On The Line

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With increasing pressure from retailers, competition from low-cost manufacturers, and global market expansion, consumer product manufacturers are carefully examining their production processes. They seek to help their operations become leaner, reduce cost and time to market, and ultimately impact the top and bottom line.

The real question is, what does it take to improve a manufacturing process? Today, more than ever before, real improvement requires two elements: first, an effective decision-making strategy focused on the realities of specific manufacturing environments; and second, the use of innovative tools, including low-cost equipment customization and prototype parts, computer animation of potential line changes – and perhaps even a three-dimensional computer “fly-through” of the entire plant.

Here’s how.

Define “Improvement”

Though it might seem obvious at first glance, the first step for any manufacturer is to get consensus about the real meaning of “improving” a production process. The answer can be surprisingly different depending on the goals of your stakeholders. There are five key components in the process of defining improvement:

- Examine equipment and operational objectives.
- Distinguish between desires and actual needs.
- Take a good look at the type of production staff you have.
- Take into account that sometimes, speed to market trumps other design constraints.
- Evaluate the necessary level of quality.

Examine equipment and operational objectives. It is important to understand the relationship between automation and staffing: Do you have a heavily automated facility with few staff, or is it largely a hands-on manual operation? Moreover, does the existing relationship between automation and staffing match current, and evolving, operational objectives?

For example, some manufacturers have a goal to run faster and increase production while maintaining staffing at the current level. These manufacturers do not need additional automation; instead, they need processes and tools to utilize existing staff more effectively.

In contrast, many manufacturers are interested in maintaining throughput while reducing staffing and associated labor costs. In this scenario, increasing the level of automation is likely the appropriate course of action.

While these objectives may be clear in your own mind, a good design consultant will make sure everyone in your organization also understands, and is on the same page, before developing a course of action. This could include modifications and improvements to existing equipment, replacement with new, faster equipment and re-training of staff, or increased automation and reduction of staff.

To make this determination, your consultant should meet with the individual who is tasked with the cost and/or production targets; key operational staff; ideally, key people on the floor; and perhaps an industrial engineer who will perform studies to analyze material flow and general operational issues. Also important is a thorough inventory of existing equipment, as well as a review of standards and practices surrounding equipment maintenance and operation.

Distinguish between desires and actual needs. A manufacturer has a set of stated goals. The key when identifying improvements is to make sure these short-, mid- and long-term goals are all aligned with the desired outcomes.

Good consultants can pay for themselves during this stage of the process. Often referred to as value engineering, this process strips away anything that is desirable, but perhaps not necessary or not cost-effective, in light of the end goal. The key is to accurately identify the critical desired outcome and the minimum alterations required to achieve it.

Sometimes this process can eliminate the need for new equipment by finding a way to modify current equipment or the control systems. Other times this process may actually identify changes that increase the initial cost output by taking into account the significant savings that could be achieved throughout the manufacturing

process lifecycle.

An accurate definition of goals and actual needs is like finding the sweet spot on a baseball: it is essential to identify a solution that fits the budget, meets operational objectives, and hits the target.

Take a good look at the type of production staff you have. Some manufacturers embrace high-tech equipment and have staff with the specialized technical skills to operate and maintain it. Others need to minimize technical complexity, so they need equipment that can be operated and maintained by staff--perhaps two or three mechanics who take care of the entire line--who have minimal training and specialized expertise

When proposing a change, it is essential that your consultant take into account the degree of tolerance for change in equipment and processes that is required to meet operational goals. This includes the degree to which you are willing and able to hire, train and pay the staff required to implement it. Otherwise, the best solution on the drawing board can fail miserably. True “design” experts understand the real-world environment in which their proposed solutions must function and are pragmatic in their approach. Be wary of a suggested improvement that doesn’t take into account your workforce's make-up.

Take into account that sometimes *speed to market trumps other design constraints.* An increasing reality for consumer product manufacturers is that they no longer determine their own production schedule. Large-scale retailers not only initiate what product will be manufactured, they also often dictate the schedule for when the product must be on their shelves. Even when this is not the case, it is likely that the marketing department has determined an aggressive window for hitting the market. Your design consultant must understand the market in which you operate and that this constraint often trumps every other criterion.

This can force some difficult decisions: identifying which improvements are possible within the established window, and which solutions are high-risk and low-risk.

Perhaps it is not possible to achieve a permanent solution by the initial time to market. However, it may be possible to implement a temporary system that will enable you to meet retailers’ or marketing’s needs. Even in limited volume, this can be accomplished while concurrently improving the overall system so that when it comes online, it can quickly make up the difference.

In some cases, it is feasible to use a sister site. In other instances it makes sense to proceed in phases on the existing site: add a bay or a major addition to the existing facility; install and start up a parallel system in the addition while the existing line is running at capacity to fulfill the market; switch over to the new line; decommission the existing line; and replace it.

To the uninitiated these solutions may not seem optimal or efficient, but it is critical that you have a design consultant who understands that your ultimate goal is to get product on store shelves.

Evaluate the necessary level of quality. For example, you may be producing cases of commercial-use products with minimal requirements for fill accuracy or label placement, or individual retail consumer products that must meet high levels of fill accuracy and/or aesthetics.

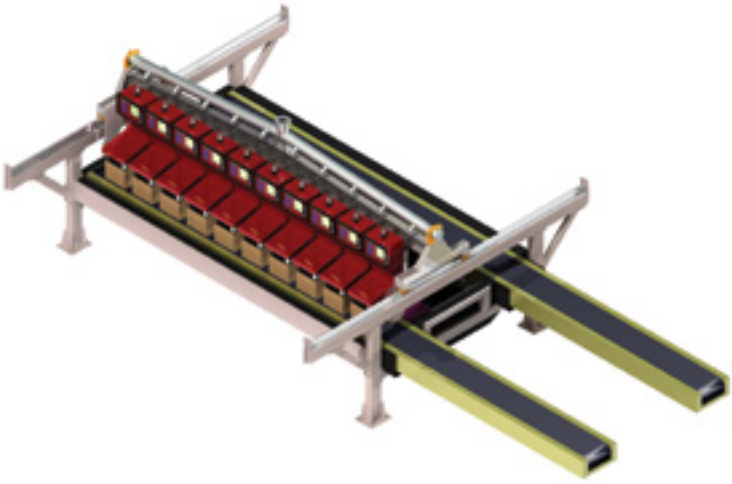
You may be running multiple lines for which the answer to this question differs. An optimal improvement requires you to quantify the level of quality necessary and the degree to which the current processes and equipment meet that standard. While it can be tempting to design a system to the highest degree of standards, it can also be a waste of money if this level of quality is not necessary—or if the quality issues cost less than the solution. The best solution is not always the one that produces the highest quality outcome—but the one that best matches the need for quality with the cost required to achieve it.

Use the Right Tools

It’s easy to look at an existing system and propose a clean slate: rip it out and replace it. However, this is rarely a cost-effective solution. Real improvement can be achieved using the right tools -- both on the line and in the decision-making process. Four ways to go about this include:

- Considering low-cost equipment customization.
- Testing a low-cost prototype.
- Animating the process.
- Flying through the plant.

Consider low-cost equipment customization. Perhaps the equipment is basically sound and of good quality, but it cannot accommodate a new process. Real improvement may be achieved through a modification of, or attachment to, the existing equipment. In some cases, the original equipment manufacturer may be able and willing to make such a modification; in other cases, a design/packaging engineer can develop a cost-effective custom modification or attachment that achieves your goal.



The advantage of this approach, in addition to limiting the cost of the improvement, is that it avoids significant changes to the operation of the equipment and the site, operator retraining, and maintenance procedures.

Test a low-cost prototype. Before making a permanent change to an existing machine on a line, consider prototyping. One way would be to test low-cost, printed plastic prototype in the environment in which it will be used. A design/packaging engineer can create a 3D model of a component such as a guide or gear. Then, using a specialized printer, “slice” the image into layers, each 1/10,000 th of an inch thick, print each layer with ABS plastic, and stack and assemble the layers into a durable part. The completed prototype has 70 percent of the strength of an injection-molded ABS plastic part. Compared with ordering a traditionally machined prototype, it is fast and cheap. Depending on the application, of course, the part can be bolted on a machine and used in production to test a process.

*Animate the process.*A picture is worth a thousand words, but when it comes to picturing a complex manufacturing process, a 3D computer animation is worth a thousand 2D drawings. Enhance the understanding of a complex process (and thus, the decision-making process) using a 3D computer animation of the solution -- from a line to a piece of equipment to the detailed function of an individual component.

As previously discussed, getting user input is a critical part of the improvement process to ensure the solution works in the real-world environment in which it will be used. Allowing all parties to view the part, machine, or process as it will (or should) actually work is far more valuable than sitting around a table of complex 2D drawings.

Fly through the plant. Taken a step further, sophisticated 3D computer animation enables decision-makers to “fly through” the entire plant, observing the effects of a proposed system or modification on the movement of material from the time they enter the plant to the time the product goes out the door. A fly-though can also

provide an invaluable perspective on safety, ergonomics and maintenance feasibility.

At whatever level is appropriate for the proposed solution, 3D animation can be used to enhance understanding, improve decision-making capability, and gain buy-in among leaders and operators while minimizing the risk of failure.

When speed to market and profitability are on the line, a manufacturer needs an effective decision-making strategy and the right tools to make a real improvement in a process or site. Now is the time.

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