Can you cut in-process dimension checking cost and improve quality?

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In-process dimension checking very often is adding to production cost and no one knows it, besides which it can be inefficient while it silently eats into profitability. In Part 3 of this series we see that there's a way out of this trap—and into a better bottom line.

It's every molder's dream: lower the cost-of-quality, improve cycle time, and reduce scrap by simply measuring one dimension in one cavity. Technology developed and owned by Algoryx, Inc. promises to do just that. Algoryx (www.algoryx.com) has been granted seven U.S. patents with additional patents granted and pending in the U.S. and other countries. The company licenses the technology discussed in this article to a number of multi-national OEMs in the medical device, automotive, electronics, and fluid management industries, to reduce both their overall costs-to-manufacture and cost-of-quality.

Algoryx is applied in three main areas: mold development, mold validation and production. Steve Tuszynski, president of Algoryx, has put Algoryx's focus on production, specifically reducing in-process inspection, because ultimately that is where the biggest cost savings can be realized.

"In-process dimensions are typically checked once, twice or even more frequently during each production shift depending on customer and molder requirements," explains Tuszynski. Algoryx's technology dramatically reduces the number of in-process measurements – and their associated costs. How? By determining the single Predictor Dimension (PD) in one cavity that is the statistically best predictor of all other part dimensions in all other cavities. The PD and the PD's Operating Range are determined by using Algoryx's patented technology and software. Algoryx recommends that molders do periodic press-side visual part inspections to supplement measuring the PD.

Algoryx Annual In-Process Measurement Cost Savings
(Example for a 16 cavity mold with 4 in-process dimensions)

Measurement and Production Metrics	without Algoryx	with Algoryx
Number of shots measured per shift	2	2
Number of parts measured per shot	16	1
Number of parts measured per shift	32	2
Number of in-process dimensions per part	4	1
Number of in-process dimensions measured per shift	128	2
Number of shifts per day	2	2
Number of dimensions measured per day	256	4
Number of days per week	7	7
Number of dimensions measured per week	1,792	28
Number of weeks per year	51	51
Number of dimensions measured per year	91,392	1,428
Number of measurements eliminated per year	**89,964**	
Cost per measurement	$0.1875	
Annual measurement cost savings with Algoryx	**$16,868**	

Table 1

Some OEMs and Tier1s require their processors to do SPC and Cpk analysis during production to verify that the dimensional output from the press/mold is both stable and capable. "Algoryx also greatly reduces the number of SPC and Cpk analyses that the processor must do from one analysis for each in-process dimension in each cavity to only the one PD in one cavity. This further reduces the cost-of-quality during production," explains Tuszynski

Algoryx Annual In-Process Measurement Cost Savings

Number of Cavities	Number of Process Dim.'s	Annual Eliminated Measurements	Annual Cost Savings
4	2	9,996	$1,874
8	3	32,844	$6,158
16	4	89,964	$16,868
32	5	227,052	$42,572
64	6	455,532	$85,412

Table 2.

Reducing in-process inspection = increased profits

Molders perform in-process inspection to ensure they are making good parts using a protocol—either one that they have developed or one that the customer dictates—that calls for periodic (typically one or two or more shots per shift) in-process quality checks throughout the course of the production run. Tuszynski notes that many low-cavity molds with one or two in-process dimensions might be easily checked press-side once or twice a shift by a roaming QC person with a go/no-go gauge. Hard measurement cost savings using Algoryx would be minimal under these circumstances.

However, many customers and molders require that sample parts be taken to the QC lab and measured to ensure parts are in spec. In-process inspection measurement in the QC lab is cumbersome and costly, eating into the molder's profits.

"If the sample production parts go to the QC lab for measurement, then we can realize some relatively big hard-cost savings," explains Tuszynski. "With Algoryx technology you need fewer inspectors, less equipment and the subsequent calibration requirements, and even fewer gauges, all of which results in less direct and overhead costs and less drain on profits."

Many companies take the QC lab measurement data and run them in their SPC and Cpk programs. For a molder running a 64-cavity mold with five critical dimensions, the data required for SPC and Cpk analysis will be reduced with Algoryx to 1 dimension instead of 320 dimensions. Even on a simple four-cavity mold with two critical dimensions (8 criticals per shot) doing press-side checks, a molder can realize a soft-cost savings by eliminating 7/8

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of the work of this QC person, freeing them to perform more checks at more presses in a shorter amount of time. “Knowing the PD means that QC personnel can focus on the critical one versus the not-so-critical many,” says Tuszynski.

What is your cost of quality?

Performing in-process measurements for extremely high cavitation molds (128+ cavities) means your measurement costs can become truly astronomical. OEMs purchase high-cavitation molds to reduce their unit manufacturing costs (UMC). However, particularly in medical device molding where the risk is greater and FDA compliance is critical, the UMC can actually increase due to in-process measurement requirements.

To reduce cost-to-manufacture, many companies reduce the number of in-process dimensions they measure or they may sample only a small percentage of the total number of cavities. Some reduce the daily or weekly sampling frequency or they may eliminate in-process sampling altogether. The result of these reduced quality checks is increased risk to the molder, the OEM and the end user.

The majority of molders, even larger companies, don’t know their true cost-to-manufacture or cost-of-quality on a part-by-part basis. These costs typically are included somewhere in the overhead. If you don’t know whether or not you’re making money on every part you mold, you’re probably losing money. Not knowing your true cost-of-quality and your overall cost-to-manufacture on a part-by-part basis also means that you can’t accurately quote a job. You may be shipping money with every part!

The following case studies show just how much savings a molder can realize by reducing in-process inspection measurements from hundreds to a few. These cost savings are just reductions in inspection measurement costs, excluding the savings realized in personnel time, equipment, reduced gauging, and reduced costs of SPC and Cpk analyses.

Sample case study

The in-process measurement cost used in these case studies is $0.1875 per measurement. The $0.1875 is an inexpensive cost per measurement and assumes that the inspector is earning wages typical for those in a lesser-developed country. Obviously, the cost savings increase when using higher wage scales. The assumptions behind these case studies are: two shots sampled per shift, two shifts per day, seven days per week, and 51 weeks of production per year. If you perform in-process measurements more or less frequently per shift, then you will save proportionately greater or lesser amounts of money.

The following case study assumes a 16-cavity mold and four in-process dimensions. The number of measurements during production is shown without and with Algoryx. You would do nearly 90,000 fewer measurements per year with Algoryx for this mold. Annual cost savings are $16,868.

“The calculations in this case study [Table 1] are for annual cost savings. Many molds run for four to five years, so total cost savings can be four to five times the numbers in the above table,” notes Tuszynski.

The annual cost savings depend, of course, on the number of cavities and the number of eliminated in-process measurements. Table 2 illustrates the annual cost savings for different combinations of mold cavities and in-process dimensions.

Conclusion

The bottom line on this is your bottom line, and reducing in-process measurements with Algoryx provides a way to improve efficiencies, reduce scrap, and increase profitability. There are many things that molders cannot control in their businesses such as raw material price increases. Algoryx provides a means to obtain real cost savings in your overall cost-of-quality, at a time when molders are feeling the pressure from their OEM customers to reduce costs.

Want to know your current cost of in-process measurement and how much you can save (including other development and validation cost savings) by using Algoryx? Contact Algoryx for a free financial analysis.

Algoryx also invites readers to take the free Algoryx Technical Challenge at www.algoryx.com. —Clare Goldsberry

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