Squeeze Pumps Safe and Versatile

By Jim Farrell

Squeeze pumps have enjoyed over 50 years of wide application and continual development in the high-velocity shotcrete and low-velocity concrete spraying market. Unfortunately, there are some misconceptions in the industry that the use of low-velocity spraying of concrete is limited to the use of rotor stator pumps, and that rotor stator pumps are not recommended with material with aggregate larger than fine sand. Current technology in squeeze pump equipment that is used in a wide variety of applications proves these perceived limitations are unfounded.

Squeeze pump technology was introduced by Challenge-Cook Brothers of California in 1963. The "Squeeze-Crete" pump was very successful during this time period; however, its success was limited by poor-quality rubber pumping tubes, which required a vacuum to be pulled on the pump housing to refill the pumping tube after material discharge. The only pumping tubes available during this time were the same type of hose used as the pump delivery line and were not designed for the demands of the pumping application.

Significant improvements in the quality and stiffness of rubber pumping tubes resulted in the reintroduction of the squeeze pump for pumping small aggregate concrete, shotcrete, stucco and aggregate pool plaster, and grout in the late 1990s. While squeeze pumps are limited in their performance when compared to hydraulic swing-tube pumps, these pumps offer advantages in operator safety, simplicity to clean and maintain, less surging and interruption of material flow, and lower cost to purchase when compared to swing-tube pumps. Squeeze pumps are popular outside the United States for pumping mortar and waste water with sludge.

Limitations of squeeze pumps when compared to swing-tube pumps include a limited pumping distance of 300 ft (90 m) horizontally and 50 ft (15 m) vertically when pumping a medium slump material with aggregate up to 1/2 in. (13 mm) using a rubber delivery line. This distance can be smaller if the size of the delivery line is reduced, which is the case with any concrete pump. It is recommended that the slump of the material pumped with a squeeze pump not be less than a 3 in. (75 mm) slump. The pumping distance can be increased by using hard pipe delivery line.

The squeeze pump is the industry standard for pumping cellular concrete because of the lower pumping pressure inherent with squeeze pumps. The maximum pumping pressure of squeeze pumps designed for pumping aggregate concrete is 400 psi (2.8 MPa), compared to 750 to 1100 psi (5.2 to 7.6 MPa) for standard rotor stator and swing-tube pumps. The lower pump output pressure maintains the integrity of the cellular concrete material and air (bubbles) in the material will be not be broken down. The lower output pressure of the pump also allows for the use of lower pressure, less costly delivery line.

Squeeze pumps have been combined with small batch and continuous mixers for many specialty mixing and pumping applications. In addition to cellular concrete, squeeze pumps are used for underground shotcrete applications using both the standard high-velocity shotcrete process as well as the low-velocity spraying of concrete using plaster or modified plaster nozzles. These same machines can be used in underground coal for a new coal mine safety procedure called "foamed rock dust". The rock dust is mixed with water and cellular foam concentrate and is pumped through a nozzle onto the walls and ribs of an underground coal mine. This process has been a significant improvement over the dry rock dust and wet rock dust methods that have been used for the past 50 years.

Other low-velocity spraying applications for the squeeze pump mixer/pumps include aggregate and non-aggregate pool plaster, stucco, structural concrete insulated panels, culvert, manhole, marine, and bridge repairs. These pumps are on the recommended list for most all structural concrete insulated panels (SCIP) manufacturers worldwide. The compact size of the mixer/pumps allow for the hose runs to be kept at the minimum.

Most squeeze pumps are powered with hydraulics. As a result, these pumps are avail-

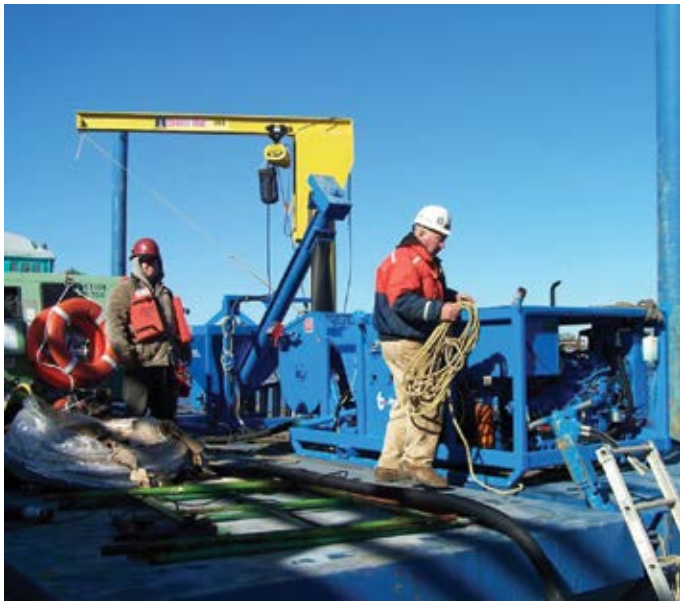

Fig. 1: Squeeze pump marine application

Fig. 2: Squeeze pump foundation pouring

Fig. 3: Squeeze pump underground

Fig. 4: Squeeze pump underground spraying

able as work tool attachments and can be operated off the auxiliary hydraulics from skid steer and hydraulic excavators. It does not require a high flow skid steer or excavator to operate a squeeze pump. Large pump attachments, with output of up to 25 yd^3/h (19 m^3/h), are used for the shotcreting of swimming pools. Smaller-output squeeze pumps are popular in pumping hot epoxy mixed with fine aggregate for underwater marine piling repairs (Fig. 1 through 4).

The versatility of hydraulic squeeze pumps allows for these pumps to operate in both forward and reverse, and the operator cannot damage the pump if the machine is run without material. The only part on the pump that comes in contact with the material is the inside of the rubber pumping tube, so cleaning is quick and simple. As a result, squeeze pumps can be used to pump all types of corrosive and abrasive materials.

Jim Farrell *is the Owner and CEO of Blastcrete Equipment Co. and Neal Manufacturing located in Anniston, AL. Blastcrete was founded in 1950 in Los Angeles, CA, and manufactured batch-type gunite machines until it was purchased by Farrell in 1983 and the business was moved to Anniston. Blastcrete is now a leading manufacturer of mixing, pumping, and spraying equipment, including squeeze pumps and swing-tube pumps. Blastcrete also manufactures the original Piccola rotary dry-mix (gunite) machine. Blastcrete acquired Neal Manufacturing in 2013. Neal is a leading manufacturer of asphalt pavement maintenance mixing and pumping and spraying equipment.*