REBUILD AN OLD LINE

Emulation Helps Team Put Together the Puzzle of New and Old Equipment

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Time is tight. Equipment is dated. Floor space is at a premium.

Engineers at a premier beverage brand have a long list of tasks to complete on their bottling and packaging line under tough restrictions.

They need to increase OEE (Overall Equipment Effectiveness) significantly, increase throughput by 30 percent, and do it under a limited shut-down period. But here's the really tricky part: a newly purchased, mono block filler is squeezing floor space and has to be integrated with some equipment that was installed in the early 1980's.

Can this jigsaw puzzle of an old line be rebuilt to get the job done?

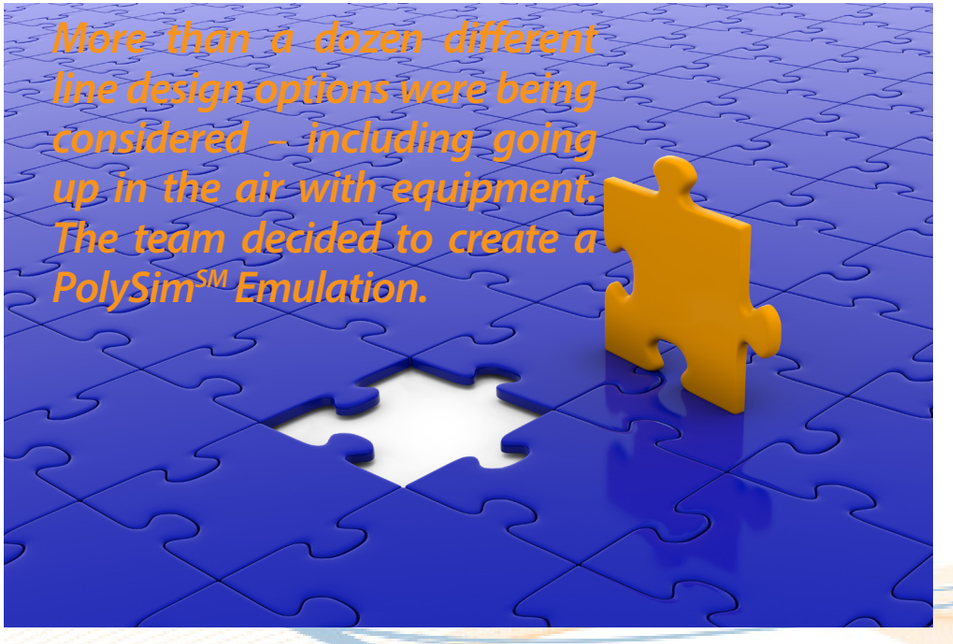
INTRODUCTION

The Challenge

- Increase a beverage line's bottles per minute (BPM) from 180 to 240
- Raise the line's OEE about 18%
- Integrate a large, high-capacity, 175 bottle Mono Block Filler with quarter-century-old equipment
- Accomplish it all in space that should be 100% - 200% larger

You know you will have to add accumulation somewhere.

Our client's plant engineers and the Polytron had their backs against the wall – literally. Now, with a very limited shutdown schedule, the team needed to reconfigure a new line to increase capacity 30% and ramp up OEE.



MULTIPLE OPTIONS – ONE RIGHT CHOICE

The company has already invested in a multi-million dollar mono block filler that could support an increase in capacity to help with the throughput demand. The good news is this hot piece of equipment could really produce. The bad news is it had to integrate with other equipment on the line that was first purchased over 25 years earlier. Moreover, the new filler was a space hog and workers in certain sections around the existing labeler were already working shoulder-to-shoulder.

Some wild design options -- including going up in the air with as much equipment as possible -- were being tossed around. In fact, more than a dozen different line design options were being considered.

The team determined that in order to meet their OEE targets, they had to add accumulation; the question was where, and an accumulation system was not in the project budget. So, the team had to make sure they got the most for their money.

Applying Emulation to Test Design Options

The team decided to create a PolySim℠ Emulation – a model that interacts with the PLC program that is going to control the line. The PLC reads the input from this dynamic model and directs the outputs to cause actions in the model, according to the logic.

This interaction allows the entire team to verify the logic and confirm that the line will operate as they intend it to. They also connect the HMI to the PLC to verify all the operator controls, alarms, and enunciators.

Where to Add Accumulation

The team knew they needed to protect the filler. Adding accumulation pre- or post-filler was the first question to be answered.

The speed of the depalletizer was enough to make up for any hiccups it may cause to the line. The team found that adding pre-filler accumulation would not offer any advantages to optimizing the line. However, post-filler accumulation would provide the most benefit. Floor space was tight, and available options were limited.

If the team determined that adding accumulation between the filler and the overcapper was necessary, they only have one option – one that is not preferred. ***But, it turned out to be the right answer.*** They tried every other conceivable layout alternative to open up their options, but none were found.

Adding post-filler accumulation allowed the monoblock filler to empty out if a stoppage occurred downstream (a quality requirement). It also buffered the filler from overcapper downtime events as well as the longer labeler outages.

Adding accumulation after the labeler was also beneficial – statistically. On the flip-side, the need for full operator access around the machine, necessary storage for materials, and a rework area all added to the congestion. The team believed that, while accumulation would help buffer the outages between the packer and the labeler, the congestion would increase the time that the labeler was down just because it would be even more difficult to work in that area.

Through the process of evaluating options, the team found that the additional OEE points were worth the hassle of working the post-filler accumulation into the layout. It was the right answer and the team made it work.

THE RIGHT CHOICE

A 500-bottle accumulator was placed between the filler and the overcapper. This proved to provide the team with a system that could achieve the OEE targets as well as meet their quality requirements. In addition, it helped to simplify the line automation programming. No more complicated algorithms that had to account for each and every circumstance.

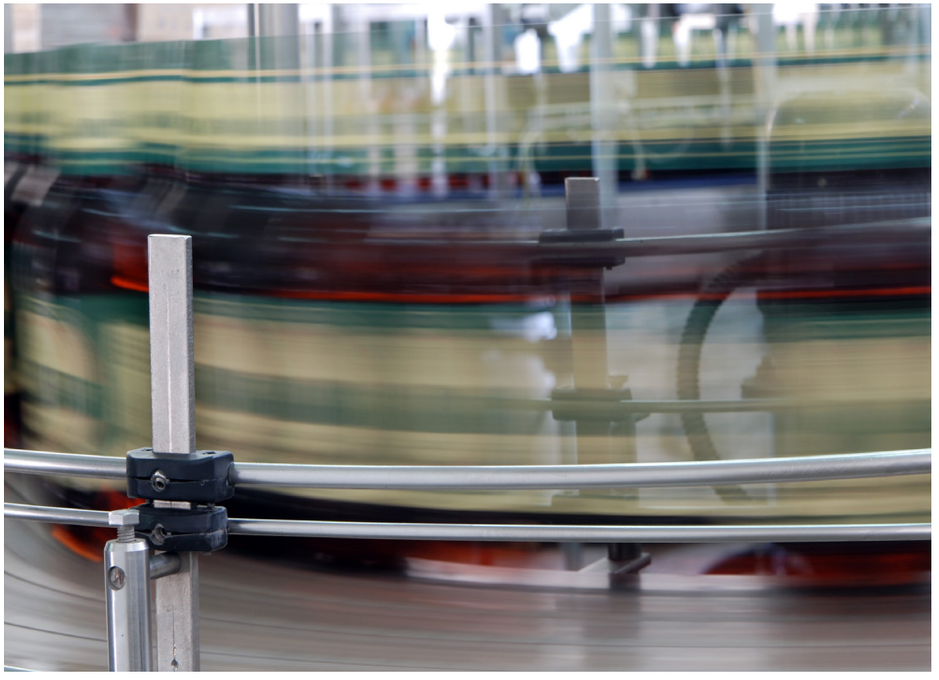
STARTING UP

Using the PolySim℠ emulation model to validate the controls and train their personnel before starting up the line was an essential part of ramping up the line.

Prior to line startup, the entire team participated in a control system Factory Acceptance Test (FAT) in the Polytron office. The logic was completely verified, along with the interface for the operators – and the code for including the additional accumulation.

The short shutdown schedule turned out to be a non-factor. Stress levels were eased, and everyone was happy as manufacturing sailed past its OEE targets within 4 weeks of starting the line – 6 weeks ahead of the plan!

New production records were being set – so much so that the line had to be stopped, waiting for new materials to arrive. The team outran all their goals.



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