

BROWNIE'S THIRD LUNG

Breathing Easier – Under Water and On Land

Crammed into the tight brow area of a 50-foot sport fishing boat with little room to move, Robert Carmichael narrowly avoided a chunk of flying metal that whizzed past his head.

He was making final adjustments to a 3,000 psi compressed air system installed in the vessel's brow. The metal that barely missed his own brow was part of a valve that broke and popped off one of the compressor lines. With full pressure in those lines for a system test, the valve piece could have done some damage – to either Carmichael or the boat. It didn't, but at that moment Carmichael decided to look for a new solution.

Anatomy Of The Third Lung.

Carmichael was working on a high-pressure compressed air system to fill scuba tanks onboard yachts. These systems are designed, manufactured, and installed under the Brownie's Tankfill division of Ft. Lauderdale, Fla.-based Brownie's Third Lung. Carmichael is president of this designer and manufacturer of underwater diving equipment.

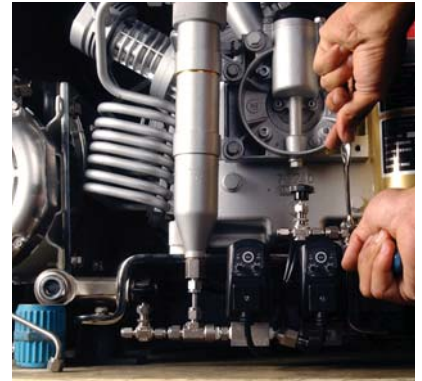
Company founder William Brown launched the business in 1969 with a unique diving apparatus that operates like a "third lung." A motor-driven compressor mounted on a floating inner tube pumps clean air through a hose. The hose has a demand regulator on the end for breathing under water and can be attached to a manifold that allows up to four divers to share the air. The inner tube moves along with the divers, enabling them to move freely as a group. This type of diving is known as "hookah diving" and is compared more to snorkeling than scuba diving because of the lack of bulky tanks. However, divers don't have to come up for air – at least until the motor runs out of fuel.

Gauging A Fitting Supplier.

No stranger to danger, Carmichael has dived with sharks, led exotic deep-sea diving survey teams, and dodged a broken valve that was speeding like a bullet. But his primary business goal is providing safe and easy diving solutions for his customers. Carmichael's failed valve experience was a wake-up call to choose a new component supplier to make Brownie's Tankfill equipment safer and more reliable.

Upon inspection of the broken bits of the failed valve, Carmichael discovered that the fine threads of the NPT valve connection had been marred, possibly during installation. The damaged NPT threads had compromised the integrity of the seal and caused stress on the valve body. He quickly realized that relying on a threaded connection to contain 3,000 psi of pressure was less than desirable. Components with alternative connections would serve the situation better – both from safety and ease-of-use standpoints.

In his search for a new supplier, Carmichael discussed options with the owner of a local marine company. That owner had recent success with Swagelok® components and introduced Carmichael to a sales representative from Florida Fluid



Brownie's employees remove plumbing from compressors and replace it with stainless steel Swagelok components.



A Brownie's employee bends Swagelok tubing for use in a tankfill panel.

System Technologies (FST), an authorized Swagelok distributor. Based in Mulberry, Fla., Florida FST services a number of customers in central and southern Florida.

“We were impressed by Swagelok products when we had our first demonstrations. The connections claim to be leak tight and that has been proven in the field,” says Carmichael. “We have a short time window, down to the day, to complete our installations onboard yachts. If we discover a leak, the entire shipbuilding schedule can be affected.”

The consistent, leak-tight tube connections are a result of Swagelok tube adapter fittings, which rely on a two-ferrule mechanical grip design. As the nut is turned, the back ferrule axially advances the front ferrule and radially applies an effective tube grip. The front ferrule creates a seal against the fitting body, as well as on the outside diameter of the tube. The seal is also resistant to vibration fatigue, which is particularly important in Brownie’s Tankfill applications.

“We have to get the job done right the first time,” explains Carmichael. “A compressor, tankfill panel, and all of the corresponding plumbing could be mounted on a yacht for 12 to 18 months before the vessel is even in the water. Then is not the time to find a problem in your plumbing.”

Proper training on the Swagelok installation process is the key to ensuring leak-tight connections, according to Hal Bolter, owner and president of Florida FST.

“Brian White, one of our sales and service representatives, trains the Brownie’s employees on how to properly tighten components as well as how to bend tubing for precise installations. Brian also serves as a consultant, helping with unique applications, such as metric adaptation and how to prevent bubbling on hose assemblies,” says Bolter.

Growth Under Pressure.

Carmichael sold six to eight compressors a year when he first delved into the high-pressure compressed air market. Now Brownie’s is selling between 70 and 80 compressors annually. The company installs the compressors as part of onboard hookah diving systems and tankfill systems on high-end yachts. The systems are housed on some of the biggest yachts in the world with each one customized to the individual vessel.

Brownie’s uses the finest German-made multi-stage compressors and adapts them to handle the harsh marine environment. When a new compressor arrives, employees tear it almost completely apart. They remove any outer casing and all of the brass and mild steel plumbing, such as fittings, tubing, and valves.

Removing the casing and reconfiguring the compressor saves about 30 percent of the space compared to the original compressor footprint. Economy of space is crucial as free space is at a premium on yachts, with virtually every square inch of free space used for systems, equipment, and storage.

Compressors used in Brownie’s air systems were originally designed for non-marine applications and, therefore, feature materials that do not stand up well to saltwater. To avoid corrosion, Brownie’s replaces the removed plumbing with between 25 and 35 stainless steel Swagelok components per compressor, depending on its



Prepackaged kits of Swagelok components provide streamlined compressor re-plumbing for Brownie’s.



Panels for Brownie’s tankfill systems feature a variety of stainless steel Swagelok components.



model number.

Good Things In Small Packages.

To streamline the Brownie's assembly process, White, who services the Brownie's account, identified the Swagelok part numbers for each of the compressor models. He then developed prepackaged kits that include all of the components for a particular compressor. Complete kits arrive in a Swagelok box with each component bagged and numbered individually by White. An enclosed packing list corresponds with the numbered bags for simple identification. The process helps Brownie's keep all of the parts for a compressor with the unit.

"Swagelok is our only supplier that provides a service like this. It makes our installers' jobs much easier," notes Carmichael. "It also keeps them moving on a compressor since all of the parts are there. If one part was missing, the job could be on hold for a few days."

Prepackaged kits also enable Brownie's to minimize its on-site inventory of Swagelok parts. The company is able to place orders and expect parts to arrive within a few days.

"We track order histories from Brownie's Tankfill to ensure that we have the majority of the components they use in stock. Our goal is making 90 percent of deliveries the next day. So we want to have it when they call," explains Bolter.

For example, Brownie's uses two 1/8-inch Swagelok needle valves per compressor. This is a rarely used valve among Florida FST's customer base, but Bolter likes to have them in inventory so a Brownie's order won't be delayed because of two pieces.

Getting Their Fill.

Brownie's full compressed air installations consist of cascading systems for filling scuba tanks with various gases required for deep-sea exploration. A mirror-polished stainless steel fill panel houses the flow lines, gauges, and connections used to move gases from compressors and storage tanks to the scuba tanks. The high-pressure panels use a variety of Swagelok tubing, fittings, and gauges.

"The tube adapter fitting design found on the components is especially useful when replacing gauges on tankfill panels. The gauge must face forward to mount properly to the panel. The tube adapter design allows our installers to place the gauge in the right orientation before tightening the nut," says Carmichael. "With alternative threaded connections, a gauge is screwed into place and may have to be improperly tightened to face the proper direction."

Privacy Please.

The majority of Swagelok components used on tankfill systems are hidden behind the panel, except for the visible front of the pressure gauges. Brownie's chose a custom dial face, which includes the company's logo and Web address to provide a point of contact for service needs.



Brownie's chose Swagelok gauges with custom dial faces for additional name exposure on its tankfill units.



Brownie's President and Owner Robert Carmichael.

“Brownie’s markets the plumbing and gauges used in on our tankfill units as Swagelok components,” says Carmichael. “Yacht owners are proud of having a diving system onboard and want to know that they bought the best.”

A Sealed Deal.

Brownie’s Tankfill uses Swagelok pressure gauges, pressure regulators, needle valves, bleed valves, tubing, fittings, hoses, and quick connects. Of these components, about 99 percent are stainless steel. Brownie’s uses a few brass components for low-pressure plumbing on the Third Lung units. The components are primarily 1/4-inch as that size provides a sufficient volume of air at low-flow rates. Brownie’s also uses a limited number of 3/8-inch, 1/2-inch, and metric-sized components.

One advantage for Carmichael is that many of the Swagelok products he uses hold a variety of maritime certificates from organizations like Lloyd’s Register, Det Norske, United States Department of the Navy, American Bureau of Shipping (ABS), and Nippon Kaiji Kyokai.

In his search for a new valve, fitting, and gauge supplier, Carmichael selected Swagelok and never looked back.

“We’re that loyal not just because of the design of the product, but also because of the reliable service we receive. We know what we’ll get from Florida Fluid System Technologies. And we know we’ll receive that same level of service and availability of product globally from any other Swagelok distributor if we need components in the field,” says Carmichael.