



Trends and Technology

SMACNA contractors and SMART's skilled workforce employ technology trends and lean practices to retain market share

By / Don Procter

Sheet metal is like any sector of the construction industry—stable in its approach, tried and true in its methods, and wary of rapid changes in too short a time span. And rightfully so. The only thing worse than staying stagnant is rushing in without the proper knowledge, training, and game plan for implementing new technologies.

But considering rising costs, modest margins, and growing labor scarcities, change is indeed inevitable. According to industry studies, several key trends in technology and efficiency practices are leading the way to more productive and competitive outlook for contractors and their well-trained tradespersons.

Lean Practices

Since Apollo Mechanical engaged in lean practices about eight years ago, its labor and materials costs have dropped by 10–15 percent while production levels have risen. At the contractor's largest project—a high-tech semi-conductor facility in Hillsboro just west of Portland, Oregon—all sheet metal supervisors and field personnel are trained in lean practices.

"We took a lot of time on the materials and tools sides to sift through what we really needed," says Eldon Parry, one of Apollo's project managers. Next, the entire field crew was

trained in the use of specific tools to meet the company's lean practices. "Everyone has gone through a standardizing and sorting effort in our commercial world, high-tech world, and some of our other project divisions," Parry says.

Successful lean implementation depends on skilled union labor, adds Jamison Connor, Apollo's division manager. "They are the ones who know where the waste is, where we can lean things up, and where the technology will help."

Connor says it is a mistake to think union jobs will be lost when technology is used more efficiently on the job. "The goal is not to make 20-30 percent on a job; the goal as a union company is to try to get more market share back. If we can get more efficient that means we can beat more of these non-union companies."

A lot of the work on the project is performed in a clean room environment. Employing upwards of 100 sheet metal workers, Apollo is installing tens of thousands of lineal feet of ductwork ranging in size from three-inch to 100-inch diameters over the contract's year span.

While prefabricating sheet metal fittings is not unusual in the industry, Apollo goes further at the Hillsboro site by assembling fittings into large spools or sections of ducting and installing



Wiegmann Associates prices total costs on design-build projects, changing the way the general contractor views the work. Photo courtesy of Wiegmann.

them “in the air,” says Connor. “It is a lot different than what most people [in the high-tech sector] are doing and it is a good learning curve.”

Apollo might be the only contractor in the sheet metal sector in the Portland, Oregon, area that provides every field foreman with a cloud-based laptop and tablet. Eliminating rework is the biggest benefit, Connor says. Not many years ago the contractor hired people “to run paper,” but that’s been eliminated. Meanwhile, the shift to the electronic medium reduces potential problems on site because documentation is sent to multiple parties instantaneously for quick resolutions.

For the past year Apollo has used a HoloLens—a holographic computer with head-mount display—in its validation installation process for prefabrication. “It portrays a one-to-one scale of the design in a holographic image, making sure the design truly works,” Parry says, pointing out that such tech solutions marry well into the company’s prefabrication and lean practices. HoloLens also acts as an important coordination tool because all of the trades get involved in the design assembly prior to installation and through it can assess where they are along the working timeline.

Cost Efficient Design

Wiegmann Associates Incorporated has an answer to owners pressuring general contractors to get the lowest price on new builds: show them how an efficient design can save money on operational costs for all trades.

Gerry Wiegmann, CEO of the St. Louis-based contracting firm, says pricing out total costs, not just first costs, in a design-build changes the parameters of how an owner or general contractor looks at the work. “We are a strong union town and going design-build helps us become competitive with construction costs in merit shop markets,” Wiegmann says.

It is important to do a comprehensive energy analysis upfront;

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otherwise, the cost of operating a building can be a guessing game, he adds, noting that roughly 80 percent of the company’s contracts in the United States are design-build and almost all of them are done in-house.

He says a lot of engineers design buildings to provide cooling and heating capacities at full load, but that doesn’t account for part loads where a lot of reheat might be required. The contractor sees equal or more efficient ways to heat and cool buildings and lower first costs by using conventional systems with a thorough analysis of how to operate efficiently at part load.

Wiegmann says BIM has played a key role in the company for decades. “We tend to be the supervising/organizing component of everybody’s BIM efforts because we have the largest component (plenum) in the ceiling,” he says.

The company uses repetitive components when possible to improve efficiencies and cut installation costs. “The (installation) contractors we hire in areas around the country don’t need to phone takeoffs into their shop to do special fabrication because what is required are the same-size plenums, same-size round ducts,” Wiegmann says.

He points out that the value of the union sheet metal workers can’t be overstated when it comes to complex jobs using BIM and CAD. “Although a CAD person from the office understands how to lay it out, they don’t have the hands-on experience our union craftpersons do to complete dimensional drawings for intricate installations,” Wiegmann says. “We know that when they fabricate it, it will fit.”



Partnerships with skilled labor boost contractor confidence the job will be completed well and on time. Photo courtesy of Wiegmann.



McKinstry uses multitrade racks containing multiple trade components in one prefab unit. Photo courtesy of McKinstry.

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Modular Building

Over a year ago McKinstry set up a dedicated innovation group to focus on research and development, new technology, and lean practices. Employing technology to meet lean practices at its offices across the United States is paramount, says Matt Allen, director of construction technology, McKinstry's Pacific Northwest region. "With disparate job sites it is a real challenge to standardize and train across those jobs," he says.

Comprising 10 people, the group includes software engineers, estimators, and others focused on McKinstry's design-build agenda. Allen says one of the aims is to calculate material costs and even scheduling durations in the design stage through Revit in BIM. "If you have that data you can have a lot more clarity around where you are at in your budget," Allen says.

Increasingly, work is being centralized offsite through prefabrication and modular construction practices. Veteran, well-trained workers are starting to move from the field to central operations. Their experience and skillsets allow very tight manufacturing tolerances, which is critical in McKinstry's offsite fabrication processes, Allen says.

It could take a couple of years to fine tune data, which will have important value-add potential for McKinstry's customers. "We can project our costs better and get information to the owner

faster and more accurately," Allen says. "We can create more certain timelines. We think that can be really transformative."

He says while it helps control McKinstry's destiny, it will be a major benefit for the industry once the technology reaches all the trades. Adding costs and schedules in the virtual design world is only part of the equation. Offsite prefabrication and modular construction are enabled by virtual construction.

The mechanical contractor typically partners with other trades to fabricate assemblies at its 125,000-square-foot prefab plant in Seattle. Multi-trade rack assemblies are expected by top tier MEP (mechanical electrical plumbing) contractors in the competitive Seattle market.

For the building industry to make some leaps, he says it is important that MEP contractors are not siloed. "If the whole consulting team (including the architect) has this mindset of designing and manufacturing components, that is where you see the needle move."

A stumbling block, however, can be the price of technology. "With margins so thin in construction, companies are scared to spend money on technology because we don't totally understand the ROI (return on investment) yet," Allen says. "We typically ask operational folks to spend more time thinking about innovation."

Building Information Modeling

Last year Southland Industries opened a 160,000-square-foot fabrication shop in Garden Grove, Cal., to improve its prefabrication and modularization capacity. Material comes in one door, is fabricated, and goes out another door onto trucks for just-in-time deliveries. "It is a one-flow shop," explains

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Alan Blomgren, construction manager of Southland's southern California division. "For lean practices, we don't have the back and forth anymore."

Training crews on the line to install piping, plumbing, and ductwork on racks in-house is paramount, but modularization goes further at Southland as its crews need to learn how to install systems for outside trades. Zone valve boxes produced for medical centers, for example, include the drywall frame. Projects have to be carefully planned for just-in-time deliveries so training crews to meet fast-paced deadlines is important.

"It is plug-and-play when it leaves the shop," says Blomgren. Along with cutting installation time in the field, the benefits include a safer, cleaner, and climate-controlled work environment.

The company is currently doing a prefabrication job for a 17-story medical center in Loma Linda, Cal., requiring one million pounds of ductwork. To meet schedule and price on projects like it, Blomgren says it is paramount to be in synch with the general contractor and the owner.

He says the southern California division is starting to model all of its projects in Revit. "We can bring our Revit models on our iPads out into the field and do comparisons in real time with the architect," Blomgren says. "I think the next step is going to be augmented reality where you can hold your iPad up and see in the space what is supposed to be there."

Southland is also finding success with Trimble software, a GPS survey system it uses for layouts of ductwork on a deck. "I think we are out ahead of the game and the competition as far as technology goes," Blomgren says.

Henry Nutt III, sheet metal general superintendent of Southland's northern California division in Union City, adds that the trained union workforce is a critical part of what the company does with Revit and BIM and the use of different types of platforms.

Nutt sits on a committee for SMART Local 104 that is involved in updating the apprenticeship curriculum to ensure training meets the needs of mechanical contractors as technology grows in the field in the San Francisco Bay area. Nutt, who also works with ITI and a SMACNA Lean steering committee, says updates in training are important and ensure that union craftspeople will be ready to go on jobs where the latest technology and lean practices are in play. ■

A freelance writer based in Toronto, Don Procter covers the building, design and planning industries in Canada and the U.S. Away from the office, his pursuits include the ongoing restoration of his centuries-old home, cooking for family and playing in a blues band.



TRENDING PARTNERSHIPS: Labor and Management Tackle Technology Together

The conversation about technology and the workforce is vast—increases in productivity and efficiency could affect man hours, but the upfront costs can be astronomical. Implementation could mean a steep learning curve for the entire industry, but failing to advance could hold us back. What is the answer? In times of changing horizons, solid partnerships between labor and management are more important than ever. The future is coming, like it or not, and there is no better way than trust and communication to ensure technology is used to supplement, support, and strengthen contractor businesses and craftspeople's livelihood. Keep an eye out for the following key trends in construction, and start thinking now about how your partnerships will work to your advantage.

Automation—Automation is set to displace workers in some industries, but construction is one where the lining is definitely silver. Products coming for our industry focus primarily on supplementing the human workforce and even prolonging careers by addressing repetitive tasks, heavy lifting, and dangerous tasks. Besides that, opportunities for the technically minded to work with automation, designing, installing, and operating, will expand the realm of construction work for future generations. Now is the time for management and labor to discuss how to make technology work for everyone.

Modular Building—The modular construction market is expected to expand by 6.9 percent over the next five years, especially as allowable heights continue to grow. However, most major prefab companies manufacturing overseas are experiencing important quality control issues, which makes a great case for in-house prefab facilities that make use of our highly trained workforce. Workforce training to tackle these types of projects is the best way to secure them in advance.

Lean Practices—Streamlining can mean big changes, including automating certain tasks, cutting material waste, and reorganizing the workflow. But the part of lean less often discussed is the workplace culture that underpins its success. As important as how many units are produced each day is establishing trustworthy relationships, open communication, and self-reflection in the workplace. If that doesn't lay the groundwork for successful partnerships, nothing will.

Visit pinp.org to keep up to date and find useful resources available to SMART locals, SMACNA contractors and chapters, labor-management cooperation trusts and committees, training centers, and individual members of SMACNA and SMART. Registration is required for full access. It is free but limited to members.