SPEED UP PACKER

Emulation Helps Evaluate Manufacturing Line Constraints

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Engineers at one of the world's best known packaged goods manufacturing companies get a mandate: increase capacity 20 to 25 percent – company management wants more of its high-demand product shipped out the door.

Plant engineers believe they have capacity in the system to increase throughput. Polytron is chartered to determine how to eliminate the constraint in the line.

INTRODUCTION

A straightforward request to increase line throughput by 20 to 25 percent. Marketing and sales at a large consumer products company have a promotional success on their hands and have increased demand for their product.

The packer has long been suspect as being the reason for the line's low throughput. If engineers can coax their packer to pump out product faster, the company has a major success. And the solution can be deployed to many other lines within their organization.

A brainstorming session was held in where Plant engineers identified many potential causes for the packer's low performance. They then developed six options to address these reasons. They landed on a few:

1. Prestack Cartons – Burden packer less by pre-staging product

2. Two in-feeds – Create a second in-feed

3. Lengthen Current In-feed – Longer stroke

4. Reconfigure the stacker

5. Replace the Packer

6. None of the Above

IT'S IN THE PACKER

Plant engineers suspect that if they move the constraint to upstream equipment, they can hit pay dirt. They are convinced that they can speed up the line with alterations to the packer. The problem is that their machine has several different sub-systems, and there are multiple options to pursue.

Before they invest the money in any one of the solutions, they need to verify that it is viable. One method to do that is to pilot the best solution on one machine. This will require capital for engineering and machine modifications. Not to mention, this will cause downtime on the machine for the changes – and potential lost production if the solution doesn't work out the way they hope.

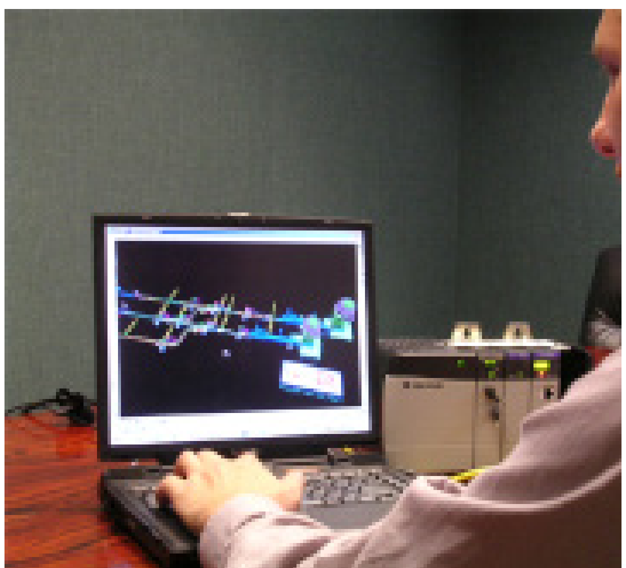
They call on Polytron to use its PolySim℠ product to emulate the machine and test changes to see if they work.

IS IT VALID?

How do you know that the model of a machine represents the machine well enough to accurately predict the outcome of the changes? In this case, the packer had multiple sub-systems. Each of these sub-systems had a dwell and cycle time for each action; moving a cylinder in and out, for example. Not only did each of these actions have to be modeled, but the timing of them had to be accurate.

The Polytron team collected data from the machine for each of the sub-systems. Code was added so that each machine action could be timed over a period of multiple shifts. This data was then statistically processed, and the result was used for the model.

The team then connected the model to the PLC program running the machine. The most accurate way to model the logic of any system is to use the actual code. This is called a PolySim℠ Emulation – the PLC reads the input from the model and directs the outputs to cause actions in the model, according to the logic.



Engineers and operations professionals both agreed that the model was spot-on. Everyone could move forward with confidence that changing the model would reveal the outcome.

NEED FOR SPEED

The plant engineers and the Polytron team created four options for a faster in-feed: pre-stack cartons; create a second in-feed; lengthen the current in-feed; and reconfigure the stacker. A fifth option was to review the business case to replace the machine. The sixth option was to do nothing at this time.

The team decided to pick the easiest method to model - a faster infeed. This would help them determine if this was the right path. If so, they would then investigate each of the options of how to speed it up. They chose the fourth – reconfigure the stacker. This option, as it turns out, would be the lowest cost and lowest risk to implement.

The team realized instant success. The rate at which the cartons were going into the machine increased by nearly 30 percent. But, then the machine started slowing down. A sub-system in the machine became a constraint internally, and the machine slowed down to its normal design rate. The team moved to this sub-system and sped it up – and another one became the constraint. This continued until the team determined that a complete machine rebuild was necessary to maintain the 25 to 30 percent increase in throughput.

NO BUSINESS WORTH PURSUING

Through emulation, the team realized that their best efforts to increase production were not possible, unless the packer was replaced. The veracity of the data captured during the emulation would support the overhaul of the line and replacement of the packer at the appropriate time.

While the conclusion to do nothing didn't ring with satisfaction, the team avoided costly changes that could have easily exceeded a half million dollars and, potentially, caused a big interruption to their existing production.

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