

## Technically Advanced Meter Mix Dispense System

**Servo-Flo 105:** The system's main features are its dual electric drive sources, pressure monitoring and intelligent controls. With this system each material is controlled independently and meaningful process data can be obtained. The goal behind the design is to control and monitor the entire dispense process allowing the process to be defined, measured and verified. With established known imputes, variables can be introduced, evaluated and its process impact understood.

**Dispense System Operation:** When acted on by the servo motors, two independent rods are forced into metering chambers displacing their respective volumes. Displaced materials exit the metering cylinders through the on/off valve and static mixer. The volume displaced is controlled by the distance the motor pushes the rod into the chamber and the rate at which they are moved equates to the flow rate.

**Two fluids of equal viscosity and density being acted upon equally will move in unison:** Two component fluids can be of different viscosities and densities and all fluids are compressible at different rates. When acted upon, compression needs to be considered as the fluids will potentially move at different rates when metering forces are applied resulting in the movement of one fluid before the other. (To minimize this phenomena the metering system must be designed with as little fluid as possible being acted upon by the metering rods.) By the use of independent drive sources each material can be acted upon separately to achieve the desired results of simultaneous fluid movement. When dispensing begins, each material will resist flowing and generate measurable pressure as it exits the system. These pressures are monitored by the pressure transducers in the fluid circuit. It is expected that each fluid will generate a different pressure, and this pressure requirement will command the force developed by the drive motors. Once understood a normal pressure condition can be established and any deviation outside the set parameters will initiate a fault.

### **Variable Ratio Dual Drive:**

From a quality control stand point, materials can be dispensed on ratio producing physical examples of what is correct. Samples can also be produced with variances' in the ratio to understand what changes in the physical properties of the end product occur when the chemistry of the adhesive is altered. This ability allows the manufacturer to establish quantifiable parameters for production norms.

Another advantage of the variable ratio feature is that a host of materials can be quickly evaluated affording the manufacturer the option to change formulations without physical changes to the dispensing system. With independent drives, real time ratio can be monitored and assured each time an assembly is being produced.

### **Independent Pressure Monitoring:**

Pressure monitoring and control are key component in a quality assured dispense system. By monitoring pressures, quality is assured. Materials are fed to the metering system from the supply source either by the force of gravity or an ancillary device such as a pressure tank or pump. Each of these conditions generates a measurable force or pressure. This is necessary for movement of the fluids. Movement of fluid is required to recharge the metering system and its pressure must be known. To illustrate the importance if we assume that a cylinder requires 5 cc of material and the pressure generated during the dispense cycle is 25 psi,

it is ideal to reload the cylinder to 25 psi.

If the reload pressure is 15 psi, the fluid will delay movement out of the cylinder until it reaches 25 psi, enough force to overcome the resistance to flow under dispense conditions. This can result in one material exiting the system before the other resulting in an off ratio condition and a wet spot in the mix due to lack of enough material in one cylinder at enough pressure to overcome compression compared to the movement of the other fluid. Conversely, over charging a cylinder will result in the same off ratio/wet spot condition. This occurs when excess force is applied to a fluid in a contained area and the contained area is opened during the dispense cycle. Over pressurized material will leave the cylinder as a natural reaction to equalize pressure with atmospheric pressure and this movement is equal to the excess pressure present. Simply put 10 cc of material can be put into an area designed to hold 5 cc if enough pressure is applied. The resulting surge becomes part of the metering without the benefit of a controlled mechanical movement. It is important to match the reload pressure to the dispense pressure. Pressure transducers provide a means of understanding the forces present and when electronically tied into precise motion control, systems can then be stabilized to optimum performance parameters.

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Servo-Flo 105 MMD System

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## Independent Pressure Monitoring (continued):

The pressure monitors will also act as a check that the supply sources are functioning correctly. If the supply system were to run out of material or the transfer equipment malfunction, the pressure transducers would detect a low pressure condition during the reload cycle and inhibit the system from dispensing.

Pressure monitoring is useful in the detection of the static mixer gelling. If the material begins to gel in the mixer, the viscosity of the material in the mixer will increase causing increased pressure in the metering system during the dispense cycle. If the material reaches the high limit of the preset high pressure setting, a fault will occur inhibiting the dispense cycle.

## Independent Pressure Monitoring Coupled with Dual Electric Drive:

When dual electric drives are tied together with independent pressure transducers control of the metering process is achieved. When the system calls for material from the supply source the incoming pressure is irrelevant.

Due to differences in material viscosities, vastly different pressures may be required to move the materials from its supply source to the metering system. This viscosity can be affected by temperature as well as differences in lot numbers from the material supplier.

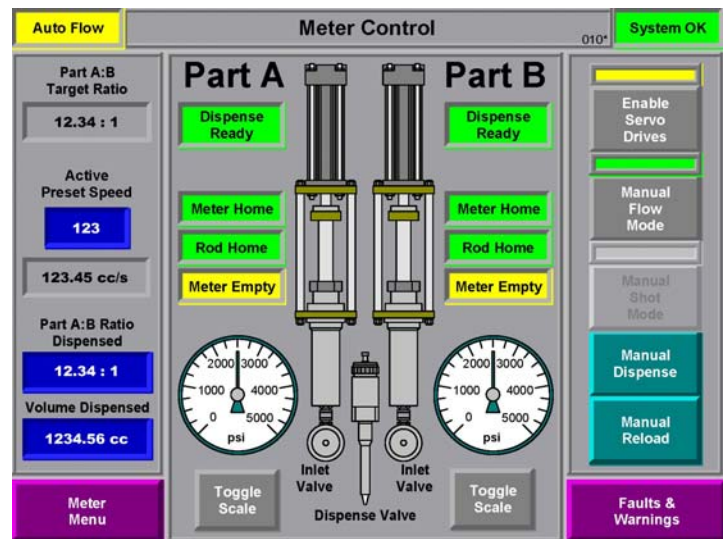
Assuming the optimum dispense pressure is 25 psi and the A side material supply is 5psi and the B side material supply is 250psi., the pressure transducers will read this incoming data and send commands to the independent servo motors to compensate. The A side motor will advance the metering rod into the chamber adding pressure until it reaches the desired 25psi. The B side motor will withdraw the metering rod from the chamber thus depressurizing the fluid until it is reduced to 25psi., at that time the system will be give the o.k. to dispense command.

The system can also run a diagnostic function to ensure integrity of the fluid control valves as well as the rod seals by inducing a high pressure condition and holding this condition for a set period of time. If during the hold time a pressure loss is noted it would indicate maintenance is required to a component.

## Meaningful Data Collection:

Through the controls architecture, meaningful data can be collected about the dispense process in real time. This feature is ideal for use by a quality control department and includes:

- \*Volume of A material dispensed
- \*Volume of B material dispensed
- \*Volume of A and B dispensed compared to the requested volume
- \*Volume of adhesive dispensed per cycle
- \*Volume trend charting
- \*Ratio of A and B materials
- \*Ratio trend charting
- \*Ratio dispensed last cycle
- \*Flow rate
- \*Dispense pressure limits high/low
- \*Reload pressure limits high/low
- \*Reload complete A/B material
- \*A material pressure trend charting
- \*B material pressure trend charting
- \*High pressure A/B Materials
- \*Low pressure A/B materials
- \*Peak servo motor currents plus/minus
- \*Real time servo motor currents
- \*Servo motor current trends A/B charting
- \*Pre-pressure/De-pressure
- \*Faults: E-stop, Purge, High volume dispensed, Low volume dispensed, High/Low ratio, Device net, Pressure limit, Speed, Math, Purge, Pre-pressure, De-pressure.



Operator Interface Screen Example: Meter Control

**For more Product Information on Servo-Flo 105**  
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