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As Americans, we don't quite understand what the TRUE Cost of Scrap or ReWork means. We get upset when our automobiles need servicing or our phone battery swells and cracks the screen on our phone, or worse, the battery explodes whilst on a flight to your next business meeting.

When it comes to running a Machining/Manufacturing Process or Environment, the dollars are always the main focus. In reality, TIME is the one constant that rules our decisions.The most valuable asset of any business is TIME.

Let's take a look at SCRAP and ReWork from the perspective of TIME. The "T" factor.

The KPI (Key Performance Indicators) are commonly calculated using CMMS and TEEP software PR/TPR x SP. The focus on TIME is overlooked. CpK can provide a total Throughput factor as a good starting point. The ratio for Finished Parts First Pass Yield compared to ReWork ratios will be one of the most undervalued costs for job runs over 10 pieces.

Example: 100 pc Order

50 pc ReWork (how exactly to calculate this cost in TIME)

5 pc Scrap (costing of RTY – FTY)

The disruption of ReWork into the "SYSTEM" is often never re-entered into the ERP and CMMS. The shop will absorb the costs, the disruptions, the re-programing and the Machine TDC (True Downtime Cost).

Because a machine is " running " (even though it's unpaid ReWork), it is not viewed as " downtime ". It is actually worse.

TDC is much lower: i.e.

Labor cost is zero

Functional costs are zero

Along with all the KPI's.

ReWork is opposite.

Labor cost is absorbed at 100%

Functional cost is absorbed at 100%

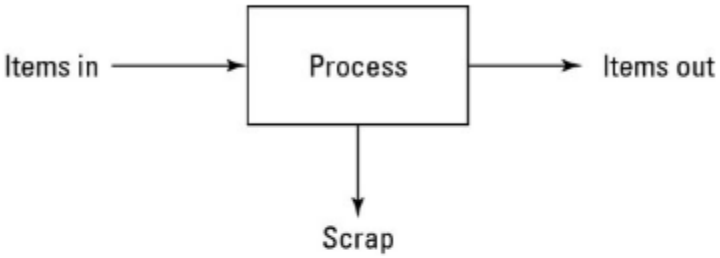
Along with the scheduling havoc and the ignorance of TCC (True Core Competency). Often shops try to implement a " Fact Finding or Corrective Action " mission to determine the " Why? "of what caused the defects. That cost will be absorbed 100% in Overhead.

Proving a process (i.e. CNC programs, speeds/feeds/workholding) is understood as " SET UP " costs and can be valued. So how do you value the ReProcessing of ReWork,

First, the creation of a new Work Router for ReWork (WRFR) can be entered in CMMS, ERP and can be reported. These costs are almost always NRS (Non Reported Scrap) and therefore do not affect the Core Competency of the Process, Machine Tools, Cutting Tools, Labor Competency and Quality Department Competency.

TRADITIONAL YIELD: OUTPUT VERSUS INPUT

Traditionally, *yield* is the proportion of correct items (conforming to specifications) you get out of a process compared to the number of raw items you put into it.



The traditional calculation of yield is often employed on the final inspection step of a process to measure the effectiveness of the overall process. So for the process of inflating the tires on cars in an assembly line, a study may reveal that of the 352 cars that went through the tire-inflation process during a day's production, 347 were later found to have a pressure within the required specification limits.

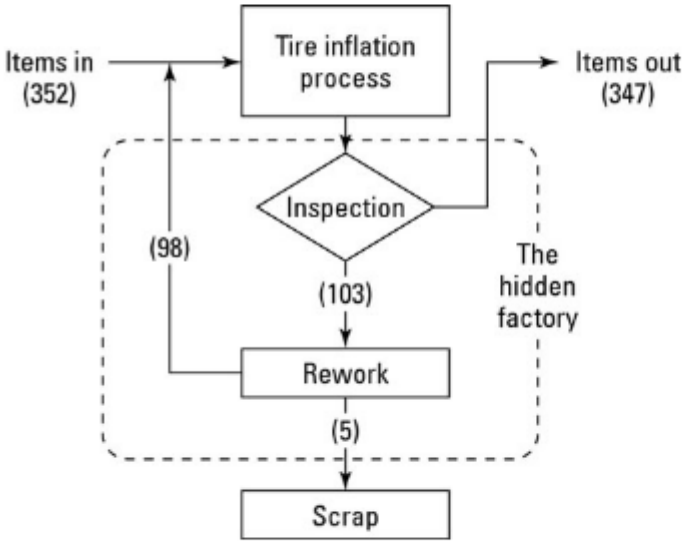
In this case, the traditional yield is

$$Y = \frac{out}{in} = \frac{347}{352} = 0.986$$

or 98.6 percent.

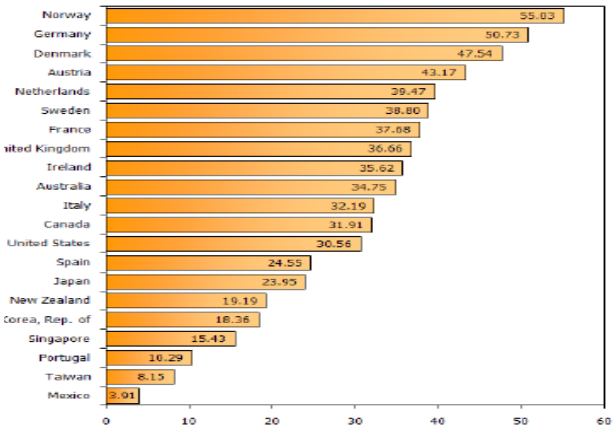
HOW TO UNCOVER THE HIDDEN FACTORY

The *hidden factory* is a natural outgrowth of a system's inability to correctly comply with required specifications the first time through the process. Here and there throughout organizations, rework and fix practices arise and become engrained as "that's just the way we do it" parts of the standard practices. But if you measure yield by using the first-time yield method you naturally objectively review and acknowledge process effectiveness.



In the case of the example tire-inflation process, the hidden factory of in-process inspection and rework accounts for 0.986 – 0.707 = 0.279 or 27.9 percent of production. All together, value-sapping hidden factories within organizations combine to consume valuable resources and time.

Average labor Costs for Re-work by nation



Rolled Throughput Yield – RTY

Rolled Throughput Yield (RTY) is the probability that a single unit can pass through a series of process steps free of defects.

Next we will turn our attention to a Rolled Throughput Yield example. If you will remember, the First Time Yield calculation we did (FTY) considered only what went into a process step and what went out. Rolled Throughput Yield adds the consideration of rework. Using the previous example:

Process A = 100 units in and 90 out Process B = 90 in and 80 out Process C = 80 in and 75 out Process D = 75 in and 70 out.

If in order to get the yield out of each step we had to do some rework (which we probably did) then it really looks more like this:

Process A = 100 units, 10 scrapped and 5 reworked to get the 90. The calculation becomes [100-(10+5)]/100 = 85/100 = .85 This is the true yield when you consider rework and scrap.

Process B = 90 units in, 10 scrapped and 7 reworked to get the 80. [90-(10+7)]/90 = .81

Process C = 80 units in, 5 scrapped and 3 reworked to get the 75. [80-(5+3)]/80 = .9

Process D = 75 units in, 5 scrapped and 10 reworked to get the 70. [75-(5+10)]/75 = .8

Now to get the true Rolled Throughput Yield (Considering BOTH scrap and the rework necessary to attain what we thought was first time throughput yield) we find that the true yield has gone down significantly:

.85*.81*.9*.8 = .49572 or Rounded to the nearest digit, 50% yield. A substantially worse and substantially truer measurement of the process capability. An Assumption is made in the preceeding example that there are no spilled opportunities after each process step.

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The TRUE Cost OF SCRAP AND REWORK