

MATERIAL HANDLING & PREPARATION



***MCC* Equipment & Service Center**
Your Sales, Service and Solutions Team

The image shows four men standing behind a piece of industrial equipment. The man on the far left is wearing a grey t-shirt and a red baseball cap. The man next to him is wearing a black polo shirt. The man in the center is wearing a black polo shirt. The man on the far right is wearing a black hoodie. The equipment is a blue and white unit with various gauges and controls. The background is white.

KNOW WHERE TO FIND THE INFORMATION

- **Materials available to you...**
- **Manufactures supply, “Material Safety Data Sheets”, or MSDS**
- **Manufactures “Performance data”, “Specification Sheet”, or “Physical properties”**

TERMS TO KNOW

- **Viscosity:** For a liquid, it is defined as the materials internal resistance to flow.
- The higher or greater the viscosity of a fluid, the more resistance it possesses to movement.
- Typically measured in “Centipoise” (CPS)

VISCOSITY - UNDERSTANDING

- Relationship references –
- Water is “thin” having a **LOW** viscosity index, therefore flow is easier
- Molasses is “thick, having a **HIGH** viscosity index, therefore possessing great resistance to flow.
- High index = thick
- Low index = thin

VISCOSITY - WHY

- **Two important points to understand;**
 - **High viscosity is more difficult to move**
 - **High viscosity products are more difficult to mix together**

VISCOSITY - UNDERSTANDING

- **The viscosity value can be found on material tech data sheets. As documented by a material supplier the viscosities of polyurea products are as follows:**
 - **A side or Isocyanate component:
500 cps @ 77° F, and 100 cps @ 150° F**
 - **B-side or Polyol resin component:
800 cps @ 77° F, and 140 cps @ 150° F**

REFERENCE OF COMMON MATERIALS

Material @ 70° F	Viscosity in Centipoise
• Water	1 cps
• Milk	3 cps
• SAE 10 Motor Oil	85-140 cps
• SAE 20 Motor Oil	140-420 cps
• SAE 30 Motor Oil	420-650 cps
• SAE 40 Motor Oil	650-900 cps
• Castrol Oil	1,000 cps
• Karo Syrup	5,000 cps
• Honey	10,000 cps
• Chocolate Syrup	25,000 cps
• Ketchup	50,000 cps
• Mustard	70,000 cps
• Sour Cream	100,000 cps
• Peanut Butter	250,000 cps

MAINTAINING MATERIAL TEMPERATURE

- **Proper storage of the product is important to prevent damage due to freezing.**
- **Additionally, the following must also be observed when understanding why a material should be at a specific operating temp in the container and process temp.**

MAINTAINING MATERIAL TEMPERATURE CONT.

- **Base temperature is important for multiple reasons:**
 1. To facilitate the ease and ability for the pumps to effectively move the material thru the circuit leading up to the heaters.
 2. Transfer pumps work at optimum
 3. Less fatigue on the proportioning pumps as they meter and pressurize the product
 4. Prevent damage to Pumps and Gun
 5. Eliminate poor quality product

HOW TO MAINTAIN THE PRODUCT

- **Store materials in controlled environments at temperatures dictated by material supplier**
- **When in process – keep production setting warm:**
 - Keep building warm
 - Keep doors on trailer closed when possible
 - The use of the MCC Air curtain
 - Use heaters to warm the surrounding area

HOW TO MAINTAIN THE PRODUCT, CONT

- Use drum heaters
- Band heaters
- Drum blankets
- In plant applications – keep material drums on a skid
- ❖ *Concrete is a heat sink and makes it difficult to maintain warm product in cold climates*

HOW TO MAINTAIN THE PRODUCT, CONT

- Use of Band Heaters or Blankets
 - Note the Band in center of drum, warming during recirculation process.
 - Blankets only maintain the temperature that the heaters create
 - Note drip ring on metal band



PREHEATING THE MATERIAL

- Omit practice of this section with use of #2 foams.
- The recirculation kit allows the material to flow through the heaters back to drums.
- Using the main unit's heaters increases the speed at which you can heat the material to the proper temperature.

RECIRCULATION METHODS

- **Thru at base manifold**
 - Quick recirculation thru primary heaters
- **Recirculation Block**
 - Optimizes complete system and helps pre-heat hose



RECIRCULATION METHODS

- **When using the recirculation kit, it is important to maintain a slow cycle rate of the pumps to slowly move the material through.**
- **Will not labor the pumps harshly while moving the high viscosity cold material**
- **Optimizes the heaters capability**

TYPICAL MAINTENANCE

- **Maintain the hose circuit**
 - **Clean and inspect all electrical connections**
 - **Protect the hose covering and insulation**
 - **Replace loose or damaged scuff guard and Insulation**

PROCESSING TEMPERATURE

- Working from a good base line of material temp will also affect the systems primary heater capability
- Optimizing the heaters Delta
- The **Delta** of a heater is the rating of its performance, the heaters capability to elevate a materials temperature from the input or ambient side through to the output, at a specific flow rate.

UNDERSTANDING DELTA

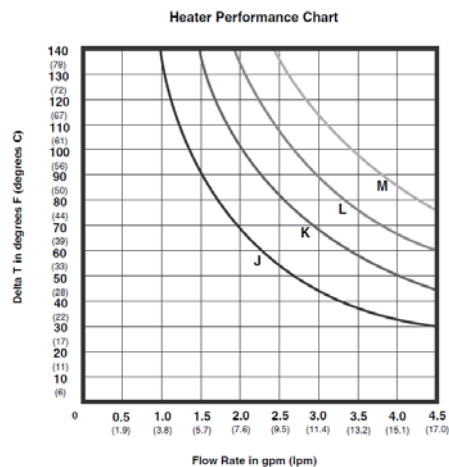
Heaters ratings from equipment manufacturer

Determine base temperature = 70°
 Delta of heater @ output = 90°
 Expected process temp = 160°

Reverse –

Required Material process temp = 160°
 Delta capability of equipment = 90°
 Required base temp = 70°

Your material = 60°
 Actual process temp = 150°



MATERIAL PROCESSING TEMPERATURE

- **The application or process temperature is essential for the following reasons:**
- **Improved flow thru the equipment**
 1. **Balance of pressures, by reducing viscosity and bringing the viscosity differential closer together**
 2. **Ease of the pumps to maintain correct volume displacement**

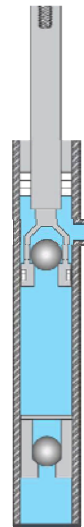
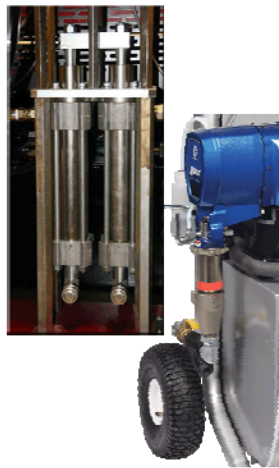
MATERIAL PROCESSING TEMPERATURE

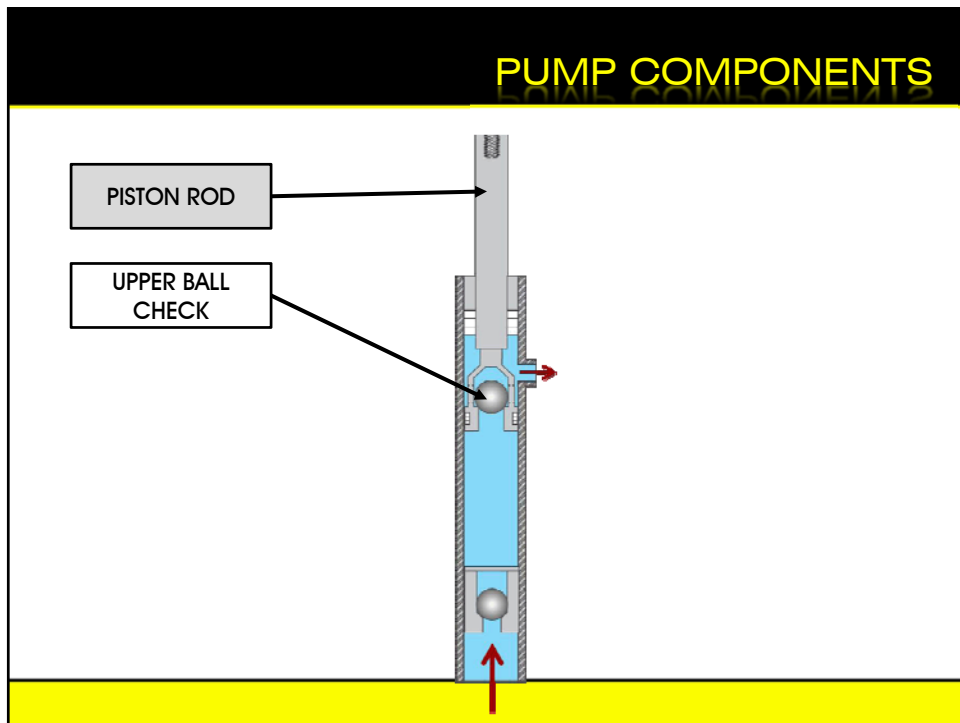
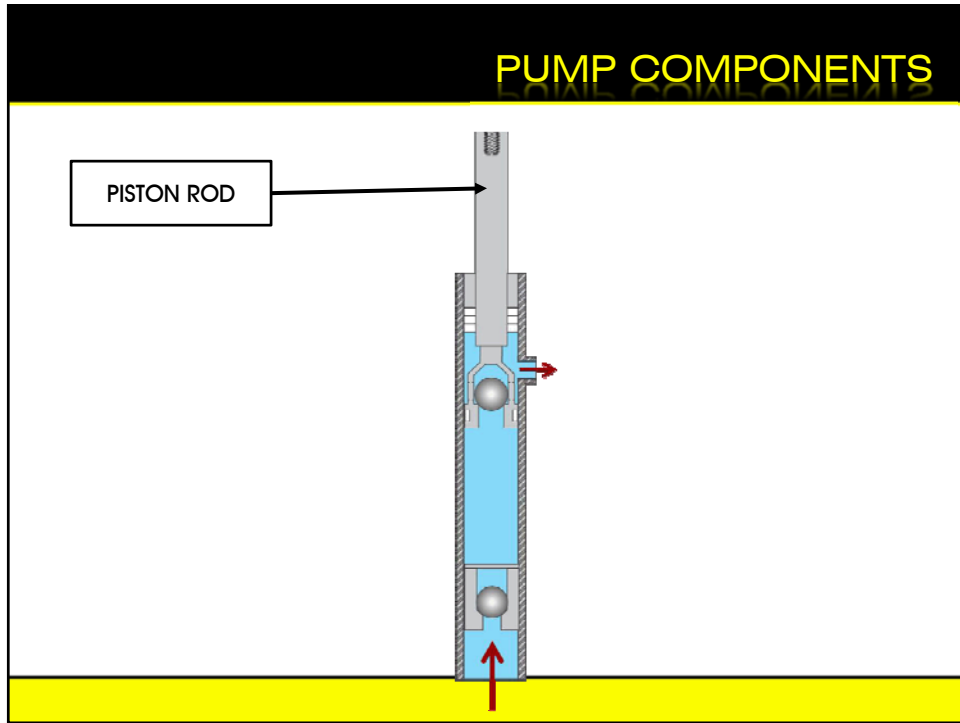
- **Quality mixing of the product**
 1. **Optimizes system functions for efficiency**
 2. **Production of quality product**
 - **Optimum physical properties**
 - **Good yields**

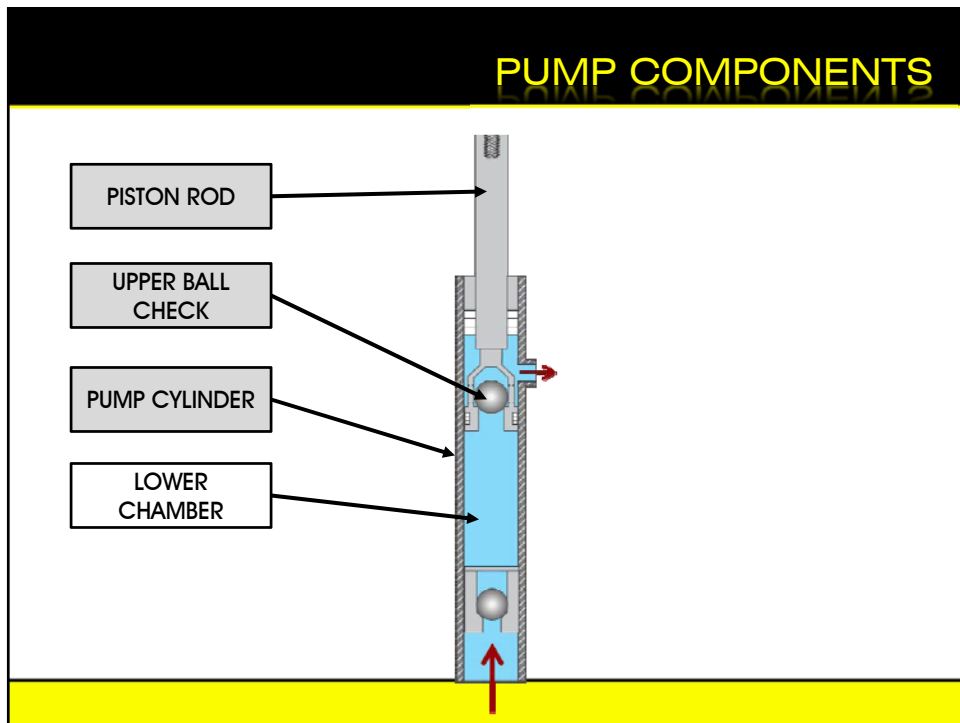
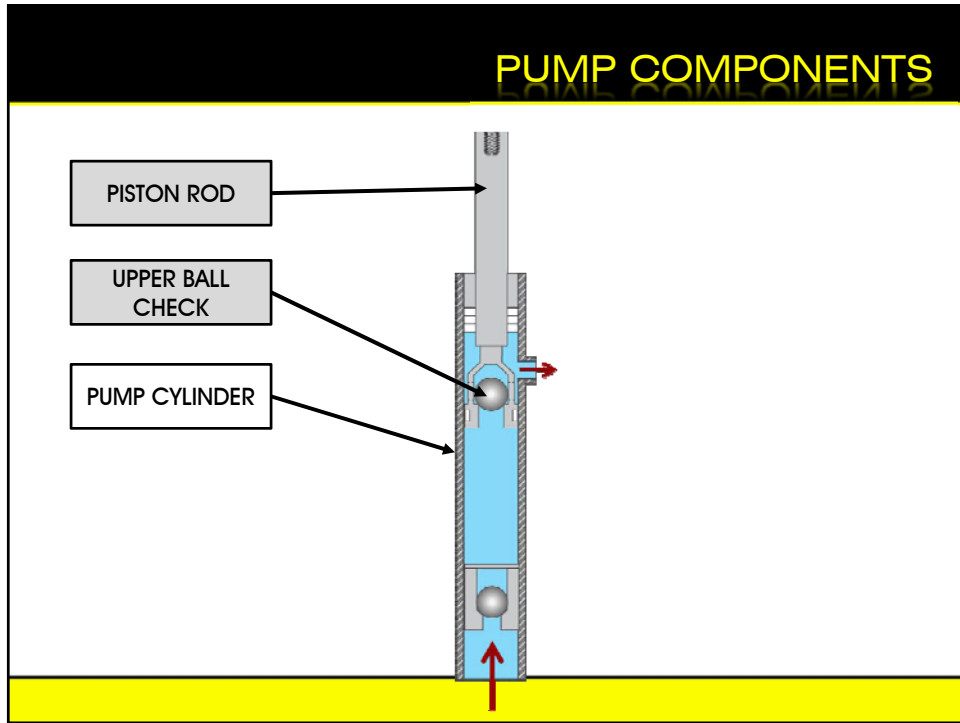
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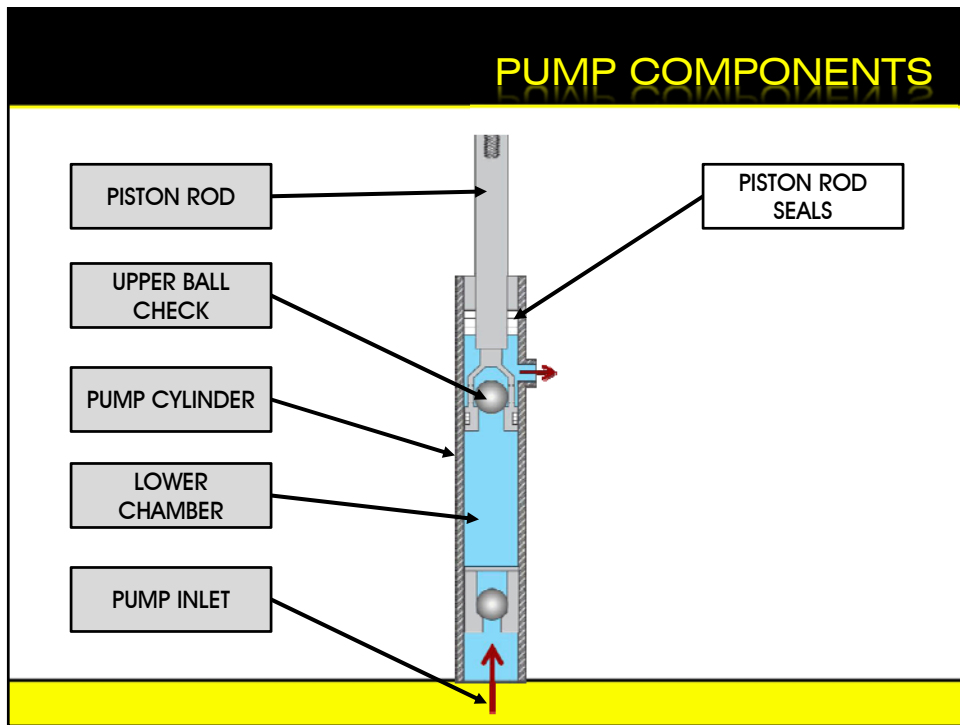
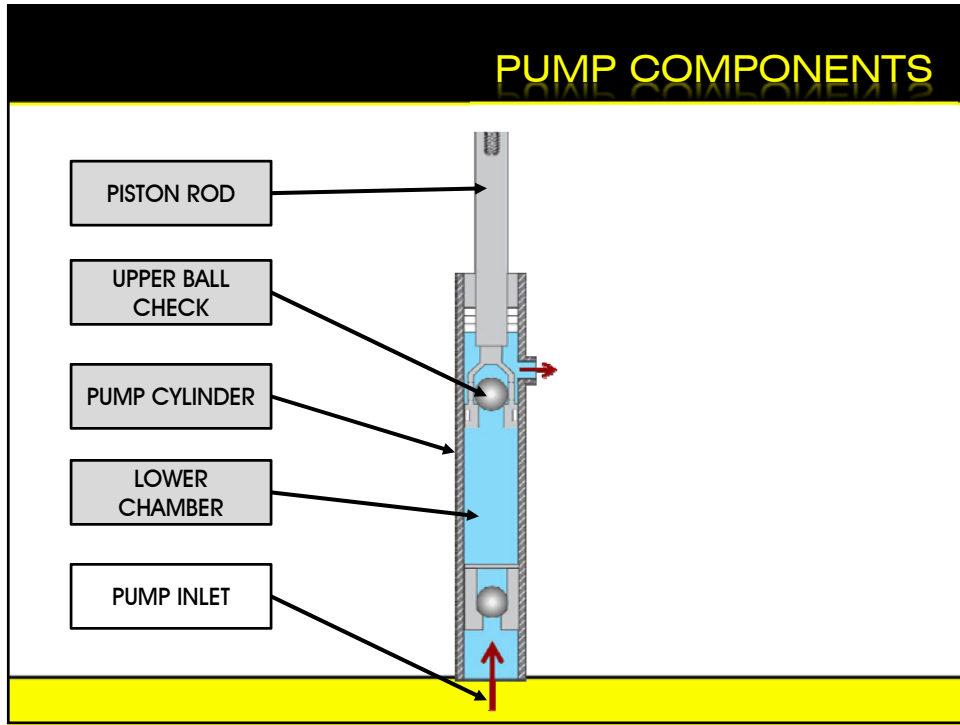
- **Consistent user friendly spray pattern**
 1. Improves quality of application finish
 2. Helps applicator maintain consistent coverage of product on Substrate
 3. Creates repeatable, quality, efficient, economical completed projects

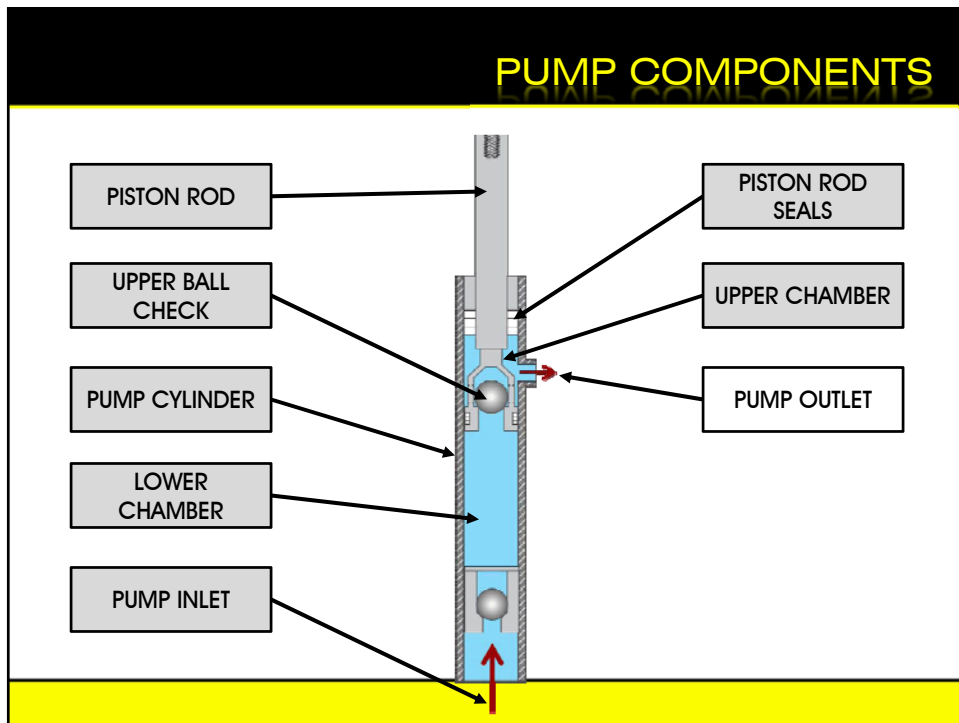
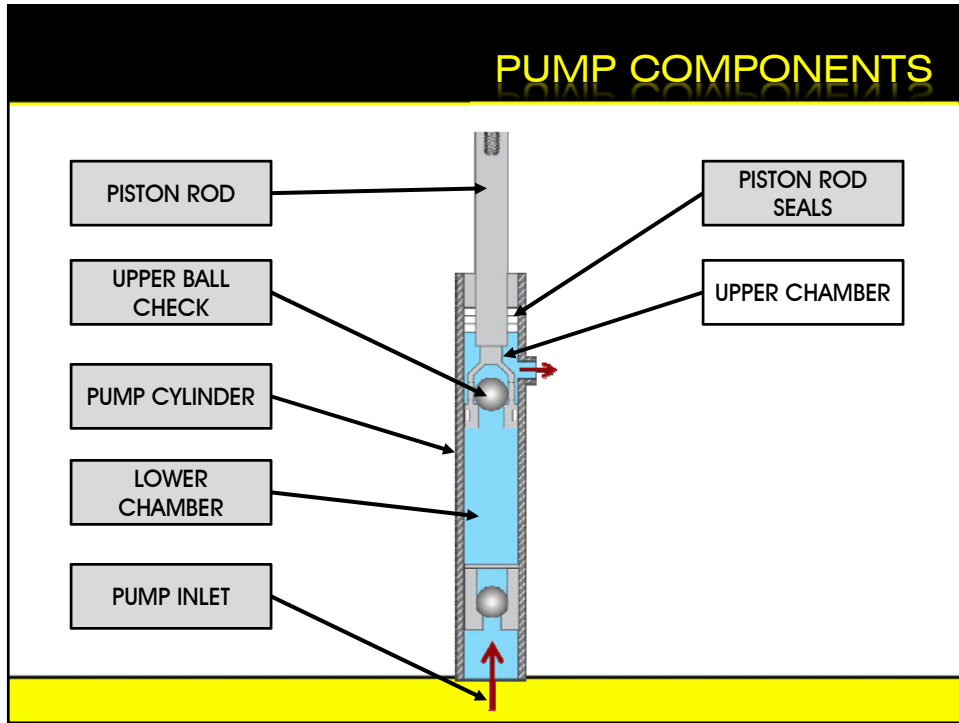
POSITIVE DISPLACEMENT PUMPS

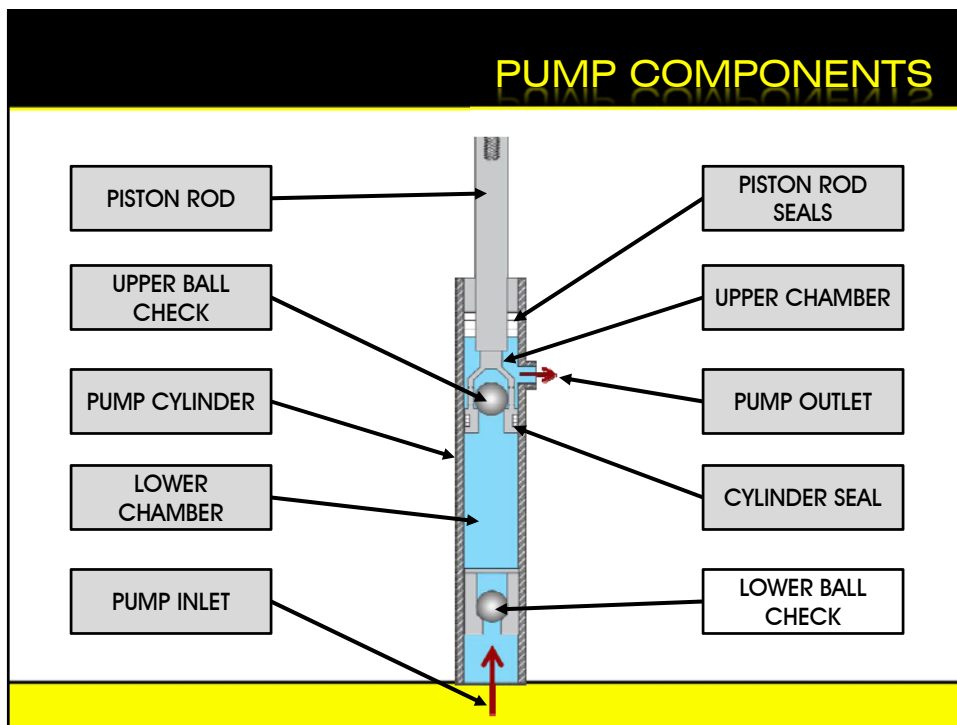
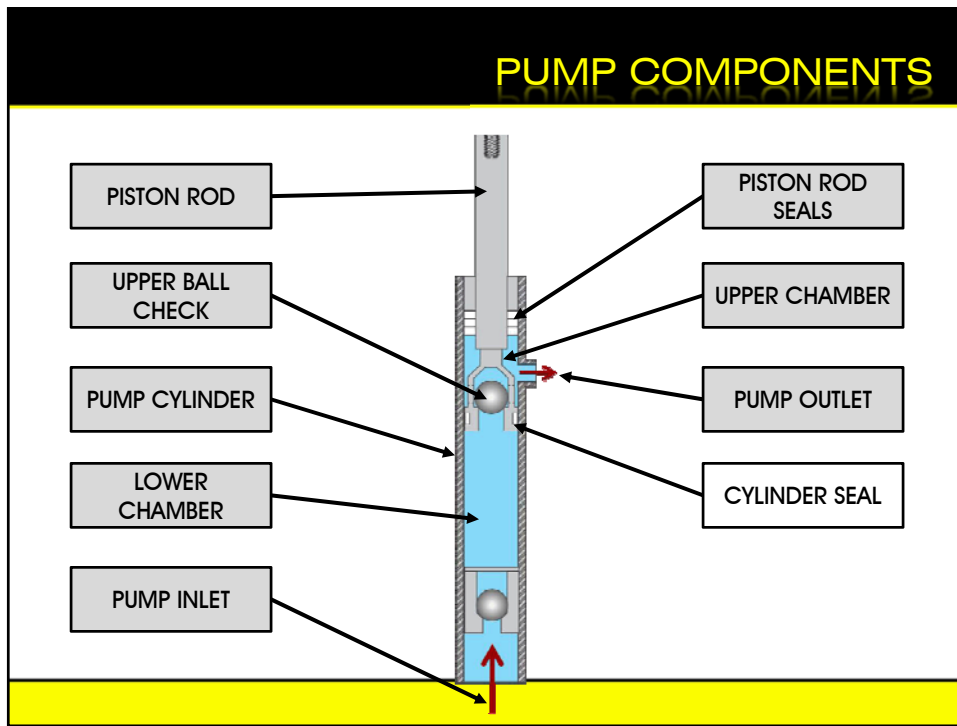


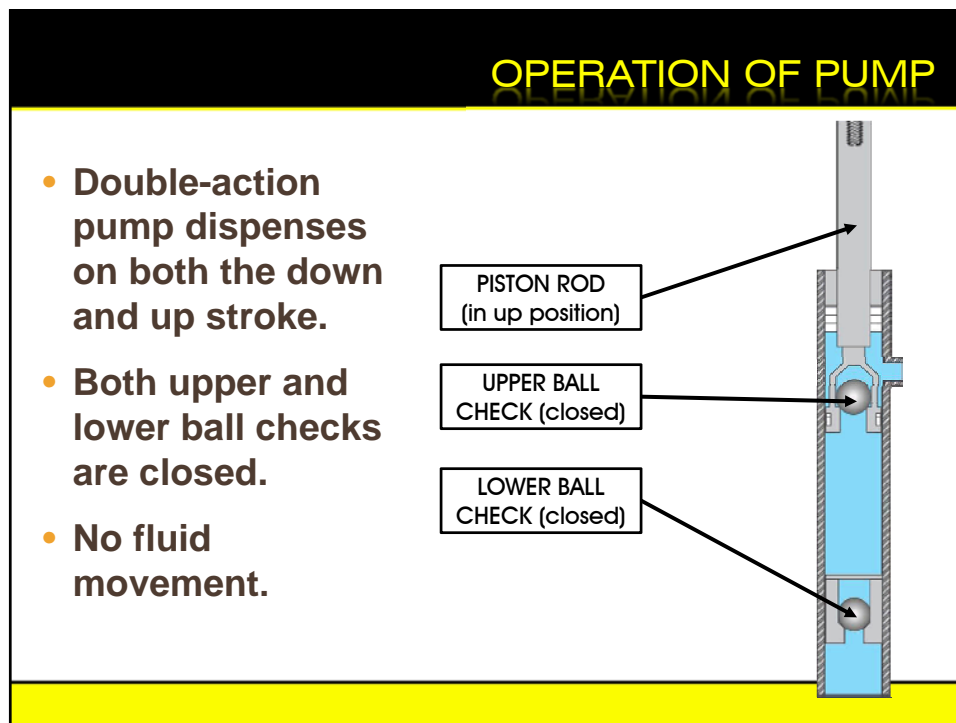
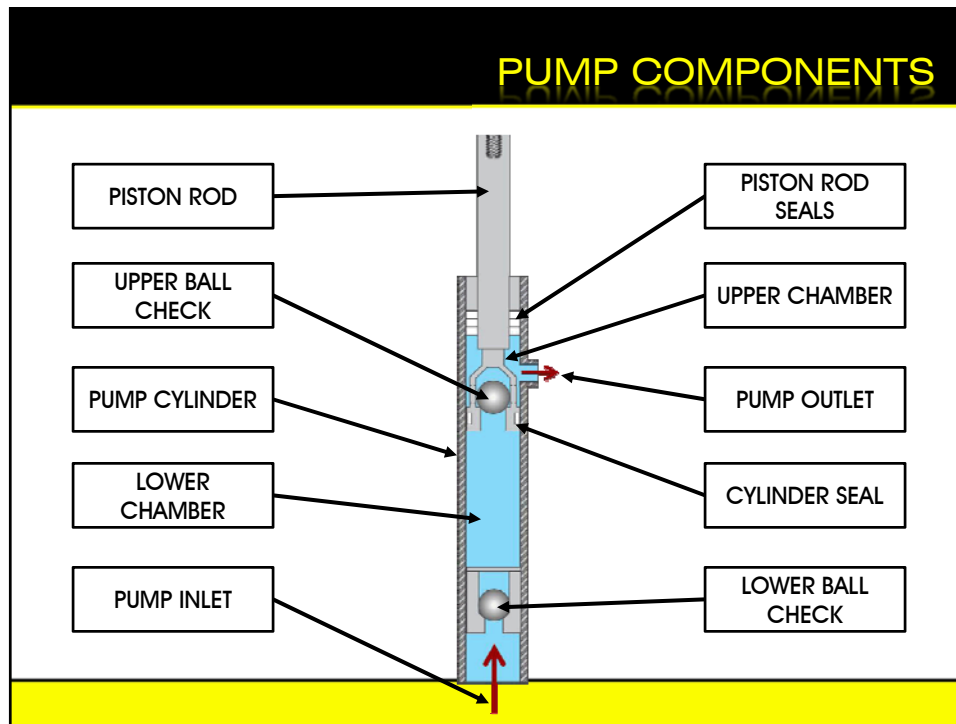












OPERATION OF PUMP

- As piston descends, fluid pressure pushes upper ball check up
- Fluid flows around upper ball check
- Fluid pressure keeps lower ball check down, sealing off pump inlet

PISTON ROD (in up position)

UPPER BALL CHECK (closed)

LOWER BALL CHECK (closed)

PUMP INLET (no fluid enters chamber)

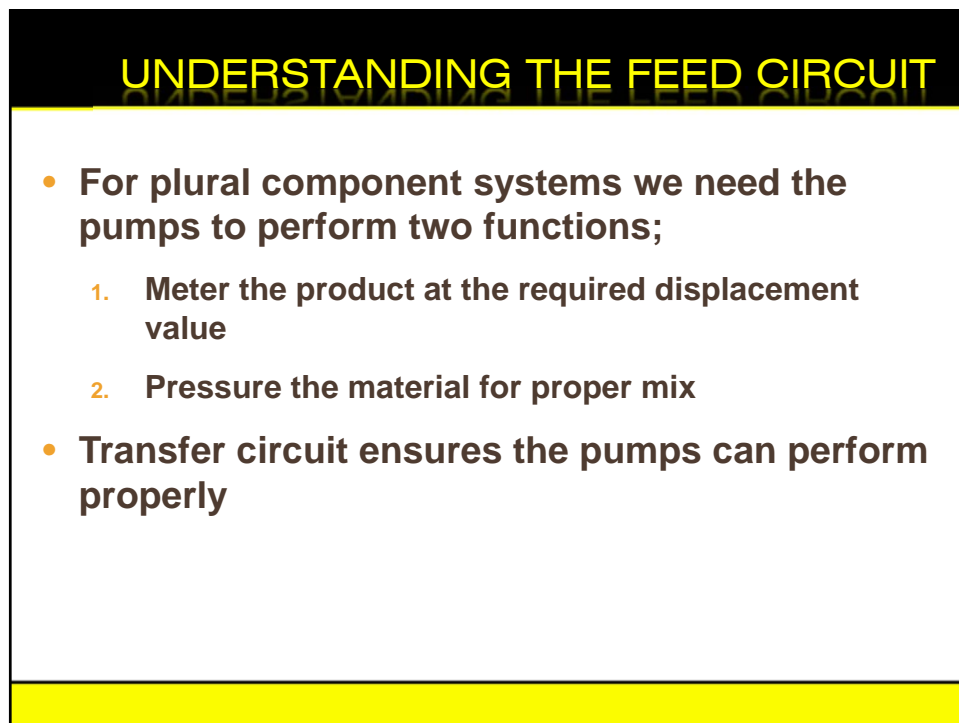
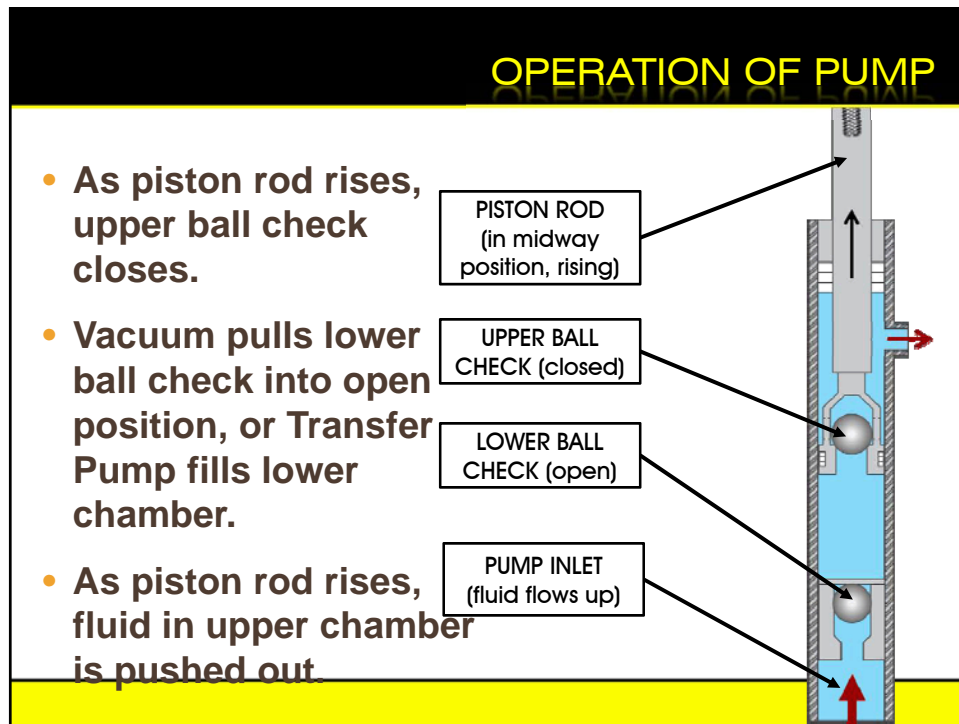
OPERATION OF PUMP

- When piston rod reaches bottom stroke, both ball checks are temporarily in closed position.
- There is no fluid movement.

PISTON ROD (in down position)

UPPER BALL CHECK (closed)

LOWER BALL CHECK (closed)



PROPER FUNCTION OF FEED CIRCUIT

- **2:1 or 2.25:1 Stick pumps most common**
- **Work best for most materials in our markets**
- **Will handle the range of viscosity due to variation of ambient conditions**
- **Run pumps @ 100 psi to ensure crisp, accurate reaction as needed**
- **Avoid use of needle valves or excessive use of quick disconnect fittings**

FEED CIRCUIT CONTINUED

- **Feed lines**
 - **Free flowing, no sharp bends, avoid 90° bends**
 - **Correct size I.D.**
 - **Avoid long runs**
- **Filtration**
 - **Medium to course filtration recommended**
 - **Larger volume – better service life**
 - **House keeping and material turn over will dictate service requirements of filters**

UNDERSTANDING WHAT WE HAVE LEARNED

- **Having learned the following will help us better diagnose field problems**
 - How ambient conditions can affect materials
 - Why we should properly store and maintain the product
 - How the pump works
 - How the feed circuit functions

DIAGNOSING APPLICATION ISSUES

- Establish 2 answers
 - Leads to 1 of 4 places
 - Diagnose, resolve, return to work!
1. What was the predominant material last out of gun to the substrate
 2. What are the gauges reading?

1 OF 4 SECTIONS

- The system can be very easily compartmentalized into 4 sections
 1. ISO FEED CIRCUIT
 2. ISO OUTPUT CIRCUIT
 3. POLY FEED CIRCUIT
 4. POLY OUTPUT CIRCUIT
 - a. FEED = Drum of material, transfer pump, feed hose, filters, in-line valves, main proportioning pump.
 - b. OUTPUT = Outlet of pump, connection tubes, hoses, manifold, heated hose, whip hose, gun block, chamber

DIAGNOSING

- Scenarios
 - Spray application – ISO rich on the substrate, POLY gauge is higher than the ISO gauge
- You stop spraying because...
 - You *FELT* the system surge thru the hose
 - You *SAW* the spray pattern “wink”
 - Did you *HEAR* the pumps misfire

ISO RICH – ISO GAUGE LOW

- **Indicates restriction on the POLY output circuit**
 - Start with the mixing chamber, clean side port as required
 - Clean and inspect side block seal, check valve, filter, etc.

DIAGNOSING – SCENARIOS CONT'D

- **Spray application – POLY rich on substrate, ISO gauge is lower than the POLY gauge**

DIAGNOSING – SCENARIOS CONT'D

- **Spray application – POLY rich on substrate, ISO gauge is lower than the POLY gauge**
- **Indicates a malfunction on the ISO input circuit**
 - **Misfire of transfer pump**
 - **correct air pressure and CFM**
 - **Filter plugged**
 - **Feed line kinked or plugged**
 - **Loss of PSI in main pump**

DIAGNOSING – SCENARIOS CONT'D

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USE YOUR SENSES

- Keep a clean orderly work environment
- Practice good house keeping
- When spraying...
 - You should *FEEL* the system thru the hose
 - You should *SEE* the spray pattern
 - You should *HEAR* the pumps

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