

Taylor, Stopwatches, and Lean Manufacturing

By Bill Waddell©200

When Frederick W. Taylor descended on Johnson Steel in Johnstown, Pennsylvania in 1898, he brought along his stop watch, of course, his unique slide rules and reams of multi-columned forms developed over the years – the tools of Scientific Management. When he was rather unceremoniously shown the door three years later, a little less than half of Johnson's payroll was working to standards set to three or four decimal points. He and his minions had analyzed and timed just about everyone, but this was the normal result of Taylorizing a factory.

It is little known that Taylor's labor standards were routinely and quite arbitrarily bumped up by Taylor himself by a factor of 40-60%. The most scientific of engineers had to acknowledge that the workday of a production worker was not nearly as consistent and foreseeable as they would have liked it to be. It is also little known that Taylorization also entailed more of a workforce shift than a workforce reduction. While time studies were the visual application of Scientific Management that the workers, the public and the press could easily see, just as critical to success were "functional foremen". These were the support people needed to plan, orchestrate and monitor the production people working to the detailed rates. The functional foremen included specialists in machine set up, scheduling, machine speeds, tooling, and so forth; along with a small army of clerks to keep track of the details of production. A typical Taylor result was a transfer of one fourth of the work force from the shop floor to one of these support functions.

That the Taylor system left better than half of the payroll going to fudge factors and support efforts, rather than to traceable direct production could be overlooked. Taylorized factories performed better than non-Taylorized ones. Having a substantial chunk of the work nailed down to four decimal point precision was far better than nothing.

Ninety years to the day after Taylor first went into Johnson, I went to work for the Amerock Corporation in Rockford, Illinois. Amerock was, and still is for that matter, a premier manufacturer of decorative window and cabinet hardware. In 1978, they were pure Taylor. The industrial engineers used a method and a system called Work Factor, sold to the company by WOFAC Management Systems, and it was seen as a state of the art approach to the science of industrial engineering. Armed with worksheets and stopwatches, they set rates for every production job.

On a daily, weekly and monthly basis, a massive Honeywell mainframe computer spun through mountains of shop floor data and measured 'productivity'. That productivity figure was a function of two numbers: direct labor efficiency times direct labor effectiveness. Efficiency was calculated by comparing how well workers performed to the four decimal point precision standards set by the Work Factor wielders. "Earned

Standard Hours” (units produced times the standard for each) divided by hours spent producing those items equaled efficiency. It always hovered around 100%, thereby validating everyone involved: the workers, management, the industrial engineers and Frederick W. Taylor. The other half of the calculation, however, was not so clean. Effectiveness was a measure of how much of the total time on the payroll workers spent actually performing standard work. It was calculated by dividing time spent actually producing by total hours paid. That figure consistently hovered around 72% for the few years that I was there. Go ahead and do the math – 72% that can be accounted for by Taylor-type standards X 1.40 to bump it up by a Taylor-type fudge factor = 100% of employee time - and you will see that it comes out eerily close to Taylor’s 40% fudge factor.

Also remarkably close to Taylor’s results was the ‘direct to indirect ratio’. The company had a goal of 3:1; one indirect worker for every three direct. They never reached the goal, but usually came close. At 2.5:1, they were within a gnat’s eyelash of Johnson Steel under Taylor. In total, Amerock in 1978 was right there with Bethlehem and the rest of the Taylorized companies of the turn of the century. A little under half of the payroll was paid with four decimal point precision, and the rest just out there en block.

Quite a bit of automation has been dumped into the manufacturing fray since 1978 and the portion of the payroll under pin point control has shrunk, but it is still there. There is no doubt as to the accuracy of the numbers. It is, in fact, the only thing on the factory floor under that level of precise control. Because Taylor methods seemed to accurate – so scientific; and because labor cost was a significant element of product cost; and mostly because it seemed so logical that the cost right there at the machine where metal was being cut must be the center of manufacturing activity; direct labor cost became the rock upon which manufacturing cost accounting was built.

There is very little in terms of factory data that accounting has taken up since the days of Taylor. That slice of precise data has become the base and cost accounting has largely become an exercise in intricate mathematics applied to that base. Using regression analyses and other mathematical tools, they have analyzed the behavior of all sorts of cost groupings trying to develop means of predicting and tracking ‘step functions’ of cost variability. Budgets are too often comprised of a relatively small direct labor figure, which is quite accurate; a few truly fixed numbers for depreciation, management salaries and so forth; and a collection of mathematical extrapolations in between based on historical relationships between those accounts and that little Taylorized slice of the business. Accounting essentially says to manufacturing, “We don’t know what that huge chunk of cost is or why it is there, just make sure it isn’t more than 448.2693% of direct labor.”

Of course, standard time, in and of itself, means very little. The important figure is the one you get when you multiply that standard time by a worker’s rate of pay. That figure is just as precisely known as the four decimal Taylor rate. Accountants being the sharp mathematicians they are, when the industrial engineers can no longer find a way to reduce the time, can clearly demonstrate to management that in Mexico, or China, or Malaysia, or any number of places, the other half of the equation has plenty of room to go down. The argument worked. Neither the Johnson Steel plant Taylor visited in 1898 nor the Amerock plant in which I worked in 1978 is open for business today. Obviously they are not the only factories this line of business logic drove off shore.

Activity Based Costing is a concept pioneered by CAM-I (Computer Aided Manufacturing – International) and others twenty years ago. ABC, in fact, is little more than a quite reasonable idea to throw a

little bit of Taylorism at the rest of the factory. It suggests that we give some thought to the work that is driving that huge unknown percentage of cost that has only been looked at from the context of its mathematical relationship to direct labor. The heart of the CAM-I research was two pronged: (1) That if labor had ever been the primary manufacturing cost driver, it certainly is not today. Through productivity improvements and the growth of automation, direct labor is often an almost trivial cost element. The folks who came together through CAM-I were looking for the other, more relevant drivers of cost. They quickly settled on the process, rather than operations and looked for the drivers of cycle time. (2) They also challenged traditional assumptions of time, pointing out that much of the overhead cost this period is actually aimed at affecting manufacturing in some future period. The only true accounting measure of manufacturing is life cycle costing, looking at all of the costs of making a product from its inception to the time when it is discontinued. They went even further with these notions and pointed out the importance of having the right set of numbers when it comes to measuring performance and making capital investment decisions. Their concern was that traditional accounting practices put too much emphasis on rewarding performance that resulted in workforce reductions, rather than quality and cycle time improvements; and the system put too much value on capital investments that reduced labor headcount.

Relevance Lost was written by Kaplan and Johnson in 1987 and it thoroughly described the utter folly of cost accounting as it is practiced today far better than I have. It and the results of the CAM-I studies were read in every serious executive office in the U.S., and then tossed out. Many of the companies who claim to have moved toward activity based costing have actually done little more than change from driving the cost system from labor hours to driving it from machine hours. This, of course, is nothing more than a parlor trick, since every engineer worth his salt has determined a 'man to machine ratio' that allows switching back and forth between labor standards and machine standards with a keystroke.

Lean manufacturing, when all is said and done, is the application of the old scientific management concept to the entire factory – not just the direct labor slice. While any number of authors and 'experts' with little actual factory experience point out that the original Ford plant had a Time Study Department and Shigeo Shingo did not consider himself fully dressed in the morning if he did not have his stop watch, there was a huge difference. They were not timing isolated operations looking for direct labor cost savings. They were on the hunt for bottlenecks, looking for anything restricting flow. The only time that matters in a one piece flow plant is the longest time in the flow. Reducing any other time saves nothing. (I imagine Eli Goldratt used a stopwatch when he made his much publicized breakthrough in the chicken coop business. As Goldratt quite accurately points out: An improvement at the bottleneck is an improvement in the system; while an improvement anywhere else is a mirage.) Just because these fellows were carrying stopwatches does not mean they saw factories remotely like Taylor did.

Lean practitioners go from one end of the process to the other looking at every action and every cost, looking to optimize the total. The traditional approach puts direct labor and machine operations on a pedestal. Every other activity is first and foremost supposed to optimize direct labor performance to the old Taylor standard. Only after that goal is met should management then pursue the second goal of minimizing the support cost. One can almost envision the operatic soloist alone in the spotlight while the other performers and the orchestra are hidden in the shadows all doing whatever they have to in order to make the soloist look good. In the remaining traditionally managed American factories, it is the machine operator, surrounded by inventory and

a gang of material handlers, inspectors and foremen all assigned the task of making sure that, come what may, that operator makes or exceeds the rate for the job. Lean looks at that and says, “Nonsense”.

Implementing lean means looking at the process with little regard to what is direct or indirect, or what accounting may have classified as variable, fixed or somewhere in between. When we come across an inspector and see that we are spending a dollar to sort out the scrap generated by a direct labor operation, we put a stop to it. If the solution is to spend fifty cents more at the direct operation to get rid of the dollar inspector, we do it without slowing down to think about it. Lean is based on the common sense fact that a dollar’s worth of inventory handling cost spends the same as a dollar’s worth of direct labor. Ultimately, lean drives us towards both: find ways to keep the direct labor cost at its optimum and get rid of the unnecessary support cost. In the meantime, however, if the cost in one category goes up while the costs in others go down by a greater amount, we will gladly take that deal.

The problem accounting has with lean is that, unless our improvement is some grand, master stroke, the only result they see is the direct labor impact. It takes a pretty hefty overhead reduction to make the accounting radar screen, while an unfavorable direct labor variance of only a few dollars sticks out like the proverbial sore thumb. If our kaizen activity has the least adverse affect on the narrow direct labor piece of the business, any offsetting improvement typically comes in one of those ‘black hole’ sort of overhead accounts. Good luck finding and verifying it. Inventory costs are quite real – but they are lost in a maze of financing agreements in corporate treasury. Freight cost reductions as result of establishing trucking milk runs actually save honest to goodness cash, but often the plant is charged with a company average freight rate and the actual billing goes to a central freight management office where your trucking bills disappear into a huge stack, the total of which may or may not result in a favorable variance this month. It rolls on that way even when the savings is in one of the plant accounts. Since the budget for many of the accounts was concocted from the thin air of mathematical algorithms, who is to say whether the favorable variance is real or merely the temporary result of the noise and error factor in the math?

Inevitably the monkey is on manufacturing’s back to do the cost analysis, dig through the records, extract costs from complicated systems and try to prove the savings from lean, while accounting sits back and challenges the validity of lean results at every turn. Lean efforts simply wear down from the never ending effort of swimming against the tide of a mistaken faith in the accounting systems. When the idea of senior management leadership is raised, and the critical importance of creating a lean culture is brought up, the focus has to be accounting. Unless the senior management is willing to challenge the underlying assumptions driving the accounting based measurements of manufacturing performance, it is unlikely that a lean effort will succeed and sustain.

In pushing for a greater lean commitment from senior management I once had a CEO tell me that I needed to think of him as Tarzan swinging through the jungle on a series of vines. He was very reluctant to let go of the vine he was holding until he had a chance to give the vine I was offering a good, hard tug to make sure it was safe. I clearly understood the analogy. He was telling me that, while my argument made sense intellectually, I was telling him to walk away from the security of the accounting system that had been a cornerstone of his career. I was telling him his most basic tool to monitor the company and the basis for all of his decisions was wrong. Everything he had learned in business school and all of the reports he had once

cranked out himself as an accountant and he now used to do his job, were in error. No matter how logical my argument, it was a difficult leap for him to make.

The moral of this story is that lean requires toppling the rock which has been the cornerstone of business thinking for over one hundred years. Executives don't *think* the accounting reports are accurate, they *know* they are accurate. That is the greatest obstacle to lean we face; and that is the fundamental reason why most lean efforts fail; and that is the reason why the larger the company and the more entrenched the financial people and systems, the more likely they are to opt for outsourcing than lean.