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Equipment Operation:
INTRODUCTION

Over the past 10 years, the use of spray polyurea elastomer coatings has increased in importance as a method of lining and waterproofing applications in building and construction.

Whether this type of coating will continue to grow in effectiveness and popularity or decline, rests to a great degree on the kind of job that applicators and/or contractors are doing now all over the country.

As you may see now, the spray polyurea elastomer technology requires the contractor to pay closer attention to detail than most other materials. Since the spraying of polyurea involves the fabrication of a lining system on the job site, the process is subject to various environmental factors. The inability of the contractor or applicator to control environmental conditions, such as temperature, wind and moisture conditions, be it rain or humidity, requires constantly being alert to immediate and upcoming weather conditions. Due to the rapid gel times and cure of the technology, the processing equipment is very important. Close attention must also be given to substrate condition before application of the material.

It means storing materials at the job site in accordance with manufacturer's recommendations. It means checking to see that the materials are not too old and/or deteriorated.

But, most important, it means knowing your spray equipment, how it works and how to maintain it in good operating condition, especially when processing the polyurea technology.

It should be noted that while this write-up and illustrations deal mainly with the GUSMER® line of proportioning units, the same principals do apply to the Glas-Craft® and GRACO® proportioning units.

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SPRAY POLYUREA EQUIPMENT

Polyurea coatings are formed when isocyanate, the "A" component, is mixed with resin, the "B" component, and metered through the spray equipment on a one-to-one basis by volume.

If the resulting product is to have the required properties such as:

1) proper cure and tack free;

2) proper physical properties;

3) uniform film thickness;

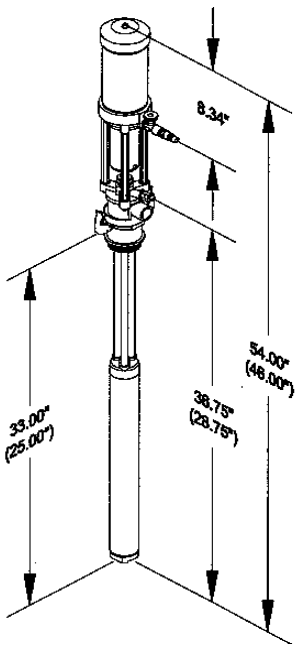
4) an acceptable finish;

the spray equipment must maintain the formulation ratio of the "A" and "B" components within a tolerance of ± 5% **by volume.**

The only way to assure keeping within such a narrow tolerance is to operate and maintain the equipment properly.

These are the equipment components it takes to create a polyurea elastomer system.

EQUIPMENT COMPONENTS



TRANSFER SYSTEMS:

The first step in the polyurea application process is to transfer the material to the equipment. This can be done by one of these methods.

1. Gravity feed, whereby the material is gravity-fed from horizontal drums to the proportioning pumps of the equipment. This is the **least** acceptable method as cavitation can and will occur in high throughput situations.

2. Transfer pump feeding directly from the manufacturer's material barrels, which is the most common method used. You must be able to filter contaminants from the air that powers the transfer pumps during this operation. In some cases, you can filter this air with a desiccant air dryer kit. This is the **preferred** method.

3. Pressure feed where by the "A" and "B" components are stored in tank type vessels and nitrogen pressure is used to push the material out of the vessels to the equipment through feed lines. This is better than the gravity feed method, but can also lead to cavitation. This method of feed should be used with some caution.

NOTE: diaphragm pumps can be used provided that a foot valve is installed to eliminate cavitation problems!

FLUID TRANSFER KIT:

Next, you need hoses and a fluid transfer kit to link the transfer system to the proportioning pumps of the equipment. The gauges on the kit will tell you the line pressure and temperature of the incoming fluid before it reaches the proportioning pumps. Often, these components are assembled in a total cabinet configuration that includes fluid filters and air filtration. If the cabinet assembly is not available, fluid can be filtered directly from the transfer pumps with a small in-line filter. This is not as effective as the larger filters, but will suffice in the field. Filters also may be mounted directly on the machine to filter the fluids coming into the proportioning pumps. Both of these filter systems must be cleaned on a daily basis.

POWER PACKS:

The amount that the proportioning pumps can move within a given time period is determined by the type of force driving them, either air or hydraulic. Pumps designed to produce 8 to 20 pounds of fluid in a minute usually are powered by air motors. Pumps designed to produce 30 pounds per minute or more use a hydraulic power pack which allows for higher pressure and higher output of material.

HEAT EXCHANGERS:

In order for the system to function properly, it must be balanced, and that is one of the functions of the heat exchangers.

The determining factor of how much material can be moved through a unit is not only determined by the proportioning pumps and the speed and volume at which they can operate, but by how much material the unit can effectively heat. Heat lowers viscosity. That is why material moves easier. Larger heat exchangers can move more material over a given area in a given amount of time, and heat it more effectively for a higher output.

HOSE TRANSFORMER ASSEMBLY:

A hose transformer assembly is what powers the heated hose. The heated hose assembly must be balanced to the proportioning pumps, the driving motor force, and the heat exchangers. It will do no good to

have a 1/4 inch hose on a 25-pound-output-per-minute unit because it cannot push that much material through that small a hose. Therefore, a larger hose, perhaps 3/8" or ½" i.d., is required.

GUN ASSEMBLIES:

There are various gun assemblies, all working by the impingement method whereby both materials, isocyanate and resin blend, meet in the gun chamber and reactivity is instant. The larger the mixing chamber's orifice, the greater the amount of fluid can pass through, in a given time period.

A spray gun can use different adapters to spray different patterns such as a round pattern or a flat fan pattern. It can also take an adapter that pours elastomer rather than spraying it.

FITTING THE COMPONENTS:

It is important to remember that the actual output of spray equipment will depend on the sizes of the components, especially the heaters and hoses. And also, that **the system must be balanced.** It does no good to have large proportioning pumps and small heaters, because the heaters cannot heat the volume of fluid that the proportioning pumps are capable of passing through them.

The unit must be balanced so the proportioning pumps feed the proper amount of material to the proper size heaters for heating and then pass it through the proper size heated hose.

OVERALL PROCESSING NOTES:

Since the polyurea spray elastomer system react so quickly and build a high mix viscosity rapidly, proper proportioning and application of polyurea spray elastomer systems depends on a combination of the following 3 parameters:

- Pressure
- Temperature
- Volume material flow

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Equipment Operation:
GETTING STARTED
Start-Up / Shut-Down Procedure

Daily Start-Up:

This daily start-up procedure will describe normal operation and will assume that all calibrations have been properly executed and that the heating system is **NOT** up to the required temperature.

1. Check the condition of the hydraulic and pump lubrication systems and service as required. For the air Marksman unit, insure that the air dryer trap is clean and excess moisture is removed. Service the air oiler system and make sure that it contains sufficient oil. Generally, the lubricating fluids should be changed when the fluid shows signs of color change.

2. Determine that the supply system is at the proper temperature as recommended by the system supplier, that the individual chemicals are properly mixed within their drums, and that the moisture protection system is properly set for operation.

Tip!
Always pre-agitate resin side.

Iso side does not require agitation.

3. Check the inlet screens and service as required.

4. Pressurize the transfer pumps and open both chemical supply valves.

5. Switch ON the main circuit breaker. The white pilot light should be on.

6. Insure that you have material in the hoses and pump system. Switch ON the hose heater circuit breaker and set the temperature controller as required. The amber pilot light should be on as well as the amber controller lights. Insure that you have the proper amps for the hose heat (45 – 49 amps) and adjust accordingly. You will note that the pressure gauges will rise as the material heats up.

7. When the liquid in the hose reaches the temperature, the green controller light will be lit and the ammeter will begin to cycle.

8. Switch ON the primary heater circuit breakers and set the temperature controllers as required. The amber pilot light should be on as well as the amber controller lights.

9. Switch ON the Motor Control and set the hydraulic pressure as required. In the case of the air Marksman, pressurize with the incoming air and set air pressure.

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10. Set the pump switch to the NORMAL position. One of the amber directional indicator lamps will light and the proportioner pumps should move a short distance and pressurize.

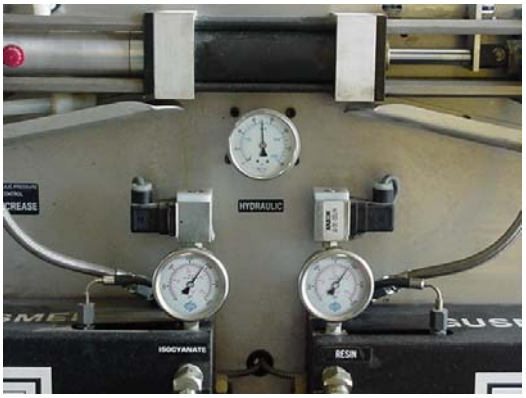
11. Check the pressure of each proportioning pump. After setting the pump switch to NORMAL, observe both pressure gauges. The Resin and Isocyanate pressure should be approximately equal and the pressures MUST remain fixed. Observe the directional indicator lights and manually depress the reversing switch rocker arm, which corresponds to the light that is off. Observe the pressures again; they MUST remain fixed. If the pressure bleeds off on either stroke, consult the Trouble Shooting Procedures before continuing. If pressures not equal, bleed down higher side at coupling block.

12. The Proportioning unit is now ready for operation. Attach spray gun to coupling block, connect air to the gun, open the manual valves (three – four (3-4) full tuns only) and you are ready for test spraying.

Daily Shut-Down:

1. Set the pump switch to the RETRACT position.

2. Trigger the gun off target until the Isocyanate proportioning pump stops in the retracted position and the proportioning pump pressures bleed off to a point where the spray pattern begins to diminish. This should be about 1000 psi. **DO NOT** bleed the pressures to zero! Some pressure is required to keep the packings operating normally and prevent weepage during shutdown. Remember that heated materials contract as they cool down.



Spray Pressures

Next Day Pressure

3. Switch OFF the Motor Control. In the case of the air Marksman, depressurize the incoming air and switch OFF the pump switch.

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4. Switch OFF the hose heater and primary heater circuit breakers.

5. Switch OFF the main circuit breaker.

6. Close both inlet supply valves.

7. Shut down the supply system as required.

8. Shut down and service the gun as stated in the gun service manual.

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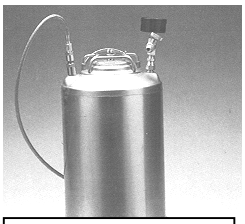
Gun Flushing Procedure:


Gun Service Kit

The Gun Block must be thoroughly flushed with Gun Cleaner before removing the valving rod of mixing components from the Gun Block. In this way, the residual left from the two components of the system will be completely diluted with Gun Cleaner and will not react with one another when the Gun Block components are removed.

This procedure makes use of the optional Gun Service Kit and is the recommended procedure for several reasons:

a) The cleaning is more efficient and uses less Gun Cleaner.
b) The gun does not have to be disassembled.
c) It can be used as a quick and efficient end of day procedure.

1. Set the two-position stop to the service position.

2. CLOSE both manual valves.

3. Remove the gun from the Coupling Block and wipe clean the face of the Coupling Block to prevent material build-up. Attach the gun to the Service Block of the Gun Service Kit and determine that system is pressurized (40 psi minimum).

4. Remove the Iso side screen screw (A-side) from the gun and carefully open the Iso manual valve. Flush solvent through allowing the screen to be flushed off. Reassemble the Iso screen screw and repeat procedure for the Resin screen screw (R-side). This procedure will insure that residual material will be flushed from the gun block side and eliminate any cross-over problems.

5. Open the Isocyanate manual valve and set the two position stop to the open position. Aim the gun into a waste receptacle and trigger the gun to open for approximately 5 seconds or until the Gun Cleaner appears clear. Close the Isocyanate manual valve.

6. Open the Resin manual valve and repeat the above procedure.

7. Open both the Isocyanate and the Resin manual valves, aim the gun into a waste receptacle and trigger the gun to open for approximately 5 seconds and insure that the Gun Cleaner appears clear. Close both manual valves and quickly trigger the gun to relieve the pressure in the Gun Block.

8. Remove the Service Block and continue with disassembly procedure or mount the gun to the Coupling Block as appropriate.

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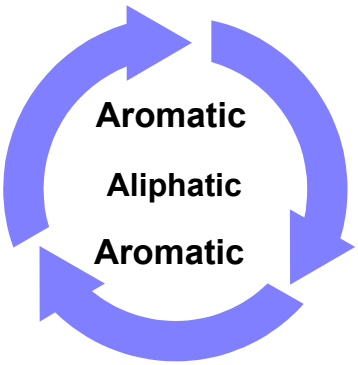

Change Over / Flush Procedure

Aromatic to Aromatic:

⇒ Turn proportioner and air supply off.
⇒ Lift drum pumps out of old system, wiping off as they are lifted out. (See Diagram 1.)
⇒ Set drum pumps into new Aromatic material.

Option 1 - Spray Flush:

- Trigger gun and spray. New material will push old material through system and out.

Option 2 - Pump Out:

- Remove spray gun from end of hose line.
- Turn air and proportioning unit back on.
- Reduce the output pressure of the proportioning unit to lowest setting.
- Attach separator fangs to the gun coupling block at the end of the hose.
- Turn proportioner on and use the proportioning pumps to flush the system out while collecting A & B resins in separate clean pails.
- Use caution when opening block valves, as there will be some pressure.
- Pump out approximately ¾ of a gallon per 50' section of hose per side.
- Reattach the spray gun, return the proportioning unit pressure to normal and spray through for 5 - 10 counts. You will now be into the new system.

⇒ **This same procedure can be used when flushing the machine with solvent.**

DO NOT USE JUST THE DRUM PUMPS TO FLOW MATERIAL THROUGH THE PROPORTIONING UNIT!

Aromatic to Aliphatic *and* Aliphatic to Aromatic:

⇒ Caution : Cross contamination can seriously affect the performance of the Aliphatic system.
⇒ When removing drum pumps from Aromatic material, take care to remove all visible signs of Aromatic material from the drum pumps. Use solvent to help with cleaning of pump before placing into Aliphatic material.

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⇒ Hold-up space in the top of the drum pump must be drained before placing into Aromatic drum. (See Diagram 1.)

Option 1 - Spray Flush:

- Trigger gun and spray. New material will push old material through system and out.
- You may observe some strange elastomeric material being produced when you get to the change-over point. **Keep spraying through it!**

Option 2 - Pump Out:

- Remove spray gun from end of hose line.
- Turn air and proportioning unit back on.
- Reduce the output pressure of the proportioning to the lowest setting.
- Attach separator fangs to the gun coupling block at the end of the hose.
- Turn proportioner on and use the proportioning pumps to flush the system out while collecting A & B resins in separate clean pails.
- Use caution when opening block valves, as there will be some pressure.
- Pump out approximately ¾ of a gallon per 50' section of hose per side.
- Reattach the spray gun, return the proportioning unit pressure to normal and spray through for 5-10 counts. You will now be into the start of the Aliphatic system.

COMPLETELY FLUSH OUT AROMATIC!

To insure that you are completely into the aliphatic system, spray several small samples and compare color. If color continues to change, keep spraying!

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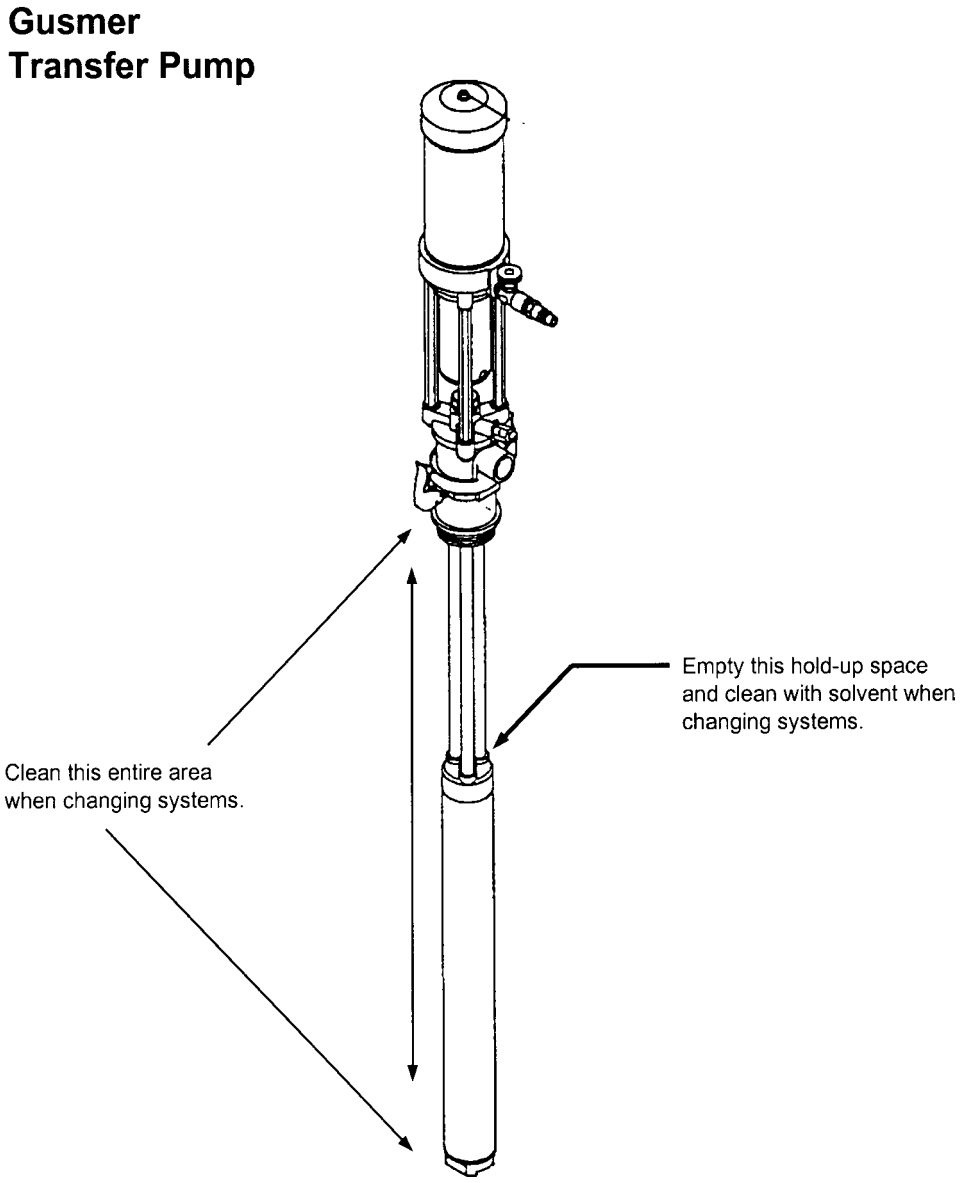
Diagram 1



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EQUIPMENT OPERATION AND TROUBLE SHOOTING

The correct temperature and pressure of the materials contribute significantly to a proper spray pattern. A full spray pattern enables the applicator to make uniform passes of mixed material in uniform overlapping coats.

For a given pressure, materials that are too cold will cause a rather narrow spray pattern, or fingers, which drives into the deposited elastomer and causes dimples, holes, roughness and ridges. The overall effect is a very rough, non-uniform coating surface as well as substandard elastomer physical properties and performance.

To achieve the required performance and operation from the GUSMER spray equipment, you **MUST** be attached to the correct voltage and amperage. For 220 volt, single phase: 100 amps. For 220 volt, three phase: 50 amps.

TEMPERATURE SETTING TOO LOW:

Application will display the following effects from too low a temperature setting.

Problem 1 A stream of material rather than a spray pattern will exit the spray gun.

What to do:

a) To troubleshoot this, increase the temperature as necessary. If the problem is not corrected within a reasonable time, then
b) Troubleshoot the equipment electrically.

Problem 2 The coating is not fully cured or tack free.

What to do:

a) Once again, increase the temperature as necessary. If, within a reasonable amount of time the problem is not corrected, then
b) Troubleshoot the equipment electrically, and if not issue, then
c) Contact system supplier for recommendations.

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TEMPERATURE SETTING TOO HIGH:

If the materials are too hot, the coating deposited will be reacting very fast and causing high exotherm. This could lead to pinholing in the coating, especially over concrete.

Problem 1 The coating surface has a pinhole appearance.

What to do:

a) Reduce the temperature as necessary while still maintaining a full spray pattern. If this does not resolve the problem within a reasonable amount of time, then priming may be required, or
b) Check the substrate moisture content.

INCORRECT OPERATING PRESSURE:

Incorrect pressure will develop incorrect mixing. The equipment will produce the following effects from incorrect operating pressure, whether it is air or hydraulically driven.

Problem 1 Large droplets and a small spray pattern exiting from the spray gun.

What to do:

a) Increase the pressure to the proportioning unit. If that does not correct the problem,
b) Check and repair any pump fault, such as leaking proportioning pumps. If no faults are found, then
c) Check for starvation from the proportioning unit to the material supply.

Problem 2 Coating that is not properly cured or tack free.

What to do:

a) To correct this, increase pressure to the proportioning unit.
b) Check and repair any pump fault, such as leaking proportioning pumps. If no faults are found, then
c) Check for starvation from the proportioning unit to material supply,
d) Contact material supplier for recommendations if no equipment issues are found.

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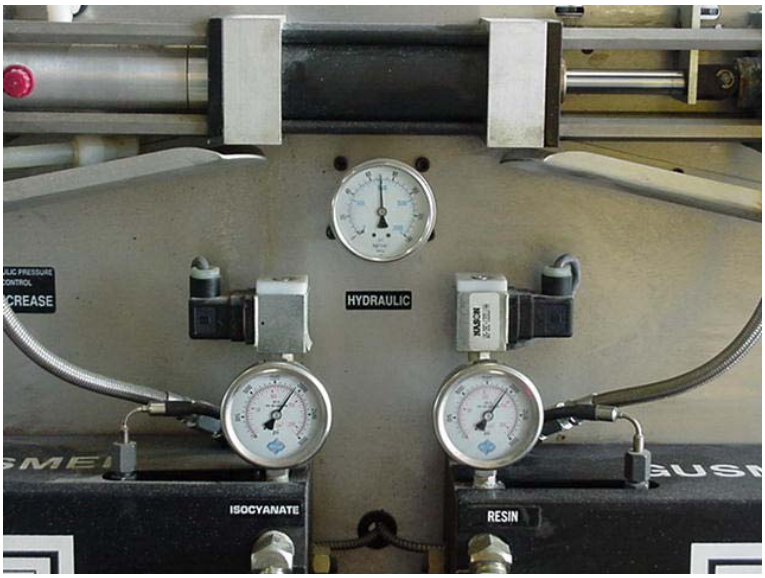
RESTRICTION PROBLEMS

With today's spray elastomer equipment, the applicator will not be able to develop a consistently proper spray pattern through the spray gun if the transfer or proportioning pumps malfunction, or if materials are not supplied to the proportioning pumps on a constant basis.

Ideally, the spray pressures between the ISO and Resin component should be balanced and differ by no more that 10% of the highest pressure. For example, if you are spraying at 2500 psi, the pressure difference between the ISO and Res should be within 200 psi. Ideally, they should be the same.



Balanced Spray Pressures

Short-term blockage of material in the spray gun, or momentary proportioner pump cavitation problems may escape detection by the applicator and will result in poor quality coating in small areas. The applicator will see a short break in the spray pattern and decide that nothing is wrong and will proceed applying polyurea. If constant fluctuations in the spray pattern are observed, or the appearance of the coating being applied is abnormal, application should be **STOPPED** until the cause is determined.

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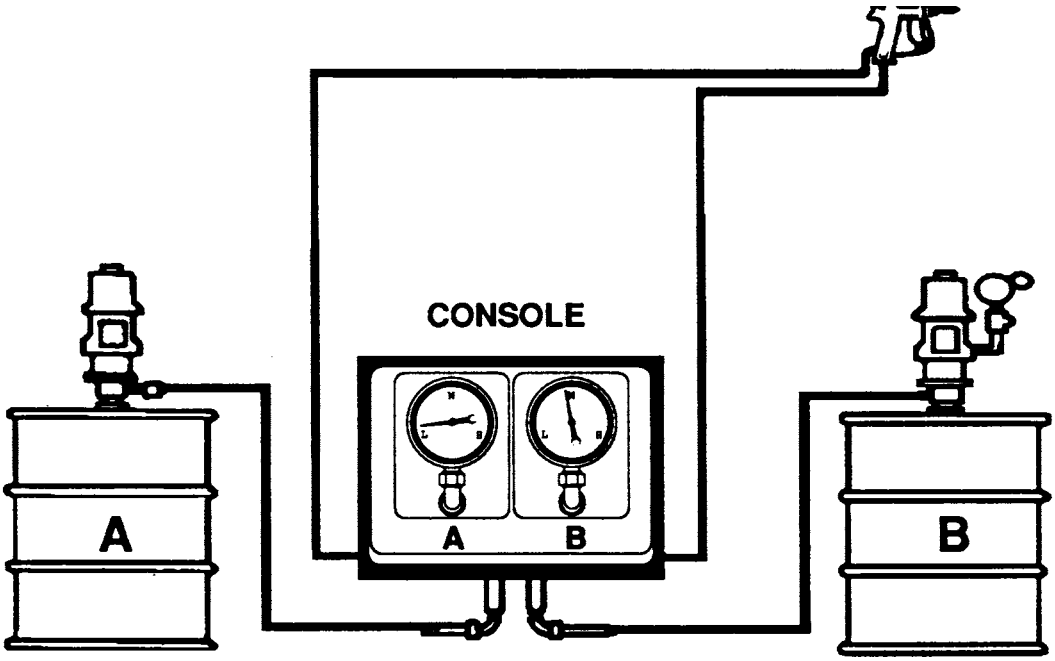
Such problems may be caused by:

Problem 1 **Momentary starvation** of the equipment. The Lacking Material Gauge will show low pressure.



What to do:

a) To correct this problem, check from the proportioning unit to the material supply system.

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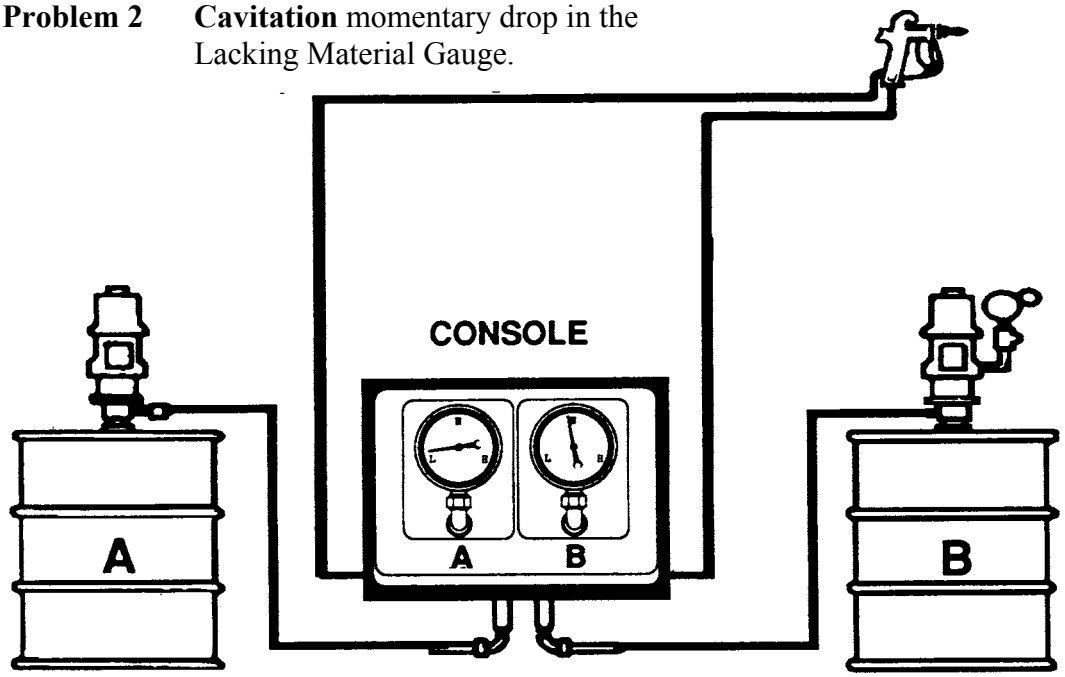
Problem 2 **Cavitation** momentary drop in the Lacking Material Gauge.



What to do:

a) Check from proportioner to material supply system.
b) Check the transfer pump on the lacking material side.
c) Check the proportioning pump on the lacking material side.

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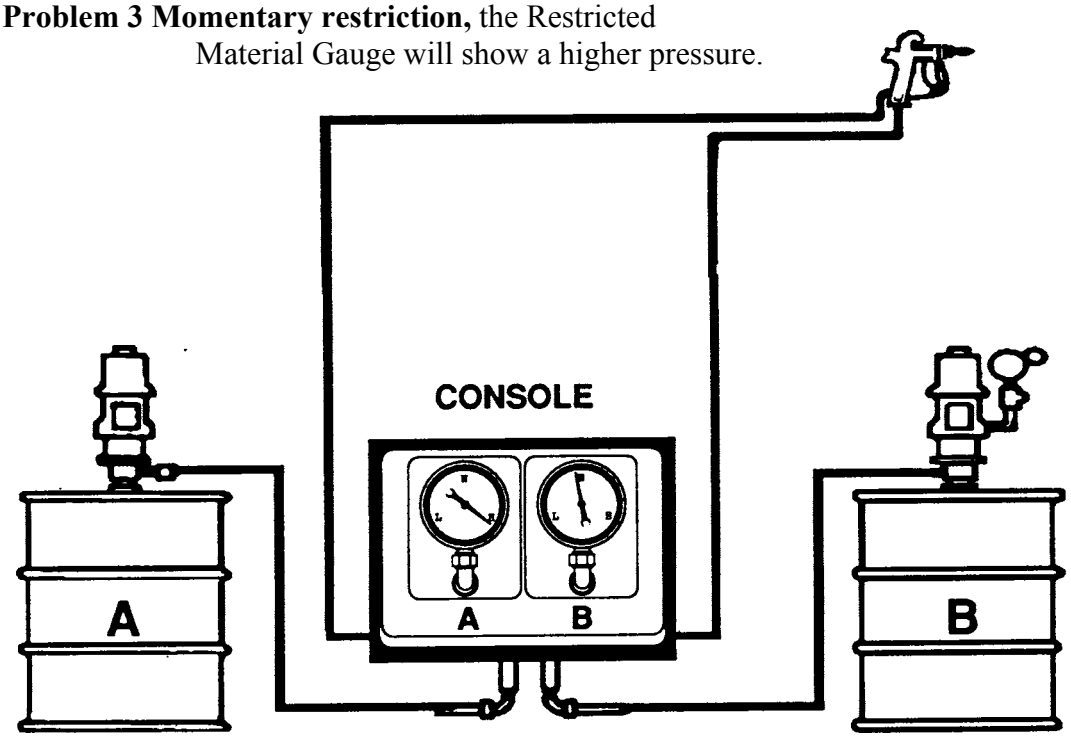
Problem 3 Momentary restriction, the Restricted Material Gauge will show a higher pressure.



What to do:

a) Check between the proportioner and the gun for the restriction.

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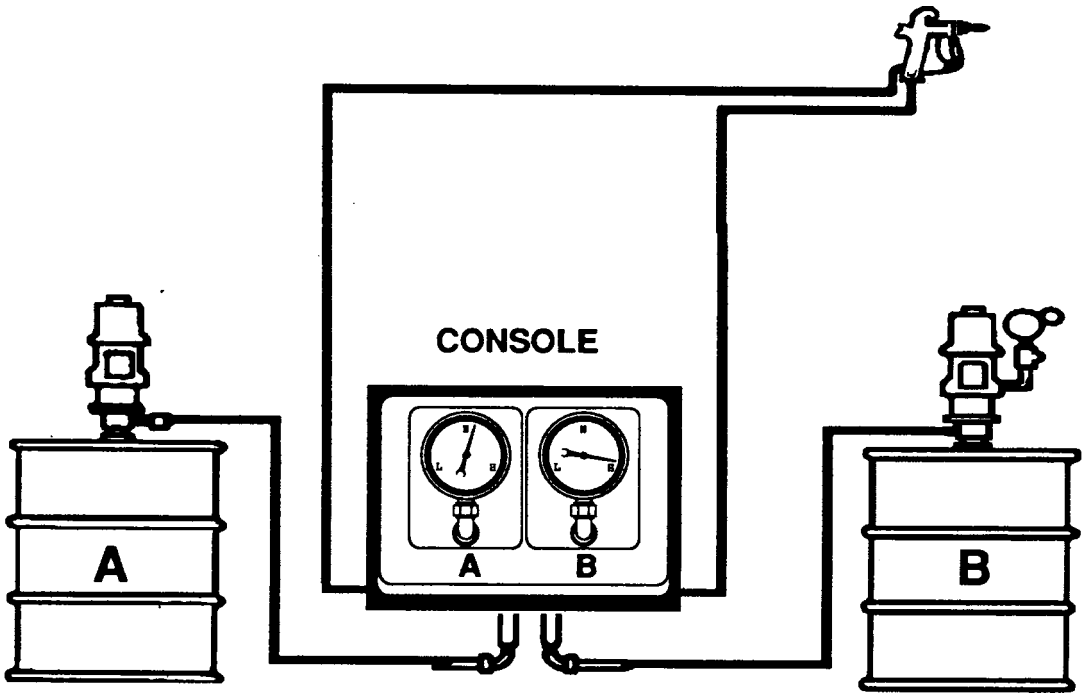
OFF-RATIO PROBLEMS

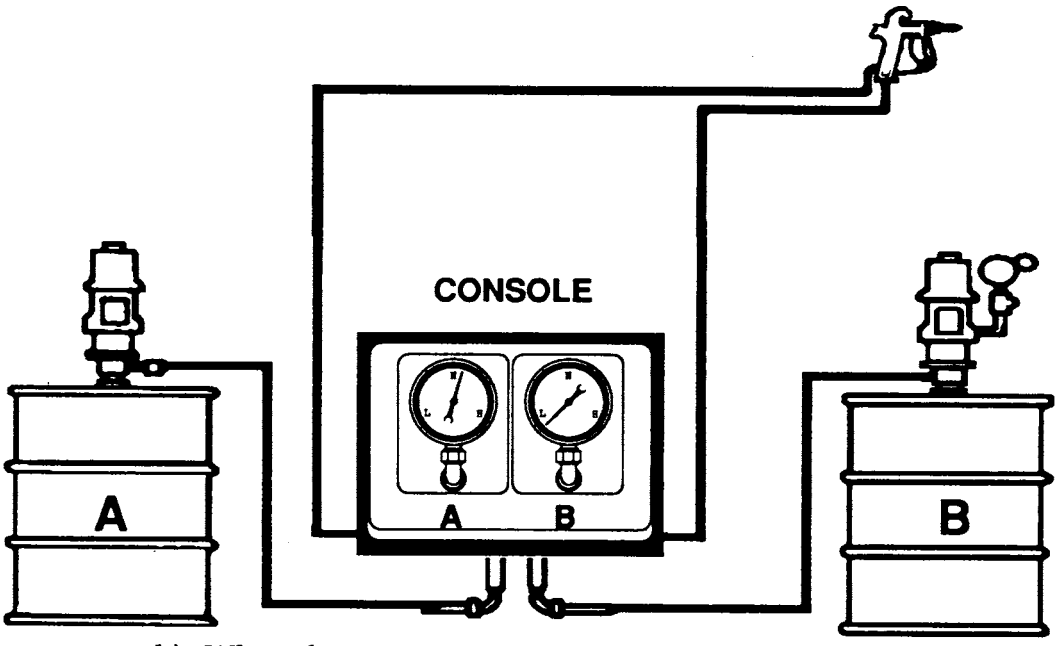
Problem 1 **Excess isocyanate or "A" component.** The effects of polyurea applied which is off ratio or miss-proportioned on the isocyanate side are more difficult to discover unless the condition is extreme. Polyurea applied with slight excesses of isocyanate is not as seriously affected as when there is excess resin, because in the former case the resin is totally reacted. The more extreme condition of excess isocyanate will exhibit one or more of the following effects:

a) Light in color, striations, high surface gloss,
b) Hard surface, less flexible,
c) Firmer at high temperatures,
d) Localized foaming or “ISO Pop” blisters,
e) Higher tensile strength and modulus, lower elongation.

What to do: These effects may be caused by either restriction or starvation.



a) When there is restriction, you will see high pressure on the resin gauge. To correct, check for the restriction between gun and proportioning unit.



b) When there is starvation, you will see low pressure / pulsing on the resin gauge. To correct this, check from the proportioner to the material supply system.

Problem 2 **Excess resin or "B" component.** The effects of polyurea applied that is off-ratio or miss-proportioned on the resin side will be one or more of the following:

a) Dark in color, striations, yellowing rapidly in sunlight,
b) Soft surface, may even be tacky, low gloss,
c) May have uncured or liquid areas under passes,
d) Lower tear strength, cheesy nature,
e) Softer at high temperatures,
f) Lower tensile strength and modulus, higher elongation, higher permeability.

Polyurea applied under these operating conditions will not have normal properties of strength, cure, or performance and may not be suitable for coating.

What to do:
These effects may be caused by either restriction or starvation.

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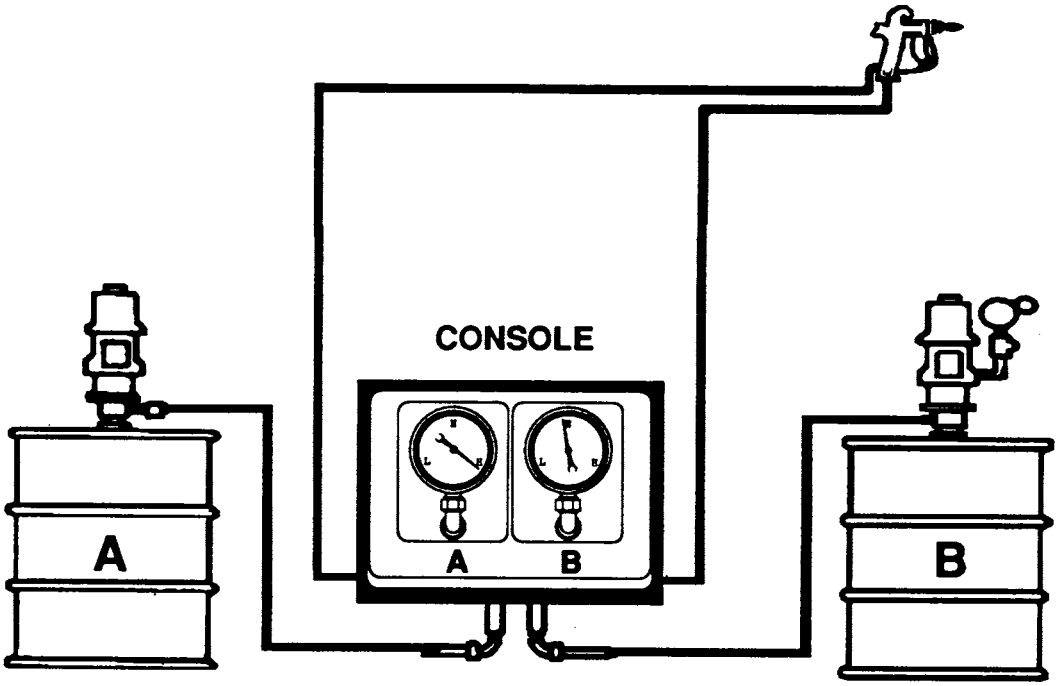

a) When there is restriction, you will see high pressure on the isocyanate gauge. To correct, check between the gun and the proportioning unit.

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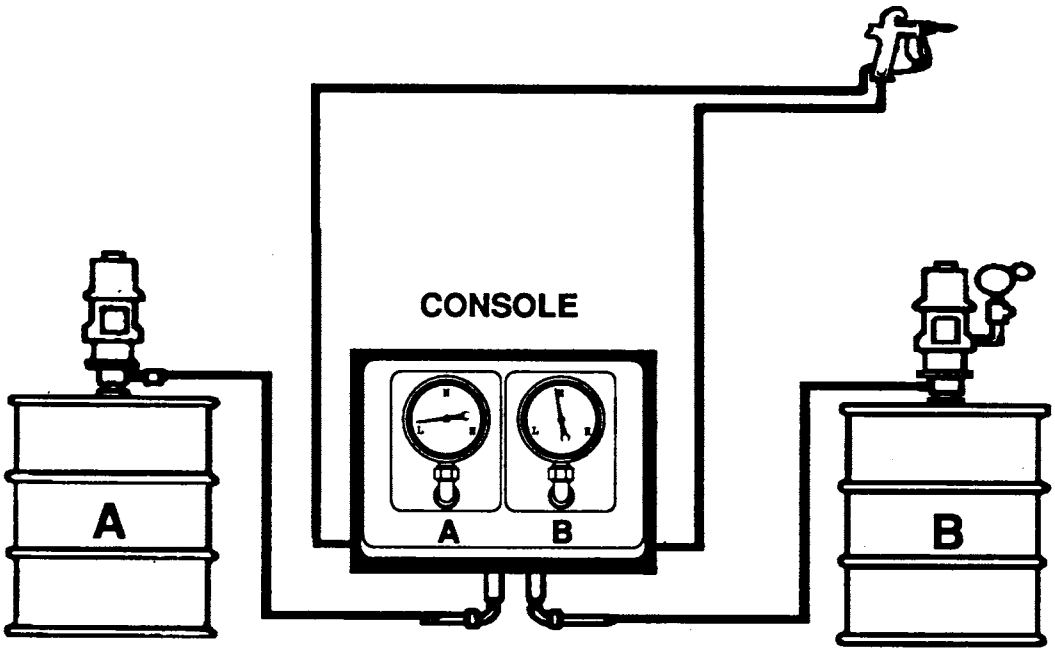

b) When there is starvation, you will see low pressure / pulsing on the isocyanate gauge. To correct, check from the proportioner to the material supply system.

NOTE: Blockage problems of any kind must be handled quickly. If the equipment is starved, it cannot move fluid it does not have. If the equipment is restricted, it cannot move fluid out of the end of the application device. Make sure your spray equipment is fed with the proper amount of material at all times.

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OTHER PROBLEMS

Problem 1 **Aged or Improper Materials, Improper Ambient or Substrate Temperatures.** The effects of using polyurea materials which are aged, beyond shelf life, have been improperly stored, have been improperly formulated, or have moisture contamination are fortunately infrequent. When they do occur, however, the effect is unmistakable. It is unlikely that any good polyurea can be produced, and no equipment adjustments can correct these problems. Any one or more of these effects can occur:

a) Slow cure and tack free,
b) Poor surface texture, soft or tacky,
c) Completely improper color,
d) Blow holes or pinholes from contaminants in system,
e) Improper flow on substrate,
f) Frequent clogging of equipment,
g) Poor spray pattern,
h) Foaming of the coating,
i) Slow curing of the coating / cheesy,
j) Very poor physical properties.

Recommended Equipment

The key to successful application and installation of the polyurea spray elastomer technology is in the application equipment. Due to the characteristics of this fast reacting technology, high pressure / high temperature / high flow / impingement mix equipment is a must. After many years of research and various equipment evaluations, the GUSMER® line of equipment is the optimum choice.

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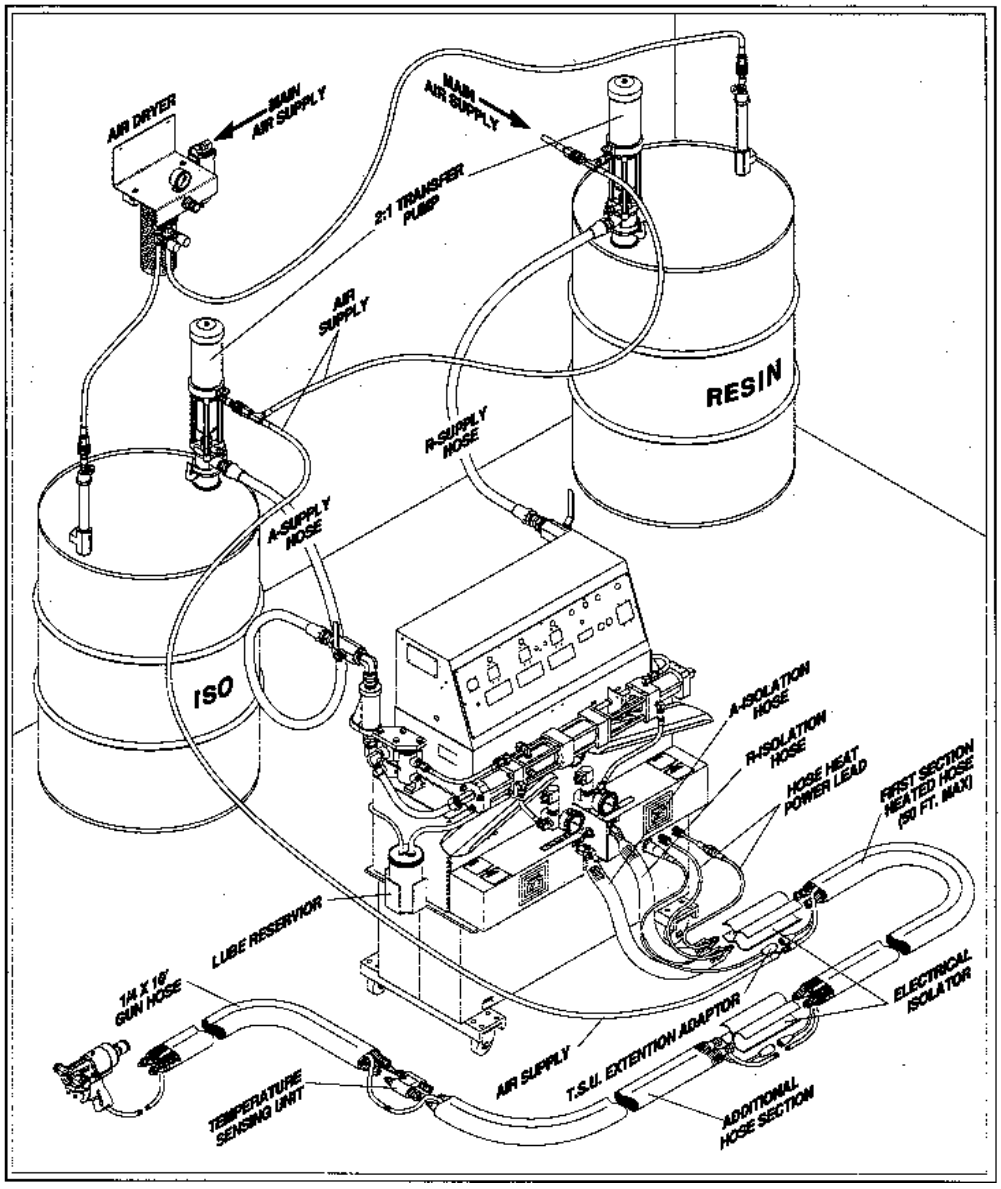
A typical equipment set-up configuration is shown below:



Proportioning Units:

Not all proportioning units will perform the same. There are many that will deliver high pressure, but lack flowability and the necessary processing temperature. The optimum proportioning unit is the hydraulic driven GUSMER H-20/35 series. This machine will deliver product to the spray gun at a constant 2000 to 3000 psi with an output of up to 26 lbs/min., well within the recommended processing conditions for the polyurea spray elastomer systems.

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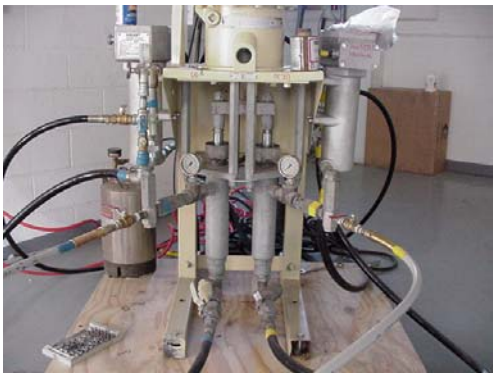
There is also the H-2000 / H-3500 unit, which is basically the predecessor to the H-20/35. This unit does not have the high pressure delivery (1800 to 2100 psi for the H-2000 and up to 3500 psi for the H-3500) but more than makes up for that by having a system output of up to 26 lbs/min. Most of the polyurea spray elastomer development work was performed using this type machine.

There is also the Marksman proportioner, which will deliver material under the same conditions as the H-3500. One drawback to the Marksman unit is that it is primarily offered in an air driven configuration. The consistency of material delivery may become questionable depending on the size of the air compressor used. A minimum of 75 cfm air is required to operate this unit. A hydraulic upgrade package is available for conversion of this unit that will yield a unit that functions as the H-3500.

Both Glas-Craft® and GRACO® are supplying proportioning units for the polyurea elastomer industry. These units have been used very successfully following a complete understanding of system application requirements.

Glas-Craft Unit



GRACO Unit

Spray Guns:

The recommended spray guns for the polyurea spray elastomer application are the GUSMER GX-7 (both standard and 400 series) and the GX-8 spray guns. The spray gun is really the most crucial part of successful application of the polyurea spray elastomer systems. These recommendations are based on numerous years of trial and error to achieve the optimum mix, process-ability and application. The GX-7 spray guns are designed for high volume output applications (8 – 20 lbs/min, 1 – 2.5 gal/min). The GX-8 gun is designed for low volume, detail type applications (0.5 – 1.0 lbs/min).

The following Module / Pattern Control Disk combinations have been found to provide the optimum mix and full spray pattern, and **must be used:**

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GUSMER GX-7 Standard Gun:
Module:
3160-3-125 Iso Ports 4 (0.0225) Res Ports 4 (0.018)
Pattern Control Disk:
16282-70-A or 16282-55-A Round Pattern

GUSMER GX-7 400 Series Spray Gun:
Module:
17190-453 Iso Ports 2 (0.025) Res Ports 2 (0.0225)
Pattern Control Disk:
17292-212 or 17292-210 Fan Pattern

GUSMER GX-7 Direct Impingement Gun:
Module: No. 5
Pattern Control Disk:
16282-212-A (for fan pattern)

It should be noted that this new a GX-7 Direct Impingement re-fit kit for the GX-7 spray gun series. This allows for direct impingement of the Iso and Resin fluid streams in the mixing chamber.

GUSMER GX-8 Spray Gun:
For Round Pattern:
Module:
32170-1-1 Iso Ports 1 (0.013) Res Ports 1 (0.013)
Pattern Control Disk: 32182-020-3 or 32182-024-3

For Fan Pattern:
Module:
32170-2-1 Iso Ports 1 (0.013) Res Ports 1 (0.013)
Pattern Control Disk: 32182-201-3 or 32182-202-3

In addition to the correct mixing Module / PCD combinations, the following is also recommended for improved flow into the mixing chamber of the spray guns:

- **40-mesh** filter screens in the GX-7 spray guns
  Part Number 16130-40
- **60-mesh** filter screens in the GX-8 spray gun
  Part Number 32130-60

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Air Purge Spray Guns:

It should be noted that air purge spray guns are also be used in addition to the more conventional mechanical purge, impingement mix spray guns note above. These are being supplied through Glas-Craft as the Probler gun and GUSMER as the GAP gun. While many of the requirements noted above also hold true for the air purge guns, special consideration must be shown to the mixing modules and required tips. These are noted as follows:

Glas-Craft Probler Spray Gun

Mixing chamber, round pattern:
17637-01 (5 – 9 lbs / min) 17637-02 (10 – 20 lbs/min)

Mixing chamber, flat pattern:
18375-01 (5 – 9 lbs / min) 18375-02 (10 – 20 lbs/min)

GUSMER GAP Spray Gun

Mixing Chamber, round pattern
35160-1-R-01 (5 – 9 lbs / min) 35160-1-R-02 (10 – 20 lbs / min)

Mixing Chamber, flat pattern
35160-1-F-01 (5 – 9 lbs / min) 35160-1-F-02 (10 – 20 lbs / min)

Material Pre-Heaters:

It has been proven that the use in in-line pre-heaters significantly improves the material supply to the proportioning unit thus improving process-ability of the system. This is especially true for applications in cooler climates.

The in-line pre-heater installs on the unit after the material supply lines from the drum pumps, prior to the y-strainers on the proportioning unit (see new machine setup Section IV). The heating occurs as the material passes by a fire-rod heat system similar to that in the primary heaters. By heating the 2-components to about 100°F to 120°F (38°C to 50°C), the material flows very well through the check ball assembly and into the proportioning pumps. Spray pressures will be almost identical using the polyurea spray elastomer systems, provided the spray GUSMER GX-7 or GX-8 spray gun is setup properly (see GX-7 / GX-8 Setup Section).

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Pour / Caulk Equipment:

Currently, there are several variations of pour / caulk machines for the joint sealant products. These included small, gear pump type units (AST) to using the actually proportioning unit for the spray application work. Excellent results can be achieved with double barrel, air driven caulk tubes fitted with a 12 to 14 inch static mix tube.

GUSMER is in process of designing a small, air driven unit that will consistently deliver a fixed ratio of product to the mix gun.

Drum Mixers:

The drum sets of polyurea systems are supplied such that the drum of Resin Blend (B-Component) has a third 2" bung in the center of the lid. This allows for the use of an air powered drum mixer to keep the system agitated and the pigmentation suspended. It also keep the material at a uniform temperature should band heaters be used.

A collapsible, 3 blade mixer is recommended such that the diameter of the mix blades are 1/3 the diameter of the drum or container of the resin blend. At least 2 of the lower blades should be a diameter of 8 inches for use in the standard size drums. Auger type mixers are not acceptable for properly mixing the materials in the drums.

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Another alternative method suggested by some polyurea system manufacturers is the use of a re-circulation loop on the resin supply side. This works provided there is proper dispersion of the pigments in the system. This process allows the drum pump on the resin side to circulate material in the drum. A 3-position valve is used to divert the material flow to the smaller drum bunghole. The valve **must** always be placed in the machine delivery position for spray work. Use of this technique should only be at the recommendation of the system supplier.

NOTE: This technique (drum re-circulation) should **NOT** be used for drums that have sat for extended periods!

OFF RATIO RESULTS SUMMARY

Polyurea can be the most user friendly, forgiving, heated plural component elastomer made. This fact is a 2-edged sword.

Polyurea systems will react and set at even 25% off ratio and may look good, but the following characteristics may be noted:

If the finished product is **ISO (A)** rich, you may observe any or all of the following:

1. Lighter in color or striations (marbling).
2. Harder surface and less flexible.
3. Higher surface gloss (not always a key).
4. Firmer at higher temperatures.
5. ISO pop blisters due to CO2 generation to unreacted isocyanate.
6. Localized foaming in slower systems (pour applications especially).
7. Lab analysis of the elastomer will show higher tensile strength, higher modulus and less elongation.

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If the finished product is **RESIN (B)** rich, you may observe any or all of the following:

1. Darker color or striations; will yellow in areas.
2. Softer surface and more flexible; may feel "tacky".
3. May have uncured or liquid areas beneath the elastomer surface.
4. Lower tear strength; cheesy nature.
5. Lower surface gloss.
6. Softening at higher temperatures.
7. Air or liquid filled blisters between the elastomer and the coated substrate when used in a liquid containment application.
8. Lab analysis of the elastomer will show lower tensile strength, possible higher elongation, lower tear strength, and higher MVT rating.

If polyurea is sprayed **ON RATIO,** but not effectively mixed at the gun due to lack of heat and/or pressure, or improper impingement, it may look good, but some of the above noted characteristics may be observed as well as the following:

1. Elastomer "cheesy" nature, cracks when bent.
2. Blister formation, especially at spray overlap areas.
3. Localized foaming.

Something to Think About:
If you end up with more material left over on one side than the other … something is wrong!

References:

"Introduction to Fundamentals of Spray Polyurethane Foam and Coating Systems", Module 4, Polyurethane Spray Foam Equipment, Spray Polyurethane Foam Alliance, Training Course 101.

"Spray Equipment Introduction Manual", GUSMER Corporation, SPRAY-1, Issue 1, April 21, 1998.

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