Why Membership Benefits Refractory Contractors

By Ted Sofis

In March 2024, at the ASA committee meetings in Austin, TX, the question came up about refractory contractors, and why that industry segment is so under-represented in the association. Considering my background, I felt qualified to address the issue. Much of my work involved shotcrete installation of refractory material. I began gunning refractory and lining steel teeming ladles in 1975, at the J&L Aliquippa Works. I gunned blast furnace troughs at United States Steel, Wheeling Pittsburgh Steel, and Crucible Specialty Steel. Over subsequent years, we've serviced the power industry, installing gunned refractory in power plant ash hoppers, burners, baffles, and power plant penthouse areas in Pennsylvania, Ohio, West Virginia, New York and Maryland.

Fig. 1: Shotcreter placing refractory

Fig. 2: Shotcreter in the foreground

REFRACTORY SHOTCRETE

Since the invention of shotcrete by Carl Akeley, refractory contractors have been at the forefront of utilizing the process for a variety of industrial applications. Early on, gunning of shotcrete began to replace brick because of the cost benefits and ease of application. Shotcreted monolithic linings could take any shape. Dry-mix shotcrete provided an efficient method for lining steel ladles, blast furnaces, and blast furnace troughs in the steel industry. In the power Industry, refractory could be installed in ash hoppers without requiring formwork. Because wet-mix shotcrete generally used ready-mix concrete, the method was not normally used for refractory shotcrete. At the time, pre-packaged refractory materials could not be mixed quickly enough to keep up with a shotcrete pump.

With the advent of the high-capacity pan mixer, this changed in the 1990s. Today, pan mixers that can handle 2200 lbs (1000 kg) pre-packaged bags of refractory are commonly used with wet-mix shotcrete installations. Both dry-mix and wet-mix have refractory mixtures that are designed specifically for each method. Some of the refractory dry-mix mixtures are among the best shotcreting prepackaged materials on the market. Great progress has been made over the years in research and development. Beginning with castable mixtures, calcinated fireclay was added to make the shotcreted material sticky enough to hold it in

Fig. 3: Pan Mixer Pump combo

Fig. 4: Bag slicer for 2,200 bulk bags of pre-packaged refractory

place until the cement began to set. Sharper aggregates were added and adjusted, to keep the shotcrete delivery hoses clean. The technology has progressed, and we now have ultra-low cement concrete designed specifically for shotcrete placement. There are also cement-free and insulating mixtures.

ASA MEMBERSHIP

One of the strengths of the American Shotcrete Association is it has brought contractors, manufacturers, and engineers all together. We talk about issues we have in the industry and share the problems that we encounter. The ASA provides resources to better train and educate our staff - from the owners to project managers to the field team. Some things are as simple as understanding why certain procedures are important. I found interacting and networking with others in the industry is one of the things that I enjoyed the most, and the most beneficial to me in my business. By working together on ASA committees, we are exposed to what is being done in other industry segments and learn about what is going on in other parts of the country. Regardless of what we think we know, there is always much more to learn.

The majority of refractory customers are privately-owned companies. I believe refractory contractors don't want others to know who they are working for. They are protective of their customers. I believe such fears are without merit. The interaction with others in the business and the synergy that can be developed far outweigh any such concerns. It's nice to pick up the phone and talk with someone encountering similar issues or problems. You build a personal network of shotcrete professionals, who can offer solutions or even a friendly suggestion when you need a helping hand.

EDUCATION AND SHOTCRETER CERTIFICATION

Customers and engineers want to see qualified bidders with a well-trained workforce. The American Shotcrete Association offers shotcrete education along with the ACI Shotcreter (previously known as Nozzleman) Certification. In the education portion of the certification process, all aspects necessary for proper shotcrete installation are covered and explained. This education includes both the dry- and wet-mix processes. It includes proper technique, good practices and safety considerations specific to shotcrete placement. It explains the chemical reactions that occur in concrete, proper curing, acceptable environmental conditions for installation. The "little things" matter in achieving quality placement. Understanding the reasons behind why we do things is important. The shotcreter certification involves both a written portion and a performance exam. In the performance exam, we grade the shotcreter's safety procedures, shooting technique and general performance in shotcreting a test panel. The certification candidates shoot a vertical panel and if qualified by experience, an additional overhead panel. The panels are then cored, and the cores graded for the encapsulation of the embedded reinforcing bars and undesirable voids. Refractory contractors shoot a much larger variety of materials than the average shotcrete contractor. These materials range from conventional dry-mix mixtures, to low-cement and light-weight insulating mixes. In all cases, there are embedded metals to shotcrete around, such as reinforcing bars, V-Type refractory anchors or conduits. An experienced dry-mix shotcreter needs to adjust the air and water as needed. The same principles apply whether you're shooting refractory or conventional concrete. The shotcreter needs to use the proper placement angles, keep the nozzle the proper distance from the receiving surface, and maintain high velocity for compaction and full encasement. Whether you're encapsulating reinforcing bar or V-type refractory anchors, the goal is the same. The candidates must pass both the written exam and the performance exam to receive ACI Shotcreter Certification. The ACI certification conducted by ASA is a credential that is widely recognized by engineers, private firms and public agencies.

TECHNICAL RESOURCES

ASA gathers a wealth of knowledge resources on all things related to shotcrete. ASA Conventions are just one venue where shotcrete-centered presentations come together. Recently at the Shotcrete Convention in Austin, TX, I sat in on a presentation where Marc Jolin's group at Laval University presented test results from various dry-mix nozzles and how effective or ineffective they were and which produced the best results. Shotcrete magazine is another valuable resource. Over the years I've written articles in Shotcrete magazine explaining why bonding compounds are not required or even recommended with shotcrete placement. Several contractors have approached me and told me how helpful those articles were. When I first joined the Association, I learned I was not the only one experiencing those problems.

You can submit technical questions on the ASA website. There is a wealth of information freely available and easily accessible covering all aspects of shotcrete on the website (Shotcrete.org). You can click on various topics or search for FAQ or past Shotcrete magazine articles. There are many resources including specification resources, a buyer's guide, safety information and shotcreter education.

Fig. 5: Workers feeding prepackaged refractory

IN THE WORDS OF SOCRATES, "ALL I KNOW IS THAT I KNOW NOTHING."

The more knowledgeable we are, the better prepared we are to succeed. We can fall into a trap when we think we know all that we need to know. There is always more to learn. New technologies emerge, new opportunities, and sometimes even new perspectives. I'm thankful for an association like ASA to help gather and capture this information, making it accessible for all with the goal of improving the application and quality of shotcrete placement around the globe.

Ted W. Sofis *recently retired as owner of Sofis Company Inc. with 47 years of experience in the shotcrete industry. He is an ACI Nozzleman Examiner and has served on the ASA Executive Board of Directors, the ASA Board, and 11 years as the Chair of ASA Publications Committee, as well as being a member on several other committees. Ted began performing shotcrete work during summers while in college from 1971 to 1974. After graduating from Muskingum College in 1975, he began full time as a nozzleman and gun operator gunning refractory in ladles and blast furnace troughs in the steel industry. Ted has worked in the shotcrete industry performing work in the power generation and steel industries, and on bridges, tunnels, dams, spillways, slope-protection, and a variety of other installations over the years.*