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The Most Challenging of Problems, Building with Tilt-Up and a Fond Farewell (of Sorts)



Frank Cavaliere
Managing Editor,
Concrete InFocus

A glance at this issue's cover tells you that our lead story is, once again, NRMCA's annual Mixer Driver Recruitment and Retention Survey. And for the fans out there of Greek mythology, you have our permission to compare Vice President, Education, Eileen Dickson to Sisyphus, that fellow who was punished for cheating death by being forced to roll an immense boulder up a hill only for it to roll down as it neared the top, repeating this action for eternity.

Fortunately for the ready mixed concrete industry, our modern day version of Sisyphus doesn't share the same fate – although it certainly seems that way. For Eileen has been charged with reporting on one of the most vexing problems this industry is facing: the finding, training and retaining of mixer drivers. Each year, she crunches the numbers from survey respondents and each year they tell her – and us – that pushing the rock up that mythical hill toward a stable driver pool isn't getting any easier. So please turn to page 18 to learn the results of the latest survey. And if you have any ideas on the subject, she'd love to hear from you and will no doubt issue a plea to join the Workforce Development Committee which regularly tackles the driver shortage and other critical issues facing the industry.

A few pages later, page 22 to be exact, is our other in-house feature, this one titled *A New Generation of Tilt-up*. Here, NRMCA Executive Vice President, Structures and Sustainability, Lionel Lemay discusses why tilt-up construction represents one of the greatest opportunities to increase ready mixed concrete's market share in building construction. He provides three case studies to bolster that claim along with some impressive photos of each building.

Elsewhere in the issue, NRMCA's continuing Developing Industry Leaders series returns, this

time with some insightful thoughts on how the industry must continually integrate technology into its operations. And the Safety, Environmental and Operations Department features the two latest entries in its ongoing Think First series of important safety reminders. Turn to page 28 and please publicize them throughout your workplace.

Our Member Spotlight this time around shines on longtime industry insider and NRMCA member James Shillstone who discusses *Quality Control Made Easy*. You can consider this entry a good companion piece to the Developing Industry Leaders article since they both analyze technological developments that can help ready mix producers become more efficient and profitable.

Finally, we turn to our three regular columnists. While we're happy to report that Doug Ruhlin's Enviroscene and Phil Kresge's Pave Ahead entries are present and accounted for – and will be returning in all their insightful glory in 2022 – we sadly bid farewell to Jon Hansen and his Corporate Suite column. He says good-bye as a regular columnist in this issue and we can say with all the authority vested in the editor's chair that Jon is – pardon the grammatical mishap – one of the goodest of this industry's good guys. He's not leaving NRMCA, thankfully, just putting his pen down for a bit until he returns in these pages as a periodic contributor with some longer articles.

So that's it for the Winter 2021 issue. Come Spring 2022, look for Jon's successor, more news you can use and, big news here, a redesign of your favorite industry magazine. Meantime, on behalf of NRMCA President Mike Phillips, Chief Operating Officer Nicole Maher and all of us here at the Association, have a wonderful holiday season and best wishes for a healthy and enjoyable New Year. ■

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America Needs Farmers – and Everyone Else



Jon Hansen
NRMCA Senior Vice President,
Local Paving

Prior to 1980, banks encouraged farmers to “go big” by offering loans to farmers for everything from land to equipment. But as prices fell for the crops farmers produced a few years later, American farmers found themselves in an upside-down economy, forcing them to sell out or file bankruptcy by those same banks that persuaded them to borrow.

During what became known as The Farm Crisis, a Big Ten college football coach was compelled to bring this crisis to national attention by dedicating one of his home games to “America Needs Farmers.” His players wore ANF logos on their helmets and the media jumped on board to support the movement. The Farm Crisis claimed over 235,000 family farms nationally, most absorbed into the now corporate farming industry, yet in 2021 the football team continues its American Needs Farmers game day message, some 35 years after the crisis ended.

I have no argument with America Needs Farmers, but don’t we need every other occupation too? Growth in construction can be influenced by many factors, from interest rates to material supply, and now particularly workers. From truck drivers, carpenters, plumbers, steel workers, concrete finishers, you name

it, we need everyone. If we focus only on one group like farmers, who will build the equipment, or for that matter, the factories to build the equipment the farmer needs if we don’t include everyone?

As with farming, advances in equipment allow construction to do more with fewer people. But unlike farming, we can’t replace the many jobs in construction with equipment that requires human interaction. This was evident in a presentation I attended by the construction manager in charge of building the structural concrete at 100 Above the Park in St. Louis (seen below). As he walked us through the Building Information Modeling

(BIM), the intricate design details and too seemingly small details about ordering post tension cables longer than specified to make sure they were long enough for unforeseen conditions on the job, I realized I was witnessing the next generation of experts in construction. On the program with the construction manager was a representative of the ready mixed concrete supplier on the project, a person that lived on the site every day concrete was being placed, monitoring quality and helping direct his trucks into and out of the tight construction site. How do we continue to convince sharp young people like this to consider a career in construction?

First, I believe it starts at home. Many family farms were, and still are, perpetuated by families in the business, as it should be in construction. Second, we need to recognize interest at the earliest opportunities. My 9-year-old



grandson Sam, the handsome fellow you saw on the previous page, likes to work with tools. I encourage him by going through my boxes and getting good quality tools in his hands. At any age, there is nothing more gratifying than to say, "I made that" or "I helped build that." But we must do more. And maybe it is a national campaign, simple and to the point like "America Needs Construction." Perhaps I can keep Sam pointed toward construction

as he navigates all the distractions of just growing up.

Passing of the Pen

I started my journey into writing some years back when I constantly came across interesting people in the concrete construction industry. I knew them from their work, but what really caught my interest were the stories behind their work. In 2009, I wrote

my first Characters of Concrete article and submitted it to *Concrete InFocus* for consideration. Little did I anticipate it would lead to seven other Characters stories, producer profile stories and then being offered the Corporate Suite spot in the magazine. I've had several people call my articles "folksy" and I consider that a compliment, not only for the comment but also just to know they read the magazine. I have always considered construction a people business, with a "look me in the eye and shake my hand" to be just as valid as any contract.

I received another compliment after speaking at a conference when a concrete industry engineer came to me after my presentation and told me "you have the ability to take engineer language and present it in a way that everyone can understand." Thank you, Matt, that has always been my intent whether in front of a crowd or in my writing. But one of my biggest joys has been when I find something I wrote was picked up and reprinted by another publication, which occurred in 2017. While during a Google search, I found an article I wrote in 2015 was reprinted by the New Zealand Ready Mixed Concrete Association.

As I put a wrap on my final *Concrete InFocus* Corporate Suite column, I have a couple of people I want to thank for giving me the opportunity to talk to you four times a year. First, I want to thank former NRMCA Director of Membership Kathleen Carr-Smith who offered me the Corporate Suite after the Characters of Concrete stories. Second, a round of thanks goes to Frank Cavaliere, managing editor of *Concrete InFocus*. I have only had one managing editor to work under, but I can't imagine anyone better at being one than Frank. His encouragement, temperament and just overall management style is the kind of management that motivates writers to do their best. And third, I thank all the readers of this column who have sent me notes and comments after reading a certain story. I consider you to be that good golf shot that keeps one playing after a bad round.

You'll hear from me again when I run across those good stories that need to be told, but until then, from the Corporate Suite, it's a wrap folks! ■

Jon Hansen can be reached at jhansen@nrmca.org.



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What the Public Knows About Your Plant's Environmental Compliance Level And What it Can Do with it!



Douglas Ruhlin

In most cases, concrete plants are hard to miss. They're big, there's a fair amount of truck traffic, often times there's noise and dusty conditions present and they're visible to anyone passing by the plant. In the past, too many concrete producers figured that they were walled off from public scrutiny, including when it came to their overall environmental compliance level.

But is that true? If a concrete plant is behind a fence, within a quarry or otherwise not very visible to the public does that mean that the plant's environmental performance is strictly a matter between the plant itself and the applicable environmental inspector, and usually only during a very irregular on-site inspection?

That used to be case before the internet, public records and full transparency. Now, concrete producers should presume that all environmental regulatory information related to their plants' operations and environmental performance is accessible to anyone with a phone or computer and internet access. In other words, presume that everything is visible to everyone! If your state, like most states now, requires that your environmental reporting be done on some agency website or reporting portal, you can presume that it's public knowledge. For example, all your water discharge monitoring data is available

to anyone who cares to look. Has your plant been getting poor results under your NPDES stormwater permit? It's public knowledge and publicly available.

And, if you continue to get poor results, you can bet someone is going to care (beyond your government regulatory agency inspector) and is maybe going to do something about it! Have you had violations of your air permit? The same thing – public knowledge and availability, and public concern! How about your EPCRA Toxic Release Reporting (if your plant is doing it at all and, if not, why not)? What toxic chemicals is your concrete plant releasing to the environment, how much and where is it going? It's all accessible and frankly doesn't require much skill for anyone to take a look online.

So if you think your concrete plant's environmental performance – good or bad – is hidden from public scrutiny, think again. It isn't and this trend is only going to continue. For example, many states are now requiring that you submit an electronic copy of your plant's Stormwater Pollution Prevention Plan (SWPPP) to be placed on a government website for one and all to review, and maybe criticize as being deficient or inadequate. Think of it this way, all your documentation, from permits to manuals (such as your SWPPP) to site plans to sample results, are probably already on the internet and accessible to the public and if it isn't right now, it will be soon.

What's this mean? First of all, it's going to bring a much greater degree of accountability and scrutiny to all holders of environmental permits, regardless of industry, and this is going to include the ready mixed concrete industry. Do a bad job and everyone's going to know about it. No more hiding, out of sight, out of mind! It's also going to

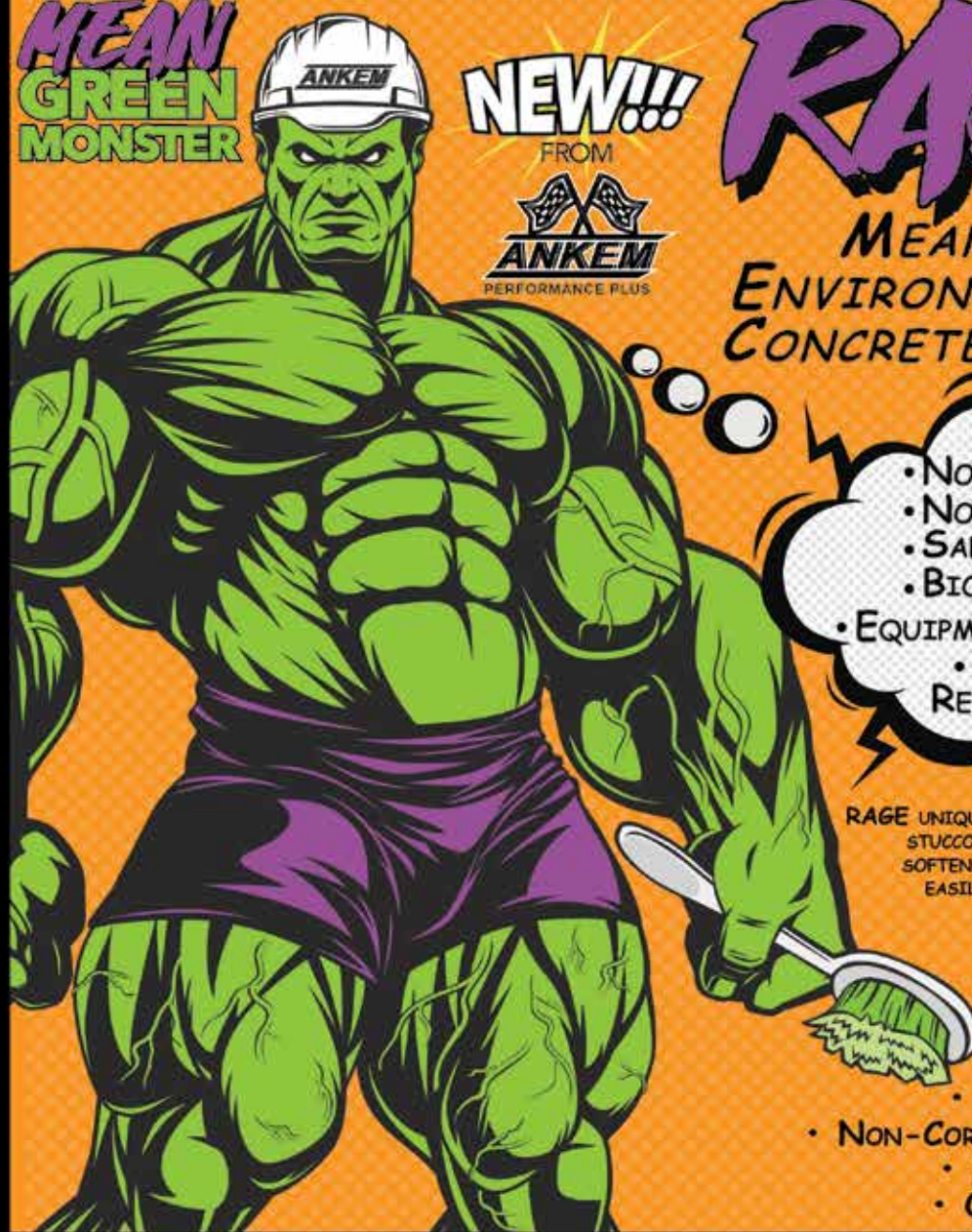
fuel the likelihood of possible legal action brought about by those with standing against non-compliant facilities. The major environmental regulations in the United States (such as NPDES, the Clean Air Act, RCRA, etc.) include provisions for those with standing, such as citizen or environmental groups, to bring legal action against anyone not in compliance to force compliance and pay penalties – which are often very significant! Many of these legal actions can also be brought about as a means to address environmental justice concerns, where this publicly available information can be used as the underlying cause to identify sources of pollution or contamination within environmental justice communities.

The wise concrete producer today is the one that acknowledges that all aspects of its plants' environmental performance is an open book and presumes that anyone and everyone is looking in – not just the government agency inspector (who may, in fact, be the least of your worries). And, given that position, that wise producer operates accordingly, striving for full and complete environmental compliance across the board by first conducting full audits of compliance level, followed by an appropriate level of action to address any and all issues found. Determining problems on your own as a concrete producer is far better than finding them out after being served notice by a public group that found everything it wanted to know by simply researching your concrete plant on the internet. ■

Douglas Ruhlin is a regular columnist for Concrete InFocus. His company, Resource Management Associates, is an Associate member of NRMCA. He can be reached at 1-888-762-0320 or doug@rmagreen.com.



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Concrete Can't Place Itself!



Phil Kresge
Senior Vice President,
Local Paving

Technology today claims to be making life easier. Voice assistant software agents conduct internet searches for us and can even turn on lights, play music and adjust room thermostats on command. Cars tell us when we've veered out of lane, when we are approaching an object and when to brake. Some cars can even parallel park themselves. Perhaps the ultimate is the driverless vehicle.

I started in the concrete industry in the '80s at a small, family-owned ready mix company in central New York State. At that time, the company was one of the first in the area to have automated batching. Looking back at the system we had then, it is almost antiquated compared to the systems in use today. GPS and laser-guided equipment help contractors place concrete more efficiently, and within tighter tolerances, than ever before.

But no matter how advanced technology may be, one thing is still true – concrete can't place itself. And unlike our competitors, concrete pavement is not a one-stop shop material. The alliance of ready mix producer and concrete contractor is key to expanding our market. But ironically, that alliance is a rarity in our industry.

I think back to my days as promotion director for the Pennsylvania Concrete Promotion Council (PCPC). From the start, we included a contractor membership level and, at one time, actually had more contractor members than producer members. We knew the importance of including contractors in our promotion efforts. When pitching the concept of a concrete pavement, having the contractor

on board to answer specific questions about procedure and cost was invaluable.

While at this year's ConcreteWorks, I had the opportunity to participate in the NRMCA State Affiliate/Promotion team meeting. Representatives from numerous state associations were joined by staff from NRMCA's Build With Strength and Pave Ahead teams to discuss topics of importance to the industry. With my NRMCA colleagues Jon Hansen and Donn Thompson, I facilitated the group discussing contractor partnerships. Throughout the discussions, there were some recurring themes. First, we need "boots on the ground" to implement a successful target market campaign. Second, an alliance with a contractor is essential. And third, the only way to get the industrial pavement market is to put the ready mixed concrete producer and contractor together.

The consensus was that we can't do anything without the contractor. The contractor has the relationships with the owners and developers. The producer needs a good relationship with the contractor to be able to maximize the opportunity.

There were also what I thought were some disturbing comments. "As producers, the contractor is our customer but not always our ally." "We need to change our mindset and move our relationship from adversarial to alliance." And my favorite, "We cooperate, but we don't cooperate."

Open lines of communication are important to maintaining a good relationship. Too often, the contractor does not know what the producer has to offer, particularly with mix design opportunities. Likewise, it is just as often that the producer does not know the true capabilities of the contractor, such as how many square feet of pavement it can place in a day.

At NRMCA, we understand the importance of the contractor/producer partnership and we're fully supportive of it. The Pave Ahead program is all about these partnerships. We have a seat at the American Society of Concrete Contractors (ASCC) Concrete Pavement Committee, where we've helped developed the Concrete Parking Lot Tool Kit. Our Boot Camps teach our partners proven



best practices. Our Design Assistance Program (DAP) provides the pavement designs that equalize the playing field between flexible and rigid pavements.

The most successful contractor attendees of our Concrete Parking Lots Boot Camp have two things in common: a dedicated market development person and open communication with their ready mix producers. Working together, they have expanded their market share to the tune of millions of square feet.

On the downside, I can cite several large projects where concrete pavement was never really an option because the contractor was not willing to present a concrete alternative for fear of jeopardizing a bid to the owner. A strong partnership could have reinforced the contractor's position.

Another word that popped up frequently in our discussions was trust. Historically, our industry was not very trusting. But slowly we've made headway in changing our ways. Going back to the days of the RMC 2000 movement, we learned that our opposition is not the contractor or even the other producer down the street. Trust is key to a solid partnership. And partnerships are what will move us forward.

Because concrete can't place itself! ■

Phil Kresge can be reached at pkresge@nrmca.org.

2021

Mixer Driver Recruitment and Retention Survey: Driver Shortage Intensifies

By Eileen Dickson

NRMCA's annual Mixer Driver Recruitment & Retention Survey collects data about the ready mixed concrete industry's largest employee segment. National highlights follow.

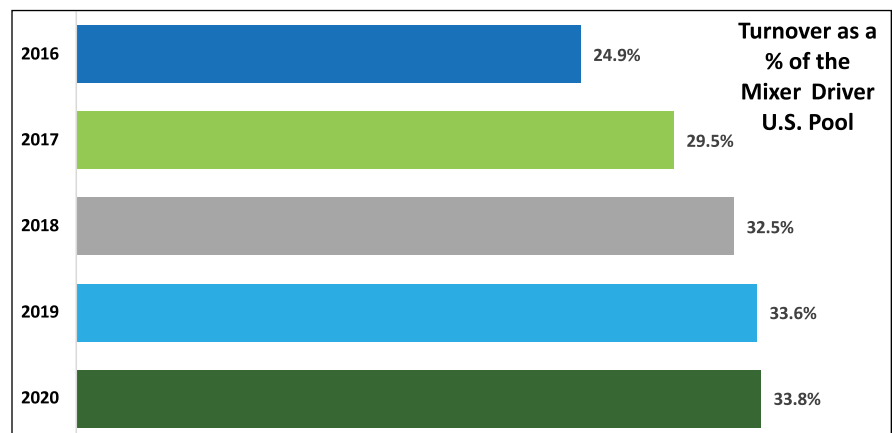
In the five years represented in the survey, NRMCA calculated ready mixed concrete production grew 9% while the mixer driver population held steady at about 75,000, perhaps suggesting why 68% of survey participants reported they lost business due to their company's driver shortage. Another 2021 takeaway shows data continuing to swing far more among the survey's eight regional classifications than the survey's five company size categories.

The ready mixed concrete industry's experiences are backed by The Conference Board's comprehensive report, *US Labor Shortages: Challenges and Solutions*, which states that 85% of companies in "mostly blue-collar industries" report recruiting and retention difficulties. If left unchecked, the report shows today's conditions could easily develop into one of the worst labor shortages in the last 50 years.

Turnover

Insight begins by calculating turnover. It tells an employer how many times a single position was occupied by a different employee throughout a designated period. There were no sizeable swings this year in layoffs or departures, therefore nothing could be directly attributed to COVID-19 pandemic pressures.

Turnover rate affects a company financially, its workload, its company culture and its employee morale. For the fifth year, the mixer driver national formal turnover rate increased, now reaching 35%. That equates to about one third of the driver population quitting or being dismissed. Tenured mixer drivers who left their employers, either quit or released, represent the overwhelming amount of departures for the past five years.



National	2020	2019	2018	2017	2016
Total Mixer Driver Departures	26,493	25,201	25,031	22,151	18,676
• New Hires Left Same Year	7,576	6,491	9,785	6,746	4,818
• Drivers 1+ Years Tenure Left	18,917	18,710	15,246	15,405	13,858
% Drivers 1+ Years Tenure Left to Total	71%	74%	61%	70%	74%

Quit Data

Nationally, 60% of those who left quit, right in line with the U.S. quit rate as reported by the U.S. Bureau of Labor Statistics. NRMCA asked respondents to rank the top five reasons why their mixer drivers quit. There were 19 choices as vetted by the Society of Human Resource Management and further edited by NRMCA's Workforce Development Committee. Even with such a comprehensive list, "reason not listed" consistently lands in the top five, as illustrated below. And for the sixth year, inconsistent daily schedules and higher pay elsewhere remain the top two reasons drivers quit, also seen in the graph below.

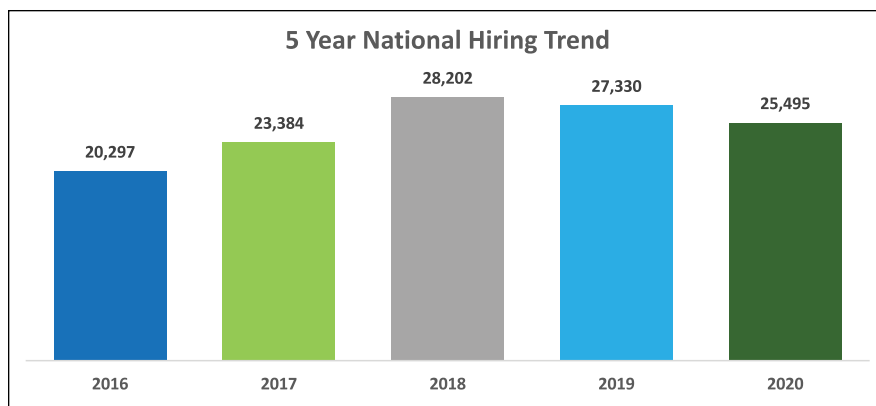
Hiring Data

Comparatively, the industry hired approximately 34%, or 25,500 mixer drivers, 2% less than was hired in 2019 as well as in 2018. About 10% of hires were rehires. The annual vacancy rate grew 3%.

Finding drivers with ready mixed concrete experience remained the biggest hiring challenge. In the past three years, producers willing to hire new CDLs grew from 51% to 59%, although the actual number hired remained 7% annually. In the past four years, producers willing to hire 18-to-21-year old CDLs increased 21% but the regional differences were dramatic, from a 98% high in the Midwest/Great Lakes Region to an 11% low in the Southeast. Willingness to hire 18-to-21 year old CDLs was roughly equal by company size.

Epilogue

While not part of the survey data, NRMCA members report a lack of awareness of the job



itself, starting at the high school level where other industries recruit non-college bound seniors. Recent literature shows younger age groups that might have gravitated to commercial driving discovered the expanding warehousing sector which is perceived as friendlier to a work-life balance. This couples with the fact that the ready mixed concrete industry does not have the tradition of growing-their-own as other skilled, licensed trades do.

Additionally, for those youngsters interested in short haul driving jobs, they and their employers must deal with Amazon's aggressive recruiting as well as the fact that 18-21 year old licensed commercial drivers cannot cross state lines (yet). Furthermore, for producers that are not self-insured, they are influenced by coverage rates for younger drivers as well as by years of experience requirements. Producers must also be aware of the impact of the new federal requirement where drivers must pass pre-employment and random drug screenings.

According to the National Association of Publically Funded Truck Driving Schools,

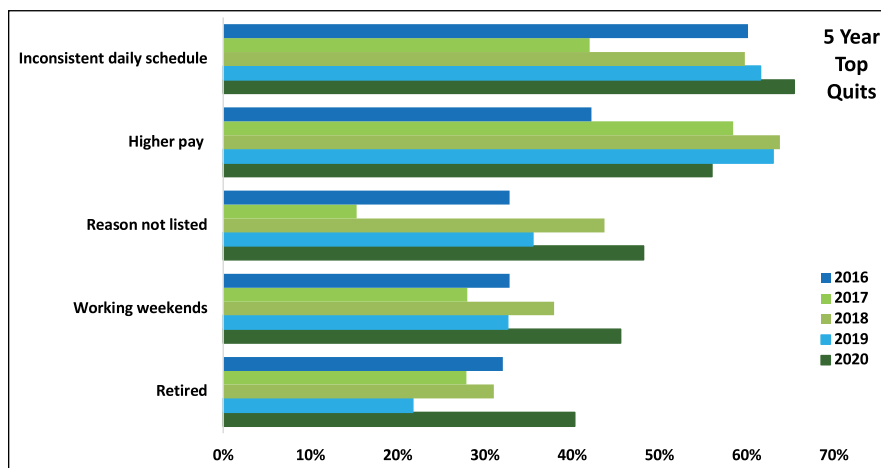
the average age for a new truck driving student is 30+ years old, meaning the person is on a new career path, perhaps his or her third or fourth. CDL schools closed in 2020 because of the COVID-19 pandemic; they graduated at least 50% fewer drivers. Nevertheless, for the near future this should not affect producers. The industry hires few new CDLs, equating to just 7% of total the total annual hire each year for the past three years.

Throw into the mix the younger generations' population numbers are not as large as retiring boomers or Gen Xers, the labor market is much more competitive on every front. Likewise, there is lots of research showing younger males are not participating in the labor market, significantly reducing the supply of workers in occupations that typically hire young and less-educated workers. And finally, it appears a year of COVID has the working population redefining essential job factors, TBD.

Thoughtfulness toward a host of challenges for such a critical work classification in the ready mixed concrete business will be necessary for it to remain healthy.

NRMCA's 2021 Mixer Driver Recruitment & Retention Survey respondents represent their company and report on their driver-employees, encompassing 34% of the job's population. The full 31-question analysis, including breakdowns by eight regions and five company sizes (cubic yardage), is available for download on NRMCA's website through the NRMCA member portal.

Eileen Dickson is NRMCA's vice president of education. She can be reached at edickson@nrmca.org.



Changing the Game Digitally – Techworld Paves its Way into Ready Mixed Concrete

By Jenay Brown, LafargeHolcim; Tyler Stanley, Irving Materials Inc. and Luis Soto-Rivas, U.S. Concrete

Technology driven wasn't always the exact term used to describe the concrete industry. As the world took a turn during the 2020 pandemic, technology made its way aggressively into concrete companies all over the world. Change and instant acceptance became a discussion in operations to be able to reduce the spread of the coronavirus among drivers, plant personnel and contractors. Safety, which has always been the top priority, became a bit more challenging; as producers were no longer dealing with injury preventions they encountered a worldwide health concern.



ISTOCK.COM/ARTHUR SHEVTSOV

How do concrete producers enforce more safety in the workplace with electronic communications? Suppliers are reverting to new and enhanced technology to utilize in their businesses. Companies began to reduce paper by switching to paperless ticketing, creating mobile and online customer web ordering applications, reducing cash on delivery and increasing electronic credit card transaction payments. Piloting a reduction in driver and plant personnel hand-to-hand exposure of freshly printed tickets was all in an effort for time savings and to reduce contact. Going digital soon raised a lot of eyebrows with its

effectiveness for continuous production and safety of non-contact between producers and consumers.

One of the tools that had a significant impact in 2020 was electronic ticketing. Integrating this technology into ready mix operations took hard planning and quick implementation. Some industries reverted to third-party companies for the paperless program while others birthed their own with more customizations to fit their company's needs.

Reliability, accuracy and accessibility are the most prominent questions asked by both the producers and customers at the start of planning. Safety took a front seat alongside agility as consumers soon adopted paperless ticketing. Soon, electronic ticketing migrated outside of the concrete affiliates toward electronic tickets to include departments of transportation and local inspection companies. In addition to paperless ticketing and electronic tickets, industries became more creative digitally. Here began the electronic creations of mobile web ordering, GPS/truck tracking and monitoring, driver vehicle inspection reports, field level risk assessments, smart drum technology and mobile load analysis.

As digital continues to evolve, let's take a step back and review what's changed.

When the mobile phone became mainstream in the early 90's, ordering concrete took a major departure from old ways. Customers were able to make order changes in real time, inquire about current deliveries and set up business for the following days. Now with the mainstream adoption of the

smartphone we are once again approaching a new milestone of how customers interact with the concrete producer. Gone are the days of "you will see the truck any second" or "we just loaded it." Customers now demand transparency and correct information, and the ready mixed industry can deliver that with mobile apps. Chatting with dispatch, tracking trucks on a live map and viewing performance metrics of the customer and producer are at the fingertips of each person.



ISTOCK.COM/ROZDEMIR01

What are our customers saying? "I like being able to manage everything from my personal device. I like the fact that notifications come when concrete is batched, the trucks track in real time on the map, the calendar shows my will call orders, and the ability to manage and sign tickets from my device." - Envision Contractors LLC.

"Why would we ever go back?" - Clark Construction

Having all your concrete delivery information at your fingertips are wowing our contractors. In discussions with different consumers working with different ready mix companies, there's no talk of a "good" or "bad" app, it's all about the convenience and safety.

What Else is Trending Digitally?

ISTOCK.COM/MARINA DEKHNIK



Safety applications such as drivers' pre/post trip inspections and field risk and hazard reports are developing as digital tools. These tools enhance current safety protocols to include more customer, dispatcher and plant level awareness of hazards on jobsites and truck defects that would both require the attention of a frontline department manager. Having these tools available electronically provides effective communication among the dispatcher, plant manager and

driver to attend to these types of safety issues immediately.

Smart drum technology is also saving a load while on the road. This emerging technology allows producers (and consumers) the ability to monitor the slump, air, temperature, revolutions and yardage of concrete in the drum of the mixer trucks while in route to the jobsite.

Finally, concrete analytics reports enable consumers to view the pour rates of their concrete and view concrete ordered, delivered and on site. Along with GPS tracking, customers are seeing exactly what the producers are sending at a plant level interface as well as monitor the trucks in route to deliveries. Contractors can monitor concrete mixers and other equipment along with real time alerts when new changes occur on orders. Problems can be addressed an instant before they become problematic. Having a GPS tool available to the customer reduces ambiguity and confusion for the contractor who's on the job site with a pump and a need for speed.

What's Paving the Future?

If we look at the silver lining of this pandemic it's the fact that businesses were forced to change

the way business was done. The technology advances discussed above have been in the field for a few years now, but if COVID had not happened the integration and acceptance of these products would be years behind our current situation. Customers now demand instant data and metrics. The world continues to speed up and we must match that acceleration rate.

So where are we headed now? The next challenge for the industry is to integrate all this new data into a way that benefits the customer and producer. A one stop shop application that provides faster data to the customers with multiple tools linked to view in real time to include order creations, vehicle tracking, concrete analysis, invoicing, drum technology and more. Some contractors are now integrating the use of drones.

It's without a doubt that high tech ideas are growing every day in the concrete industry. We are in an exciting time of change, make sure you stay ahead. ■

This article is another in a series under the heading of NRMCA's Developing Industry Leaders program. For more information, contact Eileen Dickson at edickson@nrmca.org.



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A New Generation of Tilt-up



PHOTO: DARREN BRADLEY

Adapted by Lionel Lemay of NRMCA from an article by freelance writer Cristina D'Imperio

Spano Athletic Performance Center, UC San Diego.

Once considered a method of construction suitable only to warehouses, tilt-up now presents architects, developers, engineers and contractors with the opportunity to create durable and aesthetically pleasing structures, including everything from office and residential buildings to commercial shopping centers, sports centers, schools, homes and churches. Among many cast-in-place concrete building systems promoted through the NRMCA's Build With Strength initiative, tilt-up represents one of the greatest opportunities to increase ready mixed concrete's market share in building construction. The case studies presented here represent just a few examples of how innovative tilt-up construction has become.

Case Study: Archangel Raphael Coptic Orthodox Church, Houston

Size: 12,225 sq. ft.

General Contractor: Arch-Con Corp.

Architect: Castles Design Group

Engineer: ASA Dally Structural Engineers

In 2017, when Hurricane Harvey hit the Texas coast it became the first major hurricane to strike southern Texas since 1970 and caused a total of approximately \$125 billion in damage, dumping over 27 trillion gallons of rain over Texas. Archangel Raphael Coptic Orthodox Church, located in southeast Houston, experienced significant flood damage and needed to be rebuilt.

The new church is a ground-up, 12,225-square-foot, tilt-wall sanctuary with an office for the priest, restrooms and a cry room. The sanctuary holds 510 people and includes marble flooring, a barreled, standing-seam metal roof, fiberglass dome and handmade, traditional Coptic Orthodox wooden entry doors sourced from Egypt. The new construction also added 2,680 feet of covered walkway, a new driveway and a parking lot.

Many of the tilt wall panels were up to 235,000 pounds each and needed a hydro-crane to lift them. The panels were large in order to create a more seamless aesthetic and laser cut to create decorative and tiered layers. Layering demanded a thicker, and therefore heavier, panel.



Interior and exterior views of Archangel Raphael Coptic Orthodox Church, Houston.



Working Horizontally: The Benefits and Advantages of Tilt-Up

Tilt-up concrete can be considered a form of precast concrete and is often referred to as “site-cast precast.” The greatest advantage of tilt-up construction over other forms of construction is the ease and speed of construction. The number of laborers needed on site is greatly reduced and less equipment, such as scaffolding, is needed. Expensive formwork is also eliminated. Other advantages include the following:

- **Size:** The size of a tilt-up panel can create numerous other benefits. For instance, large panels allow for speed of construction and greater height and width, but smaller, stacked panels can offer opportunities to create unique façades. Stacked panels can be efficient cladding panels that are cast-on-site, or they can become structural load-bearing panels. The widest panel on record is 89 feet wide in North Carolina and the tallest is a 111-foot, 9 inch panel in Florida.
- **Speed and Fewer Steps:** In just a few days, the poured concrete panels cure and are then ready to be tilted into place. This allows other skilled laborers to begin work much more quickly than other building methods, in addition to shorter overall project times. Having fewer steps also eliminates many of the problems inherent in coordinating different teams and deliveries for different materials.

- **Limited On-Site Storage:** When a myriad of products and building materials are used, more on-site storage is needed, more transportation is needed and more people are needed. Tilt-up lends itself to smaller sites with limited storage space and reduces the number of deliveries and people on-site.
- **Precision:** Because the majority of a designer’s focus will be on the tilt-up panels, s/he will have the opportunity to spend more time perfecting the panels, the sequence of

their lift and their placement in advance. Even brace layout and crane movement can be determined ahead of time.

- **Aesthetic Variety/Complexity (Fluidity and Versatility of Concrete):** Tilt-up construction allows for a variety of exterior finishes, including colored concrete, exposed aggregate, sandblasting, graphic painting, polished concrete and form liner finishes. Round and curved walls, expressive edges and abstract or complex geometric shapes are also possible.



Working Horizontally: the benefits and advantages of tilt-up.



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- **Sound Attenuation and Fire Resistance:** Trades working inside a tilt-up structure, as well as future occupants, benefit from concrete's natural sound attenuation. The concrete used in tilt-up construction is also specified to meet the most stringent fire safety regulations. Fire resistance of concrete can extend the building's life, plus tilt-up panels may be used for the interior fire walls and buildings may be spaced closer together under many building codes.
- **Construction in Extreme Temperatures:** Weather is less of a problem for tilt-up construction since the floor slab provides a stable work surface for the trades. Walls do not need to be covered with insulation to allow laborers to work. In freezing temperatures and high winds, temporary casting slabs can be placed below grade and embedded with heating hoses to help cure panels.
- **Low Maintenance:** Concrete is durable and low maintenance, adding to the longevity of a building. Concrete interiors are less subject to damage and easier to wash down. The exterior can be left unpainted with no damage from the elements. If painting is desired, it need be repainted only every five to 10 years.
- **Durability/Resiliency:** Concrete is unmatched in terms of strength and durability. The strength of tilt-up concrete buildings was proven in the Northridge, California, earthquake when tilt-up walls remained standing even when roof connectors failed. Additionally, buildings constructed in the 1940s show little sign of age after 50 years. Tilt-up structures are further able to withstand wind and hailstorms and are impenetrable by the smallest rodent, insect or even the most determined human.
- **Cost-Effectiveness:** In-place material costs are cost-competitive because fewer skilled laborers are needed to achieve high-quality construction. In addition, the speed of erection and ease of other subcontractors' work further reduce costs. Costs are also easier to control because there are fewer variables in tilt-up construction. Vertical forming and scaffolding are eliminated, less skilled labor is needed and the short construction cycle precludes cost runups. Positive cash flow is easier to maintain and materials are used as soon as purchased, allowing for early payment, unlike off-site fabricated building components requiring long lead times.

Case Study: UCSD East Campus Office Building, La Jolla, California

Size: 75,000 sq. ft.

General Contractor: C.W. Driver

Architect: Gensler

Engineer: Miyamoto International, Inc.

The University of California San Diego (UCSD) was set to open its new Cardiovascular Center and desperately needed office space to accommodate the administrative and clinical research activities that would support the new center. With a low budget, the university initially thought to simply install 12 to 15 temporary, modular buildings. However, John P. Mattox, AIA, LEED AP, and senior director of Healthcare Project Management for UCSD's Facilities Design & Construction, advised the Design Review Board to consider something different – tilt-up construction.

"The Design Review Board expressed serious doubts as to whether a tilt-up building would measure up to the high standards of design that the university would come to expect," Mattox noted. The Board was particularly concerned with aesthetics and maintaining harmony and visual appeal with the rest of campus. Eventually, Gensler and C.W. Driver, a nationally ranked contractor, submitted the winning design-build proposal.

Because of the precision and planning that tilt-up allows, C.W. Driver was able to estimate the costs of the interiors as well as the mechanical, electrical and plumbing (MEP)

systems with a high level of accuracy. Building with tilt-up allowed for a cladding, lateral and gravity system all-in-one. Not only did tilt-up allow for a higher quality build within a tight budget, but it also ensured the university would have minimal maintenance costs over the course of the building's lifecycle.

Overall, UCSD's East Campus Office Building houses exam rooms, a café, pharmacy, treatment rooms, blood draw rooms, waiting rooms, a reception area, and office and meeting rooms across all three floors. The building also exceeds California Code energy savings by 16% and has achieved LEED Silver certification. Many of the materials used to construct the building, including the concrete, were sourced locally, reducing transportation costs and the effects on the environment.

- **Lower Operating Costs:** Less heat and air conditioning are required for tilt-up buildings and smaller, less costly mechanical systems can often be used. The thermal mass inherent in concrete reduces the heating and cooling peaks and loads. Insulation systems are available that enable the construction of integral sandwich walls or lightweight interior insulation.
- **Safety:** Most work is on the ground. There is no vertical formwork and no scaffolding since walls are constructed horizontally. In addition, since the floor slab is poured first, workers have a safe, stable working surface. Labor crews are also smaller.



University of California-San Diego East Campus Office Building, La Jolla.

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Without vertical forming or other costly erection processes, few workers are needed, especially during the lifting operation. The short project cycle presents less opportunity for accidents.

- **Sustainability:** The longevity and durability of concrete contributes to sustainability efforts and tilt-up construction helps to eliminate waste. Limited joints and seams, combined with concrete and insulation, lend themselves to energy efficiency. Concrete can also be sourced locally, cutting down on transportation emissions.

Case Study: FIU Biscayne Bay Campus, Bayview Student Living, North Miami, Florida

Size: 180,000 sq. ft.

Architect: PGAL

Engineer: Johnson Structural Group, Inc.

Concrete Contractor: Woodland Tilt-Up

The Biscayne Bay Campus of Florida International University's Bayview Student Living complex is a nine-story, state-of-the-art apartment built with sweeping views of Biscayne Bay. The university prioritized student well-being and amenities include an inground pool, inground 205-space parking lot, and unobstructed views of the bay to the east and the state park to the north. The new site was an intentional divergence from its predecessor and aims to provide student residents with the feeling of residing in a luxury apartment.

The \$60 million, 200,000-square-foot project consists of 410 beds in 154 apartment units across two 9-story wings consisting of studios, two-bedroom/two-bath and four-bedroom/two-bath styles, and includes classrooms, a sky lounge and multiple common spaces to provide a high-quality living and learning community atmosphere. The ground floor also contains offices, a laundry room, gaming room, fitness room, computer lab, conference room and multipurpose club room with a kitchenette. The lobby further opens into a courtyard with a curvilinear pool, beach entry and a large sundeck, and the sky lounge includes a cantilevered observation window to the bay.

With 111-foot 9-inch panels, Bayview Student Living is the world's tallest tilt-up. The living rooms are formed from 16 tall panels measuring 13 feet 2 inches wide and 16 inches thick. Increasing the thickness of the panels allowed project teams to come up with a preliminary detail using a conventional four-high



Biscayne Bay Campus of Florida International University's Bayview Student Living complex.

rigging pattern and requiring reinforcing using #9 rebars. Panels ranged in weight anywhere from 134,000 to 146,000 pounds.

In addition to the nine-story panels, three other types of panels were used: four-, three-, and two-stories. They were attached to the structural steel building in a stacked arrangement on top of each other, with the four-story panels at the bottom, the three-story panels in the middle and the two-story panels at the top. In all, there were 106 additional panels besides the 16 nine-story tall panels, for a total of 122 panels for the entire project.

The structure of the building ultimately consists of a cast-in-place frame and post-tensioned slabs with an envelope/cladding system of tilt-up panels and storefront windows. It was not necessary to brace panels after they had been lifted because they were placed on completed floors. Overall, the extensive planning combined with the university's vision for luxury student living led to the design and construction of the world's tallest tilt-up structure as well as a place of respite and learning for students.

Conclusion

Tilt-up technology has come a considerable way since its inception in the early 1900s and even from more modern beliefs that it should only be used to construct warehouses. Sports centers, multifamily residential buildings, multi-story office buildings and even churches are being constructed with tilt-up methods. Large panels allow for speed of construction and smaller panels enable architects to create



unique façades. Colored concrete, exposed aggregate, sandblasting, graphic painting, polished concrete and form liner finishes can all be used with tilt-up. Round and curved walls, expressive edges and abstract or complex geometric shapes are also possible.

Tilt-up is cost-effective. There are fewer variables on-site, vertical scaffolding is eliminated and in-place materials are cost competitive. Maintenance costs are also lowered for building owners. Less heat and air conditioning are required for tilt-up buildings and smaller, less costly mechanical systems can often be used. The thermal mass inherent in concrete reduces the heating and cooling peaks and loads.

Overall, while tilt-up has been in use for more than a century, architects and innovative designers are maximizing its potential to create a variety of sustainable, durable and aesthetic structures. ■

Lionel Lemay is NRMCA's executive vice president, structures and sustainability. He can be reached at llemay@nrmca.org.

PHOTO COURTESY OF TILT-UP CONCRETE ASSOCIATION

PHOTO COURTESY OF TILT-UP CONCRETE ASSOCIATION

NRMCA Monthly Safety Initiative

Volume 2, Issue 8



Forklift Safety... It's Uplifting

Ready Mixed Concrete Industry and Forklifts

Forklifts (powered industrial trucks) are found at most ready mixed concrete plants around the nation. From lifting blocks to raising boxes of fibers, a forklift is a powerful tool that allows ready mixed concrete personnel to precisely lift and place large heavy loads with little effort. Forklift operators and other ready mixed concrete employees working around these operations are at risk of hazards such as collisions, falls, tip-overs, and struck-by conditions. According to OSHA, every year nearly 100 workers are killed and 20,000 are seriously injured in forklift mishaps across the country. OSHA also lists forklift violations as the 7th most frequently cited standard.

What to Know About Forklifts

Operators should be familiar with the forklift data plate which includes maximum height and load capacities and always perform pre-use inspections, usually at the beginning of their shift. Operators must not modify the forklift without manufacturers' approval. Battery charging stations should be designated and designed for that purpose with no smoking and no open flames in the area. Loading docks should be well lit, ventilated, with dock boards and bridge plates. Dock procedure training is a must. No person should pass under the elevated forks, and unless otherwise designed, don't allow riders (operators only). Make sure spotter/helpers use proper hand signals, make eye contact, and stay clear of the forklift while in transit. Where your vision is obstructed the operator should travel in reverse. When ascending or descending grades more than 10 percent, loaded forklifts must be driven with the load up grade. Operators must wear a seatbelt when operating the forklift. Finally, ready mixed concrete companies must put a priority on forklift training specific to their operations.



Forklift Dos and Don'ts

- Think first, obey all safe operating procedures
- Always wear a seatbelt
- When unloading semitrailers set brakes and chock
- When unattended, lower load, set controls in neutral, set brakes, ignition off
- Railroad tracks should be crossed diagonally
- Keep speed below 5 mph
- Load capacities should never be exceeded
- No horseplay, distracted operating or mobile phone use while in operation
- Be aware of pedestrian traffic, narrow aisles, surface conditions
- Never raise the load more than necessary
- Train initially and reevaluate every 3 years



Resources

OSHA: [Powered Industrial Trucks \(Forklifts\) eTool](#)

OSHA: [Forklift Safety Quick Card](#)

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NRMCA Monthly Safety Initiative

Volume 2, Issue 9



Confined Spaces... Think First-Required

Ready Mixed Concrete Plants and Confined Space

What exactly is a confined space? According to OSHA, a confined space is a space with limited entry and exit, large enough to enter and perform work, and not designed for continuous occupancy. As well, there is then a bit of a twist to this, as there is also something called a permit-required confined space. A permit-required confined space consists of all the items listed above, and contains or may contain a hazardous atmosphere, contains material that will engulf an entrant, can trap, or asphyxiate an entrant, or contains other recognized serious hazards. Confined spaces at a ready mixed concrete plant may include bins, mixer drums, silos, baghouses, pits, vaults, and tanks.



What to Know About Confined Spaces at a Ready Mixed Concrete Plant

All confined spaces must be identified and labeled. Some permit-required confined spaces may be reclassified as non-permit-required-confined-spaces if all hazards can be removed. Confined spaces shall not be entered without approval from management, without an outside attendant, until all safety procedures have been followed, and not until everyone knows and has practiced their role. Before any confined space is entered, determine the scope of work, determine all hazards, implement necessary measures to protect all employees, verify required lockout/tagout, ventilate the area, conduct atmospheric testing if required, retest if needed and monitor the atmosphere, and obtain a permit if required. As well, before entering any confined space a rescue plan should be arranged in case of an emergency. In the event of an emergency inside the confined space, the attendant shall not enter. Instead, they should initiate the rescue plan, contact help, remain ready to assess the incident, prepare for or help with extraction, and/or provide first-aid. Failure to follow these steps could result in potentially serious injury or death.

Confined Space Dos and Don'ts

- Think first, follow all confined space safety procedures
- Determine what spaces are confined spaces and label
- Don't enter a confined space without prior approval/knowledge
- Don't assume a confined space is free of hazards
- Beware of known and changing hazards inside of a confined space
- Entrants and attendants shall maintain communication
- Attendant shall not enter the confined space in an emergency
- Maintain an accurate and current permit when required
- Permit must be signed by supervisor
- Have a rescue plan before confined space entry occurs

Resources

OSHA: [Confined Spaces](#)

OSHA: [Permit-Required Confined Spaces](#)

NRMCA: [Mixer Drum Cleaning Program](#)

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Quality Control Made Easy

By James M. Shilstone Jr.
President, The Shilstone Companies

Concrete producers need visibility into the properties of fresh concrete from the time of loading through transport to placement at the job site in order to ensure top quality of the mixture. However, real-time visibility into the properties of the concrete while in transport is often lacking and has been impossible in the past. Also, during the loading and delivery process, slump is often adjusted visually, which can be a risky process.

Quality control technologies exist that can monitor mix quality, production control and mix management and provide visibility into fresh concrete properties from load to pour. One company that has successfully navigated the quality control issue is NRMCA member The Strata Corporation, a 100-year-old company located in North Dakota and Minnesota. Its materials division provides ready mix concrete and aggregate, and its heavy construction division provides a variety of paving, excavating and commercial construction services as well as oil-field services.

From the late 1980s through 2010, Strata Corp. expanded through acquisitions. Like many other companies that have purchased other businesses, it found itself in a situation where many of the operational and quality aspects of the business remained as disjointed islands of operation. In order to improve product uniformity and aid in risk management, it decided to implement an enterprise quality concrete control software solution. In Strata's case, it chose COMMANDqc for the following reasons: it allows for rapid development and adjustment of mix designs, then can upload them to the dispatch and batch systems; its native integration with Strata's

COMMANDseries dispatch system also allowed the retrieval of batch weights and analyzing them together with test data; both concrete and aggregate tests could be stored in a central location, making them available to all interested parties and COMMANDqc's submittal package would speed up Strata's submittal process.

Strata worked with Command Alkon's implementation team to set up COMMANDqc and integrate the new system with its COMMANDseries dispatch system. Command Alkon then provided on-site training to enable Strata's staff to get the most out of its new software. As a result, it has been able to standardize mixes in its plants, resulting in more accurate accounting for material costs and a reduction in over yields.

Strata has also seen a reduction in rejected loads and has been able to combine test results for the same or similar mixes to determine strength overdesign in accordance with the ACI building code. Concrete and aggregate test results are now stored in a central repository which makes them more readily available for use in adjusting concrete mix designs and producing submittals. Engineers who previously required backup of mixes by a water/cement ratio curve now allow the use of Strata's historical information. This has reduced the cost required to produce expensive laboratory water/cement ratio curves by 80%.

Permian Basin Materials Unlocks Visibility

Permian Basin Materials, LLC (PB Materials) is located in Odessa, TX, managing 15 ready mix operations and over

20 aggregate locations. It has developed a footprint with strategically placed aggregate and ready mix facilities across West Texas and Southeastern New Mexico. One of the components of PB Materials' success on the quality front is because of a partnership with Command Alkon. The visibility that COMMANDassurance provides was the answer to manage and document water addition to its mix designs. Slump, temperature, volume, drum rotation, homogeneity, water additions and other data that summarizes the overall workability of the concrete in the drum is available in real time to all stakeholders in a ready mix operation.

Sensor data provides visibility that ensures that job specifications are met while removing materials waste and saving time that would be wasted adjusting slump. This visibility also allows for continuous improvement where the collected data brings meaningful information to the entire enterprise. The data collected from the probe is fed back into other Command Alkon systems for production, dispatch, quality control and fleet management. According to Brad Burke, technical services & marketing manager at Permian Basin Materials, "the system truly supports our QC efforts to deliver and monitor quality concrete. The information that the system provides hold everyone that has a hand in the concrete accountable – from the batch man, to the drivers, as well as contractors."

Brad cited one example where he realized firsthand the impact that COMMANDassurance made on Permian's operations. The first was at a hotel in Midland, TX. There was an elevated deck that needed to achieve 6000 PSI in 28 days. This project was



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unique in that construction on the hotel began five years before being put on hold and then the building codes changed. The construction company was either going to have to make the entire outside of the building 30 inches taller at a tremendous expense to accommodate the deeper beams for the HVAC system or it could use a 12-inch, 6000 PSI monolithic deck, keep the same HVAC design and the same building height.

To ensure the materials would hit the 6000 PSI mark, the addition of water and temperature needed monitoring. It was also winter time, which can cause issues in itself, and considering the production plant that the concrete was being batched didn't have hot water, this added to the challenge. Despite

warnings that the materials would be at risk of meeting the minimum concrete temperature spec, the customer insisted that the materials be delivered to stay on schedule. The night of the pour, Burke was able to monitor the job site remotely from 120 miles away. He saw that the temperature of the first load at the plant was 48 degrees, eventually reaching 51 degrees at the job site. The minimum spec is 50 degrees; if many readings were below that, Permian would have been covered by the historical data that COMMANDassurance delivers. If something had gone wrong, Burke could access that information and defend the company's position and warnings.

Construction companies that focus on emerging technologies to modernize their

legacy operations and bring their organization into the 21st century remain competitive. There's nothing better than getting the data that's needed to deliver top-tier products with exceptional quality. Relying on real-time and historical QC data steps the game up and ensures projects stay on track. ■

Concrete technologist James M. Shilstone Jr., FACI, is an American Concrete Institute (ACI) fellow and president of The Shilstone Companies Inc. in Frisco, TX. He's been in the ready mixed concrete industry for more than 40 years and is a member of multiple ACI, ASTM International and NRMCA committees. Shilstone currently serves as the product owner of COMMANDqc at Command Alkon.



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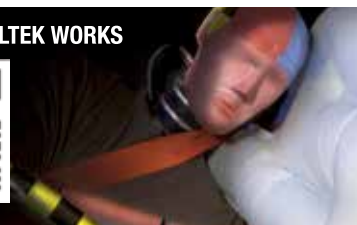
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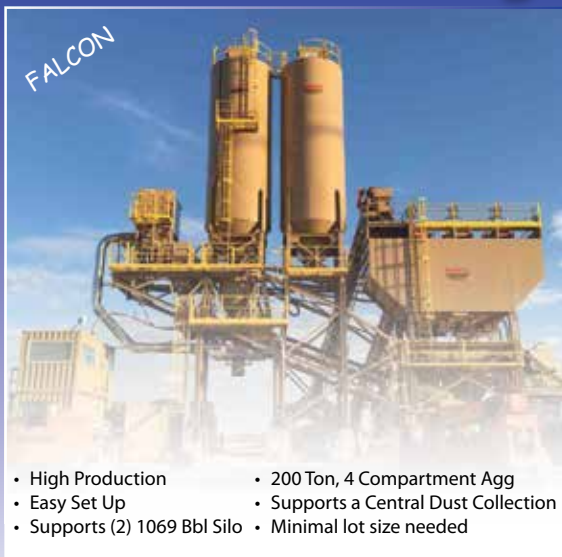
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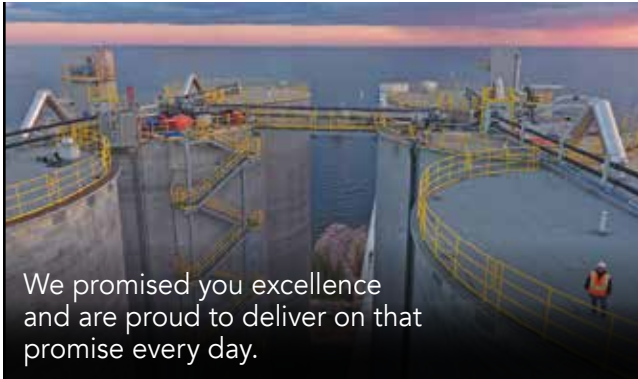
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