam products used.

Most material is delivered in 55-gallon drums but can also come in pressurized 17-gallon tanks. Consult with your materials supplier to determine the best container type for your application.

The material storage system must be capable of storing the A- and B-components within the temperature ranges specified by the material supplier.

UNPRESSURIZED CONTAINERS

The A- and B- components can be supplied directly from unpressurized containers such as drums and totes. Consider positioning and color marking the containers, lines and transfer pumps to minimize the possibility of accidental pump switching. Locate containers close to the axles for best weight and balance distribution.

Figure 2: 55-gallon drum

PRESSURIZED TANKS

One may use pressurized tanks with a low-pressure system. Follow DOT regulations when selecting pressurized tanks for over-the-road foam rigs. When utilizing nitrogen pressurized tanks, if the chemical weight is greater than 1,001 lbs. the driver is required to have a hazmat endorsement.

Figure 3: Example of a pressurized storage tank

Pressurized feed tanks may be used in lieu of pumps to supply the proportioner. This system provides the most constant, even pressure to the proportioner. This system also does not use any transfer pumps requiring less maintenance and troubleshooting and air demand from your auxiliary power. However, in using pressurized feed tanks, ensure that the feed tanks are rated for the intended pressure. Also, make sure all lines and hoses are sized properly for the material delivery requirements of the proportioner.

Pressurized tanks typically include the following:

(1) **Pressure blanket system** for nitrogen or dry air. Tanks requiring pressurization above 12 psig (80 kPa) must be ASME (American Society of Mechanical Engineers) rated. Should modifications be made to the tank after ASME certification, the certification is void and the tanks must be recertified. Pressurization below 12 psig (80 kPa) does not require an ASME certification.
(2) **Material level indicators** (optional)
(3) **Material temperature monitoring** system (customized)
(4) **Material refill systems** (customized)
(5) **Material outlet system** (customized)

Pressurized tanks avoid potential problems of transfer pumps as these pumps are not required. Some contractors find this beneficial when using the same type of foam on large jobs (e.g., large roofing projects). Pressurized tanks may not be the best choice if a contractor frequently changes foam materials.

On-board storage tanks are pressure fed with nitrogen or dry (desiccated) air used to push the material out of the vessels, through feed lines to the equalizer inlet. Tank pressure and transfer hoses sizing (diameter and length) between the tanks and the equalizer must ensure a minimum of 50 psi.

MATERIAL CONDITIONING

SPF chemicals that are being stored in pressurized vessels may need to be conditioned prior to delivery to the equalizer. The A-component will have dry air or other inert gas inside its storage vessel (tank or drum) to prevent reaction with airborne moisture. A- and B-components may need to be heated and mixed prior to transfer to the equalizer.

INERT GAS BLANKETING

Whether feeding from 55-gallon drums or supply tanks, always keep a blanket of dry air[1] in the headspace of the A-component tanks. Moisture in the air will react with the A-component, forming crystals or flakes that will clog equipment strainers. Air dryer canisters are available to insert into the vent bung of the 55-gallon drum. The silica gel in the air dryer canister changes color when they are saturated with moisture. These silica gels can be readily changed, and most can be dried and re-used. See manufacturer’s recommendations regarding maintenance of silica gel dryers.

[1] Inert gas such as nitrogen or argon may be used in place of dry air.

B-component vessels may require inert gas blanketing to keep the blowing agent in solution under high ambient temperature conditions. A nitrogen gas blanket can be utilized by using a nitrogen cylinder, regulator, and safety relief valve. Avoid over-pressuring a drum (3.0 – 5.0 psi [20–35 kPa] maximum).

Figure 4 - Silica Gel Dryer mounted in ¾" hole of A-side Drum

HEATING

The drums can be heated which allows startup with warm material. Refer to your material suppliers for recommendation prior to installing a drum heating system. There are several types, silicone band heaters are not recommended. At present, there are aluminum stand heaters and drum heating and cooling blankets available.

Figure 5 –Blanket-style drum heater (left) and under-drum heater (right)

MIXING

Drum mixers may be required for the B-component when high pressure equipment is used to apply low-density spray foam. Drum mixer impellers should a folding type which will fit into a 2-inch bung hole. Typical drum mixers include two 6-inch and one 8-inch impellers.

Drum mixers may be driven by air, electric or hydraulic power sources. When selecting the type of drive for drum mixers, consideration should be given maintenance, reliability, speed control, and capacity of the auxiliary power system(s).

Small mixers and auger-type mixers are not recommended as they do not thoroughly mix the contents in a B-component drum. It is not recommended to use a drum mixer in an A-component drum as it could cause air entrainment and moisture contamination.

Figure 6 – Different drum mixer types; pneumatic, electric and hydraulic-driven (left to right) and foldable blades (far right)

MATERIAL SUPPLY SYSTEM

The material supply system must deliver A- and B-components from the storage drums or tanks to the proportioner at sufficient volume and pressure to prevent cavitation of the proportioner pumps. There are three ways to deliver materials from the supply vessel to the proportioner:

(1) Transfer pumps and supply hoses for each component. This is, by far, the most common method.
(2) Pressurized supply tanks.
(3) Siphon system with a check valve at the foot of the siphon tube.

The material supply system depends on the type of equalizer system, the type of foam and the viscosity of the A- and B-components that you are using.

To maintain proper flows and pressures, components of the entire system need to be properly sized. The equalizermust have a higher output than the spray gun. The material supply system must have an output higher than the equalizeror cavitation may occur. Without proper sizing, the spray pressures could fall below optimum. Equalizers have different feed pressure and volume requirements; check with your proportioner manufacturer to determine the minimum and maximum pressure and volume requirements.

⚠ **CAUTION:** If the material feed system cannot feed A- and B-components as required by theequalizer, cavitation will occur, can cause intermittent off-ratio foam or plugged, damaged equipment (a.k.a. crossover).

***CROSSOVER**: An undesirable mixing of ISOCYANATE and RESIN components as a result of unbalanced pressures at the spray gun. May result in an equipment blockage.*

PUMPING FROM 55-GALLON DRUMS

Material in 55-gallon drums can be fed to the proportioner by using drum pumps that are inserted into the bung in the top of the drum.

Figure 7 – Drum driver pumps for low pressure systems

Drum pumps are usually air operated and are typically supplied with 100-psi air pressure. Air consumption can be up to 3 cfm for every 1 gallon of material pumped depending on the specific drum pump used.

A-component drum pumps are usually of a “divorced design,” whereby the fluid and air sections of the pump are separated (“divorced”). This prevents the A-component from being contaminated by moisture in the exhausting air from the air motor. Divorced design drum pumps normally have a 3:1 pressure ratio (i.e., 100 psi air pressure fed to the air motor will develop 300 psi material output pressure).

Many SPF applicators use a 2:1 divorced design drum pump for the B-component for commonality of components for maintenance, spare parts, etc. Diaphragm-type drum pumps are not recommended for the B component as they may cause frothing of the blowing agent.

⚠ **CAUTION:** When changing out empty drums, it is easy to make the mistake of inserting the A-component drum pump into a B-component drum (or vice versa). To prevent this: (1) keep A- and B-components in different sections of the foam rig; (2) color code the drum pumps, hoses, and valves with paint and/or tape; and (3) fully train your workforce as to the importance of keeping the A- and B-components separate.

MATERIAL SUPPLY HOSES

The hoses used to link the transfer pumps, or pressurized tanks to the proportioner are normally 3/4 inch (100 mm), 500 psi (3,500 KPa) rated, nylon lined. Vapor impermeable type hoses are needed for the A-component hose. The hose length should always be as short as possible, yet sufficient to allow ease of transfer pump movement. These are typically available in 10-foot (3 meter) sections and can be fitted together for additional length if required. High-capacity applications will require hoses of larger diameter. The draft or siphon systems use 1" truck-type suction hoses from the drums to the proportioner.

PROPORTIONER/EQUALIZER

Low pressure plural component equalizers heat material, meter the materials by volume, and maintains the materials' heat until it is sprayed or injected. Low pressure system includes auto calibration preheaters and utilizes air pressure under 250 PSI.

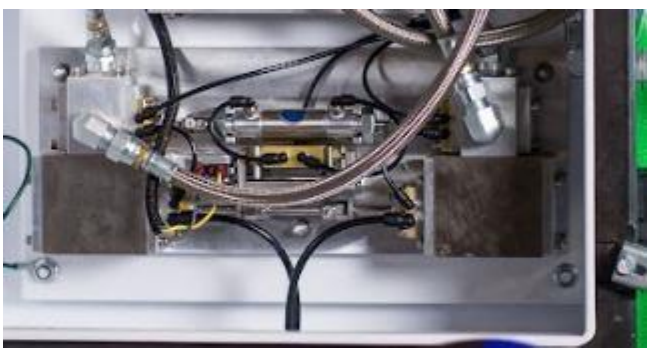

Figure 8 – Equalizer for low pressure driven by the pressurized tank or transfer pump

PROPORTIONING METER AND HEATING SYSTEM (EQUALIZER IN LOW PRESSURE SYSTEMS)

The proportioner/equalizer heating system is the heart of the SPF equipment setup. It determines the maximum output capacity of the SPF application system and is designed to accomplish four tasks:

(1) Proportion or meter the A- and B-component materials in the appropriate feed ratio (usually 1:1).
(2) Move the A- and B-component materials at the desired pressure and temperature in lb/min (L/min or gal/min) to the static and air nucleated spray gun.
(3) Heat the A- and B-component or condition, so that the viscosities allow for proper mixing in the static mixing nozzle .

Note 1: The transfer pump or the pressurized tank pressurize the A- and B-component materials so that they will mix properly in the disposable static mixing nozzle .

A heating system is necessary to raise the temperature of the A- and B-components to reduce their viscosities and to help with proper mixing. Without lower viscosities, the materials would be slower to process, and one may experience improper mix or regressed spray pattern. This could result in poor foam quality.

Note 2: Some polyurethane spray adhesive materials are formulated with lower viscosities so that a heating system is not required.

Heat is normally supplied to the A- and B-components in two stages: a primary heater (or pre-heater) and a heated hose (discussed in the next section). Generally, the primary heaters are responsible for heating the A- and B-components to their application temperatures, while the heated hose is designed to maintain that temperature during application.

Primary heaters are electric . Most primary heaters are automatically controlled. All primary heaters should be equipped with high-temperature safety switches to prevent over heating of the material.

One crucial factor in selecting a primary heater is the total power requirements (wattage). Increased material output and increased material temperature rise require greater wattage. Check with the proportioner manufacturer to determine the wattage you will need for your primary heater based on the output capacity and temperature rise. Primary heaters must also handle the high fluid pressures.

HEATED HOSE SYSTEM

The obvious function of the heated hose system is to transfer the A- and B materials from the equalizer to the spray gun. But it does more than this, including:

- Heats the A- and B-components within the hoses at start up
- Maintains A- and B-component temperatures during the SPF application
- Has temperature sensor lines compatible with the temperature controller at the proportioner or meter
- Delivers operating and/or purge air to the spray gun, if needed
- Delivers solvent to solvent-flushed spray guns, if used

In addition, the hose system (or hose "bundle") must be thermally insulated to minimize heat loss, covered with an abrasion-resistant covering to protect the hoses and its electrical components, and constructed of materials that can resist the absorption of moisture (particularly on the A-side).

The hose system, therefore, is a complicated piece of equipment and is specially designed for spraying plural component materials. When selecting a heated hose system, you need the following information:

- What type of spray gun will you be using? Will it require air for operation and/or purging? Will it require solvent for flushing?
- What length of hose will you need?

  Hose bundles come in 50 feet (15 meters), depending on the manufacturer. They are connected together to extend the hose reach, but the total length is limited by the total hose heating amperage. Two hundred feet (122 meters) is the maximum length of most heated hose systems that use low pressure . Length of hose, as well as elevation difference between the gun and proportioner, will result in pressure losses in the hose. This pressure loss can affect foam quality. Consult with your manufacturer regarding acceptable maximum hose length.

- What diameter of hose will you need?

  Material delivery hoses are available in 3/8 inch (9.5mm) to 1/2-inch (12mm) diameters; keep in mind larger diameter hoses have less pressure loss and reduce pressure variations (accumulator effect). An excessive loss or variation of pressure in the heated hose system may contribute to inadequate pressure at the spray gun or poor spray pattern.

- At what pressures will you be operating your proportioner and gun?

  Note: static pressure is measured while not spraying; dynamic pressure is *measured during spraying. In order to be classified as low pressure, material must be less than 250 psi when being dispensed at the gun and the chemicals must travel through a static mix element with air nucleation.*

Figure 10 - Insulated hose bundle without protective jacket (left), hose bundle with flex braid scuff jacket (center) and hose bundle with Velcro™ jacket (right).

Figure 11 - Hose joint with Velcro™ cover

Figure 13 - Heated 'whip' hose with braided scuff jacket

PROPER HOSE STORAGE

A hose rack is useful to neatly store hoses in the rig. However, racks must be designed and used properly. Racks should be designed to have a gradually curved support surface to uniformly support the weight and eliminate sharp bends in the hose. Ideally, when hanging a hose on a rack, the lower loop should rest on the floor to minimize the weight supported on the rack itself. Hanging the hose on a single or double rack in a 'figure 8' design can make the hose easier to load and unload.

A single layer of hose on a rack may be preheated without removing the hose from the rack. Hoses on racks that are overlapped in more than one layer must be removed from the rack prior to preheating to avoid hot spots and subsequent damage to the hose components (see Figures 14 and 15).

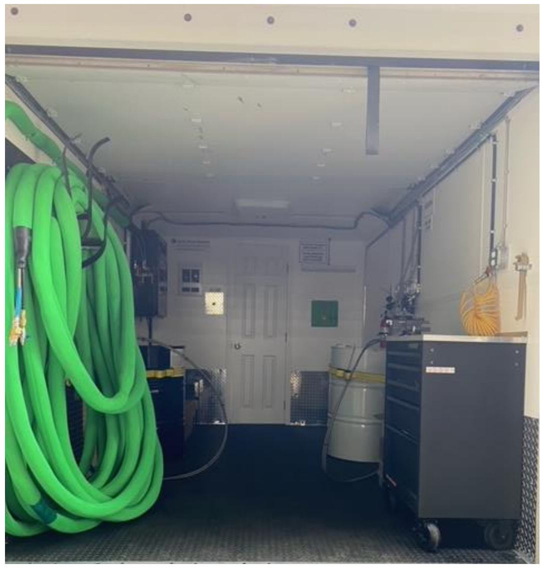

Figure 14 - Standard rack design which stacks more than one layer of hose. This hose must be removed from the rack down to a single layer before preheating. Three-tiered rack hangs the hose in single layers, preventing electromagnetic effect and overheating of the hoses, enabling preheating of the entire hose while on the rack.

Figure 15 - 180-degree swing-out rack releases the hose directly out the rear door of the rig.

WHIP HOSES

Whip hoses connect the main heated hose bundle to the gun. It is lighter and more flexible than the main hose due to its smaller diameter, facilitating handling and spraying. Whip hoses are typically heated, especially in colder weather or when intermittently spraying. Additionally, should a crossover occur, most likely only the whip hose would be contaminated minimizing replacement expense. Whip hoses come in up to 15 ft (6.0 meters).

Some installers use unheated whips in certain applications. If unheated whips are used, the length should be as short as possible to prevent unwanted cooling and purging of SPF chemicals.

Figure 16 - Typical whip (heated)

SPRAY GUNS

The function of the static mix spray gun is to mix the A- and B-components and discharge the mixture in a uniform spray pattern or pour method. Spray guns are designed to mix and spray out the A- and B-components in the static mixing nozzle . Different guns employ different strategies to accomplish this. Elements common to most guns include:

- Hose connection blocks, coupling blocks
- Material shutoff valves
- Material filter screens, inside the gun or upstream of the gun
- Material check valves
- Mixing chamber or module (in some designs)
- Spray tip or stating mixing nozzle
- Trigger air cylinder and piston (except on mechanically operated guns)
- Plastic disposable gun

Figure 17 – Metal and Plastic Static Mix Spray Guns

Low Pressure Plural component spray guns operate by mixing the A- and B-components in the static mixing nozzle with air nucleation. Mixing requires consistent material viscosities, temperatures, and pressures to control the proper mix and spray pattern.

The material delivery hose is connected to one or two hose connection blocks. The coupling block or manifold assembly allows for disconnecting the gun assembly from the hose for easier maintenance and safe gun storage. Some low-pressure guns have Coupling blocks or manifold assemblies may have material shutoff valves. Most guns have check valves (to hinder back flow and crossover), and material filter screens (to remove small particles which might clog the gun orifices).

The mixed material is then forced out a spray tip or nozzle forming a spray pattern. When the spray gun is “off,” some mechanism of positive material shut-off is employed.

To keep reacted material from accumulating in and on the spray, gun can use these methods:

- Take off static mixing nozzle change out as needed
- Solvent flush: A solvent is flushed through the spray gun in a pressurized pot to remove residual material. Solvents used for flushing should be non-flammable and should leave no residue.

Figure 18 – Static Mixing Tubes

SPRAY GUN FLUSH POTS

Typically, a solvent is used to flush out metal static mix spray guns. Consult with your gun manufacturer for a list of approved solvents.

Flush pots are a valuable tool for:

- Flushing the gun before working on it.
- Checking how the gun sprays both components.
- Cleaning A-component out for extended storage.
- Checking function, action of the gun and settings.
- Saving time and money

Figure 19 - Example of a flush pot.

SCARIFIERS AND SPF SAWS

Scarifiers and saws are handy for shaping and sculpting finished SPF surfaces; they are also useful for preparing some surfaces prior to applying SPF. On roofs, they may be used to remove old coatings before re-foaming and coating. On walls, they may be used to plane the extra SPF flush with the front of the studs. In marine holding tanks, scarifiers and saws may be used to shape and sand the SPF in freezers and water tanks before coating.

There are different types of scarifiers that use carbide blades to cut coatings, to fine wire wheels for trimming foam. It should be noted that electric units can become plugged with the fine dust particles. Care should be used to keep these tools clean to prevent motor overheating.

Figure 20 - Scarifier with wire-wheel brush (air driven)

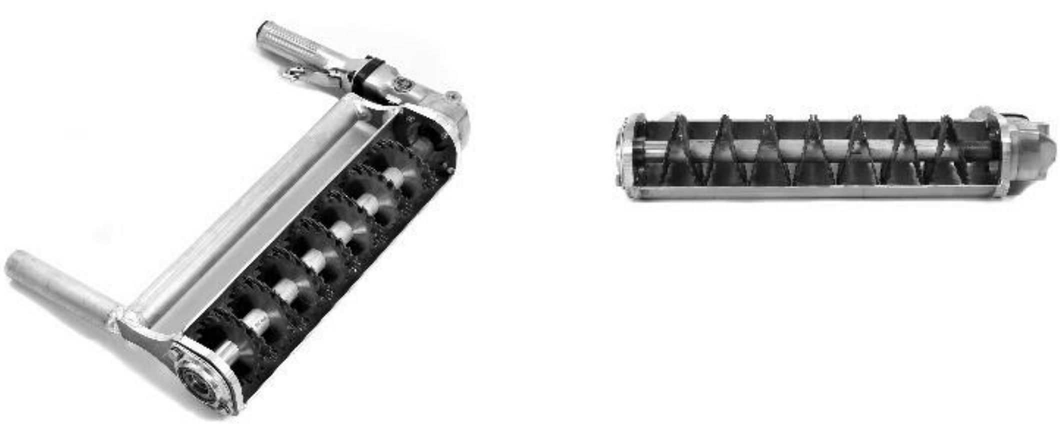

Figure 21 - Scarifier with carbide cutting wheels (air driven)

Figure 22 - Scarifier for roof coating removal

Figure 23 - Reciprocating saw for cutting open-cell SPF in stud cavities

AUXILIARY EQUIPMENT

Unless sufficient onsite electrical power and compressed air are available, an electrical generator or air compressor will be necessary. Indeed, most SPF contractors use generators and compressors because of the added independence, flexibility, and mobility they provide. Select generators and compressors of sufficient size to provide service to all the equipment employed on the jobsite. Electrical power and compressed air requirements are available in equipment technical manuals.

Considerations for selecting auxiliary equipment:

- Determine total electrical power requirements to properly size the generator.
- Determine total airflow requirements of all equipment to properly size the air compressor.
- Ensure wiring and piping is sized properly for the generator and compressor.
- Consider special combo generators/compressors designed specifically for SPF application.
    - Combo systems are typically sized at 30KVA/30CFM or larger.

    - Some generators can also provide hydraulics and air in one unit.
- Check the physical size, vibration and loudness of the generator and compressor
    - Vibration dampening and sound deadening walls may minimize noise level.
- Wire your rig so that you can easily back up your generator or compressor if they fail.
    - Many rigs are wired with double throw switches or able to use their own power or shore power.
    - Keep every component serviceable and for replacement if needed.

GENERATOR TYPES

Using diesel-powered generators rather than gasoline powered generators is generally preferred because diesel fuel is less flammable than gasoline and diesel generators provide more consistent electrical power for newer computer-controlled equipment. If gasoline generators are used, they should be mounted on a slide so that they are not operated in confined spaces. Some integrated generators (or gen-sets) can also provide hydraulic and air in one unit. This can be more economical and easier to maintain than separate systems.

There are many things to consider when planning for a generator or shore power supply. The following is not intended to replace the expertise of a certified electrician, who should be consulted before any generator purchase or installation. Generator under-sizing is all too common due to budget concerns, lack of understanding, and misinformation. This mistake can not only damage the generator but damage all electrical equipment that is being powered by it.

GENERATOR SIZING

Before inquiring about a generator purchase, you need to calculate your power requirements. Make a list of all the items that you intend to incorporate into your foam rig before you start your shop comparison. The total system requirements for proportioners are listed in the operation manuals under the model's description and/or in the technical data sections. In addition to the proportioner, consider the other electrical equipment requirements typical in a foam rig operation. This can include air compressor, air dryer, fresh air panel, lights, various outlets for electrical agitators, power tools, rig heating and air conditioning, etc.

Size generators to provide service to all the electrically driven equipment employed on the job site. Provide excess capacity for accessory tools and miscellaneous needs. Electrical requirements are available in equipment technical manuals.

o List system components using starting requirements, in watts
o Add-up watts required

o Multiply total watts by 1.25 = KVA (Kilovolt-ampere), use this number to size the generator

If on-site power is to be used, be sure that the power source is sufficient enough to provide the required amount of electricity to power the equipment being used.

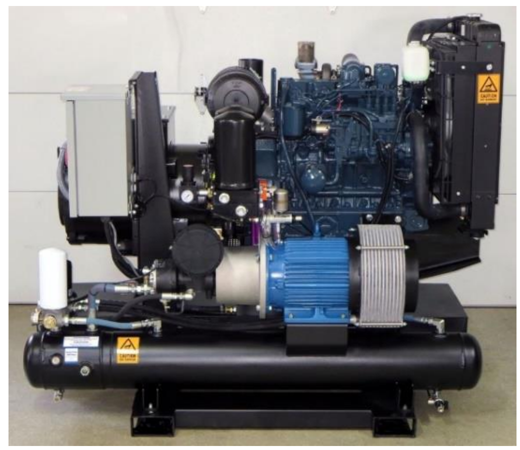

Figure 24 - Generator Only (left), Generator/Air Compressor/Air Dryer Combination (right)

AIR COMPRESSOR SYSTEMS

Compressed air is needed to run equipment such as drum agitators, drum pumps, proportioners, spray gun, respirator supplied air, as well as air powered tools such as foam planers and saws. For a self-sufficient rig, a properly sized air system is needed.

A typical air system includes an air compressor, air dryer and filtration system. Air compressors are typically powered by an electric motor, but some compressors are driven directly by the generator engine. Air compressors are piston or rotary screw driven, with the latter being most efficient to generate the 120-psi needed for most applications. Compressor size, in terms of CFM, is determined by the specific equipment used on the rig but can typically range from 20 to 80 CFM.

In some low-pressure applications, nitrogen can be used as the air system that is utilizing pressurized tanks.

AIR COMPRESSOR SIZING

Some proportioners use air driven motors, while others use electric or hydraulic drives. Air-driven proportioners require a much larger amount of compressed air. Always consult your equipment manual for the amount of air needed to run your equipment efficiently. Once you have determined the amount of air (CFM or cubic feet per minute) needed for each item of pneumatic-driven equipment, add the CFM requirements together to assure you have a compressor large enough to run everything. It is always suggested that you pick a compressor that has about 25% more CFM than needed.

Additionally, it is important to understand the duty cycle rating of compressors. While rotary screw compressor runs 100% of the time, piston driven compressors run intermittently. A piston compressor with a short duty cycle may not be adequate to supply some pneumatic equipment. Continuous-duty piston compressors are preferred. It is very important if running an electric compressor off the same generator power source as the proportioner, a continuous run system be used. The power spike needed to repeatedly start a non-continuous run compressor motor may adversely affect the proportioners electrical components.

Figure 25 - Examples of Air Compressors; piston

AIR DRYERS

Air dryers are a requirement for most pneumatic equipment. In addition to removing moisture, dryers will filter particulates and oils from the compressed air; these contaminants will shorten the life of your equipment by destroying O-rings and causing excessive wear.

Air dryers come in two types, desiccant and electric. Each have their advantages; follow manufacturer's maintenance instructions.

Figure 26 - Example of an Electric Air Dryer

Figure 27 - Example of a Dessicant Air Dryer

TRUCK OR TRAILER RIG TIPS

Careful planning will pay dividends. Consider the size of the truck or trailer needed. Too large a rig prohibits maneuvering, restricts flexibility on job sites, and costs more to operate. Too small of a rig limits the amount of material and auxiliary equipment that can be taken to the jobsite. With a truck, a liftgate is a great option.

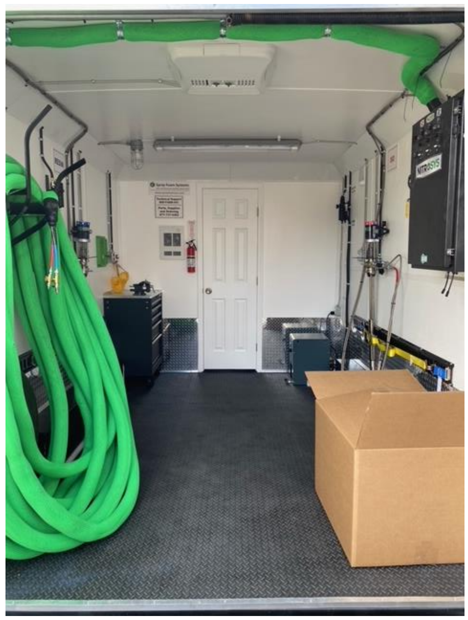

Figure 28 – Box Truck Rig

SUPPLIED AIR SYSTEMS AND BREATHING APPARATUS

Respiratory protection equipment maintenance and operation is addressed in your company's respiratory protection program. The material suppliers SDS will determine what type of respiratory protection equipment is needed for each type of product and application. More information on this equipment can be found here:
https://www.spraypolyurethane.org/personal-protective-equipment-ppe/