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FROM THE EDITOR | Kathy Wells

Our cover series this month focuses on the software and technology that is shaping the future of construction. Many of you have taken the leap and already integrated a number of tech solutions to improve your operations. But, for those who have not, or those who hesitate to invest, the series of articles beginning on page 38 is for you. The series features five articles that address five of the most popular tech initiatives in the industry: simulator training, collision mitigation systems, workstations, virtual and augmented reality and drones.



Editor Kathy Wells experiences a "mixed reality" interacting with a Microsoft Hololens headset, a self-contained, holographic computer that merges physical and virtual worlds. To learn more about virtual and augmented reality, turn to page 49.

On page 38, CM Labs Simulation's David Clark explores the benefits of simulator training for heavy-equipment operators, and how this technology has grown to become a practical alternative to on-the-job training. Next in the series, on page 42, Jim Bean, of Preco Electronics, walks the reader through the latest innovations in collision mitigation, an expansion of systems that began in the auto industry and how they are finding new applications in the construction industry. On page 46, Josh Peterson, of HP Inc., shares his advice for making changes in computer hardware to help your company grow beyond standard computer applications to sophisticated design, information and management tools. Next, on page 49, Autodesk's Dace Campbell discusses virtual and augmented reality. The article reveals ways that professionals in the architecture, engineering and construction industries are uniquely suited to grasp and incorporate this kind of virtual, spatial environment into their day-to-day operations. Wrapping up the cover series on page 52, Dick Zhang, of Identified Technologies, provides a cost-benefit analysis of jobsite drones. Zhang shares how drone mapping can have a significant impact on standard operations.

If you're attending or simply interested in keeping up with 2017's CONEXPO-CON/AGG trade show, make sure to check out our pre-show coverage on page 32. The section covers need-to-know show stats, details on educational offerings and information on the show's newest addition: the Tech Experience, as well as a sampling of new products being unveiled at the show.

As this issue went to press, our team was on the show floor at World of Concrete in Las Vegas, Nevada. To find out what happened at the show, check out our event coverage by visiting constructionbusinessowner.com/tradeshows.

Take good care,

Kathy Wells

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Struggles for the energy, manufacturing & export sectors posed a major drag on business investment in 2016, but early indicators point to growth of 3.0% in equipment & software investment in 2017.

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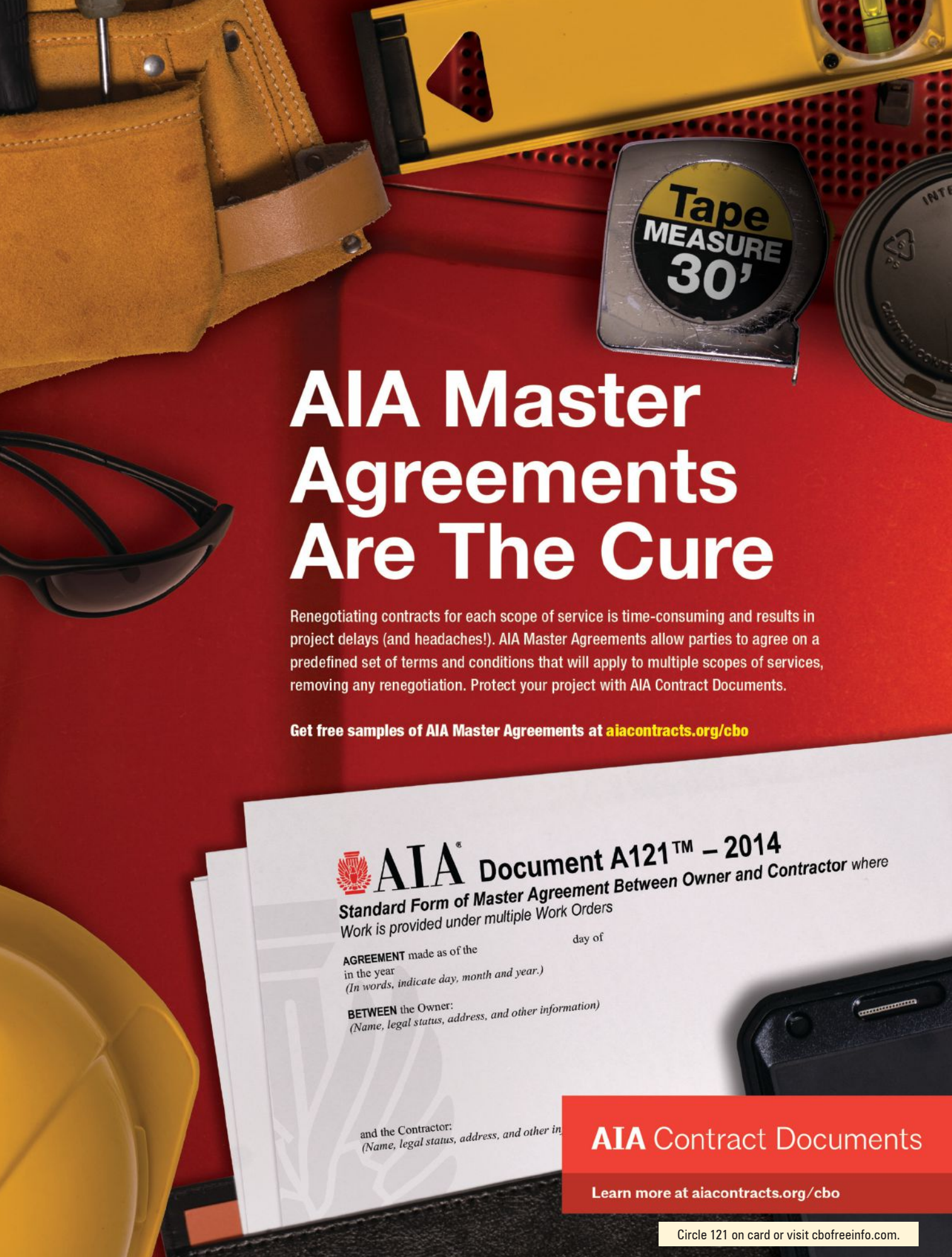

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Burns & McDonnell Inc. Acquires Azco Inc.

Burns & McDonnell is acquiring Azco Inc. The acquisition creates a comprehensive environmental, engineering, procurement and direct-hire construction and fabrication company and enhances the suite of services available to clients. Both organizations are 100-percent employee-owned and will remain that way. Azco employees will be based in their Appleton, Wisconsin, headquarters and additional offices in northeast Wisconsin, Minnesota and Colorado. Azco's relationships with international trade unions will remain in place. Azco operates a fabrication center that produces carbon steel, stainless, chrome-moly and exotic alloy pipe and metal fabrication. Visit burnsmcd.com.

AIA Announces the 2017 AIA Gold Medal Award Winner

The board of directors of the American Institute of Architects (AIA) voted to posthumously award the 2017 AIA Gold Medal to Paul Revere Williams, FAIA, whose portfolio of nearly 3,000 buildings during his 5-decade career was marked with a number of broken barriers. The medal honors an individual whose significant body of work has had a lasting influence on the theory and practice of architecture. Williams's legacy will be honored at the 2017 AIA National Convention in Orlando, Florida. Williams, the first African-American architect to receive the AIA Gold Medal, was born in Los Angeles, California, in 1894. Williams was the first black architect to become a member of AIA, and, later, the first black member to be inducted into the Institute's College of Fellows. Among his number of schools, public buildings and churches are American architectural landmarks, including the Palm Springs Tennis Center (1946) designed with A. Quincy Jones, the space age LAX Theme Building (1961) designed with William Pereira, Charles Luckman and Welton Becket, and his 1949 renovation of the iconic Beverly Hills Hotel. Williams, who passed away in 1980, is the 73rd AIA Gold Medalist. Visit aia.org.

Arcadis North America Appoints New Chicago City Leader



Alan Baxter

Arcadis North America has announced the appointment of Alan Baxter as the company's new city executive for Chicago, Illinois. In his role, Baxter will be responsible for expanding the company's market presence in the Chicago region and leading the firm's delivery of pioneering engineering solutions and capabilities to serve a growing client base. Baxter brings more than 30 years of program and project management experience to the role. Baxter has been instrumental in the delivery of many of Chicago's key construction projects, including the Public Building Commission's $2.4-billion Capital Construction Program, the Housing Authority's $1.6-billion plan for transformation and the Rehabilitation Institute's $570-million new research hospital. Visit arcadis.com.

PCA Elects 2017 Board of Directors Leadership

The Portland Cement Association (PCA) announced that Allen Hamblen, president and CEO of CalPortland Company, has been elected chairman of the PCA Board of Directors, and Tom Beck, president of Continental Cement Company, was elected vice chairman. Hamblen will take PCA board chairmanship from John Stull, CEO of United States Cement for LafargeHolcim U.S. Hamblen was once president and CEO of Glacier Northwest and has worked with CalPortland and its predecessor for 31 years. Hamblen is past chairman of the National Ready Mixed Concrete Association, a trustee of the Ready Mixed Concrete Research & Education Foundation and is past president of the Washington Aggregates and Concrete Association. A past chairman of the American Concrete Paving Association, Beck served as senior vice president at Continental Cement and as vice president of sales and marketing. Visit cement.org.

Norman-Spencer Agency Inc. Names VP of Product Management & Development



Paul Sexton

The Norman-Spencer Agency Inc. has promoted Paul Sexton to the position of vice president, product management and development. Prior to this promotion, Sexton served as the practice leader for the agency's Watercraft unit. In his new role, Sexton will be responsible for managing and developing the product portfolio for Norman-Spencer's programs. He will continue to play a key role in the operation and administration of the Watercraft unit for Norman-Spencer. Sexton will report to the agency's chief underwriting officer, George Karlis. Visit norman-spencer.com.

MSI Names Field Service Industry Leader to Management Team

MSI announced the addition of Michael Israel to its growing team. Israel is widely recognized as one of the foremost authorities on field service operations and field service software in the nation. Prior to joining MSI, Israel held leadership positions in field service as a hands-on service operations manager for 17 years at high-tech organizations, including 12 years at IBM and 5 years at a leading CAD/CAM manufacturer. He has also covered the field service industry as a consultant and analyst for major consulting firms, including Aberdeen, Jolt Consulting Group and Technology Services Industry Association (TSIA). Israel's responsibilities will include managing the successful rollout and implementation of MSI's Service Pro software for major accounts, and contributing his expertise as a driver of new product management and product marketing initiatives. Visit msidata.com.

Weil-McLain Names New General Manager



Stefan Brosick

Weil-McLain has named Stefan Brosick as vice president and general manager, based at the company's Burr Ridge, Illinois, location. The general manager position is new to Weil-McLain and was created to accelerate integration and execution of the company's sales, channel management and product development strategies to fuel future growth. Most recently, Brosick was the vice president of sales and marketing for the Americas and Europe of Sullair, based in Illinois. Visit weil-mclain.com.

Yamaha Motor Corp. USA Acquires Subaru Industrial Power Products

Yamaha Motor Corp. USA's (YMUS) Outdoor Power Equipment division announced the acquisition of Subaru Industrial Power Products. The acquisition is a result of an agreement between parent companies Yamaha Motor Co. Ltd. and Fuji Heavy Industries Ltd., and is expected to be completed by October 1. Fuji Heavy Industries is ceasing the production and sale of multipurpose engines, etc. at the end of September. Fuji Heavy Industries will transfer to Yamaha Motor Powered Products Co., Ltd. (YMPC), technology relating to three products: EH65,

EH72, and EH65V of the EH Series V-Twin Overhead Valve multipurpose engine range. The acquisition of this technology will enable YMPC to sell the EH Series V-Twin Overhead Valve multipurpose engines, both within Japan and overseas, including through YMUS in the U.S. Through the acquisition, YMUS will continue after-sales service for Fuji Heavy Industries' multipurpose engine business in North America (excluding Mexico). Visit yamahamotorsports.com.

Oldcastle APG Adds to Echelon Masonry Management Team



Brenda Harris

Oldcastle APG announced the addition of industry veteran Brenda Harris to the company's management team as director of residential masonry, with direct responsibility to grow market share in the brand's masonry cladding space. Harris will take a leadership role with several new product lines, such as the Echelon Masonry Veneers' new Be.On Stone. Harris began her career at Stewart Building and Roofing Material in Tucson, Arizona. Her career path soon took her to Southern California, where she spent a decade at Orco Block and Hardscape, and more than 11 years leading the sales efforts at the Headwater Stone Division. Visit oldcastleapg.com.

JLG Names Director of Marketing, Americas



Jennifer Stiansen

JLG Industries, Inc. announced Jennifer Stiansen has joined the company as director of marketing for the Americas, access segment. In her new role, Stiansen will lead all marketing and communications initiatives for the North American and Latin American regions. She will report directly to Alan Loux, vice president, global marketing, access segment, and serve on the global marketing leadership team. Prior to joining the access segment at JLG Industries Inc., Stiansen served as marketing communications manager for several brands, on both the manufacturer and agency sides, managing advertising, public relations, internal communications and digital marketing. Visit jlg.com.

1,000,000

Briggs & Stratton Corporation celebrated the production of the one millionth pressure washer built at the company's Milwaukee, Wisconsin-based Burleigh Facility. The one millionth pressure washer was a new Troy-Bilt model that will be sold at Lowe's stores nationwide. Visit briggsandstratton.com.

BCSP Welcomes New Board Members, Officers

The following BCSP board of directors were elected as officers on the 2017 board, and began their terms in January: C. Christopher Patton, CSP, ASP will be the 2017 board president; Linda F. Martin, CSP, ASP, OHST, CHST, STSC, CET as vice president; and Patricia C. Cruse, CSP, CET as treasurer. BCSP welcomes and looks forward to contributions from V. Raymond Ferrara, CFP and Jim S. Kreinbrink, CSP, CIC as they join the board of directors in 2017. Patton, 2017 board president, is the senior technical advisor, ES&H for UT-Battelle at Oak Ridge National Laboratory. He has over 20 years of experience in safety, health and environmental practice. Patton is a past president of ASSE and served on the ASSE board of directors for 7 years. Patton received the ASSE Culbertson Volunteer Service Award for outstanding service to the organization. Martin, 2017 board vice president, is the corporate safety director for Bay Crane, an adjunct faculty member at Embry-Riddle Aeronautical University and a faculty member at Columbia Southern University. Martin has over 25 years of experience in occupational safety management, construction safety, industrial hygiene and consulting. Cruse will continue to serve as the BCSP board treasurer in 2017. She has 35 years of experience in industrial hygiene, product stewardship, training and occupational safety. She is a safety and health manager for Evergreen Packaging. Visit bcsp.org.

Legrand Raises $112,540 to Aid Red Cross Natural Disaster Relief Efforts

Legrand North America announced its fundraiser for disaster relief through the Red Cross will make a total contribution of $112,540. All money raised will provide assistance to the people and regions affected by natural disasters throughout the country. Legrand President and CEO John Selldorff and Data Quality Manager and Better Communities Committee Leader Alyssa Adnani encouraged all North American associates to donate, incentivizing them with a dollar-for-dollar company match. 2016 saw 16 consecutive major disasters across the U.S. Visit legrand.us.

ACPA Appoints Chairperson of the Board

Lori Tiefenthaler, senior director of marketing for Lehigh Hanson Inc., has been appointed chairperson of the American Concrete Pavement Association's (ACPA) Board of Directors. She is the first woman to serve as the top volunteer leader in the 54-year history of the association. Her appointment to chairperson reflects Tiefenthaler's more than 30 years of experience and expertise in the cement and concrete materials industries. She brings a broad range of skills and expertise to her new role and her background includes extensive experience in sales, marketing, sustainability and the development of promotional programs to increase concrete and cement usage. Prior to joining Lehigh Hanson, she served as executive director for the Southeast Cement Association and held management positions with the Iowa Concrete Paving Association and her family's ready mixed concrete and sand and gravel operations in Iowa. Tiefenthaler accepted the ACPA leadership role from 2016 Chairman Steve Jackson, president of Cedar Valley Corp. LLC. In addition to leading the ACPA's Board of Directors, Tiefenthaler also serves on the board of directors for the Slag Cement Association, as well as on the paving and sustainability committees of the Portland Cement Association (PCA) and National Ready Mixed Concrete Association (NRMCA). Visit acpa.org.

Prairie Capital Advisors Names New Vice President



Mark Rutledge

Prairie Capital Advisors Inc. has announced the hiring of Mark Rutledge as vice president. Rutledge will primarily focus on employee stock ownership plan (ESOP) advisory services. The

addition of Rutledge is part of a larger initiative by Prairie Capital Advisors to expand and support the firm's ownership transition clients and to enhance existing relationships. Prior to joining Prairie Capital Advisors, Rutledge was director of valuation services at Smith & Howard. Before joining Smith & Howard, Rutledge served in valuation roles for American Appraisal Associates, Ernst & Young, Phillips Hitchner Group, Adams Capital Inc. and Tidwell DeWitt LLC performing valuations for a variety of purposes. Visit prairiecap.com.

TDIndustries Announces Retirement of Chairman of the Board



Jack Lowe Jr.



Paul Minton

Former TDIndustries CEO and Chairman of the Board Jack Lowe Jr. has announced his retirement from the board of directors. His retirement comes after serving 52 years at TDIndustries. Lowe served as TD's CEO from 1980 until 2004, when the board named Harold MacDowell as his successor. He continued his leadership on the board of directors as its chair through 2016. Paul Minton, president and chief executive officer of California Eastern Laboratories in Santa Clara, California, has been selected to succeed Lowe in the role of chair, effective January 1. Minton facilitated TDIndustries' strategic planning from 1997-2007, then joined the board of directors in 2014. In addition to his leadership roles, he cofounded two startup technology companies and serving as a strategy consultant for Cisco Systems, Toshiba Medical Systems, Johnson Controls, Hormel, TD and other firms. Visit tdindustries.com.

Komatsu America Launches New Sales, Support Unit

Komatsu America Corp. announced the company has formed a new unit (Komatsu Northeast) and will assume Komatsu's trade territory for New Jersey. This includes all Komatsu construction, mining and utility equipment sales and rentals, parts, service and customer support activities. Previously, the territory was served and supported by Binder Machinery Company. The new unit will support Komatsu's long-term strategic plans to strengthen the distribution channel by getting closer to the customer. Visit komatsuamerica.com.

Lincoln Electric Announces Changes to Leadership Team



Frederick G. Stueber



Jennifer I. Ansberry

Lincoln Electric Holdings Inc. announced that Frederick G. Stueber will retire from the company as executive vice president, general counsel and secretary in April. Stueber's retirement marks a 36-year career in law, and 22 years as Lincoln Electric's general counsel and secretary. While at Lincoln Electric, Stueber has led global litigation, corporate governance matters, mergers and acquisitions, corporate compliance, intellectual property, labor law and environmental, health and safety initiatives. He also served as a member of the senior management committee. During his tenure, he successfully led an industry defense group and collective plan against fume litigation, which resulted in the dismissal of numerous cases against the company and industry. Prior to joining Lincoln Electric in 1995, Stueber served at Jones Day for 13 years, the last 6 years as a corporate partner. Jennifer I. Ansberry will be promoted to executive vice president, general counsel and secretary and she will serve as an officer of the company. Ansberry joined Lincoln Electric in 2004 and serves as vice president, deputy general counsel and oversees the company's legal function in global mergers and acquisitions, securities law compliance, corporate governance and other general corporate legal matters. Visit lincolnelectric.com.

McCarthy Texas Announces New Hire & Promotions

As the Texas division of McCarthy Building Companies Inc. continues to increase its focus on heavy civil and solar work, the company announced it has expanded its leadership team with the return of Todd Henson as vice president of transportation operations. In addition to the recent hiring of Henson, the company announced the promotion of Bob Rogers to vice president of marine operations, Fitz O'Donnell to marine project director and John Frazier to solar project director. As vice president of transportation operations, Henson will lead efforts to secure and successfully execute heavy civil/transportation-related projects throughout Texas. He was previously with McCarthy from 1995 to 2004, and served in various roles. Henson brings 20 years of experience to McCarthy. Rogers joined McCarthy in 2000 as a project engineer with a focus on quality and client relationships. He has contributed to the success of several projects, including the reconstruction of IH 410 in San Antonio, the Port of Houston Bayport Terminal Wharf 1, MARAD Beaumont Layberth Facility and many more. In his new role as vice president of marine operations, Rogers will lead McCarthy's efforts to expand client relationships and successfully execute marine projects across the gulf coast. O'Donnell started with McCarthy in 2008 as an assistant project manager working on the Port of Houston Authority Bayport Wharf 1 project. In his role as project director, he will focus on McCarthy's port and marine efforts, providing leadership and technical support to three ongoing Port of Houston projects. Frazier joined McCarthy in 2006 as a project manager working on the IH 410 reconstruction project in San Antonio. In his new role as project director, Frazier will focus on McCarthy's efforts to expand solar market share and deliver renewable energy solutions throughout Texas. Visit mccarthy.com.

ICRI Elects New Officers & Board Members

The International Concrete Repair Institute (ICRI) announced the election by the membership of new officers and board members for 2017, including Brian Daley, C.A., of Lindman of South Florida LLC, as its president. The terms began on January 1. To support Daley, the ICRI membership also elected the following officers: president-elect – Ralph Jones, Structural Engineering Associates; vice president – Chris Lippmann, Kenseal Construction Products Corp.; secretary – Mark LeMay, JQ Engineering, LLP; treasurer – Scott Greenhaus, STRUCTURAL; Keith Harrison of Capital Restoration & Waterproofing Inc., served as president in 2016 and will continue his service on the board as immediate past president. Visit icri.org.

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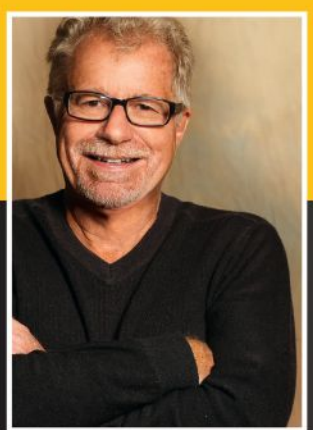

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To submit a question, email Managing Editor Elizabeth Manning at emanning@cahabamedia.com.

Smart Equipment Acquisition

How can business owners make better equipment purchasing decisions?



RALPH PETTA
President & Chief Executive Officer
Equipment Leasing & Finance Foundation



HERB BROWNETT, CCIFP
Senior Vice President
Brubacher Excavating Inc.



DAVID JAMES, CPA, CCIFP
Chief Financial Officer
FNF Construction Inc.

"One of the most effective ways that a business owner can maximize purchasing power is through financing equipment acquisitions. Financing increases purchasing power in a number of ways. For one, leasing terms with 100-percent financing and no down payment avoid a large cash outlay, as with a purchase or loan down payment. It provides businesses with access to more and better quality equipment, which enables them to be more productive with smaller, more affordable monthly payments rather than making a big, upfront cash purchase. Equipment financing also enhances purchasing power by freeing up working capital so it can be used in other areas of the business. Our research points to increased construction equipment investment this year due to a number of factors, including gains in wages and income, personal consumption, housing growth and expected infrastructure spending. Equipment financing is used by nearly 8 in 10 firms in the United States to acquire the equipment they need to operate and grow. Ongoing innovations in the equipment finance industry will continue to increase flexibility and convenience for end-users, making it more attractive than ever to leverage the power of financing.

"Sound decision making with regard to purchases of major pieces of equipment in a capital-intense, heavy-highway construction company is critical to the long-term profitability and financial health of the company. It is not uncommon for the owners of such companies to be enamored by equipment. This can lead to purchasing decisions that are intuitive or emotional, a condition that construction financial managers humorously call "yellow fever." A best practice is to take a long-term view of the company's equipment fleet. This starts with a 5- to 7-year Cap-X spending plan. The plan should schedule each piece of major equipment with its current hours, projected economic total hours and estimated hours per year. Based on this plan, a replacement year can be identified for each piece of equipment. Replacement schedules for individual pieces can be shortened or lengthened to smooth out total annual purchases. Since it may be subject to changing economic conditions and equipment needs, the schedule should be updated annually and adhered to rigorously. Companies that maintain this discipline will have higher equipment utilization and lower long-term equipment costs, which are two key ingredients to a profitable, heavy-highway construction company.

"For capital-intense construction companies, equipment purchasing becomes a significant part of their business routine, and must be done with a disciplined approach. This applies both to the decision to buy, and the decision to finance the acquisition. The ability or desire (these two elements are not always the same) to finance equipment should be a consideration during the go/no-go decision on the acquisition. Financing options can be complex, and they will impact the contractors' financial statements and cash flows. Contractors should establish a threshold for using cash for acquisitions versus using financing. The threshold may be related to the overall company cash flows, equipment turnover or a function of debt covenants with your bank. Once the threshold is exceeded and financing alternatives are being explored, realize that there are several approaches to this activity. Debt financing, capital leases and operating leases all come with their own set of pros and cons. Rates, terms, cash flow, taxes, your flexibility to sell the asset and balance sheet, and financial ratio implications will all need to be considered. Lender resources may include the vendor, banks, leasing companies and specialty lenders. In short, buying smart includes funding smart.

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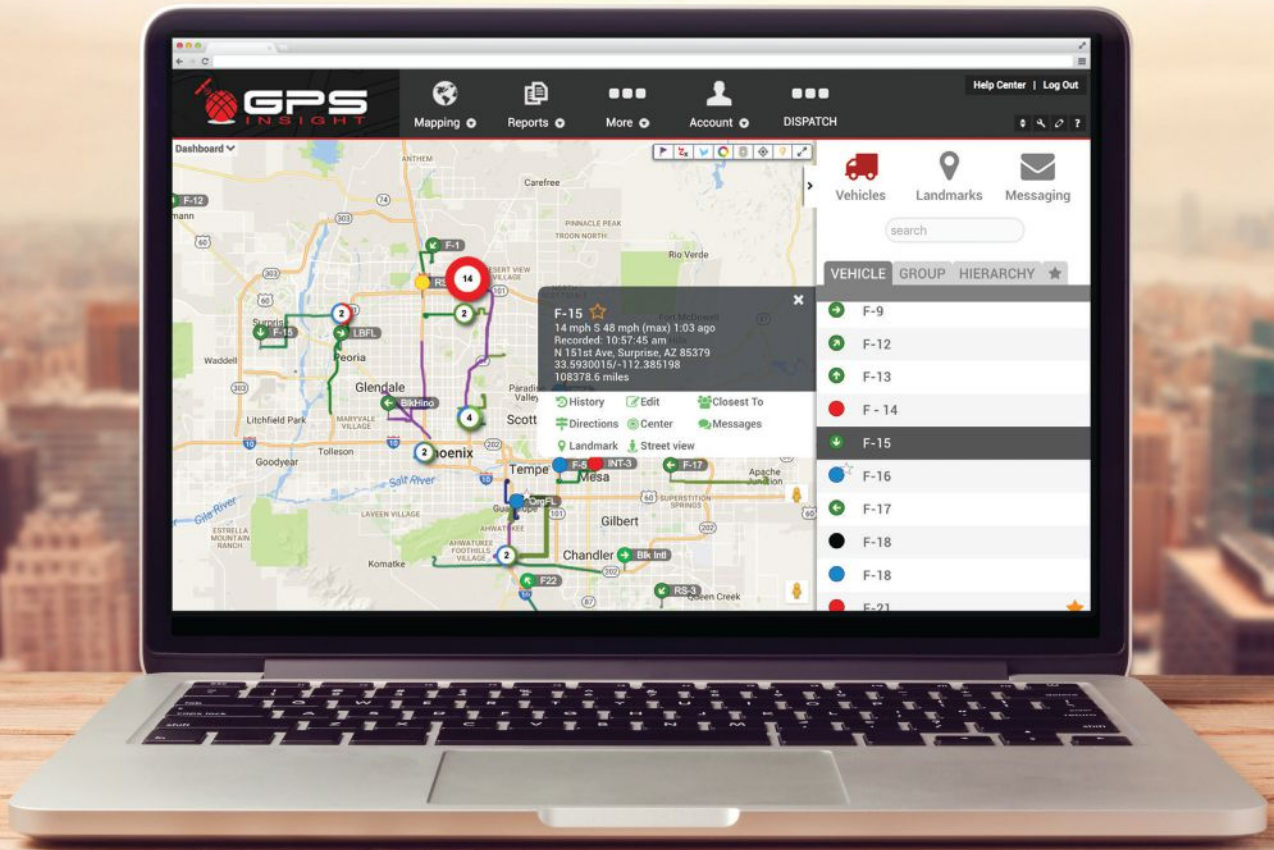

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George Hedley CSP CPBC is a professional construction BIZCOACH and industry speaker. He helps contractors grow, profit, build management teams and get their businesses to work for them. He is the best-selling author of *Get Your Construction Business To Always Make A Profit!,* available on amazon.com. Email gh@hardhatpresentations.com to sign up for his free e-newsletter, start a BIZCOACH program, attend a 2-day BIZ-BUILDER Boot Camp, or get a discount at hardhatbizschool.com, an online university for contractors. Visit hardhatpresentations.com for more information.

ASK GEORGE

To submit a question for George Hedley, email Managing Editor Elizabeth Manning at emanning@cahabamedia.com.

In 2004, I wrote an article for one of the first editions of *Construction Business Owner* magazine titled "Is Your Goal to Retire Before You Learn the Computer?" At that time, many owners didn't want to add technology to their operations, and they were hoping computerization would not be required to do business. Boy, were they wrong. Now, cutting-edge technology is required to communicate with customers and subcontractors, obtain and read plans, schedule jobs and people, and manage business and field operations. A lot has changed over the last several years. Back in 2004, there were only a few technology options to make your construction business cutting edge. Now, the options are always changing. The decision today is about what software or technology solutions will allow your business to make more money, become more efficient and get more organized. What will it cost, how hard is it to implement and will it perform as promised?

1. DO YOU HAVE THE RIGHT TOOLS?

You wouldn't start a construction company without the tools needed to compete and get the work done. Today, the tools required to run a profitable construction business include necessary technology options, training and ongoing support to keep current and competitive and maximize your bottom line. Construction business owners who postpone implementing required technology tools will never build the kind of company that maximizes profits, attracts the best customers and delivers the highest results.

2. WHICH TECH TOOLS DO YOU NEED?

Start by assessing your current technology, what needs upgrading and what new tools will help your company improve and make the biggest impact on your bottom line with the least amount of disruption.

When I work with companies to draft their strategic business plans, we always start by making a list of their top priorities for the upcoming year. Review the following list of typical priorities to determine what you need to focus on, implement or improve to hit your goals over the upcoming year. Next, rank these priorities in order of importance for your company.

- Implement accurate estimates with no missed items
- Improve bid-hit win rate at higher margins
- Develop better customer relationships
- Finish all projects on budget
- Finish all projects on schedule
- Stop profit margin shrinkage
- Track field job costs weekly
- Maximize field production
- Encourage field superintendents and foremen to plan ahead
- Standardize project management and field systems



- Get paid promptly for all work and change orders
- Avoid mistakes, rework and call-backs
- Maximize the return on equipment investments
- Implement timely and accurate financial management and accounting

Next, decide what cutting-edge technology solutions from your list will allow your company and teams to become better at achieving their goals.

3. HOW MUCH SHOULD YOU INVEST?

Contractors typically prefer not to spend money on things that don't improve their field operations. How much money are you willing to invest to get better results?

Technology is almost never something that owners want to add to their overhead expense. One example of trying to save money by not doing what is needed is to invest in technology and then not utilize it. Not using technology to the fullest causes the accounting department to hand enter every timecard.

This doesn't allow for things like up-to-date job-cost reports to be available weekly for the project manager and foremen to review. These reports are atop the list of what every contractor needs, including: weekly job-cost reports to review with the field; accurate estimates and job-cost history; written look-ahead schedules prepared weekly; and more. Each of these can be improved with a solution and will add to your bottom line, but only if you are willing to invest. To help you decide where to invest time and money in technology solutions, use your top priority list to determine what improvement will give you the highest return on investment.

4. WHAT SHOULD YOU IMPLEMENT NEXT?

MANAGEMENT DASHBOARD ADMIN

- Calendar, contacts and email
- Document database
- PDF review and markup

ACCOUNTING

- Accounts payable
- Accounts receivable
- Invoicing and billing
- Job-cost tracking
- Payroll and timecards via tablets
- Monthly financial statements
- Monthly profit and loss

ESTIMATING

- Digital takeoff
- Pricing database
- Bidding and estimating
- Bid invitation solicitation
- Bid analysis
- Job-cost history database
- Bid presentation

PROJECT MANAGEMENT

- CAD drawings, plan management and BIM
- File sharing/document management
- Writing subcontracts/purchase orders
- Change order management
- Submittals and shop drawing management
- Meeting minutes, RFIs and job correspondence
- Scheduling and look-ahead schedules
- Daily reports and job photos
- Inspections and punch list
- Safety management

EQUIPMENT MANAGEMENT

- Resource management, logistics and dispatch
- Equipment maintenance
- Inventory control
- Tool management
- GPS

MARKETING & SALES

- Customer database
- Project lead generation
- Sales management
- Proposal follow-up
- Presentations
- Website
- Email marketing and newsletter

5. WHAT IS YOUR GOAL?

Find the technology solution that is best for your company by asking similar construction companies what they use and if they are happy with it. Go to your local industry association and ask around. Also, look at annual trade shows and conventions, where many vendors display their systems and you can ask them about your specific needs and budget. Computers and technology won't save you money or eliminate positions. But they will allow you to keep track of your projects, become more productive, communicate better and make more money. **CBO**

The Skunk Works Idea

Exploring the concept of research & development in a construction organization



Gregg M. Schoppman is a consultant with FMI, management consultants and investment bankers for the construction industry. Schoppman specializes in the areas of productivity and project management. He also leads FMI's project management consulting practice. Prior to joining FMI, Schoppman served as a senior project manager for a general contracting firm in central Florida. He has completed complex construction projects in the medical, pharmaceutical, office, heavy civil, industrial, manufacturing and multifamily markets. He holds a bachelor's degree and master's degree in civil engineering, as well as a master's of business administration. Schoppman has expertise in numerous contract delivery methods, as well as knowledge of many geographical markets. Visit fminet.com, or contact Schoppman by email at gschoppman@fminet.com.

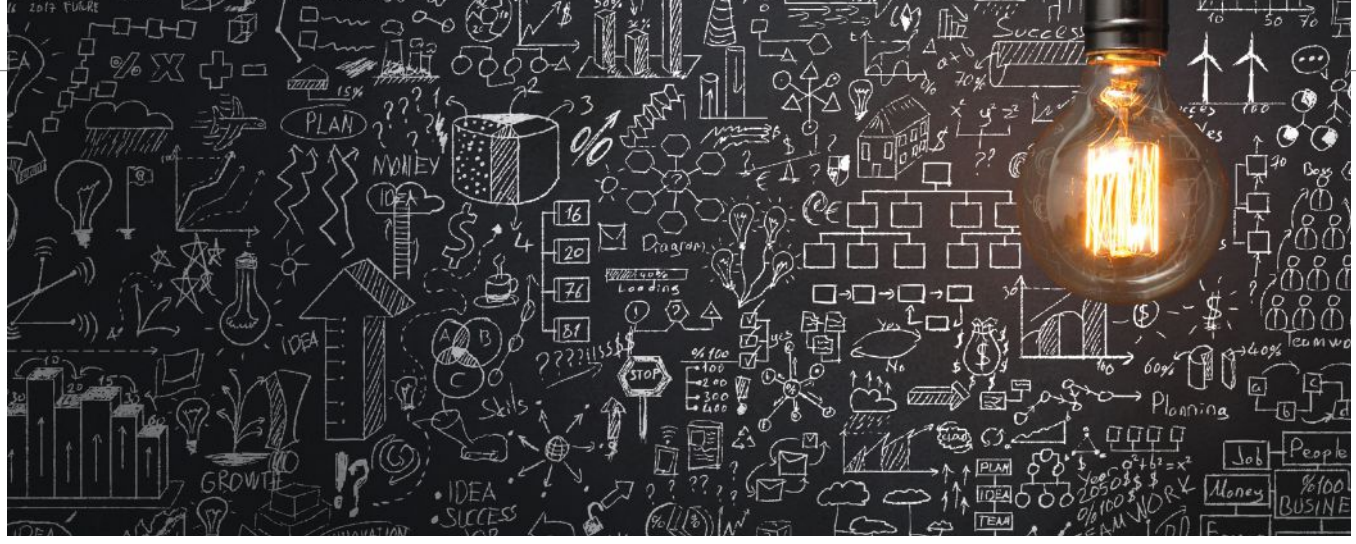
"For more than 70 years, the Skunk Works has existed to create revolutionary aircraft and technologies that push the boundaries of what is possible (Lockheed Martin)." Area 51 has long been thought to be one of the most secretive places on the planet. Whether there was an actual, extraterrestrial event remains a mystery, but one true aspect of this secluded part of Edwards Air Force Base in Nevada is the existence of Skunk Works. While the name itself is peculiar, the various projects that have been launched within this boundary-pushing faction of Lockheed Martin have long been viewed as some of the greatest achievements in aeronautics and military science. The U-2 spy plane, the SR-71 Blackbird and the F-117 Stealth are all products of Skunk Works, each providing an amazing milestone in aviation and technological innovation.

Construction firms are rarely veiled in such secrecy. In fact, most projects are constructed within the prying eyes of the customers, competitors and the public with a simple chain link fence providing the only visual deterrent. This is not to say that a construction project should be veiled in the same way Area 51 is shielded from the probing eyes of conspiracy theorists. The real lesson is in the culture of innovation that Skunk Works has provided to the military, aviation and our country. When you lay pictures of construction projects side by side from 1985 to now, how much variation will you notice? While pundits might argue that some innovation is not easily seen—GPS, BIM, smartphones—most construction projects would look identical, even separated by decades. How many other industries can tout that same level of advancement, or lack thereof?

It is interesting to note the rationale for choosing the obscure and even off-putting name of "Skunk Works." The pioneers at Lockheed describe their values for this business initiative as balanced, visionary, instinctual, quick, strategic, quiet, quality-focused and passionate. How many construction firms use similar vernacular when describing their core values? While many like the moniker of "strategic" and "innovative," they are hardly strategic or innovative. A better indicator would be a demonstration of strategy and innovation and a long-term commitment to such statements.

THE NOT-SO-DISTANT FUTURE

Consider a normal construction site 10 years from now. The only difference is that this one has no people traipsing the site. The site is dominated by autonomous vehicles. Three-dimensional printers are constructing valve assemblies that are being spooled to them. Drones are providing deliveries of modularized systems and prefabricated assemblies. These same drones are surveying the site and providing real-time information on the percent complete and overall progress on the project.



While it sounds more like a scene from the new "*Star Wars"* movie, several of these technologies are already alive and well on jobsites around the world. This is not to say that every firm should make a sizeable capital investment in new equipment. However, how much time is spent within any firm on thinking about the face of the industry and the response to deal with new opportunities and challenges? Better yet, is there a Skunk Works operating with any firm today that is consciously and proactively pushing the boundaries of technology and innovation? Simply put, how much does your firm invest in strategic thinking?

- *Strategic business thinking*—Whether it is once a month or two times a year, best-in-class firms are working to elevate the thinking of its associates. The keys are pushing everyone to make a shift, with the aim of changing the way they do business long term.
- *Research and development teams*—Many firms dabble in true research and development. Some firms are making it part of their culture by rewarding innovation. This doesn't mean that every firm has a new cost center or separate line item dedicated solely to research. However, the progressive firms are encouraging new thought leadership and incentivizing it.
- *Opportunistic or strategic*—Many firms will capitalize on a new market, new concept or new idea, but only after it comes through the door. Other firms are making a new door. It is one thing to be open to new concepts, but it is another to be the true leader and be the first.

THE GREY-COLLAR WORKER OF TOMORROW

One of the most fascinating outcomes from the recent minimum wage debate within the confines of the fast food industry in the United States has been the technological shift to "self-service" modules that have popped up at many of the greasy counters. Now, consider the construction industry. For many years, there have been discussions about the labor shortage and the continued hurdles that firms face relative to finding top talent. Maybe the solution comes in the form of new labor. While the vision described previously depicted a jobsite void of human beings, all of the equipment and vehicles in question might be controlled from some off-site control room with all of the accouterments of a video arcade. Workers are no longer exposed to the hazards of a dangerous jobsite and nasty weather conditions. The worker of tomorrow is now part gamer, part technician. Is this a way to make a job that for the last 50 to 60 years has born the title of "dirty job" now fun and attractive? Once again, it is easy to dismiss this thesis, but look again at the team at Skunk Works. Ultimately, the messaging for firms should be one of serious consideration around employee development. The following are possible considerations for growing the grey-collar worker of tomorrow:

- *Competencies*—What core competencies will be required of associates in the future? This is less about skill sets and more about a marriage of the right qualities of associates to the vision for the firm.
- *Training*—Your company should adopt a training program that supports the core competencies. What will customers want in the future, and how are we able to service those needs?
- *Roles and organizational structure*—The firm should be open to considering an evolution of different roles within the organization. What roles will be required in a future state organization, and what positions will vaporize?

Once again, so what? Proactive planning, investigating and testing are the key themes. For John Q Construction, the emphasis should be on asking the question, "How can we employ something like this on our projects?" Firms that began prefabricating and modularizing years ago focused on one area first. They didn't leave the planning table with the aim of modularizing everything on day one, but began with something to launch their endeavors.

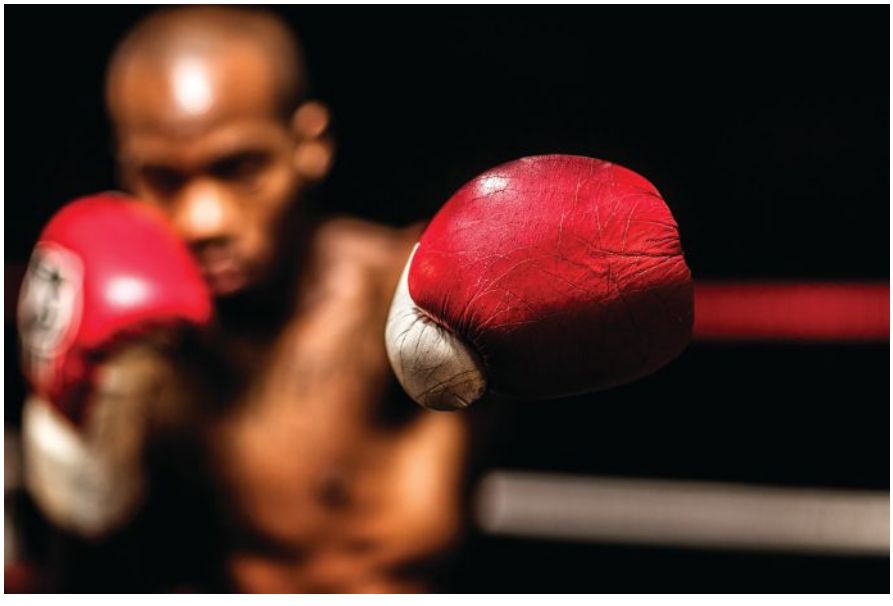
It is incumbent upon every construction leader to challenge what they are doing today. Doing business the same way over and over will simply yield the same results. Leading firms should have their own Skunk Works strategy, constantly pushing them to find the next big thing. Overall, the industry is ripe for the next big thing. **CBO**

Surviving the Fight

6 tips for protecting your company when it comes to bond claims

BY BEN WILLIAMS

Former heavyweight boxing champion Mike Tyson famously said, "Everybody has a plan until they get punched in the face." This is as true in construction as it is in boxing. Even the best contractors can find themselves in the middle of disputes. Occasionally, these disputes escalate, and the contractor is presented with a bond claim. Depending on the size of the claim and the strength of the company, these claims can put contractors on the ropes and even knock them out of business. So, what can contractors do to protect themselves?



Most projects involve either performance bond claims or payment bond claims. Generally speaking, a performance bond guarantees that the contractor will perform the obligations spelled out in the contract, while a payment bond guarantees that the contractor will pay subcontractors and suppliers. Each contract and bond form is a little different, but, generally, four events need to occur before the bond company will act on a bond claim. These include:

1. The contractor has to be in default (breach of contract).
   a. The obligee (owner or upstream contractor) has to declare the contractor in default. Don't make the mistake of defaulting yourself. Contractors and bond companies have pointed out that claims cannot be made because they haven't been defaulted. This will immediately prompt a default letter.
2. The obligee must have performed its obligations under the contract.
3. The obligee must terminate the principle's right to proceed.

Once these requirements are met, it is the bond company's responsibility to investigate the claim to see if it is valid. If the default is found to be accurate, the bond company will have four options to pursue:

1. *Financing the contractor*—With this option, the bond company provides financial assistance to the contractor to complete the job. All financial assistance from the bond company adds to the loss, and the bond company will expect reimbursement from the contractor and indemnitors. Typically, in a financing situation, the surety will require the contractor to reaffirm a pledge of personal assets and/or set up joint checking accounts to handle contract proceeds.
2. *Takeover*—This option allows the bond company to step into the contractor's position on the contract and complete the work according to the contract.

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FRED ODE
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Bond companies would choose this route if the job is closer to completion. However, because it can open the bond company up to additional liability, this option is rarely used.

3. *Tender new contractor*—The bond company chooses a new contractor to finish the job. The bond company will negotiate the price and terms of the contract, and then submit to the obligee for approval. One reason a bond company may take this option is if the contractor disputes the default. The bond company can tender a new contractor and later dispute their liability with the obligee.
4. *Obligee completion*—Often referred to as owner completion or "do nothing" option. This is an option if hazardous waste is involved, the surety believes the contractor has a valid defense, the obligee will not have damages because the remaining contract proceeds will cover the cost of completion or the cost to complete will be more than the penal sum of the bond.

Regardless of the claim, surety bonds require indemnification, which means that the bond company will come back to the construction company and owners looking to be reimbursed for any loss. Therefore, none of these options are good for the construction company. Check out the following tips to reduce the pain and ensure your company gets off the mat.

1. NEGOTIATE WITH THE CLAIMANT

By the time a bond claim is submitted, the relationship has suffered some strain. It is better if the two parties can reach an agreement. Keep in mind that once a bond company gets involved, you will be working with the bond company's claims people and attorneys, and not the underwriters and agents that you have relationships with previously. These are two different groups of people with different goals in mind. Along those lines, do not default yourself.

2. DON'T OFFSET BONDED & UNBONDED OBLIGATIONS

Many contractors choose to work with the same reputable subcontractors and suppliers on multiple projects. However, not all projects are equal. Contractors can get into trouble when they withhold payment on a bonded job because of nonperformance on another job. Even though it sounds unfair, a subcontractor or supplier will have a valid bond claim if the company has not paid them for work on a bonded job, even if they have not performed their obligations with your company or other projects.

3. READ THE CONTRACT

This sounds simple, but it is the most important part of the process. Bond companies guarantee the contract and must use its terms and conditions, along with the bond forms, to decide if the contractor is in default. Make sure that you have met all necessary conditions to the owner, subcontractor or supplier. Then, it's time to decide whether there is a valid bond claim. In many cases, subcontractors and suppliers use the bond as leverage to collect payment. If this is the case, make sure you communicate that to your bond company early in the process.

4. KEEP AN EYE ON THE TIMELINE

Once you receive notice of a bond claim, check to see if it was filed promptly and properly. Most bond forms require written notice of a claim within a certain period of time. State and federal laws, along with case law, tend to vary, but improper paperwork could cause any claim to be invalidated. Make sure to know the laws and local regulations for where you operate.

5. DON'T FORGET TO DOCUMENT

You must keep good records to survive a serious bond claim. Emails, photos, checks, pay app and other records become valuable information. Make sure you have systems in place so that you can document and easily retrieve this information.

6. CHECK YOUR INDEMNITY

If there is a valid claim and the bond company has to cure the default, it will eventually seek reimbursement from the construction company and potentially owners or other indemnitors. Refer to your general indemnity agreement—the document you signed when you started working with your bond company. Unfortunately, many contractors do not read these until there is a problem. This document will outline all of your responsibilities and requirements to the bond company, including notice requirements. Personal indemnity is of great importance to contractors. Someone will have signed on behalf of the company, but check to see what other indemnitors have signed as well. Usually, a signature under a person's name will mean they are personally indemnifying, meaning that personal assets are at stake. Be on the lookout for a "Capital Retention Agreement." Many contractors sign this believing they have no personal indemnity. In reality, the indemnity kicks in when the company's financial strength drops, for instance, during a bond claim. Some bond companies may be willing to trade personal indemnity for your willingness to stick around and see that the bonded obligations are finished. Then again, some will not, as they expect this already and it is in the indemnitors' best interests to minimize any losses.

Despite best efforts, bond claims are always a fight. Even the best contractors typically walk away a little bruised. However, with the right knowledge and experts in your corner, you and your company can survive to fight another day. **CBO**

Ben Williams is the director of surety operations for the Miller Group. He works with contractors to establish and maintain the surety bond credit they need to carry out their business plans. Williams holds an associate degree in fidelity and surety bonding (AFSB) and construction risk and insurance specialist (CRIS) designations. Visit millercares.com.





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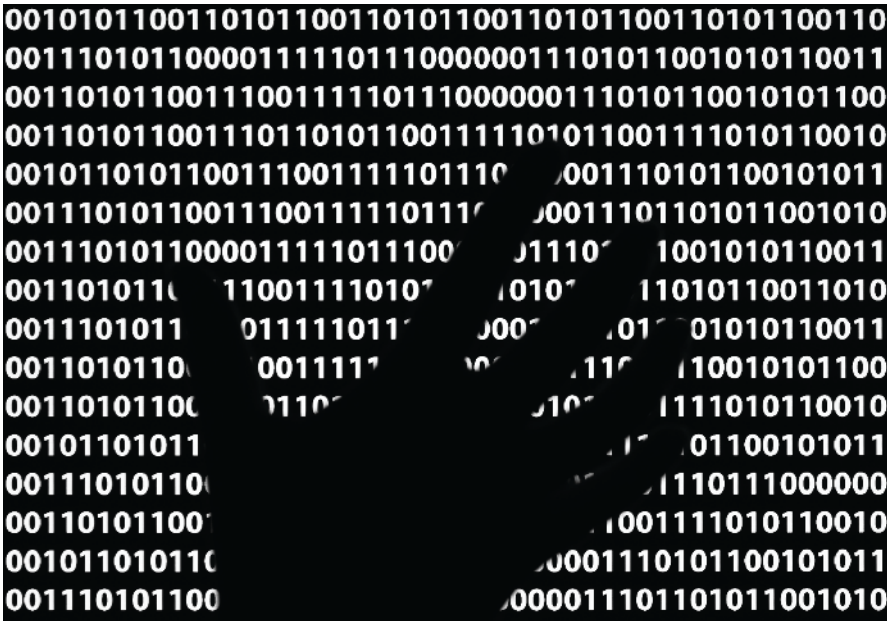
CONSTRUCTION BUSINESS OWNER

Are You a Cyber Target?

What to watch to keep your company from becoming the next victim

BY KATHRYN RICHTER, LAURIE KAMAIKO & SCOTT LYON

A wide range of construction and design firms are involved in public and private projects, including government-sponsored infrastructure projects, making them attractive cyber targets, which imposes additional cybersecurity requirements. In addition to seeking personal information on customers and employees to use or sell, attackers may also seek to leverage a company's access to its business partners' confidential business information, intellectual property or plans and specifications. A unique feature of the industry is the extent to which contractors, subcontractors, vendors and service providers are connected and share access to networks and information subject to confidentiality restrictions or regulatory protections. Increased reliance on technologies, such as remote monitoring, risk management and expense data analytics and building information modeling (BIM), may benefit your competitive advantage, but it also may increase vulnerability to cyberrisks and liabilities if they are not addressed from the outset. In today's environment, information security is no longer optional. Companies in the construction industry are all subject to state laws that mandate notification when there is unauthorized access to personally identifiable information of individuals (defined differently by different states, but includes at least a person's name, plus a unique identifier, such as a driver's license number, financial account(s) or Social Security number and other such information). Increasingly, state laws and federal agencies also require that data security procedures be in effect, and litigation and regulatory inquiries are increasingly instituted against entities that have not paid attention to their data security or have misrepresented their processes and protections. Involvement in government projects also subject design and construction firms to additional cyber and data security requirements.



A TARGET FOR CYBERCRIME

One of the biggest cybersecurity myths is the belief that "nobody would be interested in our data." Too often, companies assume that only financial institutions, healthcare providers and government entities are the targets of cyberattacks. As a result, these businesses may not implement adequate security procedures and incident-response plans or scrutinize those of their vendors. However, these companies are desirable targets because of who they know, the data they possess and their susceptibility to attacks.

Indeed, one of the most "cyber attractive" aspects of companies in the construction industry is their relationship as a known and trusted vendor to other entities, as well as to their own vendors. The well-known Target store breach, which resulted in the disclosure of over 70 million customer records, provided a lesson to companies in all industries that data security must include awareness of vendor security and access. Target's attackers were able to access the network where it stored its customer credit card information using network credentials provided to the company's HVAC vendor.

Companies in the construction industry are also a target for funds-transfer fraud, a rising risks for businesses that often wire transfer funds to vendors. Con artists monitor businesses to identify external business partners and internal accounting personnel. Using information found on the company website and publicly available, they may impersonate a business partner and submit fraudulent invoices or payment instructions.

These and other types of attacks seeking to steal commercial information, such as bids on projects, intellectual property or personally identifiable information, often involve "spear phishing," where an attacker will target a company by spoofing or impersonating a key employee or known associate in an email, then tricking the recipient into opening a malware-infected attachment or visiting a malicious website. The resulting intrusion of malware on company networks can allow the cybercriminal to access information or disrupt operations.

Construction companies and design firms are also targeted because of the access they have to certain types of information. In the case of companies working on government or infrastructure projects, competitors may seek access to a company's network to exfiltrate proprietary information or trade secrets in order to gain a competitive advantage when submitting bids for critical projects. Foreign hackers, often suspected to be government sponsored, are usually financially motivated, but may also be associated with suspected political and terror-related objectives, such as gathering intelligence from government contractors. Inside information on suppliers, vendors and customers and their business plans can be extremely valuable to a competitor willing to exploit weaknesses in your company's security processes.

Attackers also increasingly use ransomware, a form of malware that encrypts critical data on affected systems. The encrypted data is then held hostage until the victim pays the untraceable cryptocurrency ransom to recover the decryption key. Construction companies are susceptible to these attacks because rendering plans, schematics, accounting records or other key electronic records inaccessible for an extended period of time can result in a missed deadline, breach of contract or overdue payment. Thus, many companies consider themselves forced to quietly pay such ransom to preserve their business operations and reputations. Unfortunately, ransomware attacks are lucrative for cybercriminals—security researchers have reported that there were more than four times the number of ransomware attacks in 2016 than in the previous year.

TOP 10 DATA & CYBERRISK CHECKLIST

1. What data do you have in sensitive, regulated and personally identifiable information and confidential business information? Do you need to keep it?
2. Who has access to your information and login credentials, and to what companies' information and networks do you have access?
3. How robust is your data encryption?
4. Do you have an up-to-date privacy and data security plan? Is it in compliance with current laws, regulations and contractual requirements?
5. Do you have a breach response team identified, with both internal members and external specialists?
6. Do you have a business continuity and backup plan that can keep you in operation in the event of a ransomware or business-disruption attack?
7. Do you have a vendor management and contract review processes that address vendor data security, indemnity and breach response?
8. Have you had any employee training for a cyber incident?
9. Have you made representations about your cyber and data security on your website or in contracts? If so, have you recently confirmed those are consistent with your current practices?
10. Have you assessed whether your current insurance will apply in the event of a data breach or other cyber incident and consulted with a knowledgeable broker?

AN ENTERPRISE-WIDE PLAN

One of the first steps to take is to assess what types of data your company collects and maintains, as well as where that data is stored. The company can then identify the related risks that must be addressed and the protections to institute. This assessment should also be used to evaluate whether the business has satisfied both its regulatory and contractual obligations. Once there is an understanding of the scope of the data and related risks, it is advisable to seek the assistance of an information security professional.

Often, a company's greatest vulnerability is its employees. Password and other credential sharing have been identified as the initial source of most cyberattacks involving access to company networks. Routinely training and testing employees on the importance of strong passwords and the risks of sharing credentials and opening phishing emails, and what to do when they suspect such an incident has occurred, can dramatically improve cybersecurity.

Ultimately, while increased security can make it more difficult for attackers to access your network, mistakes or unknown vulnerabilities can still result in security incidents. The key to successful mitigation of these attacks depends on the preparation of an incidence response plan (IRP), identifying which stakeholders will assume responsibility for promptly addressing incidents and limiting the information available to the attacker by eliminating unnecessary personal information and restricting access to sensitive and confidential information. An IRP can be tailored to your organization's structure and capabilities in order to achieve the best possible outcome.

AVAILABLE RESOURCES

One of the most widely recognized resources is the National Institute of Standards and Technology (NIST) Cybersecurity Framework, which is intended to be a tool for organizations to self-assess their level of preparedness to prevent, detect and respond to cyberattacks and then outline a plan to improve security processes.

Some organizations offer information and training without charge to join. InfraGard, a nonprofit organization designed to promote information sharing between private-sector companies and the FBI, provides training and regular updates to its members, primarily in the critical infrastructure sector. The FTC also offers free information and guidance for businesses on data security and privacy best practices.

Cybersecurity threats are an underappreciated but growing concern for the construction industry. Planning and preparation are the keys to a strong defense, ensuring that adequate internal controls are in place and employees are trained to recognize and respond to threats. Companies can also substantially benefit from drawing upon the specialized knowledge and experience of legal professionals in this field before a security incident occurs, as well as advising on required responses after a suspected breach. In an increasingly interconnected marketplace, the importance of a robust, mature cybersecurity program simply cannot be understated. **CBO**

Kathryn Richter has been working within the construction industry for over 30 years, counseling and defending owners, contractors and design professionals, as well as serving as a mediator. Laurie Kamaiko is a partner in the New York City office of Sedgwick LLP. She is on the leadership team of the firm's cybersecurity and privacy group and co-chair of its cyber insurance task force, as well as a member of its incident response team. Scott Lyon, CIPP/US, CIPT is a partner at Sedgwick LLP, is on the leadership team of the firm's cybersecurity and privacy group and is head of the firm's business and technology taskforce. Visit sedgwickllp.com.



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The Recipe for Hiring Success

Start with the right ingredients to create the best mix of qualified employees

BY FRED ODE

The easiest part of baking is picking out the shape of the cookie you want to make. The easiest part of hiring is writing a job description. The only problem is that the taste outcome doesn't come from the cookie cutter, and your day-to-day operations aren't completed by a bunch of bullet points and boilerplate rhetoric.

Finding the best fit for a position in your organization isn't just about what you need—it's about who you need. If you want to hire the best estimator, controller or project manager, always look to hire the best person for the job, not just someone who meets basic requirements.

POSITION-FOCUSED HIRING

Understandably, employers usually want someone who can hit the ground running and do the job they were hired to do. Of course, new employees will always need training, but you should look for a hire who assimilates quickly.

When contractors have a specific vacancy or a concrete need in their organization, they identify the position, the duties and responsibilities required, the desired skills necessary and the level of experience that might make a hire successful.

They might even think to call out some soft skills and traits that will help them perform the job well, such as the following:



- Critical thinking
- Interpersonal communication
- The tendency to be a self-starter
- Adaptability
- Teamwork skills and collaboration
- Problem-solving
- Conflict resolution skills

But merely constructing a job description and looking for someone to fit it can cut success short. Position-focused hiring can cause you to miss the best people because it is not aimed at them. It's aimed at an "ideal candidate," who may or may not be the best addition for a company.

For many reasons, hiring dominated by a job description might rule out excellent candidates, whether that is because they don't quite have the 5 years of experience required or because they are turned away by how static the job sounds. Potential hires want to be able to see a clear path of growth in any particular role. On the other hand, bullet points can also prequalify

People-focused hiring doesn't ignore basic qualifications. But it does give weight to factors that a position-focused approach can view as the icing on top, rather than critical ingredients, such as cultural fit, character, aptitude, attitude & passion.

a number of candidates who won't be a long-term fit for your company. They might have the right education and experience, but they may be unable or unwilling to grow with the position as your company's needs change in the future.

So how do you find the best person for the job your company currently needs to fill? You look for the best person and the best fit for your organization.

PEOPLE-FOCUSED HIRING

People-focused hiring doesn't ignore the real, day-to-day needs your company has to do in order to get the job done—it simply recognizes that an organization's first and foremost need is the right people.

In *Good to Great: Why Some Companies Make the Leap…and Others Don't*, Jim Collins looks at the common denominators that explain how top-performing companies escaped mediocrity and achieved greatness.

Surprisingly, Collins learned, it wasn't that their CEOs came up with an amazing vision and led their people there. Instead, they got the right people on board, in the right seats, and then figured out where to go from there. Once the best people were on board, it simply became a matter of letting everyone thrive where they had the best chance to succeed.

People-focused hiring doesn't ignore basic qualifications. But it does give weight to factors that a position-focused approach can view as the icing on top, rather than critical ingredients, such as:

- Cultural fit
- Character
- Aptitude
- Attitude
- Passion
- Honesty
- Work ethic
- Creativity

These are attributes that you cannot teach and aren't likely to appear mid-career. On the other hand, someone with an above-average aptitude and the motivation to grow and be challenged continually can easily learn a few missing skills or a new software application. All an employee needs is to be empowered to flourish.

RETHINK THE IDEAL CANDIDATE

Moving from position-focused thinking to people-focused thinking might mean revising that ideal candidate job description. However you craft your actual job ads, the following are some important questions to keep in mind throughout your recruitment and hiring process.

- *What are the marks of a "fit" for our culture?* Think about how your staff works together and when you are working in your best flow as an organization. Is it important that they have a sense of humor? Do they need to be able to stick to their guns? Can they adapt and pick up the slack easily?
- *What are the non-negotiable items?* A candidate for an internal CPA position who isn't credentialed is a nonstarter. Your superintendents might have to be bilingual for safety reasons. What are the qualifications that you absolutely have to have?
- *What could a top candidate learn on the job, if necessary?* Could the right candidate teach himself/herself your estimating software? Would you be willing to take on someone outstanding who is finishing their degree? Could you consider reimbursement for Spanish-language classes to land an otherwise ideal fit?
- *How might you prefer a candidate to be able to grow in the future?* Whatever plans you make for your company, you can never be entirely sure where the market, changes in technology and sudden staff moves can take you. Could your receptionist need to pick up a couple of HR tasks in the future? Do you harbor secret dreams of opening a second office, and need someone to groom for leadership one day?

The ingredients that go into hiring the right candidate for your construction company can be a complex and subtle mixture. The last thing you want to do is limit your pool of resources and miss out on the best talent to move forward with your business in 2017 and beyond. **CBO**



Fred Ode is the CEO/Chairman of Foundation Software. Contact him at fode@foundationsoft.com. Visit foundationsoft.com.



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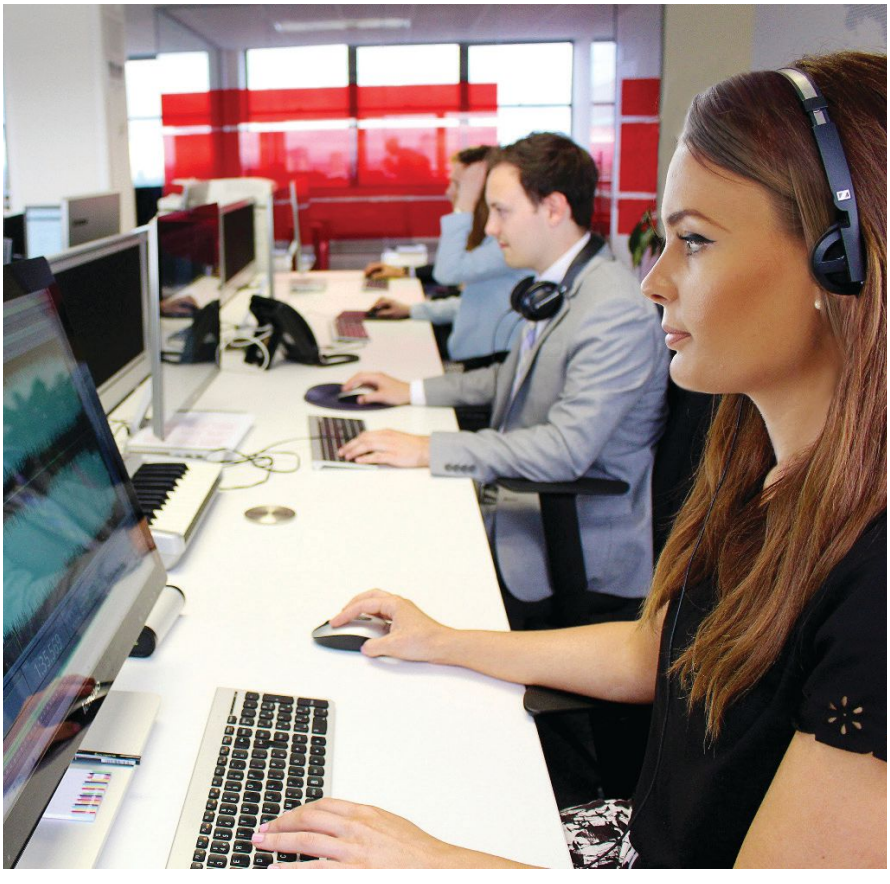
Your Call Is Important to Us

How to turn dead air into a valuable marketing opportunity

BY MARK WILLIAMSON

"Thank you for waiting; your call is important to us, and we will attempt to answer it as soon as possible." That message is a common one, and waiting on hold often represents a source of irritation for consumers around the world. This is especially true if they are left in a call queue with nothing but monotonous beeps or poor music for company. In order to avoid the pitfalls associated with such practices, construction companies must take an alternative approach.

Many businesses want to answer the phone as quickly as possible, but there are times when placing a call on hold is the only option. In such cases, it is important for the caller to be kept engaged and entertained in order to avoid hang-ups. Inbound calls are a major source of new business leads, and customers have a notoriously low tolerance for poor call-handling practices, so the implications for profitability are clear.



SOUND AS GOOD AS YOU LOOK

Visual branding is high on the marketing agenda for companies, as people can form a permanent opinion of your business based on how it looks at first glance. However, the way your company sounds is equally as important. When a customer picks up the phone, his/her ears are his/her only tool for forming an initial judgement and, as with its visual counterpart, a call may leave a lasting negative perception, which can be very difficult to shake.

In recent research of 2,234 American consumers by audio branding specialist PHMG, it was discovered that the construction industry lags behind when it comes to providing a positive telephone experience. Only 21 percent of respondents are happy with the way construction firms handle their calls, while the same survey also found 59 percent would not do repeat business with a company if their call wasn't handled to their satisfaction. Therefore, it is important for companies

to implement a best-practice approach to handling customer calls.

Employees should be trained to answer the phone in a polite way, giving their name and providing the caller with guidelines on how to respond to specific queries. This represents a good start in encouraging callers to enjoy a positive telephone experience, and it ensures leads are not wiped out at the first hurdle.

But when a customer needs more information or has to be transferred, leaving them to wait on the line is unavoidable. This is where on-hold marketing—customized voice and music messages played over the telephone—can turn "dead air" into a construction company's advantage.



SPEAK TO AN ATTENTIVE AUDIENCE

Construction companies operate in a concentrated market, so it is even more important to have a competitive edge over other organizations. In essence, on-hold marketing provides an ideal chance for highly-targeted advertising that is conducted in an unobtrusive manner and speaks directly to a captive audience. The voice and music used in on-hold marketing messages can be customized to reflect specific brand values. Different attributes, such as the volume of the music and the age of the voice, should be taken into consideration and could have a profound effect on the customer's impression of the company.

On-hold marketing can benefit a company's business strategy and allow the company to up-sell and cross-sell its services, while also boosting customer service. For example, a caller could pick up the phone to enquire about the cost of a potential construction project, and find out through

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the on-hold marketing messages that the business also offers demolition services. The listener could then inquire about and arrange both services, leading to increased revenue for the organization and also showcasing the company's ability as a multifaceted construction business.

Equally, the messages could promote the firm's ISO accreditations, as well as advertising any notable projects from its portfolio. By notifying callers of certifications, qualifications and success stories, it can help build client trust and provide reassurance that a building project is in safe hands. It enhances the company's image and gives customers another reason to choose your business over another one.

Perhaps your firm organizes training sessions or has promotions available on a certain type of construction project or equipment rental. Awareness can be boosted through the customized messages, leading to an increase in inquiries. Messages can also inform callers about the company's website, which details the list of available services, business hours and industry guides. This can help increase website traffic, while also improving customer service levels by giving the caller a more convenient option to get information.

Recent research of 2,234 American consumers discovered that the construction industry lags behind when it comes to providing a positive telephone experience.

KNOW THE BUSINESS BENEFITS

When done well, on-hold marketing has been found to reduce hang-ups by 79 percent, as well as decreasing the perceived amount of time left on hold. It ensures that those companies who sound as good as they look gain a competitive advantage and reap the business benefits from improving the customer experience. **CBO**

Mark Williamson is the CEO at PHMG, an audio branding consultancy. With more than 12 years of experience of working in the industry, Williamson manages the global brand strategy of the company and advises businesses on how best to implement on-hold marketing and design an audio brand. Visit phmg.com.





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EVOLUTION

2017 Pre-Show Coverage

CONEXPO-CON/AGG

Imagine What's Next

It's hard to believe it has already been 3 years, but the time is upon us yet again to descend on Las Vegas, Nevada, for CONEXPO-CON/AGG and IFPE on March 7-11. The event, which showcases the latest in construction equipment and technological solutions, was named the No. 1 exhibition in the United States in the 2015 annual Gold List of Top 100 trade shows.

The trade show draws attendees from around the world in all segments of the construction, aggregates and ready-mixed concrete industries. In 2014, the show hosted more than 125,000 attendees. This year, attendees can browse the booths of over 2,500 exhibitors on the show floor and take in seminars in 10 different tracks.

CONEXPO-CON/AGG and IFPE will continue the tradition of a benefit auction on March 9, from 4 to 5 p.m. The show recently named The Call of Duty Endowment as the official charitable partner for the 2017 auction. The endowment focuses on funding and supporting organizations that work to lower the unemployment rate among U.S. veterans. For this auction in particular, 100 percent of the proceeds will go to the endowment. Attendees can also bid on items in a silent auction through 3 p.m. on March 11. These items will be on display near the Association of Equipment Manufacturers (AEM) Booth GL20401.

Organizers have made it especially easy for attendees to check in–badge pickup locations are available at the convention center, as well as at McCarran Airport and more than 10 hotels and monorail stations.

Las Vegas Convention Center
Las Vegas, Nevada
March 7-11

Show Hours
Tuesday, March 7 - Friday, March 10
9 a.m. to 5 p.m. PST

Saturday, March 11
9 a.m. to 3 p.m. PST

Visit *Construction Business Owner* Booth S60109

did you know?

CONEXPO-CON/AGG 2017 is co-located with the 2017 IFPE exposition for fluid power/motion control/power transmission.

CONTINUING EDUCATION

Those attending the show have the opportunity to take advantage of the comprehensive education program available with registration. Seminars spanning a variety of industry topics will take place every day throughout the show. Specific topics run the gamut—construction professionals have a chance to learn more about almost every aspect of the industry.

The offerings are generally one hour to an hour and a half long. Seminar styles range from question and answer and panel sessions to interactive sessions led by industry experts. For instance, "Machine Control for Site Prep" features a panel of industry veterans addressing how this technology solution can provide cost savings and efficiency improvements. The session aims to teach attendees what machines work best with machine control, when to invest in the solution and the best practices for using equipment with machine control. Another session, "Master LinkedIn to Build Your Professional Brand," helps participants learn how to enhance their LinkedIn personal and company profiles and build a stronger voice on the networking platform. Some other sessions include:

SHOW STATS
2,500+ exhibitors
2,500,000+ square feet
150 education sessions
75,000+ square foot Tech Experience

- The Next Generation Jobsite: Drones
- Innovations in Concrete Structures
- Quality Crane Inspection: What is That?
- The Upskilled Workforce: Strategies for Growth
- Transitioning Effectively to a Leadership Role
- Preventing Falls During Bridge Construction
- Avoiding and Mitigating Defect Risks

This is only a small taste of the plethora of education options available to you while at the show. For a full list of seminars and to purchase different levels of access to educational content and seminars, visit conexpoconagg.com/visit/education.

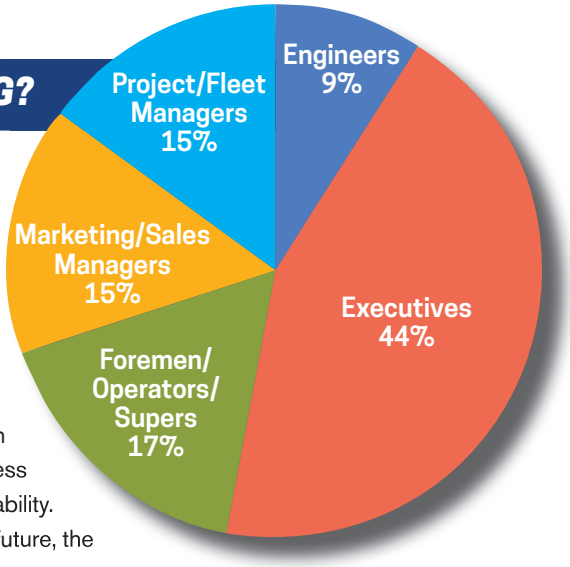
INSIDE THE TECH EXPERIENCE

The theme for this year's show is "Imagine What's Next," giving attendees a glimpse into the newest applied technologies that reduce downtime, maximize jobsite efficiency and minimize waste. New this year, the Tech Experience is a 75,000-square-foot pavilion dedicated to showcasing the

GET THE APP

CONEXPO-CON/AGG and IFPE 2017 released a new mobile app, powered by CAT, to help attendees efficiently pre-plan their show visit and stay connected on-site. The show app is enhanced with beacon technology and features interactive, 3-D maps to help attendees navigate the show floor. The app continuously syncs to the online show planner, where attendees can create a personalized agenda and edit it on-site.

WHO'S ATTENDING?



emerging technologies and industry innovations that drive future growth.

According to Sara Truesdale Mooney, show director and vice president exhibitions and business development for AEM, "The Tech Experience will not only present a vision for the future of our industry, but it will also raise awareness of technologies that enhance safety, productivity and profitability. Attendees will explore three key zones: the worksite of the future, the jobs of the future and the infrastructure of the future."

Located in Silver Lot 3 outside, the Tech Experience will feature innovations including solar-powered roadways, data visualization and interactivity, drones, robotics and intelligence advancements.

Attendees will also have access to the first-ever, 3-D-printed excavator—a joint collaboration between the AEM, National Fluid Power Association (NFPA), Center for Compact and Efficient Fluid Power (CCEFP), Oak Ridge National Laboratory (ORNL) and the National Science Foundation (NSF).

Dubbed "Project AME (Additive Manufactured Excavator)," it is the world's first fully-functional, 3-D-printed excavator and the first large-scale use of steel in 3-D printing. The technology allows for innovative integration of fluid power, with the printed boom having fluid flow passages embedded inside the superstructure. It also includes a printed cooling system, which will increase efficiency and reduce weight.

No footage or photos of the completed project will be released until 9 a.m. on March 7, at its official unveiling during the show. Turn to page 37 for a sneak peak of the excavator's cab, designed by a student engineering team from the University of Illinois at Urbana-Champaign. In addition to the excavator, attendees will also have the opportunity to see a demonstration of the 3-D printing technology on the show floor.

> ***"Technology is critical to the future of the construction industry & CONEXPO-CON/AGG helps industry executives keep pace with the latest in new equipment & product innovations."***
>
> **RICH GOLDSBURY,** CONEXPO-CON/AGG 2017 show chairman & president of Bobcat Company & Doosan

After "Imagine What's Next" ends in March, the industry will have to wait 3 more years for the next CONEXPO-CON/AGG, which will be held in 2020. As the tech world continues to change, the industry will undoubtedly find even better ways to reinvent how things are designed and constructed. It seems like "what's next" will be here in no time. CBO

did you know?

Both CONEXPO-CON/AGG & IFPE shows are produced by the Association of Equipment Manufacturers (AEM).

at the SHOW



Thunder Creek Equipment's all-new multi-tank trailers (MTT) are the first fuel and service trailers designed to legally transport bulk diesel on the road, without requiring drivers to maintain a CDL or HAZMAT endorsement. The trailers are available in 460-, 690- and 920-gallon capacities and retain the manufacturing quality and customization that Thunder Creek's full line is known for, including bulk diesel exhaust fluid (DEF) storage and dispensing solutions. Visit Booth C22521.



The Signature Systems SignaPlate is a composite, modular trench cover, which covers trenches up to 36 feet and at 130 pounds per section and can be installed by two people. The system is quiet, slip-resistant, will not rust or corrode and comes equipped with transition ramping. Visit Booth B9005.

The new DigiRoller Plus III from **Calculated Industries** measures lengths, widths and heights in either U.S. or metric units up to 9,999,999 feet, meters, yards or inches. It calculates areas, volumes, perimeters and circles. The gear drive is sealed for better protection and the center line design gives it good balance and 99.5 percent accuracy. Rugged handle-mounted controls and large, glove-friendly buttons make it easy to use the controls and read the display. Visit Booth S65407.



Hyundai Construction Equipment Americas will unveil four new equipment models at the show. Hyundai plans to display more than 20 machines. Hyundai will debut additional models in its HL900 series of wheel loaders, 9A series compact excavators, pictured here, and its HR-9 series of tandem-drum compaction rollers. Visit Booth N11603.



63%
of show attendees are contractors



JLG Industries Inc. will launch nine new products in the boom, scissor and telehandler categories. A variety of the company's best-selling products, including the 400S (pictured here) and the SkyTrak 10054 telehandler, as well as the 1932R electric scissor lift, will be on display. Visit Booth G3946.



CONEXPO-CON/AGG and IFPE 2017 will unveil the end product of a special project, the world's first fully-functional, 3-D-printed excavator, at the trade show in March. The project was a team effort involving the Association of Equipment Manufacturers (AEM), National Fluid Power Association (NFPA), Center for Compact and Efficient Fluid Power (CCEFP), Oak Ridge National Laboratory (ORNL) and the National Science Foundation (NSF). The group worked with research teams from Georgia Tech and The University of Minnesota to convert the current excavator design to one that is conducive to 3-D manufacturing.



CASE Construction Equipment will introduce new products, line extensions and model updates at the show, and host the "What's Now" Speaker Series from the CASE stage. CASE will make major product introductions in the categories of mass excavation, compaction and compact equipment. Visit Booth N11825.



Chicago Pneumatic Construction Equipment (CP) has released the new Red Rock CPS 110 portable air compressor. The compressor was built with the same characteristics as the complete CP range, offering reliability, easy maintenance and flexibility. The Red Rock compressor is the latest addition and first 110 cfm compressor in the CP lineup. The CPS 110 offers a normal effective working pressure of 100 psi at 110 cfm. Visit Booth C31727.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VIRTUAL TRAINING
& REAL-LIFE RESULTS

5 benefits of simulator training for heavy-equipment operators

BY DAVID CLARK

Jeff is a crane operator working out of Detroit, Michigan. Thirty years ago, he learned how to operate heavy equipment the same way every other operator did: on the job. "I remember starting out in a 20-ton crane years and years ago," he said. "I didn't know what I was doing—alarms were going off; I was hitting override buttons—I'm lucky to be alive."

This kind of story gets told all over the industry. For operators of a certain era, on-the-job training was simply how things were done. But times have changed. Safety is taken more seriously now. In the past, a proactive safety culture might have been seen as a necessary evil, but now it is widely understood that strong health and safety measures are just plain good for business, resulting in cost savings, improved worksite morale and more satisfied clients.

From that point of view, on-the-job training is just not practicable: it's dangerous; it's hard on the machines; and it often means that equipment, as well as experienced operators, are taken out of production.

DOWN-TO-EARTH TECHNOLOGY

It's only in the last 10 years or so that any useful alternative to on-the-job training has become available. Although crane simulators have been used for operator training since the mid-1990s, early simulators did not have very realistic graphics, and the simulations of the crane and load dynamics were poor. In addition, training content was limited to basic control familiarization and understanding basic operating procedures.

On the other hand, the defense and aviation sectors have used advanced simulators to train pilots for decades, to the point where it has long been impossible to get or even maintain a pilot's license without regular simulator



training. In recent years, the professional-grade simulation technology that is common in the aviation and defense sectors has come down to earth, so to speak, thanks to a more pervasive construction safety culture, as well as the increasing complexity of cranes and heavy construction equipment.

Now, there are construction crane and heavy equipment simulators that provide the most realistic simulation of machines, whether they are excavating dirt or lifting a load.

Professional-grade crane simulators accurately capture the behavior of rigging and hoisting cables, from the load to the drum, using actual engineering properties. This ensures that they behave appropriately as lines are placed under tension or a load is released. In turn, this means that all loads swing, snag and collide just as they would in the real world, providing valuable experience to students without endangering them or others on the jobsite.

This realism is central to effective training, because it means that simulators can serve as the perfect bridge between classroom theory and actual equipment on the worksite. A simulator that behaves like the real equipment helps trainees develop skills that are directly transferable to the jobsite, with no habits needing to be unlearned, and none of the negative training that is often associated with unrealistic machine responses.

That being said, the barrier to simulator training has traditionally been the cost of the simulators themselves. However, with advances in technology, simulator costs have come down to the point where it is proving more costly to defer simulation training than to adopt it.

Although simulator use has not yet been universally adopted in the industry, businesses that have adopted this technology are already seeing the benefits.

1. REDUCED TRAINING RISKS

Simulation is used extensively in the aviation industry because the equipment is complex, assets are expensive and consequences can be catastrophic. Compare this with the construction industry, where the equipment is complex, assets are expensive and consequences can be catastrophic.

With simulation-based training, construction businesses are lowering the risk of damage, injuries and fatalities. Before training even begins, construction crane and heavy equipment simulators can be used to screen trainees and make sure they have the coordination and skills to perform.

During training, trainee progress can be tracked with objective performance metrics and reports, which ensures that any skill deficiency is measured before it becomes a risk in the real machine.

Professional-grade training simulators provide the experience of being there—meaning that they are minimizing the costs and risks of training, while providing an experience that is just like the real thing. This allows trainees to receive the full benefit of acquiring skills without jeopardizing themselves, others, the equipment or the environment.

2. SAFER JOBSITES

With simulators, trainees can experience operations that might take a lifetime to attain on the job. Simulators can recreate the feel and experience of load shifting, unsafe lifts and other hazards, so that trainees learn to respect the machine before they ever get into the operator's seat. Trainers can also condition operators to respond to the unexpected by injecting equipment faults or inclement weather into the simulation. This is knowledge that is difficult to teach in a real machine, and it results in operators who are better prepared than they were without simulation, particularly when they have the opportunity to repeatedly practice specialized or difficult maneuvers in a safe, controlled environment.

The realism of the simulation is critical. Otherwise, there is a risk of trainees developing bad habits that will need to be unlearned, or of having overconfident trainees who may work in an unsafe manner. With simulators, you can measure operator performance against unsafe actions, as well as their responses to incidents. Ultimately, the training value of simulators consists in their ability to develop skilled operators who have demonstrated capabilities to execute complex tasks and the confidence required to know when it is time to stop an unsafe lift.

3. FASTER TRAINING

Along with reduced accident rates, construction businesses are training faster with simulators. There are a few reasons for this happening. For one thing, a single instructor can simultaneously instruct many trainees, as opposed to one-to-one on the real machine. Trainees also get more seat time, and simulators can run 24/7, in rain, snow and hot weather. Operator training can also be reinforced through after-action review and quantitative measurement of student performance, resulting in more rapid learning and a more effective training process.

It is also possible to conduct team-based training multimachine and multirole simulation, involving signalers and operators working together in a virtual environment. For example, an excavator operator can work on a busy jobsite and even with other simulated machines working around them at the same time, all in a multisimulator collaborative environment that engages the entire crew.

4. REDUCED COSTS

Using simulators for training lowers equipment fuel costs and reduces wear and tear on expensive equipment. Crane rental and lift companies can keep their fleet in production while operators train on the simulator. In addition to fuel cost savings, simulators can also free up instructors to focus on other higher-value-added tasks



because trainees can work their way through simulation exercises at their own pace. It should also be said that simulators are not just for novices. Using simulators to convert an operator from average or below-average productivity to above-average productivity can improve the bottom line. In this scenario, companies can deploy simulators as both a training tool and an operator benchmarking tool by using the simulator's objective performance metrics to calculate competency scores. Other bottom-line benefits accrue from the use of simulators to rehearse complex operations with the entire team. This improves communication between crew members and increases the likelihood of efficient, profitable operations.

5. BRIDGING THE SKILLS GAP

Globally, there is a shrinking labor pool of experienced and competent operators due to an aging workforce and pending retirement—and the most obvious drawback of experience is that obtaining it takes a long time. Alternatives are either expensive or infeasible, given the competition for competent operators. To bridge the skills gap, construction businesses are searching for ways to train faster and better. By using simulators as a tool to propagate experience and knowledge, they will find that it is indeed possible to do more with new operators and assure safer, more efficient operations. **CBO**

David Clark is product marketing manager at CM Labs Simulations, developer of Vortex training simulators and CM Labs' Construction Equipment Training Suite. Visit cm-labs.com.





COLLISION MITIGATION
COMES OF AGE

Integrating technology-based safety detection with automatic avoidance

BY JIM BEAN

Over the past few decades, we have seen vehicle safety progress from being predominately operator-based—relying on the operator's ability to foresee and respond to a potential incident before it can cause any damage—to being increasingly technology-based.

At the current pinnacle of the technology-based safety pyramid are collision mitigation systems. Initially designed for passenger vehicles, these systems are expanding into heavy-duty industries. The construction industry stands to benefit greatly from these safety solutions, so long as business owners and equipment operators are open to innovating.

SAFETY BEYOND THE WINDSHIELD

Awareness of other vehicles, pedestrians, cyclists and stationary objects was once the sole responsibility of the operator. Back in the pre-tech days, it was the operator's job to detect potential collisions by checking the vehicle mirrors; looking through the front, rear windshields and side windows; and enlisting the help of spotters.

Other devices, such as backup alarms, help operators by alerting nearby pedestrians and vehicles to equipment driving in reverse. These devices have the potential to transform the world of jobsite safety.

In the early 2000s, passive monitoring technology began to be added to equipment, specifically camera/monitor systems. Now, sensors, such as object detection radar, have been added to the mix.

These sensors continuously scan the area around the equipment in order to provide active, audible alerts when something or someone is detected (the system is considered active because the operator is alerted to the potential danger, regardless of where his/her attention is directed). Once alerted, the operator can focus on avoiding a potential collision with the object.

INTEGRATING ADAS INTO COLLISION MITIGATION SYSTEMS

It has taken longer for collision mitigation systems to enter the heavy-duty market because engineering the systems' technology to withstand harsh work environments is not the same as designing

Instead of the operator having to sense & react to the presence of other vehicles, people or objects, ADAS steps in to stop unnecessary damage. Object-detection sensors provide the active safety solutions ADAS relies on to mitigate accidents.

automotive-grade technology. As you well know, a construction jobsite is no place for fragile technology solutions. Heavy-duty, object-detection sensors require advanced engineering to ensure enhanced and reliable performance, regardless of the setting.

These more advanced systems provide opportunities for sensor fusion (the integration of object-detection sensors and image-recognition systems). They enable the detection and tracking of objects through the use of core algorithms that are adapted to detect, scan and track vehicles, people and objects. Such systems also provide operators with an even more comprehensive view of what is in the operator's blind zones, no outside spotters required.

When an object-detection sensor and a camera/monitor system are fused, operators can react when they are alerted to an object in the vehicle's blind zones by braking or slowing the vehicle, and then confirm the potential danger with the camera/monitor system.

When advanced driver assistance systems (ADAS) are integrated into a vehicle's steering, acceleration and braking systems, the technology takes pressure off of the operator. Instead of the operator having to sense and react to the presence of other vehicles, people or objects, ADAS steps in to stop unnecessary damage.

Object-detection sensors provide the active safety solutions that ADAS relies on to mitigate accidents. The next step, intelligent



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collision-mitigation applications, integrate telematics applications, vehicle control systems, vision systems and other sensors using industry-standard communications to further reduce heavy-duty, industry accidents.

LIKE AUTO-SAFETY SYSTEMS

Collision mitigation is well known to people in the market for a new car. Nissan offers passenger-car collision mitigation technology known as moving object detection (MOD). MOD includes a backup warning system, forward emergency braking system, blind spot warnings and lane-change warnings. More recently, some car manufacturers are offering predictive forward collision warnings, in which the collision mitigation system actually monitors the movement of cars traveling two vehicles ahead.

All of these technologies act first to warn vehicle operators of the need to take action, whether by slowing down, speeding up or making steering adjustments. If the driver doesn't take action, the automated system then takes over and completes the action or actions needed to avoid an accident.

When all of these technological advancements come together in one vehicle, modern, heavy-duty machines become intelligent. A dump truck or front-end loader might have a collision mitigation system that includes front, back and side radar sensors; backup alarms; interior safety monitoring and alert systems with visual, audible and/or haptic (vibration) alarms, and cameras that give the operator a 360-degree view around his/her vehicle and numerous viewing options, including a 3-D, bird's-eye view.

NEW SAFETY MEASURES FOR A DISTRACTED SOCIETY

As if it weren't hard enough for operators to navigate tight alleys and busy jobsites in rain, snow, ice, dust, mud and dirt, now they must face the increasing incidence of distracted driving and distracted pedestrian behaviors.

For many drivers, pedestrians and even bike riders, cell phones can make them oblivious to the real world around them.

There is ample evidence that talking, texting and internet surfing on mobile devices while driving is causing a rise in very dangerous behavior. For example, distraction.gov has found that in 2014, 3,179 people were killed and 431,000 were injured in motor vehicle crashes involving distracted drivers. Just as one technology (handheld digital devices) is leading to the increased incidence of accidents, another technology (integrated object detection) is helping to decrease such accidents.



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DETECTION ZONES ADJUST TO MEET SPECIFIC NEEDS

Since all situations are not the same, advanced object detection manufactures are providing the ability to adjust radar detection zones to fit specific conditions. Radar sensors can be adjusted to detect objects from the face of the radar up as much as 100 feet away. The width of the detection zone can also be adjusted to fit almost all vehicle types. The systems can be adjusted to simultaneously identify the location and the velocity from one to a dozen or more people or objects.

At the same time, leading manufacturers are hardening detection devices. It is one thing to put object detection sensors on passenger cars that spend the majority of their time on paved roads. But when the equipment operates in harsh, off-road environments, these sensors must be impervious to the environmental rigors they are often exposed to when being used on a jobsite.

Investing in sensors that have durability in the face of harsh weather and environmental conditions, as well as electrical hardening, is a necessary expense for equipment owners.

Construction-grade sensors deliver endurance and reliability that passenger car systems cannot approach. Heavy-duty, construction-grade systems typically last the life of the equipment, with the return on investment typically recouped within the first year following installation.

COLLISION MITIGATION SYSTEMS THAT TEST THEMSELVES

To further prevent accidents, progressive safety technology manufacturers design their systems with built-in, fail-safe alerts that notify the operator of radar blockage or problems with communication between the sensor and the operator.

These alerts immediately notify operators (and potentially fleet managers, through remote applications, such as telematics systems) that the collision mitigation system(s) installed on a specific piece of equipment should be inspected and maintained. This is the kind of automatic testing safety professionals have come to expect from advanced technology.

The next trend in heavy-duty equipment safety is vehicles that can drive themselves. Semi-autonomous and, increasingly, fully autonomous heavy equipment is now being deployed on a growing number of construction and mining sites around the world.

Platoons consisting of digitally linked bulldozers move as one through underground tunnels, having been previously programmed to navigate themselves to jobsites. Chains of digitally linked tractor trailers are now becoming a feature of some European highways. For these vehicles, collision avoidance takes a new form as it communicates directly with the vehicle, rather than with the operator.

Intelligent vehicles will continue to make their way into our world, often limited only by society's willingness to let them into what has been for thousands of years an operator-based system. But the days of the horse and cart are long behind us.

The gradual introduction of new technology, such as collision-detection systems, gives industry veterans a welcome chance to increasingly get used to the idea.

Companies that continue to innovate and deliver the technology to make this a reality are ultimately contributing to saving more money through equipment efficiency. More importantly, those companies are saving lives through the adoption of technology that has the potential to completely transform a construction jobsite. **CBO**

Jim Bean, president and CEO of Preco Electronics Inc., brings more than 30 years of operational experience to the position. Bean provides leadership and vision to Preco's entire suite of heavy-duty collision mitigation solutions. Joining Preco in 1997, Bean's experience includes positions with National Semiconductor Corporation, Apple Computer and Sun Microsystems. Bean is an active member of the national technology community, serving on the boards of several companies. Visit preco.com.





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WORKSTATION DELIBERATION

What to consider when your business needs more than a traditional PC can offer

BY JOSH PETERSON

Most businesses are well aware of the timesaving benefits afforded by email, document generation and internet-browsing software running on a traditional desktop or personal computer (PC). But, when the needs of the company grow beyond these standard applications to require sophisticated design, information and management tools, a change in computer hardware is needed.

High-end software requires high-end, workstation-grade hardware in order to properly function. Before moving to a more compute-intensive platform, the business decision maker should understand the fundamental differences between a workstation and a PC.

MAKING THE RIGHT CHOICE

For a typical business running standard office applications, such as word processing, e-mail, presentation software and simple spreadsheet calculations, the performance level and storage capacity of a standard, business PC is adequate. However, if the business grows to involve designers, engineers, architects, financial analysts or researchers running more demanding software, then a workstation should be considered. Such professionals typically need access to applications to render complex graphics, create sophisticated digital content and run database-intensive financial analysis and CAD-type technical computations, as seen in Table 1. These applications can overwhelm the hardware components commonly used in a PC and lead to a loss of productivity. As a result, employee satisfaction declines.

Even a traditional business like construction has become increasingly dependent upon sophisticated programs to ensure the fast, accurate exchange of information and data. Today's construction business has moved from blueprints, which can be ridden with mistakes, to digital representations contained in building information modeling (BIM) and collaborative file sharing.

After breaking ground, many project managers find that typical PC programs that handle paper forms, random photos and generic spreadsheets are no longer adequate tools to deal with projects of growing complexity. Many people hear the word "workstation" and picture a product costing several thousand dollars. While this used to

be true, the cost delta between a PC and a workstation is lower than it has ever been. However, the two solutions are designed for completely different workloads.

WORKSTATION VERSUS PC

A workstation can be thought of as a beefed-up, commercial, business-grade PC. In terms of hardware, this means a multitude of dedicated, high-end processors, professional graphics cards and large amounts of memory and storage. Further, workstations are designed to be more reliable than PCs, in order to withstand harsher environmental conditions, from operating 24/7 to dealing with the greater heat generation, which is often caused by high-powered components. Most workstations are also certified by independent software vendors in order to ensure the applications will run with the intended performance and reliability.

Additionally, users expect a different experience from workstations than they do with PCs. A recent report from the 3-D CAD modeling community found that users complained about the slow speed of PCs when running powerful business applications. Many noted that it often took minutes, instead of seconds, to open files or compile 3-D models and video edits on a PC. The cause for the slow performance was the lack of sufficient processing power, graphics performance and memory speed available on most PCs.

Another complaint was that robust technical and business programs would automatically disable several features when running on a PC versus a workstation, as the PC had insufficient memory and less available performance capabilities.

TASKS DETERMINE THE TOOL

Business and technical users alike can be easily overwhelmed by the variety of configurations available for the workstation. Selecting the appropriate configuration requires research, knowledge and reviews from other users. Just remember that the most appropriate workstation should be more than just the sum of its parts. The following guidelines highlight important considerations when selecting a workstation:

1. *Cost*—Workstations cost more than PCs, as the software running on a workstation is often more expensive than the office software that operates on PCs. Typically, a PC costs $300 to $1,000, while workstations costs about $700 and up.
2. *Performance*—A PC is fine for typical office applications, but a workstation is needed to handle more sophisticated programs (see Table 1).
3. *Reliability*—Workstations are held to a higher level of reliability than most PCs. Each component and subsystem is built for full-time operation, typically for 3 or more years of service. This level of robustness is required to handle the computations needed for large database manipulation, modeling and simulation.
4. *Form Factor*—Like PCs, workstations are available in both mobile and desktop form factors. Mobile workstations provide the same performance benefit over a typical laptop. For desktop workstations, they come in a large variety of sizes and capabilities.
5. *Hardware*—Workstation components and subsystems fall into these categories:
   - *Internal memory*—Workstations typically use higher quality, error-correction code (ECC) random access memory (RAM) to ensure high system reliability. RAM is the computer's internal memory, the place where the computer stores data and information for quick retrieval. RAM is "volatile," meaning that the information that is put in it disappears when the power is turned off. Typically, the larger and more complex the model, the more RAM you want to configure. For best performance, maximize the amount of RAM. This also gives you more headroom as projects continue to become more complex. To determine the optimal amount, look at both the recommendations for the workstation's operating system and the applications you intend to use.
   - *Processors*—There are two primary types of processing subsystems in workstations; namely, central processing units (CPUs) and graphical processing units (GPUs). High-end workstations tend to have more powerful CPUs and GPUs than you would find on a PC. Most workstations do fine with just CPU and GPU boards, each of which may have multiple cores within a single chip. As the names imply, the CPU performs most of the general number crunching processing activity. Similarly, the GPUs handle the graphic intensive video calculations and renderings. Today's CPUs and GPUs work closely together to optimize processing tasks and performance. To determine which CPU and GPU are needed for your application, read the hardware requirements of the business or technical software programs that you will be using. You can also get help from the workstation vendors,

Software Applications	PC	Workstations
Office (email, documents, presentations)	▪	▪
Simulation	Limited	
Product design	Limited	
Video editing	Limited	
Large or complex data management		▪
Computer-aided design (CAD)		▪
Computer-aided manufacturing (CAM)		▪
Building information modeling (BIM)		▪
Project lifecycle management (PLM)		▪

Table 1.

Business & technical users alike can be overwhelmed by the many workstation configurations. Selecting the appropriate one requires research, knowledge & reviews from other users.

as they often have tools on their websites to help you find the right configuration.

- *Storage*—The workstation's hard disk drive or modern, solid state drive (SSD) is referred to as storage. It's the place where data is recorded and can stay indefinitely, to be recalled when needed. Unlike conventional hard-disk drives, SSDs have no moving parts, so there is less chance of a physical failure. They provide much faster access to your data, increasing your application performance.
- *Interfaces*—Interfaces connect the computer to peripherals like keypads, drawing devices and printers, as well as the outside world. Connectivity interface cards connect the workstation to the local office network, the global internet and the cloud. The faster the interface, the quicker the workstations can send and receive information and data.

In today's competitive market, providing employees with the right tools that make them more productive and more creative will pay huge dividends to a business. For businesses that have grown beyond the typical office applications to more sophisticated design, automation and management tools, a workstation is the best choice.

Regardless of whether a PC or workstation is the right solution, the one thing they have in common is that semiconductor innovations have led to continued decreases in costs, while the performance and capabilities have increased. **CBO**

Josh Peterson heads global product management for workstation and immersive computing at HP Inc. He holds a bachelor's degree in mechanical engineering from the University of Colorado and a master's degree in business administration from Colorado State University. Visit hp.com.





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VIRTUAL & AUGMENTED REALITY IN THE AEC INDUSTRY

How construction pros can master virtual, spatial environments & embed these tools into operations

BY DACE CAMPBELL

Twenty-five years ago, I was first turned on to the idea of virtual reality (VR) as the holy grail of design visualization in architecture while thumbing through inspirational musings and essays published in *Cadence's* "Special Summer Reading Issue." Indeed, VR took hold of many an imagination, as popular media glimpsed into bleeding-edge work by research labs like Massachusetts Institute of Technology's (MIT) Media Lab and the Human Interface Technology Lab (HIT Lab) at the University of Washington. Sadly, VR failed to live up to the hype, as it rarely broke into common industry use, and interest in VR and its cousin, augmented reality (AR), largely waned after the 1990s. That is not to say there weren't valiant attempts to embrace VR and AR in architecture and construction, though. For decades, VR has captured the imagination of architects seeking the ultimate experience for design and creation. Likewise, AR has captivated contractors, seeking the "ultimate stud-finder" to assist in layout and inspections. Unfortunately, those visionaries were saddled with limitations, such as prohibitively expensive technology, strained workflows for content development, clunky interfaces, an infantile internet and a lack of clear business cases, keeping a lid on any industry enthusiasm for VR and AR for far too long. Until now. Or about 2 years ago, when VR came storming back into popular view. This time, fueled by the internet, Wi-Fi and mobile/wearable devices with affordable GPUs, VR and AR have caught the attention of tech giants like Facebook, Google, Samsung and practically every other big name in computing. This time around, it seems architects and contractors are not immune to the visions that VR and AR inspire. AEC professionals are often surprised to discover that AR and VR are a natural extension of BIM: immersing designers, creators and their customers into an environment as the ultimate medium for conveying a concept as spatial experience. While BIM and other media can represent the characteristics of a space, VR can convey the experience of a place, and AR can enhance your understanding of that place.

THE USE CASES

The use cases are becoming more clearly defined for VR and AR in AEC as well. It is worth noting that uses for VR and AR will likely not



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There seems to be just enough disjoint, disconnect, disillusionment & dissatisfaction to train craft labor in the field to operate safely & flawlessly, to explore & invest in VR for real this time.

be evenly distributed across design and construction phases alike. VR is thought to be a tool better suited to architects, while AR will likely find more uses in construction. VR is a medium for transporting participants to another experience altogether. To paraphrase Michael Abrash of Oculus, the immersion, interaction and intuitive interfaces offered by VR will ultimately require participants to suspend belief, reminding them that they are not, in fact, experiencing reality. In AEC, the use cases for VR include:

- VR can help you differentiate you from your competition today, and that is true for all AEC professionals. It can help your business development efforts, supporting your pitch in pursuit of new project opportunities.
- VR is an ideal visualization tool, supporting the creation and confirmation of design models. It's a natural fit with what architects do every day.
- Further, VR is a collaboration tool, supporting design review, critique, consultation and task sharing among multiple participants. Here, too, architects ought to be able to take full advantage of this capability.
- VR can also support education and remote training scenarios. In this way, architects could potentially develop a new generation of construction documents; contractors could process new shop drawings and field installation instructions; and owners could commission, test and maintain equipment using remote instructions
- Of course, there is an entertainment aspect to VR, and there's no limit as to how AEC professionals could entertain their clients and customers with new experiences.

Unlike VR, which fully immerses participants in an artificial environment, AR enhances the experience of the real world by incorporating contextual information when and where it is needed. AR will be more integrated into our everyday lives than VR, and a much larger market opportunity in construction and facilities maintenance. The sweet spot for AR lies at the intersection and overlay of domains of information.

- Architects design by imagining and developing their "design intent" in the context of "as-is," real-world conditions. There is a case to be made for enabling architects to design with AR, overlaying BIM data onto the real-world context for design visualization and collaboration.
- Probably a larger case for AR, however, is for contractors, who will overlay BIM (design intent) over an "as-built" project site, to support layout, inspections and quality control. Here, remote training may play out, but with AR overlaying assembly information on the real world, rather than a completely artificial VR environment.
- Possibly the largest case for AR ultimately will be for owners, who overlay the "as-built" BIM information with the "as-is" (as-maintained), real facility, revealing hidden conditions in facility operations. In this way, AR can be thought of as the "ultimate stud-finder." Further, AR can be combined with the internet of things to

provide real-time status or information from building assets and equipment overlaid in context for those performing maintenance.

THE BUSINESS CASES

So VR and AR technology is back. But, will it last? Maybe so, at least in B2B and professionally, if not for consumers. This time around, the tools are better, the processes and workflows are in place and business culture has never seemed more ready to accept wearing computing devices and displays. The startup investment for VR or AR used to be in the tens and hundreds of thousands. Now, the cost of quality display hardware is in the $500-$5,000 range. Further, some models can be exported and processed in the cloud to create a VR experience for just $1 a day. Truly, the barrier of entry is now low enough that every architect, engineer, contractor and owner can harness the power of VR and AR as easily as he/she can watch a YouTube video.

More important than a disappearing technology threshold and interesting use cases is this question: Are the business cases there to justify an investment in VR tools and processes? The use cases, combined with the democratization of the VR technology, alter the equation for business justification and should offer a meaningful return on investment. Professionals in the AEC industry face sufficient pain trying to accelerate design thinking, communicate design ideas and inspire confidence and comprehension in design and preconstruction visualization. There seems to be just enough disjoint between AEC professionals and visualization specialists; just enough disconnect between documentation-friendly BIM and real-time rendering; just enough disillusionment by owners who expect to experience their projects in order to understand them; and just enough dissatisfaction to train craft labor in the field to operate safely and flawlessly to explore and invest in VR for real this time.

As an industry of professionals specializing in the design and construction and operations of a physical, spatial environment, we are uniquely suited to master this new virtual, spatial environment. If you haven't begun to embrace these tools and embed them in your operations, what are you waiting for? **CBO**

Dace Campbell, AIA, LEED AP is a senior customer success manager at Autodesk and a nationally recognized expert and thought leader in innovative tools and processes. He is a licensed architect with almost 30 years of experience in design, construction, innovation, collaboration and business consulting, and over 25 years of applied research in virtual reality and augmented reality in AEC. Campbell's projects have won four AIA BIM awards, and he is a winner of the 2011 Building Design+Construction "40 Under 40" award. Visit autodesk.com.





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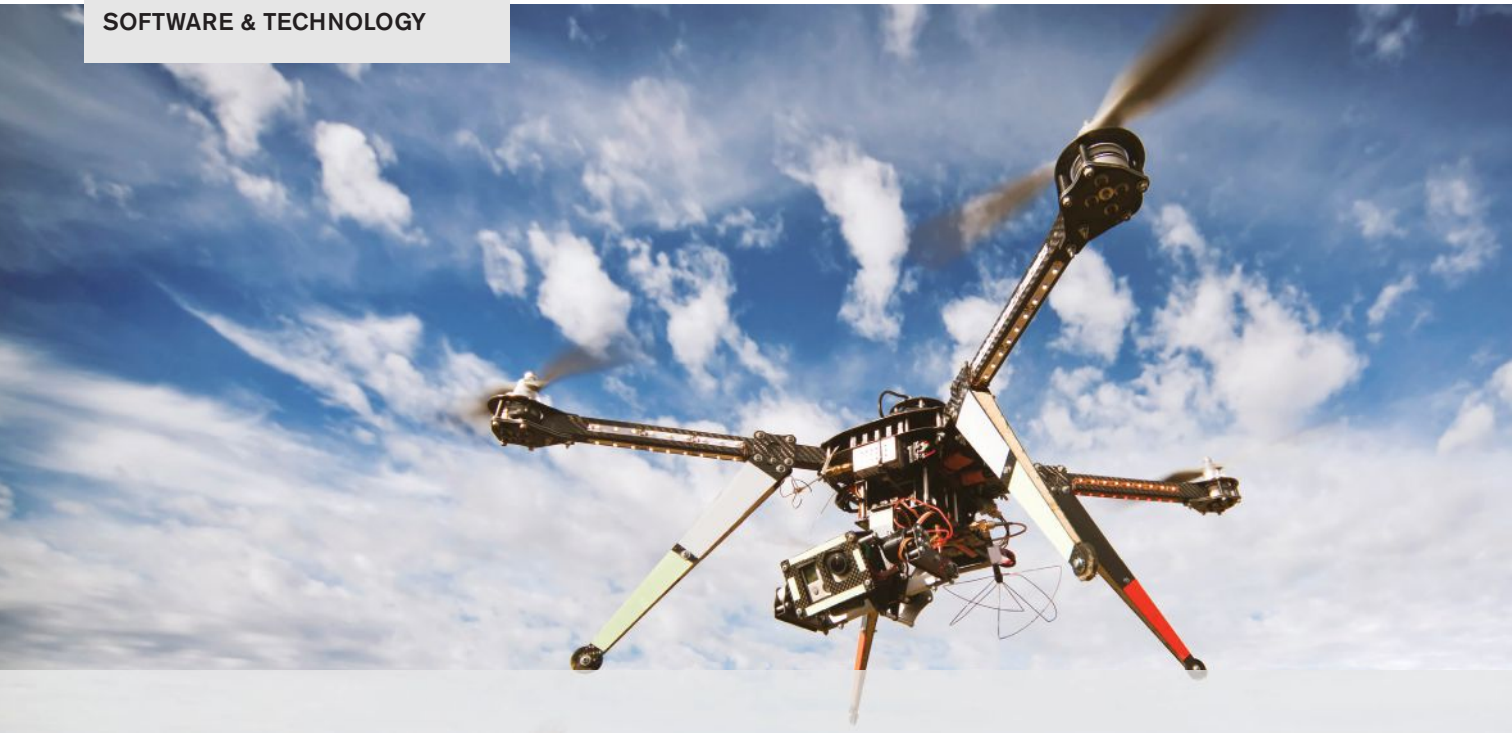


THE COST-BENEFIT ANALYSIS OF JOBSITE DRONES

Bid better & manage costs with automated drone mapping solutions & advanced data capture

BY DICK ZHANG

Construction business owners sometimes live in a rearview world, where visibility into their work is retroactive, advance planning is nearly impossible and the bidding process is unnecessarily complicated. Until recently, the only way to measure cost per yard on a project had been a combination of estimates or guesses based off of previous work or truck counting. But with new technology, such as drone mapping and advanced data capture and processing, construction companies have an opportunity to turn their guesses into certainty when it comes to cost measurement, cash-flow analysis and bidding.

DOING THE JOB RIGHT

In construction, the ability to know your exact cost per yard and accurately predict profitability has been elusive. If you work on large jobsites, the most common way to track progress is through manual surveying. However, traditional methods, such as using aerial imagery or manned survey teams, each come with costs and delays. Both of these methods could take weeks from the time you reach out to book the survey to when you get your data back. By then, the job has moved on, and the data, while useful, won't help with real-time budgeting and cost analysis. Your manned survey team may also need to navigate heavy equipment on steep hazardous terrain, which increases the risk of injury.

With drone technology, you can do the survey in minutes (10 minutes for a 100-acre site) and get the data back in real time. In addition, you can fly a drone as often as you like. If you use a simple, automated solution (one that takes off and lands on its own), you can get updated data back every week or even every day. When you have data that frequently, estimates are more accurate, and you have an ability to catch and fix mistakes immediately, before major time and resources have been spent.

Getting interim data this frequently allows construction executives to manage cash flow based off of near real-time activity, and not on where the jobsite was weeks or months ago. With manned surveys, it can take 2 weeks to capture the data and 2 weeks to process the data, so you are invoicing for progress that was completed 4 weeks ago.

With drone technology, you can survey the area you plan to work on before you bid. That way, you are not relying on obsolete data gained from outdated state maps to calculate your potential costs.

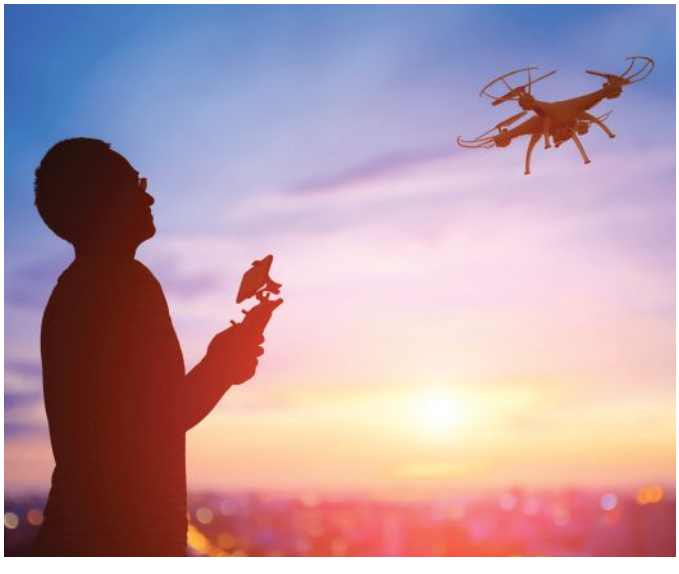
Now, for the first time, you can reconcile based on your real-time progress, which improves cash flow significantly. Subcontractor payment can also be significantly improved, as you only pay for what has been done. You can also return equipment earlier and reduce rental fees by accurately forecasting when you will be finished with it.

WINNING THE NEXT JOB

Doing the job better will increase the bottom line. To increase the top line, though, companies need to win more work. However, sometimes the bidding process gets complicated because a lack of data either stops you from putting in a profitable bid, or it stops you from beating the competition.

With drone technology, you can survey the area you plan to work on before you bid. That way, you are not relying on obsolete data gained from outdated state maps to calculate your potential costs. If the old data exaggerates the project scope, you can underbid and win the project. When the scope is too low, you can avoid surprise costs and bid appropriately.

For private jobs, technology can also provide an edge in the bidding process. When you compete for a job, having the 3-D maps and data from your pre-bid survey or your last job can make a big impression. You will be able to show the real-time progress, especially if the potential stakeholder isn't likely to make it to the jobsite in person. It is one thing to tell them that you have completed similar projects, but it's something else to show them your real work.



There are also major gains in timing that can come from having mapped data before bidding. If you know the area first, you can compress your schedule, which will allow you to complete more jobs in less time, bringing in more profit every year.

Knowing how much earth has been moved every day and capturing the data in easy-to-view reports and 3-D maps can help keep your clients happy. You can avoid misunderstandings from phone descriptions and let the actual results do the talking. This is especially important when your clients are not able to go visit the site in person. Keeping clients informed can also help win the next job.

CHOOSING THE RIGHT COMMERCIAL DRONE SOLUTION FOR YOUR NEEDS

There are two major routes to using drones for surveying. The first is to use a fully managed solution that will supply the drone and process the data for you. These kinds of solutions work well for companies that don't want the hassle and time to market delays of on-site hardware maintenance and software staff.

The second would be to build the capability in-house. In order to do that, you will need to handle FAA regulations, insurance and drone pilots. You will also need to source, integrate and maintain flight planning software, mapping drone hardware, processing equipment, data management, analytics solutions and updates to avoid technological obsolescence.

Technology has come a long way since the advent of GPS, and industrial leaders are increasingly incorporating mapping drones into their standard operating procedures because of their significant impact on cost savings and increased productivity. For construction, the sky is no longer the limit. **CBO**

Dick Zhang is president and CEO of Pittsburgh, Pennsylvania-based Identified Technologies. Zhang leads his rapidly growing team's efforts to deliver real-time jobsite updates to industrial companies around the world by providing a fully managed commercial drone solution.
Visit identifiedtech.com.



Improve Excavator Uptime Protection

6 maintenance tips to extend excavator life & boost performance

BY JASON ARCHBOLD

Unexpected compact excavator maintenance can place financial strain and undue stress on you and your company, and it may directly impact your profitability. Not only can poor equipment performance and component failure be frustrating, but also, you and your equipment operators may not have adequate service training or access to an on-site mechanic to get your compact excavator operational.

Preventive maintenance is critical to your business. Developing a comprehensive maintenance plan that incorporates the following six maintenance tips will allow you and your operators to focus on the most important part of your business—the job.



1. READ THE OPERATION & MAINTENANCE MANUAL

The first thing you and your excavator operators should do is read the manufacturer's operation and maintenance manual. The manual explains in great detail the machine's safety features, instrumentation, controls, service schedules, maintenance points and much more.

2. UNDERSTAND PROPER FLUID LEVELS & CORRECT FILTERS

Fluids, including engine oils, coolant, hydraulic fluid, grease and drive motor lubricants, need to be inspected on a regular basis. Using the wrong lubricants can lead to expensive and unnecessary repairs, so it is important that you work with your dealership to match excavator fluids to the proper ambient temperatures and the manufacturer's recommendations.

For instance, synthetic or synthetic-blended oils are formulated with additives that can extend oil change intervals and promote longer engine life. These oils have better cold weather starting and lubricating performance, as well as additional wear protection during high-performance operation.

Fuels should also be assessed at the same time you check fluids. A No. 1 or No. 2 ultra-low sulfur diesel fuel is the most common specification in the industry. No. 2 grades should be used at temperatures above 15 degrees Fahrenheit.

However, it is recommended to use a blended or No. 1 diesel fuel and/or anti-gel additives when temperatures drop below 15 degrees Fahrenheit.

To protect today's advanced components in excavators, it is important to follow published interval schedules for engine, air, fuel and hydraulic system filters and purchase original equipment manufacturer (OEM) filters compatible with your machine. Changing filters on a consistent basis can help reduce potential system contamination and extend the life of core components.

3. CHECK THE BATTERY

Today's compact construction machines constantly draw on the battery. Check your excavator's battery before operation. If you disconnected the battery during nonworking seasons, be sure the battery is reconnected properly and is fully charged.

4. INSPECT THE TRACKED UNDERCARRIAGE

It is vital to keep compact excavator undercarriages clean to help minimize any material buildup that can contribute to wear. During a visual inspection, examine wear on components to make sure idlers and rollers are functioning properly.

Complete a full undercarriage inspection for excessive or uneven wear, and look for damaged or missing components. During a routine machine inspection, check the tracks to see if any components look out of place or need repairs. Look for signs of damage or cuts to the rubber tracks.

It is also important to inspect the rollers, idlers and drives for oil leakage. These oil leaks could indicate a failed seal, which could lead to a major failure in the rollers, idlers or track drive motors. Many manufacturers' idlers and rollers are permanently sealed and lubricated to provide uptime protection and reduce maintenance costs.

If compact excavators are being operated in colder climates, then mud, dirt and other debris may collect and freeze, causing problems to the undercarriage. Routine cleaning of the undercarriage helps to prevent unplanned downtime and reduces potential wear later on in the machine's life.

5. PREPARE ATTACHMENTS AHEAD OF TIME

Attachments are an important driver for utilizing excavators and require the same attention to maintenance as the machine itself. Complete a visual check of the hydraulic hoses, cylinders and guards on the attachments, which can help determine if damage or wear has occurred. Everything that engages with the ground, from bucket cutting edges to trencher teeth, should be looked at for wear and damage. Consider these other maintenance tips:

- Operate only those attachments that are approved for use with the

WHEN IN DOUBT, VISIT YOUR DEALERSHIP

Don't have service training or an on-site mechanic? Consider partnering with your local dealership for:

- Special maintenance packages
- Assessing key machine features before servicing
- Ensuring scheduled maintenance is performed on time
- Controling costs
- Minimizing machine downtime



A comprehensive maintenance plan will allow you to focus on the most important part of your business—the job.

corresponding excavator.

- Connect the attachment and operate it briefly to make sure the attachment works properly before using it on the jobsite.
- Check attachment-specific fluid levels, and change them as needed.

6. CREATE A PLANNED MAINTENANCE SCHEDULE

Make sure to work with your compact equipment dealer to create a planned maintenance (PM) contract to better assess what equipment and tools are needed to keep your excavator up and running. A PM contract helps control the cost of ownership by guarding against unexpected downtime that often leads to sudden, costly repairs.

Your dealership and their service team should know what parts are stocked and can ensure that scheduled maintenance is performed on time and at a convenient time. Properly and timely scheduled maintenance can help extend the life of the equipment, minimize downtime and save you money over time.

Additionally, making a PM schedule that is easy to follow and documenting service intervals allows you to make sure each item is completed weekly, monthly, quarterly or as scheduled.

Maintaining excavators is crucial in your line of work. If your compact excavator is not maintained, you may be risking needless breakdowns and losing money because the machine cannot be used on the jobsite. By following these six maintenance tips, you can decrease costly downtime and remove the element of surprise when it comes to maintaining your equipment. **CBO**

Jason Archbold is the marketing manager for Bobcat Company, a Doosan Company. Archbold has nearly 20 years of marketing and analytics experience in several industries, including construction, engineering and electrical/industrial supply. Visit bobcat.com.



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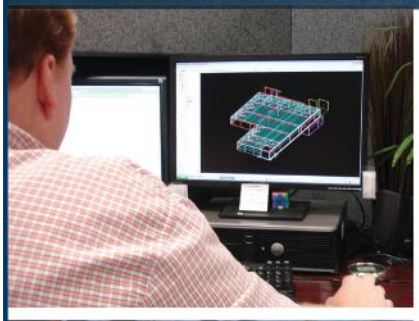



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Realizing the Potential of Digitalization in Construction

Go beyond the nuts & bolts of operations to develop a tech strategy

BY SARAH DUBETZ & STEVE COUGHRAN

The emergence of construction technology has sparked an overdue, industrywide revolution. As technology companies attempt to capitalize on the unspoiled market, the industry is becoming infiltrated with a slew of enticing new options. Innovative project management and scheduling software, building information modeling (BIM), lean tools, value stream mapping (VSM) and 3-D printing are flooding the market. These solutions present enormous efficiency opportunities to an industry that has suffered a productivity decline of 19 percent over the last half century.

However, realizing the full potential of industry digitalization requires companies to go beyond the nuts and bolts of day-to-day construction operations. Long-term success demands the complete marriage of technology and strategy. It entails an innovative approach to one of the oldest industries on earth.



MERGE STRATEGY & TECHNOLOGY

Too often, strategy and technology operate in organizational siloes. For example, one company had an outdated project management and accounting system that was understood and operated by only two employees in the information technology (IT) department. The information bottleneck not only presented an internal threat to the company due to the heavy reliance on a few individuals; but it also prevented the company from establishing a modern strategy. The company failed to merge innovation efforts with its overarching plan, which kept it from being as efficient and cohesive as possible. Employees failed to understand how systems were supporting the organizational vision and how technology was propelling the company toward better serving the customer and reducing the company's overall cost structure.

As stated by Brendan Adams, vice president of operations at 8020 Builders, a Denver-based general contractor, "People are attracted to shiny objects. The key to executing a strategy is to make objectives clear." Adams describes the temptation to adopt a slew of different "best-in-show" tech options as they emerge in the market, but states that "after clarifying [8020's] strategy, it became obvious that what we needed was to focus on the technologies that would enable us to solve the problems

Onboarding a new system requires employees to change their ways of thinking & processes that are often engrained over time. Introducing technology as more than a technical platform will incite organization-wide acceptance of the solution.

of our customers." Strategic transformation must be underpinned by organizational innovation. The two ideas should work in tandem, or they will begin to compete with one another. Successful initiatives begin by evaluating how the technology will impact the strategy. This first requires the company to define its strategy.

Where does the company want to go, how will it differentiate itself and how will it build in adaptability to sustain a competitive advantage? It is paramount to your success to craft a solid strategy for onboarding a solution before you ever begin the implementation process.

EVALUATE CRITICAL TRADEOFFS

Next, a company must assess the viable technology solutions and understand exactly how each option supports the strategy. Technology implementation is neither cheap nor easy. Too much adoption at once will overburden systems, confuse employees and result in inefficiency. Every company must articulate how each technology option will impact the business and establish a step-by-step plan that coincides with the strategy.

Many companies have attempted to integrate lean construction principles without investing in the proper technology. These companies' competitive advantage relied on achieving an advantageous cost structure through minimizing waste and maximizing value. However, management failed to implement the appropriate tools to execute such a plan. By integrating lean technologies, such as a last planner device, the company could have optimized pull planning to reduce process redundancy.

Other companies have effectively aligned innovation with strategy. Layton Construction focuses on healthcare construction. Due to the liability and complexity involved in healthcare projects, the company has effectively implemented technologies to improve safety and quality. Steve Serra, superintendent of Layton Construction, said the company's integration of BIM360 has vastly reduced mistakes in the field.

Another example of this is a firm that planned to expand geographically in the next year. The company determined to implement and train employees on new project management software anticipating territory growth.

As the company migrated to the new location, current employees were comfortable with the systems and processes in place and were able to coach new hires effectively. It optimized its processes, such as RFI submittals, and enhanced communication at its core. The company was able to seamlessly transition into a new stage of technology adoption and strategy by blending the two business functions.

EFFECTIVE IMPLEMENTATION

Bringing in key players who understand the business and will be responsible for using the software is crucial. Let's return to the example of the company with the alienated IT department.

The project management capabilities were put into the hands of two people whom had never even been to a jobsite. Since the success of implementation will be largely determined by the key users of the technology, it is important that management understands the perspectives of different company players. The technology functions for each group must be related to each individual's operations and the strategy at large.

Onboarding a new system requires employees to change their ways of thinking and processes that are often engrained over time. Introducing technology as more than a technical platform will incite organization-wide acceptance of the solution.

The supportive reaction will motivate employees to get the most out of the technology and the company to advance its strategic objectives.

Successful implementation of any change to a company involves careful planning and a focus on complete employee adoption. Evaluating your company's specific needs prior to choosing a project management solution, as well as getting extensive employee input from every department of your company will set you up for a smooth transition. **CBO**

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Climbing Out of the Rabbit Hole

How Baker Rock Resources reduced maintenance costs to 1%

BY E. VICTOR BROWN

For nearly every heavy construction company, the unpredictability of maintenance costs is not unlike falling down the rabbit hole in Lewis Carroll's famous story, *Alice in Wonderland.* Of course, this hole has serious ramifications that negatively impact the present and future bottom line. More companies are finding innovative ways to crawl out of that reactionary maintenance hole by developing and implementing comprehensive maintenance programs that suit their daily jobsite operations.

Some of the best of these programs are based on the predictability and comprehensive approach of total process reliability (TPR). This maintenance approach brings holistic structure and predictability that can deliver major improvements and changes to companies that implement it correctly.

One company that has already found success with TPR is Baker Rock Resources, an Oregon-based aggregate and paving materials supplier. The company is in its third full year of implementation of a TPR program, and has seen major changes and cost savings.

The company has gone from a 50-percent emergency breakdown rate to a rate of just over 1 percent in 2016. How they found success is a study in commitment and business cultural change that can be easily replicated by others.



THE CHALLENGE

Founded in 1956, the family-owned company and its more than 100 employees supply aggregate and paving materials to Northwest Oregon via divisions in Beaverton, Dayton and Molalla. Through ongoing relationships with major and minor road and construction projects throughout the state, Baker Rock's main Beaverton quarry spans 250 acres and processes an average of 1.5 million tons of aggregate per year.

Heavy equipment operators often see vendor labor as being highly trained with the latest tools, techniques & practices, but prohibitively expensive. The reality is that it doesn't have to be that way.

Like most major heavy construction companies in the United States, Baker Rock's inefficient maintenance processes were suppressing true gains in maximized uptime, productivity and future growth.

According to Baker Rock Equipment Division's Director Brian Young, the story is common across the construction industry where companies think operations are fine, yet they are falling down the rabbit hole of reactive maintenance. "Like many companies, we were constantly chasing problems and money with a tremendous amount of emergency repairs and downtime," said Young.

Heavy equipment operators often see vendor labor as being highly trained with the latest tools, techniques and practices, but prohibitively expensive. This leads many companies to having an in-house labor force that suffers from an unconscious lack of efficiency. The reality is that it doesn't have to be that way.

DISCOVERING THE SOLUTION

The first step for Baker Rock was realizing that there is a problem to remedy it, which was an understanding that came from the top. For Baker Rock CEO Todd Baker, that realization came from a specific incident at their maintenance facility in 2011. After a piece of angle iron that had been left near the maintenance shop for some time punctured a company truck tire as it was exiting, Baker had reached his limit with inefficiency and reactive maintenance.

Baker remembered a presentation given by Preston Ingalls, of TBR Strategies, 8 years before and put thought into action. TBR Strategies, a Raleigh, North Carolina, maintenance and reliability consulting firm had a successful track record implementing total process reliability (TPR). "I had been intrigued by TPR, but at the time, I didn't feel that we were in the right place as a company to take it on, but the incident irritated me so much that I knew it was time for a change," said Baker.

As an outgrowth of principles devised by Japanese Engineer Seiichi Nakajima called total productive maintenance (TPM), TPR is about increasing equipment reliability, decreasing downtime and creating a unified asset management process by engaging the entire organization. For the three basic principles of TPR, see the box on page 61.

FORMING A MAINTENANCE PROGRAM OR PROCESS

The Baker Rock team began a process of overhauling existing processes, such as oil analysis, preventive maintenance (PM) procedures and service policies to bring them in line with new technology standards. This happened in conjunction with new process implementation for operator care, process guide development, inventory control, auditing, FMEA, root cause analysis and key performance indicators (KPIs).

The company established a training schedule and invested in tooling, computer diagnostics equipment, compression adaptors and hydraulic test kits.

"Among the processes brought to us by TBR was 5S, which set a visual and physical standard for shop cleanliness and organization," said Young. 5S focuses on organization and orderliness of the workplace.

"[TPR] is a very holistic approach that starts at the leadership level and continues through to the newest employee," said Young. "Consequently, it took the leadership and commitment from Baker Rock President Todd Baker to initiate and invest in it, as well as to have the patience to see it through to fruition."

Baker, for his part, explained his ongoing role. "TPR is an [integral] part of what we do now, but that took constant reinforcement in the first couple of years, but in the ensuing 3 years, it's become foundational to the business," said Baker.

Old school technician productivity structures equated wrench turning alone with productivity, but the shift to training and education to learn new techniques to be functional teams would ultimately be more fruitful and efficient on the back side.

CHANGING THE CULTURE

Both Baker and Young were quick to point out how a maintenance program based on TPR is a cultural change for the business, where the plan, goals, roles, expectations and feedback are built into the business. The company initiated a check sheet as part of the process to ensure follow-through. "You need leaders and managers willing to coach and mentor, because process and procedure change requires that type of accountability; without it, you are going to have a slow change process," said Young.

To foster that cultural change, Baker personally attended 5S and CLAIR events. This type of attendance by leadership

includes the executive staff, which rotates through bimonthly program meetings. "Rather than talk a lot, I mostly observe, and, at the end, I try to reinforce our commitment and how big a part they are playing in the TPR program," said Baker.

FINDING PROGRAM RESULTS

While costs were higher for the initial PM cycles of the equipment, within 6 months, the machines with the highest PM cycles were showing financial gains in terms of lower maintenance costs and emergency repairs. This continued to improve throughout the first year and thereafter. "By our third year with the program in full swing, repair costs were really dropping and the emergency rate continues to drop to the current 1 percent," said Young.

One of the key benefits was a major reduction in standby equipment. For example, the company had purged boneyard equipment at the start of the process and scraped six small rollers that averaged no more than 200 hours per year.

These were replaced with two new, small rollers that would immediately be part of the new maintenance program. A turn schedule was implemented that would introduce additional new rollers, which will continue to save on parts and maintenance costs, as well as downtime due to the maintenance program. As the maintenance program took hold and breakdowns disappeared, other benefits became apparent, such as comments from the community, customers and government agencies regarding the near pristine look and operational efficiency of the equipment and facilities. This would bring tangible results in terms of being far more competitive in the marketplace.

While the benefits of TPR and a successfully implemented maintenance program is huge in terms of cost and time savings as well as overall company efficiency, it is a major undertaking.

Baker made it clear that this commitment starts with company leadership, but must have full buy-in from the staff.

"The owner, as well as the executive team, must be committed to process implementation and be ready to figure out how to maneuver through the inevitable bumps in the road," said Baker. "Ultimately, the key is having good employees, as nothing gets done without their buy-in and cooperation. We make TPR part of everyone's job, so when employees are scheduled for training, managers are responsible for scheduling a way to fill that time in the field and ensure that the employee goes to training."

CREATING A FUTURE MAINTENANCE WONDERLAND

Currently, the company is optimistic about the future results for their emerging training program in cooperation with local colleges and vendors to deliver factory and systems theory training to employees.

While the future is bright for Baker Rock, getting to a true maintenance wonderland takes hard work, open communication, commitment to change and, most of all, clear planning and direction.

On Young's office wall is a quote that he references throughout his day from Carroll's *Alice in Wonderland*, "If you don't know where you are going, any road will take you there."

"If you don't believe in the vision that you have created, and you don't communicate that with your team and your organization, you are never going to get there. In the ongoing journey, it is vitally important to measure everything, work on continuous improvement, never rest and never settle, because there is always a way to improve what you are [currently] doing." **CBO**

3 PRINCIPLES OF TOTAL PROCESS RELIABILITY (TPR)

1. *Detection*—Use preventive & predictive technology to inspect, detect & correct small defects before they become costly.
2. *Restoration*—Restore equipment to optimal conditions as it is needed.
3. *Prevention*—Prevent small defects from becoming major problems by correcting them before they become costly repairs.

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E. Victor Brown is a 20-year veteran freelance writer specializing in technology, data and processes with an emphasis in health care, business, manufacturing and industrial sectors. Contact him at evictb@gmail.com. Visit tbr-strategies.com.

Expansion of the Lancaster North Sewage Pumping Station

How rental resolved this municipal project's dewatering & bypass issues

BY STEPHEN ALLEN

The city of Lancaster, Pennsylvania, like hundreds of other cities across the United States, is saddled with an aging infrastructure originally designed and built in the mid-1800s. Basement sump pumps, roadside storm water drains, sewage lines and industrial wastewater all drain together, and the system is easily overwhelmed by storm events and annual snow melt. One solution, to build miles of separate lines for storm water and sewage under city streets, was financially and physically prohibitive. So, the city is tackling the challenges as efficiently as possible without causing undo financial burden to the city or its residents. Upgrading the city's four pumping stations along the Conestoga River to reroute more storm water to the city's Advanced Wastewater Treatment Plant (AWWTP), instead of draining into the river, has been part of the upgrade plan for the past few years.



The Lancaster North Sewage Pumping Station expansion was one of the many projects that the city had undertaken. To spearhead the effort, city officials hired CDM Smith as consulting engineers to design the pump station project. Wickersham Construction & Engineering, a local firm with over 100 years of experience in commercial and industrial construction, won the bid for the construction work. Given the many projects in the environmental and wastewater space over the years, and the fact that the company's headquarters was located in Lancaster, the company was the perfect fit for the job. Wickersham brought in Xylem, a water technology provider, to design and handle the temporary bypass required to circumvent the station while it was being upgraded.

"This wasn't a straightforward construction job, with the bypass and the multiple components. It was pretty complex, so it was important to have a good team in place," said Jeff Laney, project manager for Wickersham Construction. "Our previous experience with both CDM Smith and with the Xylem team gave us the comfort level we needed."

The North Sewage Pumping Station is designed to receive influent from three different lines: a 120-inch, combined sewer and storm water line from the city; and two sewer lines—one 30-inch line and another

Renting the pumping equipment allowed Wickersham to minimize costs, paying only for the equipment & services they needed.

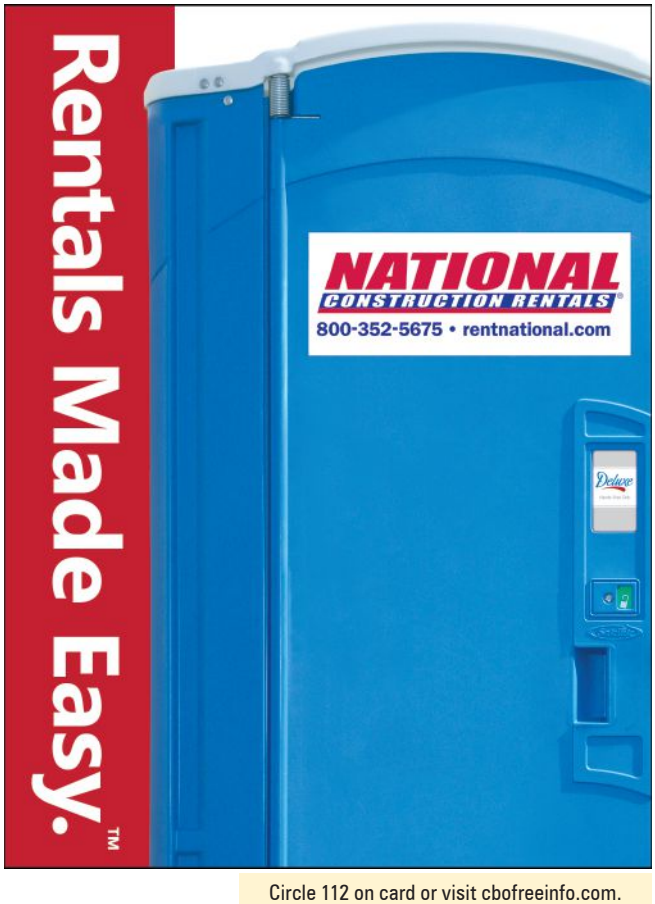
24-inch line—each coming from different area municipalities. The average flow into the pumping station is roughly 9 to 12 million gallons per day (MGD), with the capacity for twice that in case of a storm event. As a result, the team designed a bypass that could handle upwards of 24 MGD, a precautionary measure to ensure that increased flow could be handled, even in the unlikelihood of a 100-year storm event.

TEMPORARY BYPASS WITH PERMANENT CAPABILITIES

The team needed to be sure that every detail was addressed with the bypass. They couldn't risk a sanitary sewer overflow (SSO) caused by a failed pump or a power failure. As a result, there were multiple backup precautions taken to ensure 100-percent uptime and optimum efficiency. "We needed a temporary solution that would be in place 3 to 6 months, but it needed to have permanent substance," said Laney. "The concern is that a temporary solution might have less staying power, and falter along the way. But the bypass design was very strong, and we had every confidence it could do the job for us, as long as it took."

To move that much wastewater, Xylem recommended that Wickersham rent six Godwin HL250 pump sets with 12-inch discharge flanges. Four of the six units were electric pumps, and they were established as the primary pumps for the project, running from a temporary power line. Each pump was installed with a variable frequency drive (VFD) unit, in order to control pump speed and enhance power usage.

For additional energy savings and to optimize efficiency, the bypass design called for the pumps to be installed and to be started sequentially, only kicking on as needed. Each pump was set up with a level transducer, which was preset to turn the pumps on and off, depending on the fluid level in the wet well. The pumps were only activated if increased system flows called



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for additional pump activity. During typical daily flows, one, or possibly two, pumps would be running. As many as three or four pumps would run during higher, peak-flow activity. To ensure the electric pumps would work in case of a power outage, a backup generator was installed to kick on should the temporary power line be disrupted. The other two pumps that were implemented into the design were diesel-driven, and were put in place as redundant backup pumps to kick on automatically, should any of the four primary pumps fail. The bypass around the pumping station turned out to be approximately 400 feet long, and comprised of twin discharge lines of 24-inch, HDPE pipe. Each discharge line was fed by two pumps, and the lines tapped into the 36-inch, force main 400 feet downstream, on the way to the Lancaster AWWTP. The team installed flow meters in each of the twin lines. The data from the flow meters fed into a PLC controller and the plant supervisory control and data acquisition (SCADA) system, alerting plant operators to the amount of flow that was coming their way from the bypass. This would allow the facility to adjust their influent flow rate, should there be spikes or drops that needed to be handled one way or the other. To ensure that flow rates were monitored and that the bypass pumping operation was handling the flow, the team installed high-level floats with auto-dialers to alert Wickersham personnel and the project foreman when the backup pumps kicked on again.

WHY RENTAL IS KEY FOR A TEMPORARY SOLUTION

After years of working with the city of Lancaster and careful planning, designing and implementing the expansion of the Lancaster North Sewage Pumping Station, the team was able to activate the bypass pumps on June 22, 2016. The actual construction component of the upgrade and expansion of the station could actually begin in earnest, and it was expected to take 3 to 6 months.

For the duration of the project, Wickersham rented the pumping equipment, piping and accessories. This allowed Wickersham to minimize costs, paying only for the equipment and services they needed. They also didn't have to worry about the maintenance and upkeep of the equipment long term, unlike had they purchased it outright. They could also focus on their core business and their primary part of the project—the pump station upgrade and expansion. **CBO**

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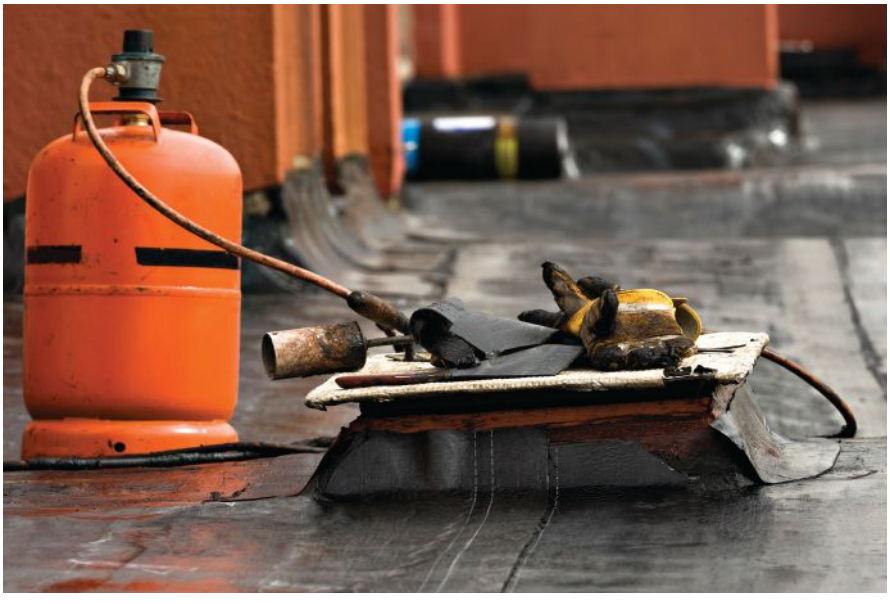
How to Gain with Propane

4 ways propane power can reduce costs & improve jobsite efficiency

BY JEREMY WISHART

Propane is being put to work on construction jobsites more and more as owners do some digging and find that the it makes for an attractive jobsite fuel for all kinds of construction applications. In fact, propane-powered engines are already found running a whole host of jobsite mainstays, including concrete trowels, portable generators, welders, lights and heaters. Propane can even fuel the light-duty, pickup trucks that transport equipment and crews to and from a jobsite.

For construction business owners who live in a world where time is money, propane is an attractive jobsite fuel for several reasons. It is versatile, portable and cost effective, especially when compared to traditional fuels powering construction equipment like gasoline and diesel. The following are four reasons why propane is finding a home on more jobsites managed by savvy construction companies.



1. OPERATES INSIDE & OUTSIDE

Propane is a versatile fuel for a jobsite. Unlike electric equipment, propane allows contractors to work both inside and out, without being tethered to electrical outlets or the charge limits of batteries. When compared to traditional fuels, propane emits 15-percent fewer greenhouse gases and 40-percent less carbon monoxide than gasoline. It is less harmful to operators working on a ventilated indoor project. Propane also doesn't require extra filters or fluids to meet emissions restrictions like diesel equipment.

Two examples of propane equipment that can be used both inside and outside are floor burnishers and concrete trowels. Propane wheel buggies, with the ability to operate inside or out, can also make removing debris from an indoor site easier. During winter conditions, propane heaters and lights can help make full use of a day by keeping jobsites safe with better visibility and workers who aren't distracted by cold weather.

2. PROVIDES A CONTROLLED SOURCE OF FUEL

Construction sites can become the target of theft, with valuable tools, equipment and fuel left on a site or in trailers overnight. Disgruntled employees may also pilfer gasoline from tanks for personal use. That's not the case with propane. Propane is a closed fuel source, stored in secure cylinders installed on the equipment before the fuel is delivered through the fuel system. Fuel cannot be siphoned off from the equipment's fuel tank for other use.

Because propane cylinders operate on a closed-loop system, the fuel won't spill

when refueling, eliminating clean-up time and wasted fuel.

For construction companies that own and maintain their own equipment, this can also keep garage and repair facilities cleaner. The closed-loop system also makes transporting and storing cylinders simple. Storage is often done in a locked cage from which cylinders can be removed for refueling as needed, and, unlike gasoline or diesel, propane won't deteriorate if it is kept in storage for long periods of time between uses.

3. INCREASES JOBSITE PRODUCTIVITY

Another advantage of propane is that refueling is more efficient than with gasoline or diesel. With propane, a company has options from which to choose its refueling strategy, so it meets the needs of a specific project or jobsite.

There are two main options for refueling with propane: a cylinder exchange program and on-site refueling. Both options are designed to significantly curb downtime spent at off-site refueling stations, which helps ensure that projects stay on time and under budget.

With a cylinder exchange program, propane cylinders are stored in a cage at a corporate office or on a jobsite. Working with a local propane retailer, a set schedule is determined to exchange empty cylinders for full cylinders. This system is hassle-free, as employees need only to remove a cylinder from the equipment and grab a full one from the cage, rather than go off-site to a service station.

For on-site refueling, a larger propane tank is installed at a corporate office, or propane retailers may be able to set up a portable propane tank on a long-term jobsite. It takes only a few hours of training by a propane retailer for employees to refill cylinders for use. Having on-site refueling is also beneficial to businesses considering incorporating propane autogas trucks into transport fleets.

4. REDUCES FUEL COSTS

Propane costs less per gallon than gasoline or diesel. It is one of propane's most attractive benefits for construction business owners.

By working with a local propane retailer, construction companies protect themselves from any market fluctuations, too, by signing an annual fuel contract. This can help with overall budgeting, especially when considering the costs of gasoline and diesel, which can swing widely throughout the course of a year.

The Propane Education & Research Council has a "Find a Propane Retailer" tool available at retailers.propane.com for contractors to find their nearest retailer.

Fuel costs can be further reduced by using tax credits and state incentives. Checking with state propane associations can lead to incentives for installing propane refueling infrastructure and equipment or vehicle conversions, too.

Propane has begun to make a name for itself on more construction jobsites across the country. The alternative fuel offers better versatility, security and productivity. Plus, it is cleaner and cheaper than other fuels. Propane is already fueling many of the equipment must-haves for any construction site, from concrete trowels to skid steers, which is why construction companies are turning to the alternative fuel to get more work done on time and under budget. **CBO**

Jeremy Wishart is the deputy director of business development at the Propane Education & Research Council. Wishart is responsible for projects within the small engine and off-road markets, including the lawn and landscape and material handling industries. He leads initiatives, such as engine and product development and commercialization, outreach and communications programs and end-user engagement programs, to drive technology adoption. Contact him at jeremy.wishart@propane.com. Visit propane.com.





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SOFTWARE & TECHNOLOGY

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1

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2



3



4

2 SPECTRUM INTEGRATION HUB

Dexter + Chaney announced its new Spectrum Integration Hub. The hub allows Dexter + Chaney clients to integrate Spectrum with virtually any other software program available. The Spectrum Integrations Hub features solutions comprised of pre-built connectors, standard-based interfaces and bulk data access. These solutions make it easy to facilitate seamless communication between Spectrum and other applications, creating an open application program interface (API) environment, based on open technology standards. The Spectrum Integration Hub is powered by several different Spectrum offerings that can be used together or separately. Dexter + Chaney clients get out-of-the-box application connectors between Spectrum and some of the most widely used software applications, thanks to technology partner agreements with leading integration companies. Spectrum users and partners can build their own bidirectional connectors—integrations that are reliable and validated. In addition, if one can use Excel, one can easily push data into Spectrum from Excel with a single click.

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3 VERTICAL UNIT HEATING & COOLING PUMP

Modine Manufacturing Company has unveiled its latest in classroom HVAC solutions with the TeamMate single packaged vertical unit cooling and heat pump. Designed with the same footprint as the Modine ClassMate, the TeamMate is a value-priced single package vertical unit engineered to provide efficiency, noise reduction and a small footprint at a budget conscious price. Features of the TeamMate include: patented CF microchannel evaporator coil technology; smart integration capabilities to work with your existing thermostat or Modine Controls Systems; meets DOE efficiency requirements; and decreased sound and power output.

modinehvac.com

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4 CLOUD-BASED, SELF-POWERED JOBSITE CAMERA

Sensera Systems presents its cost-effective, portable solar-powered jobsite monitoring and time-lapse camera systems, which will change the way project managers can document and promote their projects, as well as support potential claims and disputes. Features include: DIY installation, all-time remote monitoring and management, live streaming, DVR and time-lapse. The lightweight, portable self-powered camera system features an integrated, rechargeable Lithium Iron Phosphate ($LiFePO_4$) battery pack and 3G/4G/LTE data transfer, making this the perfect solution for jobsites with limited or no access to power and internet. The MC26 is a solar-powered, wireless live video webcam with time-lapse documentation.

senserasystems.com

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5 MASS NOTIFICATION SOFTWARE

Construction companies use **AlertMedia's** mass notification software to streamline operations and improve employee safety. Via an easy-to-use mobile application, AlertMedia allows your company to easily manage jobs, schedule crews and organize fleets by sending your employees and vendors messages across multiple channels. AlertMedia also strengthens your ability to react to and recover from an emergency by delivering critical messages to any audience, over any device, giving your employees a voice through two-way communications, and by monitoring your people and your business on AlertMedia's map-based view.

alertmedia.com

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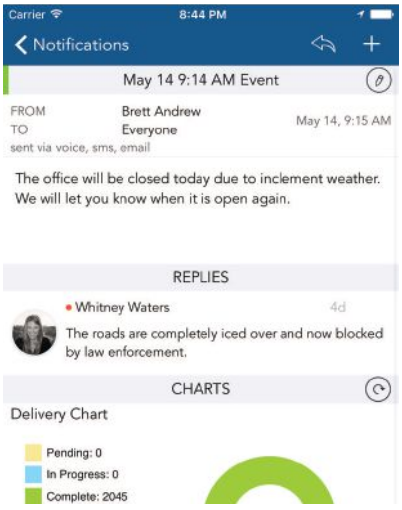

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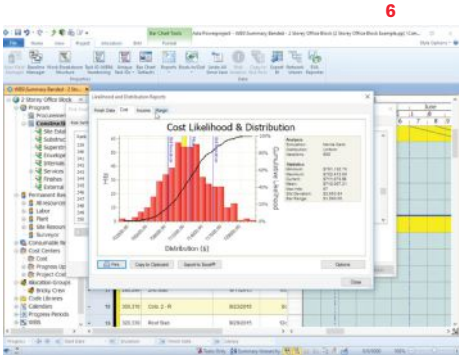

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6 PROJECT MANAGEMENT SOFTWARE SOLUTION

Elecosoft announces the launch of Version 14.0.02 of Asta Powerproject, its flagship project management solution. The software has evolved over nearly 30 years by listening to customer feedback, which is why it is recognized as best in class for scheduling and how it is tailor-made for construction users. This latest release brings new features and extended functionality, including several specifically requested by U.S. customers to reflect the way they work. Users can also specify the way negative costs are handled when exporting to and importing from Microsoft Project or Primavera; create new summaries and charts by right-clicking in the project view; display heat maps in resource usage views; constrain tasks to complete within a specified time period; view a task's complete chain of linked predecessor or successor tasks; and store the original duration of each task before any progress has been applied.

astapowerproject.com

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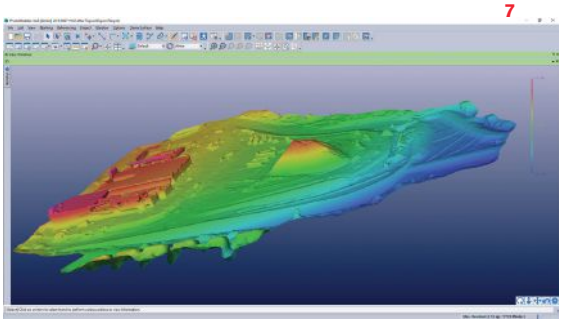

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7 PHOTOGRAMMETRY SOFTWARE FOR DRONES

Eos Systems Inc. has introduced new photogrammetry software optimized specifically for photographs taken with drones or unmanned aerial systems (UAS). The new PhotoModeler UAS 2016 software creates 3-D models, measurements and maps from photographs taken with ordinary cameras built in or mounted on drones. PhotoModeler UAS 2016 software includes numerous features that provide higher performance in drone photogrammetry. Camera calibration is optimized for high accuracy with UASs and the global positioning system (GPS). Post-processed kinematics (PPK) makes it possible to correct a survey with GPS data after the fact for survey grade accuracy. Full geographic coordinate system support enables users to work in their local geographic coordinate system for better compatibility. An intuitive interface is provided for marking ground control points.

photomodeler.com

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8



9

8 JOBSITE HEARING PROTECTION

Workers that need to wear hearing protection on the job often have diverse safety and usability concerns. To help overcome a range of issues, **3M Personal Safety Division** has expanded its line of Peltor headsets with four new products: 3M Peltor ProTac Hunter and ProTac Shooter, 3M Peltor ProTac III and 3M Peltor WorkTunes Pro AM/FM Radio Headset. In environments where loud or sharp noises are present, workers need hearing protection that helps protect against hazardous noises, but also minimizes overprotection to help worker hear warning signals, alarms or other sounds in machines and processes. The 3M Peltor ProTac III Headset allows workers to do both by monitoring the surrounding environment and automatically adjusting the amount of attenuation when hazardous noises are present.

3m.com

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9 TILT-TURN WINDOW 3-D IMAGING LASER SCANNER

Leica Geosystems announced the BLK360, a miniaturized, black, 3-D-imaging laser scanner. The BLK360 captures the world around you with full-color panoramic images overlaid on a high accuracy point cloud. It is so small and light that it fits in a typical messenger bag and can be carried almost anywhere. It features a 60-meter measurement range for full dome scans. A complete full-dome laser scan, 3-D panoramic image capture and transfer to the iPad Pro takes only 3 minutes. Using the ReCap Pro 360 mobile app, the BLK360 streams image and point cloud data to iPad. The app filters and registers scan data in real time. ReCap 360 Pro enables for point cloud data transfer to a number of CAD, BIM, VR and AR applications.

leicaus.com

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10 MICROSOFT SURFACE STUDIO INTEGRATION SOFTWARE UPDATE

Bluebeam Inc. announces the release of Revu 2016.5.2, empowering Revu users to streamline digital workflows, increase efficiency and unlock productivity by leveraging the new Microsoft Surface Studio and Surface Dial. The new Surface Studio from Microsoft is an all-in-one computer designed for creative workflows. Surface Studio turns every desk into a collaborative work environment by switching between desktop- and tabletop-viewing orientations and interfacing with a variety of creative input tools, including touch, stylus, mouse and the new Surface dial. Revu 2016.5.2 now empowers industry professionals to leverage Surface Studio's innovative enhancements to simplify tasks and create new value for project teams. Annotation appearance properties, undo/redo editing functionality, markups list, layers and tab access can be administered through intuitive scrolling.
bluebeam.com
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10

11 COLLABORATIVE, CLOUD-BASED PROJECT MANAGEMENT PLATFORM

Milwaukee Tool introduces the Tick, a professional-grade Bluetooth tool and equipment tracker. Designed to withstand the harshest jobsite environments, the Tick can be easily attached and hidden from sight on any product, regardless of brand, providing users a way to track anything in their inventory through the One-Key app. With its low-profile design, the Tick can securely attach to anything through glue, screw, rivet or strap. Its flat back enables a snug fit to a variety of surface types and its circular shape fits into a range of places hidden from view. Each Tick is also laser engraved with a serial number so users can easily identify and assign multiple Ticks. Products with a Tick attached are paired via the One-Key app. Tool records and locations are updated when any device with the One-Key app comes within 100 feet of the Tick.
viewpoint.com
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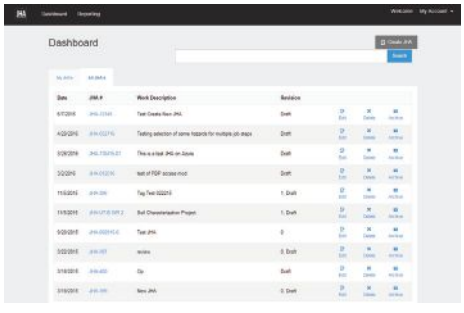

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12 FIELD SOFTWARE SOLUTION

PlanGrid is used by tens of thousands of contractors, designers, owners and architects to finish their projects on time and under budget. Lightning fast, easy to use and loaded with shortcuts, it delivers thousands of plans right to users' fingertips—helping field teams edit, share and manage blueprints, specs, photos, RFIs and punch lists in a single place. PlanGrid currently stores over 50 million customer blueprints in its cloud, translating to savings in labor costs, increased productivity and on-site safety improvements. PlanGrid is available on iOS, Android, Windows and the web. PlanGrid for Windows includes: fast, smooth sheet viewing, offline mode, multiple windows for side-by-side comparison, snap-to annotations and estimates and measurements.
plangrid.com
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13 JOBSITE SAFETY SOFTWARE

Job Hazard Analytics announces a new brand design, marketing website and product enhancements as part of release 4.0. The new update includes features such as: quick access to expiring JHAs; enhanced navigation; improved page loads; and company settings customization. Job Hazard Analytics was originally built by safety specialists who needed a digital way to create safety analyses that scale from one project to another. Over time, JHA has added features to reflect the changing needs of safety professionals. JHA's 4.0 enhancements include an enhanced design, e-commerce licensing, discounted pricing and an improved reporting module.
jobhazardanalytics.com
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14 JOBSITE SECURITY CAMERAS

Eye Trax adds two new camera systems to its product lineup—the Mega and the Predator series. The Eye Trax Mega series cameras are designed for security applications that require exceptional high-resolution images, up to 12MB (4,000 x 3,000 pixels), of recorded events. The Eye Trax Predator series fills a void in the market for reasonably priced camera systems offering both video and still image capabilities to capture events. Eye Trax Mega and Predator camera systems use available wireless and cellular networks to transmit information, eliminating the need for the infrastructure of a computer, phone line, internet connection, router and power. The Predator camera system can monitor human and vehicle activity up to 250 feet away with an optional battery-operated, wireless motion sensor, while the night vision capability provides 125 feet of invisible infrared light.
eyetrax.com
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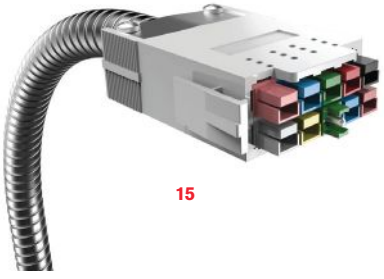

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17

15 ENERGY-EFFICIENT LIGHTING & CONTROL SYSTEM

Communications Integrators Inc. (Cii) announced ReVolt Control, a modular, plug-and-play lighting and control system that optimizes building lighting and power usage. With 25 percent of construction companies having turned down work last year due to labor shortages, ReVolt is especially attractive because installation is not labor intensive. ReVolt comes pre-configured and pre-provisioned; and its modularity allows you to simply snap it together. It can be reconfigured and hot-swapped live, making tenant improvements (TI) fast and painless. With ReVolt, you can set time schedules, adapt to occupancy and vacancy and dynamically adjust brightness based on the amount of sunlight entering a space. The plug-and-play nature of ReVolt takes your space beyond LEED: its reusable infrastructure cuts your raw material usage by an order of magnitude every time you reshape your space. Because the solution comes pre-configured and pre-provisioned, it is a quick installation, meaning one month less rent lost (due to TI improvements related to electrical).

ciinet.com

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16 UPDATES TO TEAM PORTAL & MOBILE APPLICATIONS

Corecon Technologies Inc. announced new features for its Corecon Mobile app and TeamLink Portal. The updates were developed to complement the newest version of Corecon's browser-based construction software, which was released in August 2016. Serving as the next generation of Corecon's mobile solution, the modernized iOS and Android Corecon Mobile apps now have a new user interface and navigation functions, making it easier to view and add construction project information from a smartphone or tablet device. The updated app also adjusts to the appropriate time zones for Corecon's domestic and global customer base. Like its predecessor, the modernized app provides the same tools that are available in the Corecon browser-based solution. The Corecon TeamLink Portal is a user-friendly, web-based service that provides subscribers of Corecon with an economical solution to seamlessly connect project team members. Recent updates to the TeamLink Portal include a modern user interface similar to Corecon's browser-based flagship solution and modernized mobile apps.

corecon.com

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17 FIELD MOBILE APPLICATION

eSUB Field Works Mobile Application enables your team to document and update project data from anywhere in the field. Utilizing cloud technology, eSUB's mobile app allows team members to communicate quicker and increase productivity. For team members, the ability to stay connected to stakeholders on a jobsite can shave hours and even days from the work schedule. And by not having to chase down contracts, insurance documents, RFIs, change orders and the most current project plans, employees can keep the project moving forward while working in the field. The office and field staff become essentially one unit.

esub.com

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18 SIMULTANEOUS LOCALIZATION & MAPPING SOLUTION

GeoSLAM unveils Zeb-Cam, a new add-on option for the Zeb-Revo mobile indoor mapping system. Zeb-Cam integrates seamlessly with the existing Zeb-Revo 3-D laser scanner and allows imagery to be captured simultaneously alongside scan data. With an integrated inertial sensor, Zeb-Cam utilizes optical flow technology to accurately synchronize the acquired imagery to the point cloud data. The difficult manual processes of scanning and surveying are eliminated using Simultaneous Localization and Mapping (SLAM), as the operator holds the Zeb-Revo device in hand and does a steady walk throughout any structure. An intelligent algorithm is doing the thinking, and the output is highly useable and detailed centimeter-grade measurements. The end result is that a map is created from the data, known as a point cloud. SLAM technology does not require a GPS signal—thus can scan any enclosure—and requires one moderately trained person to use.

geoslam.com

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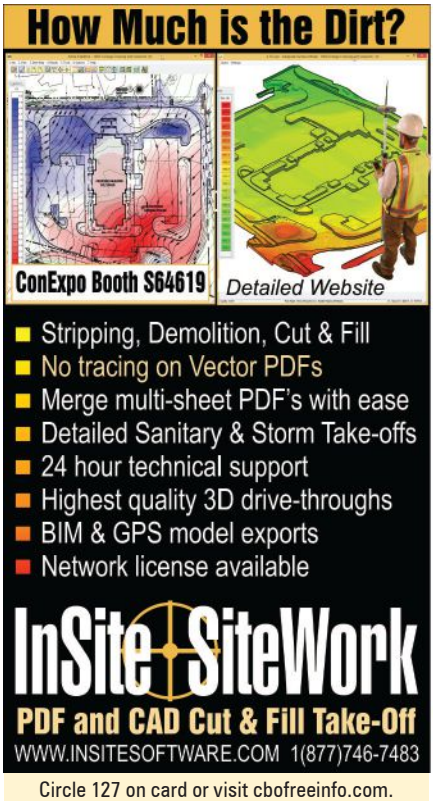

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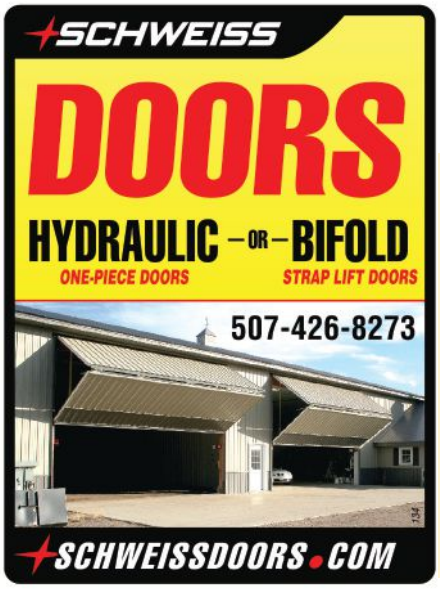

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Annual Value of Construction Put in Place

2014/2015/November 2016 Annual Rate Comparison

This chart compares the two previous years' total value of construction put in place to an annual forecast based on November 2016 figures. (Millions of dollars. Totals may not add up perfectly due to rounding.)

	2014	2015	Nov 16
Total Private Construction	**704,483**	**827,345**	**892,820**
Residential	349,643	433,108	462,906
Nonresidential	354,840	394,237	429,913
Total Public Construction	**280,019**	**296,153**	**289,277**
Residential	5,566	5,909	6,763
Nonresidential	274,453	290,244	282,514
TOTAL Construction	**984,502**	**1,123,497**	**1,182,097**

**Seasonally Adjusted Annual Rate. Source: U.S. Census Bureau*

$1,182,097

NOVEMBER 2016 TOTAL ANNUAL VALUE OF CONSTRUCTION PUT IN PLACE

"Without many details of the **policies proposed**, it's still **too early** to tell the likely impact of the programs of the **new administration,**" said AIA Chief Economist Kermit Baker, Hon. AIA, Ph.D.

AIA Architectural Billings Index (ABI)

National			*Regional - Billings				*Sectors - Billings			
Month	Billings	Inquiries	Northeast	Midwest	South	West	Multifamily Residential	Commercial/ Industrial	Institutional	Mixed
Jun-16	52.6	58.6	51.8	48.2	55.5	54.1	57.9	50.3	52.7	51.0
Jul-16	51.5	57.5	49.3	50.1	56.9	49.2	55.2	50.3	50.7	50.5
Aug-16	49.7	61.8	44.9	52.8	55.2	49.0	50.9	50.8	50.7	51.8
Sep-16	48.4	59.4	44.0	50.1	53.4	49.5	48.8	50.4	49.0	49.8
Oct-16	50.8	55.4	47.3	46.8	53.7	49.7	51.2	49.8	49.1	49.5
Nov-16	50.6	59.5	50.8	50.9	51.3	48.6	51.7	50.4	49.5	51.3

For more information on the index or to subscribe to the complete historical data going back to 1995 for your internal analysis, **please contact economics@aia.org.** The ABI presents monthly construction billings data, using a base score of 50. A score of more than 50 indicates a growth from the previous month, and a score of less than 50 indicates a contraction from the previous month. A score of 50 indicates no change. Source: The American Institute of Architects (AIA), Architecture Billings Index (ABI).

*Regional and Sectoral indexes are three-month moving averages, due to small sample size. All data is seasonally adjusted.
**Every January the AIA research department updates the seasonal factors used to calculate the ABI, resulting in a revision of recent ABI values.

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CONSTRUCTION EQUIPMENT

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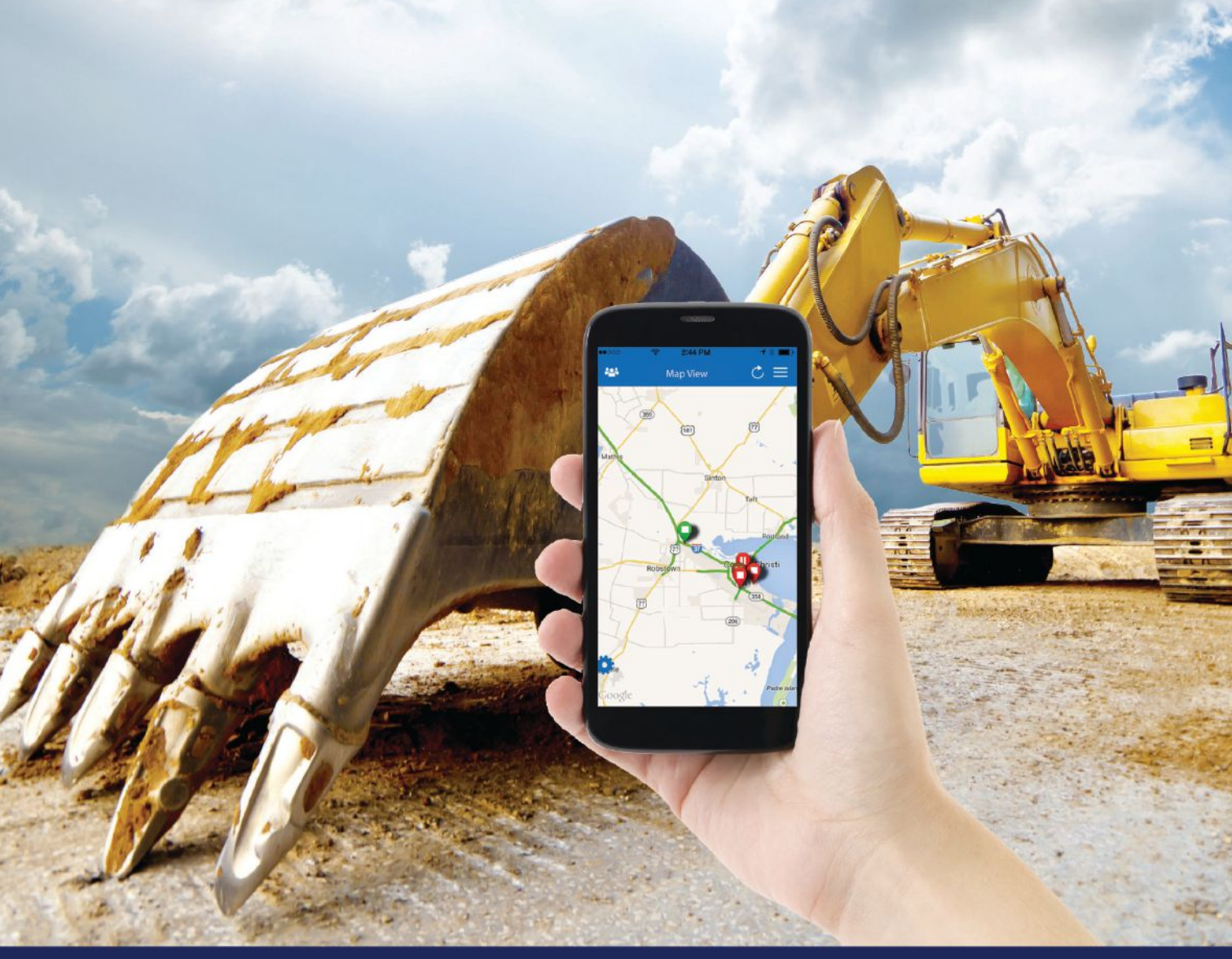

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