

# ***SELECTING THE RIGHT DISPENSING EQUIPMENT FOR YOUR APPLICATIONS***

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Fluid dispensing has come a long way. In the early days, the only dispensing option is to use a plunger to manually push fluid out from a syringe. With the rapid advancement of technology, today there are various dispensing techniques available and within each technique there are quite a few types of dispensing equipment options. They range from simple manual dispensing device to sophisticated positive displacement pump. Facing with too many choices to choose from, selecting the right dispensing equipment can be a daunting task if you are not familiar with the dispensing technology. The following information will assist you selecting the right dispensing equipment for your applications.

## **Manual Syringe System**

The rudimentary way to dispense fluid is through manual dispense process. A typical manual system includes a plunger with piston and a syringe filled with fluid. The operator just simply pushes the plunger down until enough fluid is dispensed on the work piece. Repeatability rate is depends entirely on how consistent the operator can repeat the process. This method is suitable for low volume applications where product yields below 80% are acceptable.

## **Time/Pressure Dispensing (TPD)**

The next step up in process improvement is the Time/Pressure dispensing (TPD) technique. As the name indicates, this technique utilizes air pressure couple with a control timing circuit to help increase product throughput and yields. Because of the simplicity and decent repeatability rate, over 60% dispensing applications is done by this technique. OK International offers a complete range of TPD equipment and accessories that includes: syringes, needles, receiver heads, pressure containers, valves and controllers.

## **Time/Pressure Syringe System**

The basic system TPD syringe system, shows in figure 1.0, starts with a dispenser, air power syringe and receiver head assembly.

The syringe, filled with fluid to be dispensed, is connected to the time/pressure dispenser via the receiver head assembly.

Appropriate air pressure and dispense time is then set according on the dispenser.

After the setup is done, the operator can activate the dispense cycle by simply pressing the foot switch or finger switch.

During operation, the dispenser delivers a measured amount of air pressure for a pre-set dispense time to a syringe. The

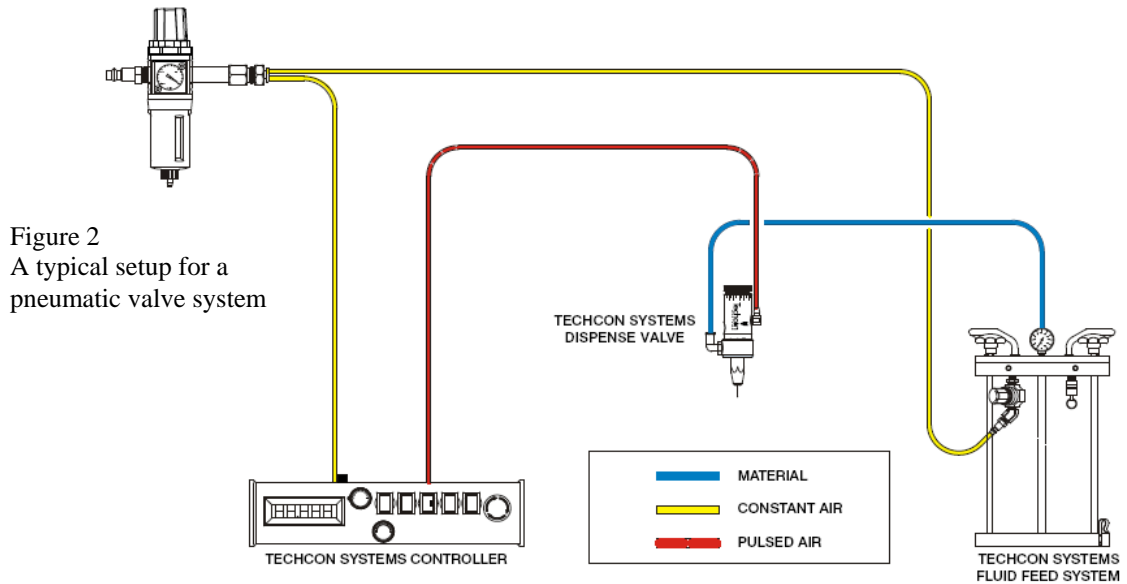
controlled shot of air forces the fluid out of the syringe, through the dispensing needle and onto the work surface. The DX series dispenser from OK International has been



Figure 1.  
A precision dispenser that features a digital timer to dispense small dot of fluid accurately from a syringe

widely used in most bench top applications because it has proven to be the most accurate and repeatable in the market. Typical applications include: to dispense solder paste on PCB for rework applications or to dispense all types of adhesive to bond parts together.

The disadvantage of the syringe system is that it depends on too many variables to maintain good repeatability rate for the entire dispensing process. One of the variables is the internal diameter of the syringe. If the internal diameter of the syringe is tapered too much then the shot size will decrease as the fluid travels down toward the bottom. To address this problem, OK International offers various series of TPD valve systems. A typical TPD valve system includes a pneumatic valve, a controller and a pressure reservoir, show in figure 2.



### Pinch Tube Valve

The simplest and most inexpensive TPD valve is the disposable pinch tube valve, shows in figure 3. It is designed to dispense small dots or continuous beads of low viscosity fluid. This air-actuated valve is operated by automatically opening and closing (pinching) a molded plastic tube assembly. The only part of the valve making contact with the fluid is the disposable pinch tube assembly. This unique feature making the valve perfectly suited for applications that use quick curing adhesives or highly aggressive fluids that might damage the valve body. This valve is commonly used to dispense Cyanoacrylate (CA) for general bonding applications, or dispense two-component epoxies for potting applications.

Benefits include disposable path, light weight, compact size and simple operation.



Figure 3  
Pinch Tube Valve

## Diaphragm Valve

One drawback of the pinch valve is that some applications might require frequent pinch tube replacement. In such cases, the Diaphragm valve, shown in figure 4.0, is a perfect replacement. Due to the resilient of the diaphragm material, it can last for millions of cycles before needing replacement. This pneumatic valve uses a diaphragm to open and close the fluid path. During the dispense cycle, the air pressure signal forces the diaphragm to pull back creating an opening for the fluid to flow through. When the air signal stops, the internal spring pushes the diaphragm down to the closed position. The unique component of this valve is the diaphragm. It is a solid barrier made from Ultra High Molecular Weight Polyethylene (UHMWPE) to prevent moisture from the air cylinder from coming into contact with the fluid. This attribute makes the valve an excellent choice to dispense moisture sensitive fluid such as Cyanoacrylate. Other attributes that make this valve widely acceptable in the industry are: compact size/light weight, simple and low maintenance, adjustable stroke control that can produce shot size as small as 0.002 CC. Virtually any low to medium viscosity fluid can be dispensed using one of the diaphragm valve variations. Applications of this valve are ranging from dispense moisture sensitive adhesives for general bonding applications, to dispense UV cured adhesives in the medical device industry, to spin coating application in the DVD manufacturing industry.



Figure 4  
A diaphragm valve designed to dispense consistent deposits of low to medium viscosity fluid

## Needle Valve

For applications that require micro dot size (less than 0.002CC), the microshot needle valve is an ideal choice. Shot size as small as 0.0005 CC can be easily achieved thanks to the unique design of the shut off mechanism located inside the dispense tip that virtually eliminates the “dead fluid” volume. Smallest needle size of 32 gauge can be used without dripping between dispense cycles. The needle valve is a pneumatically triggered single-acting valve. Air pressure signal lifts the piston-driven needle away from its seat, allowing fluid under pressure to flow through. When the cycle is completed, the internal compression spring pushes the needle back in the closed position. Higher viscosity fluid, up to 100,000 cps, can be dispensed accurately with this valve. However, moisture sensitive fluid and quick curing adhesives are not to be used. Some recommended fluids are UV adhesive, solvents, inks, oils, primers, activators... Typical applications include: dispense small amount of UV adhesive to bond speaker of the hearing aid device, dispense a small dot of ink for marking application.

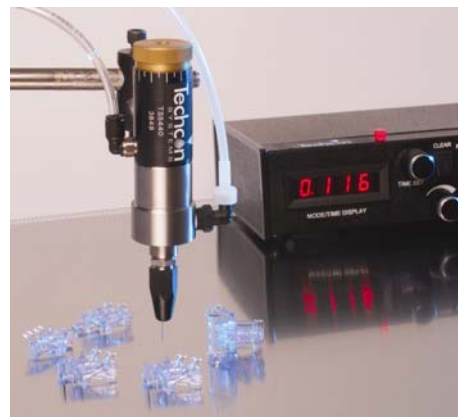


Figure 5  
A microshot needle valve designed to dispense 0.0005 cc shot without dripping

## Spool Valve

Valves described above have one thing in common is that they are not designed to dispense high viscosity fluid in high volume applications. To fill this gap, OK



Figure 6  
High pressure  
spool valve is  
an ideal choice  
for high  
viscosity fluid

International offers the spool valve series. High viscosity fluid, up to 3 million cps is dispensable through a heavy duty spool valve version. The valve uses an air-actuated piston to opens and closes the fluid's path. However, contrary to the needle valve, the air pressure signal drives the piston down to open the fluid path. When the dispense cycle is done, the internal compression spring lift the piston up to keep the valve in the closed position. The pull back action of the piston in the closing cycle creates a natural "suck-back" action. This feature is very effective for preventing drips when dispensing high viscosity fluid such as silicones, greases and sealants. Most use application of this valve is to dispense sealant for form-in-place gasket application. Other commonly applications that well

suited are: dispensing grease for automotive application, filling material into syringes or cartridges for the material packaging industry.

## Rotary Auger Valve

The common weak spot among pneumatic valves is that they are susceptible to fluid's viscosity fluctuation. When the fluid become thicker or thinner, the fluid pressure needs to be adjusted accordingly to keep the dispense repeatability rate stable. One way to minimize this problem is to use the Rotary Displacement Dispensing technique. Developed in 1987 by Techcon Systems, a division of OK International, this method uses a rotary feed screw (auger) coupled with a precision DC motor to dispense fluid with a rotary displacement action. The unique design ensures fluid is constantly present at the feed screw inlet while the controlled rotation of the feed screw dispenses fluid from the feed point out to the dispense tip. Dot size of 0.010" (0.25 mm) in diameter can be achieved with high percentage of repeatability rate.

Due to its versatility, high accuracy and easy to setup, the TS5000 series rotary valve is the prefer choice in the electronics industry. It can dispense virtually any fluid that has viscosity of 30,000 cps or higher, including difficult material to dispense like solder paste. In fact it is the only valve that can dispense solder paste consistently. Applications in electronics industry such as dispensing surface mount adhesives, silver filled epoxies, encapsulant materials, solder pastes... are excellent choice for the rotary valve.



Figure 7  
A TS5000  
Rotary Valve is  
the favorite  
valve in the  
electronic  
applications

A disposable material path version, TS5000DMP series, is available for applications that use two-component adhesives, quick curing adhesives or highly abrasive fluid. Wetted parts are fully disposable, eliminating the need for cleaning and repair.

Selecting the right dispensing equipment is the most important part of the manufacturing process. Manufacturing engineers are urged to contact dispensing equipment supplier for complete detailed analysis of the application. OK International is one of the few dispensing company that offer a complete product range to suit every type and level of dispensing application requirement.



Figure 7  
A TS5000DMP  
Disposable  
Material Path  
eliminates the  
need of  
cleaning and  
repair