



Technical Note Improving OEE through User Centric Design

Choosing to automate secondary packaging processes has one primary objective: to make the operation more efficient – to increase output, to save labor costs, to avoid repetitive motion injuries, and to ensure a consistently high-quality output. Each piece of automation equipment is theoretically capable of a certain level of output in a given time, often a number that is used to help calculate the return on the investment. Yet, achieving that level of efficiency under real-life circumstances is difficult at best.

From corrugate board quality to environmental aspects, many variables can affect the overall efficiency of the packaging line. However, the human variable is by far the most impactful one. Machines have to be set up correctly, changed over to new recipes, troubleshot and maintained. Plagued by high turnover and seasonal production cycles, many manufacturers struggle with maintaining an acceptable skill level among operators and at times even maintenance personnel. A lack of worker experience, training, sometimes

Pearson Packaging Systems

Pearson Packaging Systems specializes in the design, production, integration and service of secondary packaging automation solutions. As a systems provider, Pearson offers a full line of customizable machinery to erect, pack, seal, and palletize top-loaded cartons, cases and trays.

Focused on minimizing total cost of ownership, Pearson Packaging Systems is dedicated to a solution-driven partnership. For sixty years, a diverse set of high-volume manufacturers and distributors has relied on our engineered systems and continuous service support.



even sufficient abilities to read and speak English hinder packaging lines from reaching their optimal efficiency. High turnover can also lead to a low sense of ownership for the responsibilities assigned.

Employee training becomes an issue. According to a Washington-based potato packing plant manager, "It takes about a year to learn the do's and don'ts for a particular machine, so investing in training someone isn't worth it when they are likely to just move on in a few months.[...] Right now there are people who have been on the job two months teaching new hires." Even those companies that do invest in training admit that the unceasing indoctrination is costly, directly eating into their bottom line. When new machine operators are hired (one of the positions with the highest turnover in most manufacturing companies), more seasoned employees are generally pulled away from their job to train the new hire for one or two weeks. For roughly 8-12 weeks, new hires are considered apprentices, meaning the cost for getting a particular job done is often twice as high. Adding overtime, lost productivity and the cost of mistakes and the human element in a high-turnover position becomes a significant cost center.



Machine operators are trained on basic machine function, navigation, operation and maintenance tasks

Existing Solutions Manufacturers deal with the staff-related efficiency problem in ways that vary greatly. Some companies invest in fairly elaborate orientation trainings as well as incentives or other retention programs in an attempt to reduce turnover. Maintenance recommendations by the OEMs are used to create work orders and clear procedures are established for assigning tasks to operators or maintenance staff depending on their complexities. Other manufacturers fall into the opposite side of the spectrum, accepting the consequences of high turnover simply as cost of doing business, running machines until problems demand attention and turning a blind eye on lost efficiencies related to short employee tenures.

A New Approach

The consumer electronics industry, which serves a customer base with a vast span of technical aptitudes, offers a different approach to solving the efficiency challenge associated with learning new skills or using an unfamiliar machine. As an engineering subset, Human Centered Design, also referred to as User Centric Design, focuses on helping users of various products accomplish their objective effectively and efficiently without having to study complex manuals. For example, smartphones, tablets, or cameras - few customers ever read the instructions but nonetheless quickly become adept at navigating through the system, taking advantage of existing knowledge and following logical paths. To provide this level of intuitive design, product designers must conduct in-depth studies about users' behavior, needs, wants and limitations - all with one primary objective: enabling them to realize the product's purpose consistently and with ease.

User Centric Design in the Packaging Industry

In the secondary packaging industry, machine operators and maintenance personnel become the primary target for User-Centric Design improvements. Operators who are new on the job or who have less mechanical ability can benefit most from machinery that is easy to oper-



ate. If they can accomplish their tasks successfully and more rapidly, system availability and product quality can be maximized, resulting in more output and improved profitability.

Larger Human Machine Interface (HMI) screens and high contrast color selections address readability, icons help facilitate mind maps for improved learning and faster navigation, pictures and interactive maps reduce language barriers and limited screen count and content reduces complexities and facilitates comprehension. These are an impactful first step. However, User-Centric Design does not stop at the HMI.



Large color HMI screens, shown above, contain common icons and maps to facilitate user comprehension

Changeover and fault-recovery tasks are conducted on the machine, not just the HMI graphical user interface. Therefore, the interactive maps guiding the operator through changeovers and fault recoveries must be tied to mechanical improvements on the machine. Examples include improved identification of changeover points, better accessibility of various areas within the machine and increased lighting for better visibility to accurately find set-points. In addition, accessing the HMI from a wireless mobile tablet further increases user efficiency by enabling operators to refer to the changeover or fault map and related instructions from any point around the machine. Maintenance functions in a manufacturing plant generally employ higher skilled labor with longer average tenures,



Durable, portable tablets allow hands-free mobility as needed by users

reducing some of the challenges seen with the high-turnover position of an operator. However, many packaging system maintainers are responsible for a large number of machines requiring in-depth knowledge in troubleshooting and skillful prioritization of proactive and reactive maintenance tasks. User-Centric Design carefully studies their needs and difficulties. Storing specific maintenance and fault recovery instructions in the equipment's HMI instead of a separate source such as a hard copy manual or CD makes information easily accessible when needed. OEMs preventative maintenance recommendations should be easily accessible from the HMI, but open for customization depending on plant specific requirements or preferences.



Customizable preventative maintenance program is tailored to machine environment and includes detailed instructions with photos



This facilitates proactive and proper care of the machines, resulting in a longer lifespan and an improved return on the investment. In instances where maintenance requires specialized support from the OEMs, remote access capabilities drastically shorten response time and consequently reduce system downtime.

User Centric Design – A Systematic Approach to Help Customers Fully Utilize their Machines' Capabilities

Understanding the employee turnover and related efficiency issues that many of its customers face, Pearson Packaging Systems established its User Centric Design program in 2013. Since then, two releases have addressed various aspects of usability for both operators and maintenance personnel. The basic idea is that if the graphical and mechanical interface is intuitive, learning, engagement and error tolerance increase. As a result, the user is more productive. More productive users positively impact the overall efficiency and effectiveness of the packaging line, which in turn improves profitability.



Operators can complete changeovers quicker and more efficiently with numbered changeover points and scales

However, what constitutes 'intuitive design'? For most manufacturers of secondary packaging equipment, it is whatever the design engineer perceives as "easy to use". With different backgrounds, experiences and education levels, an engineer's perception of "easy to use" can be quite different than that of actual users such as operators and machine maintainers. Utilizing customer feedback can uncover valuable insight, but unless a user is actually studied in his or her environment, many usability challenges remain hidden.

At Pearson Packaging Systems, a dedicated team led by a Human Centered Design engineer exclusively focuses on identifying user needs and obstacles, developing solutions, and validating them through customer feedback, in-field studies, video observations, surveys and contextual inquiries. Complementing Pearson's Continuous Improvement culture, User Centric Design is an iterative program resulting in continuous machine usability improvements.

UCD improves OEE

Most manufacturing plants are using some form of Overall Equipment Effectiveness (OEE) measure to evaluate the performance of their operations. When high employee turnover is present, the human element significantly impacts each aspect of the OEE equation – system uptime, performance and quality. Machines that have been designed around the capabilities and limitations of their users effectively support OEE targets. Employees that are not forced to adapt to unique machine specific tasks and processes intuitively climb the learning curve and are more productive at a much faster rate. User Centric Design enables employees to accomplish tasks independently where previously more seasoned employees had to provide hands-on support.

If your secondary packaging operation experiences high employee turnover, contact us to discuss how User Centric Design can help operators and maintainers be more efficient and drive up OEE.

Call us at 509-838-6226 or toll free at 800-732-7766.