

Retrofit with Purpose: Take Your Food Facility to the Next Level



Tips for retrofitting your food plant to meet today's demands—and opportunities

Like most processors, you're probably thanking your lucky stars for surviving the worst recession since the Great Depression. Those years were probably the leanest years anyone can remember and for good reason. Money was tight, costs went up, not down, and competition for your customers' business was rabid. But here we are in a new era in 2014 where the Dow Jones Industrial Average is setting a new record every other month. All those improvements or renovations you were putting off until "things got better" are starting to become more urgent as production ramps up and orders come in. You might be one big order away from panic mode as your facility seemingly crumbles around you. Now, it seems, is the time to act. But where do you begin?

Depending on what your needs/goals are, I think most retrofits would fall into one of two categories: 1) upgrade/modernize your plant or 2) expand or repurpose your plant. The first type is probably more common and is a natural part of doing business. Equipment ages, technology changes and energy costs continue to rise. These are all good reasons to make that investment to get your plant in top running condition. The second is usually a function of your business being really strong. You've outgrown your existing production line or you finally land that really big order and you have a year or so to ramp up production for that new customer. We'll take a look at these two versions individually.

Once you've determined that the time is right to move forward with your upgrades, a little planning up front will go a long way to help you realize your goals. The best place to start is to evaluate your existing facility and identify the issues that are most critical to the safe operation of your plant or have the biggest return on your energy dollars. Review your maintenance records to see where your highest recurring costs occur. Talk to the people on the line to see where functional problems with your equipment lie. You might find some surprising issues that weren't necessarily reflected in your maintenance bills. Once you've done your homework, you should be able to select the best candidates to attack for your long-awaited retrofit. Don't forget to reach out to your local utility company to see if there are programs that will reimburse you for energy upgrades. A little bit of financial help may be enough to make an expensive upgrade affordable.

Approach 1: Upgrading and Modernizing Your Plant

If your plant is like most others, there is a fairly standard list of items that age over time and are probably due for some much-needed attention. Additionally, depending on the age of your equipment, technology and efficiency continuously advance, so chances are there is a more-efficient technology to reduce energy use that might not have been available when your plant was built. More importantly, energy codes have been keeping up with these changes and you may be required to make these improvements to meet current code requirements. Even if it's not required to meet the current energy code, it's always good practice to upgrade your plant as the energy savings over time will go directly to improving your bottom line.

Given all of the above, here is a

list of improvements or upgrades you should consider in your quest to bring your facility into the 21st century.

Repair insulation – Most plants I have been in have all kinds of piping running throughout the building, tons of it. Most of the piping, if not all, must be insulated. Hot water, chilled water, steam and refrigerant piping all require insulation, not only from an energy-

usage standpoint but also from safety (steam) and contamination (condensation) standpoints. Damaged or uninsulated piping forces your boilers and chillers to work harder and can cause condensation problems that the U.S. Food and Drug Administration inspector won't be happy about. Provide new insulation that meets or exceeds current energy code requirements, provides a continuous vapor barrier and has a jacket suitable for wash-down. Not only will you save energy, but your plant will look a lot nicer too. And don't forget to use this upgrade as an opportunity to provide proper pipe labeling, indicating what is flowing in the pipe and the direction of flow. Your facility guys will appreciate it.

Fix compressed air leaks – I have had air compressor manufacturers tell me anecdotally that 30 percent of the energy used to generate compressed air is lost due to leaks in the piping system or fittings. Empirically, this makes sense because the compressed air systems are typically never turned off, even during periods when the plant is not producing product. I know of some instances where once a plant eliminated its compressed air system leaks, the company was able to reduce the compressor horsepower by one-half. That translates into a lot of energy savings every single day.

Minimize cross-contamination – If your process currently involves producing a

product that does not require cooking prior to consumption, you are probably already doing a good job preventing cross-contamination. There is a clear separation of raw and ready-to-eat, and boot washes, hand sinks and clean and dirty garment receptacles are strategically located throughout the facility. Why not take this to the next level?

Consider providing ventilation systems that positively pressurize finished-product packaging rooms. If allergens are a concern, provide hoods or exhaust systems where dry ingredients are mixed, measured or stored to capture airborne particles.

Eliminate old refrigerants – If your plant uses direct-expansion CFC or HCFC refrigeration systems, it is time to switch to the newer, more environmentally friendly HFC refrigerants. The availability of CFC/HCFC refrigerants is rapidly diminishing, and the cost per pound is dramatically increasing, if you can get it at all. The Montreal Protocol currently bans the manufacture or import of CFCs and the same ban for HCFCs is rapidly approaching. If you don't do it now, you'll have to do it later.

Upgrade motors – Whether it's a motor that drives a compressor, conveyor or pump, chances are that there is a more efficient version of that motor available today. Motor technology continues to improve every year. There are premium efficiency motors available for every application. If your motors need to cycle frequently during a typical day, consider utilizing variable frequency drives to allow for soft starts that reduce the inrush current and extend the life of the motor. Reducing the inrush current may also cut your plant's peak electrical demand, which could lead to reduced utility rates. Don't forget to check with your utility company to see if it has a rebate program to help offset the cost of

a motor upgrade. Most utilities do.

Upgrade lighting – This is one of the most straightforward upgrades that yield immediate benefits. If any fixture in your plant still has a T-12 or HID lamp in it, this is a no-brainer. Upgrading to the new T-5 HO fixtures will improve your lighting and save you at least 30 percent on your lighting energy bill. The current state of the art for warehouse areas is the four- or six-lamp T-5 HO high bay fixture. Equip each fixture with a motion detector, and the savings will increase dramatically. But don't make this change just for the energy savings, use it as an opportunity to improve the lighting levels in critical areas to step up safety. And as with motor upgrades, check with your utility provider as rebates are typically readily available for these improvements.

Upgrade water heating systems – If your plant utilizes an old fire tube boiler to make hot water, you should seriously consider investing in a newer high-efficiency condensing boiler. Older boilers generally have an efficiency of around 80 percent if they are well maintained. This means that you are capturing only 80 percent of the energy put into the boiler as hot water. A modern condensing boiler can achieve efficiencies of up to 98 percent! This is an efficiency improvement of more than 22 percent. Plus, modern boilers generally take up much less floor space, so your mechanical room will seem much larger after you upgrade. As with motors and lighting, most utility companies have rebate programs to offset the cost of this upgrade. The only caveat here is that you need to consider how hot your water needs to be. Condensing boilers are most efficient at 140–160 °F. If you need a higher temperature, your savings might not be as attractive.

Improve ventilation and humidity control – One of the biggest problems in refrigerated process areas is the moisture generated in the space during a wash-down cycle. Clouds of steam linger and condense on the cold surfaces. This must either be allowed to dry out over time or be manually cleaned up prior

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to resuming production. The best way to minimize your downtime is to provide positive ventilation and exhaust to remove this moisture post-wash-down. Both the ventilation and the exhaust should be accomplished by fans that have interlocked controls and be set such that the system slightly overpressurizes the space during the purge. This ensures that you don't draw air from other spaces during the process. If the space being ventilated is typically below 38 °F, the outdoor air should be conditioned prior to entering the space to reduce the moisture content and speed the moisture-removal process.

Improve drainage – If there are areas in the plant that continually pond water or have drains that require frequent cleaning, take steps to improve the sanitation and safety in those areas. In areas that already have drains, consider replacing the existing drains with larger ones or a different type to improve capture. Trench drains are typically installed in areas that have a lot of water flow. When installing new drains, be sure they are stainless steel (if acceptable with your cleaning chemicals), have radiused corners to prevent collection of solids and have an easily removable strainer basket for easy cleaning. If water ponds in areas without a drain but there are drains nearby, have a flooring contractor apply an epoxy floor finish and create floor pitch to direct the water to the drain.

Improve grease/solids interceptors – Most plants have a central grease/solids interceptor located outside the plant to allow for ease of servicing. If your process produces significant amounts of grease or solid waste in limited areas and the drain lines from those areas require frequent cleaning or jetting, you should consider installing a local interceptor to

protect the lines inside the plant. This helps stop the problem at the source. Local interceptors are available in a variety of sizes from small to very large and can be recessed in the floor or mounted on the floor if the source of the waste is elevated. You should check with your local sewer authority prior to moving

forward with this as some authorities have limitations on how these can be applied.

Provide ventilation in interstitial spaces – If you have cold storage rooms or freezers inside your plant that are built up to the underside of the building structure (a box in a box), the space above the rooms (the interstitial space) tends to become very hot during the summer

months. However good the ceiling insulation is, this condition will add load to your cooler or freezer, and the refrigeration system will have to work that much harder to keep your product safe. To combat this parasitic load, provide an automatic ventilation system in that space to prevent the buildup of heat. Typically you only need one to one and a half air changes per hour to effectively remove this heat. Allowing a small exhaust fan to do this work is much more economical than letting your refrigeration plant do it.

Install fast-acting doors – One of the largest components of the refrigeration load in a freezer is the infiltration of warm, humid air. The constant opening and closing of the door as you move product in and out can wreak havoc on your refrigeration system and your energy bill. This can even create a slip-and-fall condition as frost and ice accumulate inside the entrance to the freezer. If you have a freezer that opens to an unconditioned warehouse or worse, a loading dock, this problem is exacerbated. The best solution is to add a fast-acting roll-up door. The door

can be either manually operated or automatically operated by sensors located on both sides of the opening. There are multiple manufacturers and doors can be custom-made to fit any opening.

Recover waste heat – Refrigeration systems represent one of the largest energy consumers in your plant. They typically have multiple, large-horsepower motors that are required to run 24/7, year-round. One of the byproducts of refrigeration systems is that they are very robust sources of waste heat. If your plant has a regular need for lots of hot water, like for wash-down purposes, this is definitely an option you should consider. For a relatively small investment, you can recover a significant amount of “free” hot water. Even if your boilers are extremely efficient, you will see a relatively quick payback on this investment.

Approach 2: Expand or Repurpose Your Plant

While this is a complicated endeavor that requires a very specific solution to address your needs, there are a few key things to keep in mind when putting this plan in motion. First, you should engage qualified personnel early on to ensure a successful outcome. This would include an architect, building engineer, process engineer, material-handling engineer and any other design professional your project requires. They will work as a team to turn your needs into a reality.

So as you start your plan to reinvent your plant, here are some of the things to spend some time thinking about.

Improve the layout and flow – This is where getting your design team on board early really helps. The layout of your plant should be such that the raw materials and product flow in a more or less continuous way. Provide separate loading docks that receive the raw materials. From there, the materials move to storage or processing and then to production, cooking and finished product packaging. At that point, it moves to storage or ships to the customer. There should be no back and forth in the flow. Also consider a

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separate path for dirty bins, cooking equipment and trash so that once it leaves a clean area, it doesn't have to pass through another clean area to get where it's going. Provide handwashing and dressing areas at the entrances to all processing areas. Provide a separate entrance for process employees that is secure and separate from the office staff. Put areas for maintenance or mechanical systems on an exterior wall so there is direct access for service. Design your refrigerated areas to be a "box in a box"-type construction, so that all utilities are located above for access without having to enter the process areas. This also allows for easy future modifications to these systems without disrupting production.

Incorporate automation – Wherever possible, look to automate aspects of your process. There are plants in operation today that literally require no human interaction from raw materials to final product. This will speed production, increase capacity and reduce waste. It also helps provide consistency of the product and allows for better tracking of the product and ingredients should a problem arise.

Evaluate utilities – This can be a biggie when looking at either reconfiguring your production or building a new plant. Prior to signing the lease or buying the land, you need to do your due diligence and determine whether the existing utility services or the services in that area have the capacity to meet your proposed plant's needs. The two worst-case scenarios are 1) there is not enough water, sewer, power or gas available at any cost, or 2) it is available, but bringing it to your site will be prohibitively expensive. I have seen both of these issues occur in real life. Don't just assume that because your site is in an industrial area that the utilities you need will be available. Always review your

project with the local utility authorities, including the sewage department. There may be a moratorium on the treatment plant's accepting additional flow or restricting the type of flow they can receive, which could lead to your having to provide your own pretreatment plant on site. A little effort early on will protect from surprises down the road.

Provide separate waste systems for raw and finished product areas – Food safety is

paramount to survival in our industry. Any measure that helps prevent the possibility of contamination is worth considering. In every processing plant design that comes out of my office, there are at least three waste systems: raw waste, finished waste and

sanitary waste. This eliminates the possibility of raw waste backing up into the finished product area and vice versa.

Think vertical – So you are out of space and there is little or no open space left to expand your plant. If your building has sufficient interior height, there might be an opportunity to add a level or two to increase your production area. Even if your building doesn't have the height, there are companies that specialize in raising the existing roof to accommodate the height you need to go vertical.

Emergency power – Loss of power for an extended period can be catastrophic to a plant that stores or processes large quantities of perishable goods. A single event can result in the loss of millions of dollars worth of product. The time to plan for this event is now. A traditional approach would be to provide a standby emergency generator to provide power to critical systems to avert loss of product. This approach is expensive and requires a fair amount of maintenance to ensure power is available when you need it. An alternative would be to build provisions into your electrical service to allow for a portable generator

to be connected in the event of a loss of power. This is relatively inexpensive and the maintenance falls onto the generator provider. This approach would require that you contract with a portable generator provider to ensure a unit will be available when needed. Or you could take your peace of mind to the next level and have a cogeneration plant installed at your new facility. This would reduce your utility costs and make plenty of hot water year-round. And as with other systems that reduce your reliance on the electrical utility company, there are plenty of programs available to help offset the first cost.

Conclusions

So as you ramp up to take your plant to the next level, if you take the time to review your existing and proposed goals, and identify key areas that will have the greatest impact on the success of your business, you'll have results of which you can be proud. Remember to get the design team together early in the process to eliminate surprises and make the transition to construction a seamless one. Always reach out to your utility providers and look for opportunities to partner with them on rebate programs to help offset costs. Make your next plant improvement the best move you ever made. ■

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