

The More Things Change, the More They Stay the Same

By Edwin Brady

Over the last 10 to 15 years, the shotcrete industry has seen remarkable advances across the board. Technical advances in equipment, accessories, admixtures, and fibers have truly revolutionized the industry. It would seem, at least to some, that you can simply specify materials and process equipment to get a successful, profitable project. Don't be so naive!

Nozzleman Expertise is a Must

Shotcrete has and continues to be heavily dependent on the expertise of nozzlemen. An experienced nozzleman can combine sand and cement using old technology and produce a successful project in most instances. By the same token, the most elaborate equipment package coupled with an expertly designed shotcrete mixture and a less than experienced and skillful nozzleman will almost certainly result in failure on multiple levels.

The physical demands on shotcrete nozzlemen, especially in the application of wet-mix shotcrete, are tremendous. Because the overall success of a project is so dependent on the performance of the nozzleman, one can easily understand the impact that fatigue has on every project and the benefits that will result in taking every opportunity to reduce that fatigue.

Fatigue Directly Affects Efficiency, Productivity, and Profitability

Fatigue is a very broad term, and its full effect is the cumulative result of many elements of stress. These include fatigue from the obvious physical demands of the job but also include stress from the environment (heat, cold, dust, sun, protective clothing and safety gear, noise, lighting, equipment, and accessories) and mental stress.

Physical elements are best addressed through the experience of the nozzleman, who has most



Pressure-washing being performed from the man-lift used for shotcrete, which gives a good perspective of dimensions of tunnel and access requirements



Scaffolding setup on mobile trailer with lighting for access to work. Air compressor and power unit mounted beneath scaffolding

Technical Tip

likely developed techniques over the years to use his strength in the most efficient way and conserve his energy. Even so, an experienced hosetender can prove invaluable, along with the use of scaffolds, man-lifts, and other devices to reduce the weight of the hose/nozzle for the nozzleman and provide free and clear access directly to the work with a minimum amount of effort on the part of the nozzleman. Personal protective clothing (PPC) and personal protective equipment (PPE) often contribute to heat stress, even in cold temperatures. In addition to the physical effects of heat stress, ongoing attention must be directed to maintaining proper hydration through the constant intake of fluids. Dehydration will directly and immediately produce extreme fatigue, along with a host of other ailments and health issues. Over the course of the workday, however, it is hard to fully estimate the advantages of PPC and PPE in reducing the amount of stress due to dust and debris that come in direct contact with the skin, eyes, and lungs, even though they may contribute to heat stress. Wearing safety glasses, hardhats, respirators, and clothing to fully cover exposed skin is a necessity. Hearing protection should be mandatory for safety concerns and at the same time reduce stress. Inadequate lighting can obviously directly affect the quality of placement but also results in more physical effort and reduced efficiency, which in turn increases the overall workload. Properly maintained and operating equipment always results in more productivity with less effort.

Mental Fatigue Is Just as Significant as Physical Fatigue

The nozzleman should be able to focus on his work and not be burdened by excessive mental stress. An alert mind makes logical and rational decisions. A well-trained crew that works well as a team will always increase quality and productivity, which results in fewer physical demands on everyone. The use of admixtures and hydration control agents as an integral part of a good mixture design results in a more easily conveyed/pumped product that provides more flexibility in the time allotted for placement. Therefore, every minor delay does not become a “fire drill.” Well-maintained and properly operating equipment (even though it does not guarantee the absence of breakdowns) clearly allows more attention to be focused on the work instead of wondering (worrying?) when the next inevitable breakdown will occur. Proper coordination and scheduling of



Nozzling performed from man-lift equipped with lighting, allowing for excellent visibility and immediate access to work while supporting the majority of the material delivery weight and air hoses



Nozzling performed from mobile scaffolding

logistical issues produce an even and consistent flow throughout the day, hopefully allowing for scheduled breaks and minimal interruptions in the work. All of this leads to the conclusion that good management and attention to detail reduce fatigue.

Reduced Fatigue = Increased Profits

To summarize all of the aforementioned factors, fatigue directly relates to efficiency. Efficiency directly relates to productivity. Productivity

directly relates to profitability. A crew that is physically worn out and mentally stressed is a fatigued crew that will not produce quality work, at least consistently, and will most definitely directly affect profitability and the long-term positive reputation of the company.

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So, the next time you are planning a project—after planning equipment, materials, scheduling, management, and so on—don't forget to consider the factor of fatigue and how it relates to all of the other issues. Take the time to “take care of your nozzleman,” as he is the central member of the crew. Taking his level of fatigue into consideration will directly impact the successful and profitable outcome of the project—the same way it did 100 years ago and most likely will 100 years into the future.



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