LEAN SIGMA
CORPORATION

Rolled Throughput Yield

- Calculating Yield
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Rolled Throughput Yield

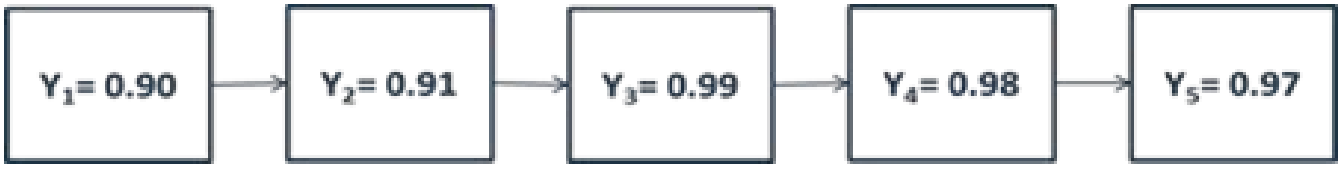
Rolled Throughput Yield (RTY) is a process performance measure that provides insight into the cumulative effects of an entire process. RTY measures the yield for several process steps and provides the probability that a unit will come through that process defect-free.

RTY allows us to expose the “hidden factory” by providing visibility into the yield of each process step. This helps us identify the poorest performing process steps and gives us clues into where to look to find the most impactful process improvement opportunities.

Calculating Rolled Throughput Yield (RTY):

RTY is found by multiplying the Yields of each process step.

Let's take this 5-step process below and calculate its Rolled Throughput Yield using the above mentioned multiplication method.



- ✓ The calculation is: RTY = 0.90*0.91*0.99*0.98*0.97 = 0.77
- ✓ Therefore, RTY = 77%.

You may have noticed that To calculate RTY, we must determine the Yield for each process step (which we have not covered yet).

Before we get into calculating Yield, there are a few abbreviations that need to be declared.

Abbreviations

- Defects = D
- Unit = U
- Defects per Unit = DPU
- Yield = Y
- e = 2.71828 (mathematical constant)

Calculating Yield

$$Y = e^{-dpu}$$

The Yield of a process step is the success rate of that step or the probability that the process step produces no defects.

To calculate Yield, we need to know DPU, and then we can apply it to the Yield equation above.

Process Step	Defects	Units	DPU	Yield	RTY
1	65	598	0.10870	0.89701	0.90
2	48	533	0.09006	0.91389	0.82
3	5	485	0.01031	0.98974	0.81
4	10	480	0.02083	0.97938	0.79
5	14	471	0.02972	0.97072	0.77

For example, suppose a process step has a DPU of 0.109 or 10.9%, derived by dividing the number of defects (65) by units (598).

Then, we can apply the Yield equation: Y = 2.718 ^ -0.109 = 0.8967 rounded, Y = 90%

The table on the previous page uses the process yield data we used in the earlier RTY calculation. This table allows us to see the DPU and Yield of each step and the RTY for the whole process.

Guess What? There's an Easier WAY!

Calculating RTY Using an "Estimate" of Yield

*This method assumes Max DPU is 1. In the real world if you have a process with Max DPU > 1 this method will not work.

It is possible to “estimate” Yield by taking the inverse of DPU or simply subtracting DPU from 1.

Referring to the table above, let's run a quick yield estimation.

Yield Estimation*
1-DPU

Yield Estimate for Process step 1 = 1 - 0.10870 = 0.89

Yield Estimate for process step 2 = 1 - 0.09006 = 0.91

Yield Estimate for process step 3 = 1 - 0.01031 = 0.99

Yield Estimate for process step 4 = 1 – 0.02083 = 0.98

Yield Estimate for process step 5 = 1 – 0.02972 = 0.97

RTY using the Yield Estimation* Method

0.89*0.91*0.99*0.98*0.97
=
0.76 or 76%

PRETTY DARN CLOSE!

And you don't need the yield equation.

Let's Do an Exercise

As the manager of the label production process for a sign company, you want to understand the full view of your process and determine the probability of producing defect free labels.

The process is made up of 3 process steps and you are evaluating the defect rate of the production of 1,000 labels.

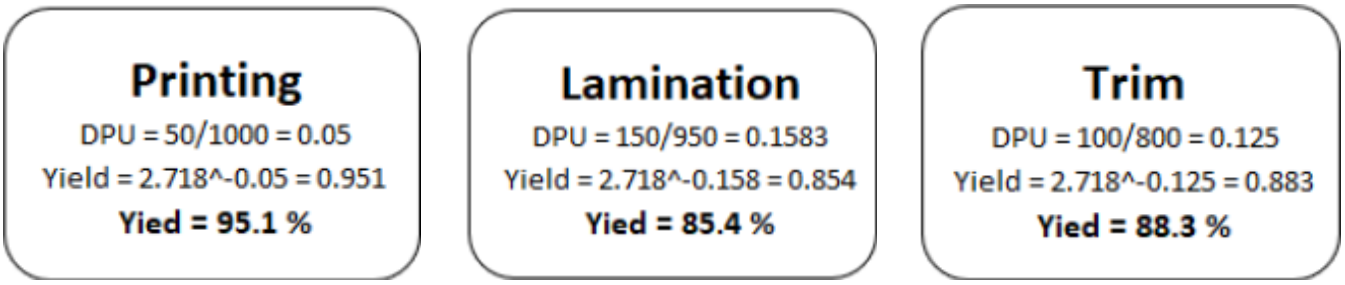
- **Process Step 1 - Printing**
  - 1,00 labels go through the printing process, and it is determined that 950 of the printed labels are acceptable.
- **Process Step 2 - Lamination**
  - After printing, 950 good labels reach the laminating process, 800 of the laminated labels are accepted by the quality reviewer.
- **Process Step 3 - Trim**
  - Now, after printing and laminating, there are 800 labels that will go through the trimming process, and 700 of these trimmed labels are determined to be acceptable.

Assignment:

01 Determine the yield of each process step.

02 Calculate the Rolled Throughput Yield of the entire process.

Exercise Solution



Rolled Throughput Yield

0.951 x 0.854 x 0.883 = 0.712

71.2%

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