

# Push-in Fittings

Overview of applications, features and benefits

By Ray Demirjian

The concept of push-in fittings has been around for decades, yet it has only seen significant growth in the U.S. water market since the early 1990s. Since then, push-in fittings have been—by many accounts—the fastest-growing technology change in the water industry.

With their initial entrance into the U.S. water markets in the mid-1980s, push-in fittings had to overcome many obstacles of misperception. Dealers and installers couldn't believe something so simple could work reliably. Old methods of connecting tubing (compression and barbed fittings) were difficult to let go for fear of trying something new and innovative. However, as leading edge technologies were changing the water market, more and more installers and OEMs started enjoying the labor-saving and reliability benefits of push-in fittings. The rapid acceptance of push-in fittings during the 1990s has established them as the connection technology standard for today's water industry.

## Applications

Push-in fittings have found their place in the water industry. Their most common use is for general tubing connections in RO and water filtration systems. However, push-in fittings are also used on water valves, tanks, pumps and faucets to ease installation and increase system reliability.

Push-in fittings can also be found in installations of water fountains, water coolers, ice machines, juice and beverage dispensers and coffee brewers.

## Fitting Construction

While push-in fittings require complex engineering design and precise, high-quality manufacturing to produce, they are quite simple to understand and utilize.

Push-in fittings are made up of three basic components—the fitting body, a flexible “collet” and an O-ring.

The fitting body can be made from metal (brass, stainless steel) or plastic (acetal, polypropylene). The body has an internal geometry to precisely house the collet, O-ring and tubing when assembled. Fitting bodies come in many configurations such as tees, elbows, unions and threaded connectors.

The collet is typically made from plastic with stainless steel gripping teeth molded into its flexible legs. The collet teeth provide a firm grip on plastic or copper tube. The flexibility of the collet legs allows for easy insertion and release of the tubing.

The O-ring is usually made of a food-grade rubber compound (nitrile, EPDM). It is seated inside the fitting body and forms a seal on the outside diameter (O.D.) of the tube.

## Installation

As with any product, proper installation is critical to accurate performance and reliability. Care should be taken with any type of fitting to ensure generally accepted, good installation practices are employed. There are certain key points to remember, specific to push-in fittings, to ensure a quality installation:

**Tubing.** Some push-in fittings are limited for use with either plastic or copper tubing. A few are capable of handling both plastic and copper without any change to the fitting. Always check with the manufacturer to ensure tubing compatibility. Tubing should be of sound quality. Ensure that tube dimensions, tolerances, roundness and surface finish are consistent with the manufacturer's recommendations.

**Threads.** Many push-in fittings allow transition from threads to push-in connection. There are various types of threads used such as NPT, NPTF, flare, compression, BSP and BSPT—in straight, tapered, male and female configurations. Again, check the manufacturer's specifications to ensure correct mating of threads. Also, most plastic threaded push-in fittings need only be hand-tightened. Over-tightening may cause stress fractures and result in leaks. Your manufacturer's catalog should

give tightening torque value guidelines.

**General practices.** When making a connection with a push-in fitting, it is essential the tube is cut square and is free of score marks, burrs and sharp edges. A quality guillotine-style tube cutter should be used for plastic tubing, while a plumber's pipe cutter should be used for copper tubing. The tube is inserted through the collet, then past the O-ring, all the way to the tube stop. The tube should be pushed in as far as it can go. This ensures the tube is fully inserted and properly seated. The collet holds the tube in place, while the O-ring seals on the tube O.D. It is a good practice to pull on the tube to verify it is secure, and then test the installation prior to use.

One of the benefits of push-in fittings is that installations can be quickly disconnected for service. The tube can be removed by simply pushing the collet in squarely against the fitting. With the collet held in this position, tubing is pulled straight out. Generally, both fitting and tubing can be re-used.

## Technical Specifications

In the water industry, virtually all push-in fittings are made from plastic—commonly acetal or polypropylene. Operating parameters of pressure and temperature may vary from one installation to another. Care should be taken to ensure that application operating parameters are within the fittings manufacturer's guidelines. Check the manufacturer's catalog for technical specifications.

Generally, plastic push-in fittings are suitable for pressures from vacuum to 150 lbs. per sq. in. (psi) of pressure, temperatures from 33° to 150° F, and tube O.D.s from 1/4- to 1/2-in. Tube O.D. tolerances should be +.001/- .004 in. to ensure proper sealing on the O-ring. In applications where harsh chemicals are present, the manufacturer's chemical compatibility chart should be referred to. This can be especially important for system cleaning and sanitizing procedures.

## Benefits

When compared with the older methods of connection, the benefits of push-in fittings



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begin to stack up quickly.

With compression fittings (metal or plastic) the various bit parts (nuts, ferrules, etc.) must be assembled as part of the connection procedure. Trying to find a dropped nut or ferrule while working beneath a sink is not a very productive use of time. Also, in tightening the compression nut, the question of "how tight is tight enough?" usually comes up.

Similarly, with barbed fittings, the barbed inserts are forcefully pushed into the tube I.D. and then secured by tightening a tiny clamp over the connection. Tees, elbows and other multi-connection fittings become quite a chore to assemble.

Push-in fittings eliminate the difficulties associated with these older methods. The

components of push-in fittings are self-contained, insertion is simple and quick, and thread tightening can be done by hand. No pipe dope, sealants or special tools are needed.

In addition, because they are plastic, push-in fittings lend themselves better to applications where lead exposure from brass is a concern. Their light weight and small size also make them easy to ship and receive and carry around.

#### Components and Accessories

Many push-in fittings manufacturers offer component part sets that allow push-in technology to be incorporated into product housings. The part sets typically include a metal or plastic "cartridge" insert that presses

into a pre-determined port in the housing. The collet snaps into the cartridge after the O-ring is pushed down into its seat. This allows for an integral push-in connection to valves, filters, pumps, etc. Such component part sets are employed at the OEM level, making the OEM's products more user-friendly and thus more marketable.

Various accessories enhance the use of push-in fittings. These include locking clips, collet covers and threaded stem adapters to make swivel combinations.

#### Conclusion

The growth in the use of push-in fittings has been fueled by the needs of dealers and installers to enhance productivity, increase reliability, and reduce overall costs. However,

one must remember that any product is still only as good as the company that makes it. Areas such as customer service, technical support and training should always be considered when selecting a push-in fitting brand. In addition, the manufacturer should have a strong distribution network and trained sales personnel, as well as provide marketing and promotional support. *wqp*

#### About the Author

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