Complex Machine Performance Testing

Business Justification

To meet demand for objects on a 3-year forecasting schedule, the Complex Machine manufacturing system will need to decrease manufacturing time. Additionally, over the last few months we have noticed an increase in variability of time spent in the pipeline, and need to investigate the cause of the variability. To that end, performance tests were executed and recorded for the Complex Machine manufacturing system by Quality Assurance over three manufacturing cycles.

Testing Process

This table illustrates the required confidence levels and sample sizes for different testing tasks. To verify our process is working, we will complete 25-50 test runs each week. For chaFnrgeeqsu teon tchye proceCsosn, faid seanmcpe le sizeS aomf 7p5le-1 s0iz0e is required with a h level

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• Minimum tolerable sample size for

Low 90% 25 • weekly checks

• Run this holiday weeks

High 95% 50

• Desired sample size for weekly checks

Run this every normal 7-day week

• Minimum sample size required for

Medium 97% 75 • small processing changes

No more than twice per month

• Required sample size for process

Low 97% 100 changes

Once per month

This monthly report examines potential process changes (highlighted in yellow above). To consider changes to machinery and process, a 97% confidence level is required. Our testing proc

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e ss is built for and looks for at least one of the following quality/cost benefits.

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Reduced manufacturing time

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Definition: A total system reduction of at least 5 milliseconds

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Increased system maintainability

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Increased system stability

Increased employee safety and satisfaction

Results

Here are the results from 100 test runs of manufacturing objects. The average time spent manufacturing one object is 66.797 seconds, which is nearly 3 seconds faster than the last test. Based on outside analysis, the Pre-processing and Machine B steps might see the largest reduction of time through parallelization with other steps.

Setup Pre-processing Machine A Machine B Machine C Validation
Minimum
Average
1,301 3,447 11,776 15,212 23,087 378
Maximum
3,339 4,502 18,505 16,110 27,890 451
Total
6,002 4,998 29,004 17,019 28,921 521
33,390 45,020 185,050 161,100 278,900 4,510

This figure shows the results from from 100 test runs of manufacturing objects. Notice the extreme variability in Machine A. The variability in Setup and Machin C is not as prominent.

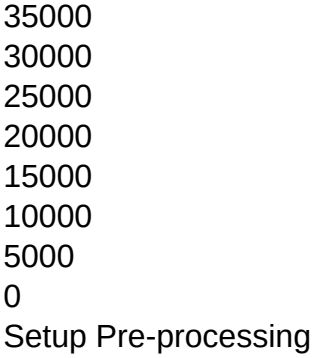

Figure-1: Results are in milliseconds

Conclusion

Based on our analysis, we have two main recommendations. Even though most of the time is spent in Machine C, our recommendation is to focus on parallelization of Machine B with Machine A. We expect to see a 6-7,000 millisecond reduction in time spent. To reduce the variability in the system, our recommendation is to optimize the parameters for Machine A toward consistency.