

Man – vs – Machine

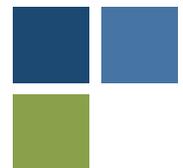
How to Maximize Human
Productivity Before the Next
Wave of Automation

 By Paul Baker



Part 2

Extraordinary
Productivity through
Human Performance



Chapter 4: Baselining Your Cost Per Unit Metric

A quote to keep in mind:

"You can't improve what you can't measure"

WHY COST PER UNIT

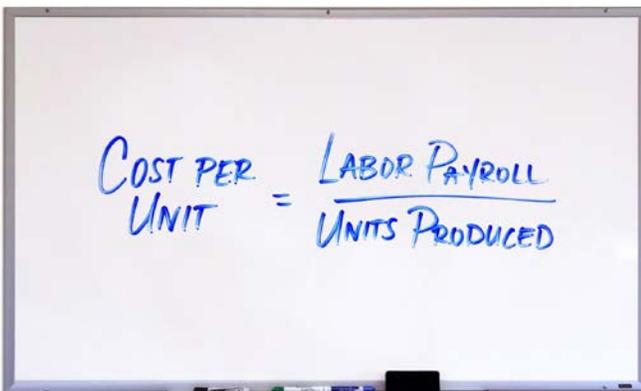
Cost Per Unit (CPU) is for manual labor production such as kitting and assembly what OEE (Overall Equipment Efficiency) is to equipment based production. When comparing CPU to OEE, the main difference is that in CPU we are targeting a cost baseline while in OEE we are targeting an efficiency baseline.

CPU is valuable because it lets us know (1) real time profitability of a job, (2) our baseline cost for considering alternatives such as automation or outsourcing and (3) the metric adjusts immediately which allows us the ability to get instant feedback on line adjustments and improvements (or mistakes).

While we will use CPU as our main metric, it is complemented by safety and on-time delivery. For this productivity book, we will focus on CPU and how to use it to increase throughput while reducing cost.

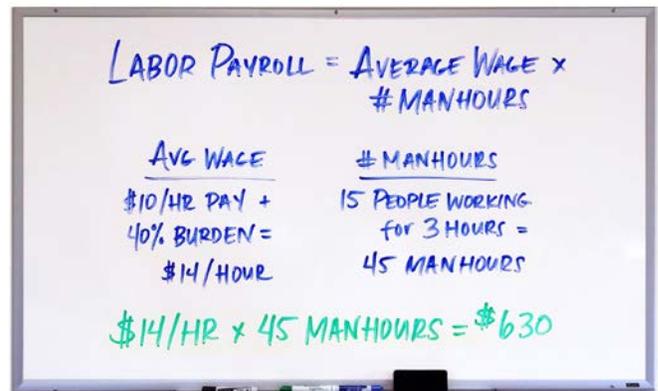
CALCULATING THE FORMULA

CPU is an easy metric to get on the production floor. The formula for cost per unit is:


$$\text{COST PER UNIT} = \frac{\text{LABOR PAYROLL}}{\text{UNITS PRODUCED}}$$

Labor Payroll

To calculate labor payroll, we are basically looking for the burdened cost of an hour of work. The burdened cost of labor equals the hourly wage plus benefits and taxes.


$$\text{LABOR PAYROLL} = \text{AVERAGE WAGE} \times \text{\# MANHOURS}$$

Avg Wage	\# Manhours
\$10/HR PAY + 40% BURDEN = \$14/HOUR	15 PEOPLE WORKING for 3 HOURS = 45 MANHOURS

$$\$14/\text{HR} \times 45 \text{ MANHOURS} = \$630$$

To calculate # of manhours - we count the number of production workers involved in the project. If we have 15 people working on a job for 3 hours, # of manhours = 45 (15 people x 3 hours = 45 manhours). What is important here is that we need to calculate the 3 hours as total hours as opposed to merely working hours. We need to account for downtime as well should the line stop for any reason during production.

To calculate average wage, we can take a shortcut as its better to use an assumption so we can get this figure on a real time basis (ie after a job / shift / day) where it is more useful and pretty much just as accurate than waiting for actual payroll figures. A good rule of thumb is to increase the hourly wage by 40% to cover taxes and benefits. For instance, if we still have those 15 people people working on a job who make on average \$10/hour, let's use \$14/hour as the Avg Wage.

So 15 people working an 8 hour shift at \$14/hour would make Labor Wage $15 \times 8 \times \$14 = \$1,680$.

Units Produced

The next thing we need to figure out is how to calculate # of Units Produced. This should be done on a 'per SKU' basis and only count 'good units' meeting quality specification. This is pretty straightforward as well and doesn't really require a paragraph to explain - it's the # of good units completed during the time period.

So if during the 8 hour shift example from the previous page, those 15 people produced 5,000 units of SKU 1001, then our CPU would equal \$0.34 (\$1,680 / 5,000 units).

WHAT CAN WE DO WITH CPU

Now that we know the CPU is \$0.34 for SKU 1001, we can use that as our standard for which to measure performance against. Perhaps we want to measure CPU for SKU 1001 across different shifts, or different teams? Perhaps we want to set a goal for our teams to get to \$0.29.

We can go about doing this by either (1) increasing throughput per shift (units produced) or (2) reducing the number of people on the line (labor payroll). We'll talk more about methods to achieve each in the subsequent chapters.

WHAT DOES THIS REALLY MEAN?

This means we should be focused not just on hourly wages and staffing mark-ups, we should be primarily focused on OUTPUT. What good is bringing in temps at a lower wage than full time employees if you have to use 50% more people, or take twice as long, to get the same amount of work done? Our data finds that individuals performing manual labor can have a productivity variance of 300% - we'll discuss this data analysis in a later chapter. Here are two ways to illustrate this point using the following example whereby our client wants us to produce 5,000 units. We have three different crews of 10 people at our \$14/hour average wage who will run this job, a Strong Crew, Fair Crew and Weak Crew.

	WEAK CREW	FAIR CREW	STRONG CREW
RUN HOURS	24	22	16
LABOR PAYROLL	\$3,360	\$3,080	\$2,240
SAVINGS		8%	33%

	WEAK CREW	FAIR CREW	STRONG CREW
STANDARD HOURS	16	16	16
LABOR PAYROLL	\$3,360	\$3,080	\$2,240
IMPLIED WAGE	\$21.00	\$19.25	\$14.00

This example illustrates how variable manual labor work results can be and therefore why this is worthwhile to focus on to drive meaningful savings. A Strong Crew, which we'll discuss how we build, can generate 33% savings. Looked at another way, while we were focused on bringing temps in at \$10/hour and getting the mark-up on our staffing agency as low as possible - it turns out that we are actually paying \$21.00/hour for that team.

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THE FULL PICTURE: INDIRECT COSTS, MATERIALS AND DOWNTIME

In addition to the production CPU, we also have a number of indirect costs that we won't consider as part of CPU but need to take into consideration when we look at our total costs. These include:

1. Supervision and Quality
 - a. The supervisor's time in managing the work
2. Material handling, Shipping, Receiving
 - a. Fork truck drivers time to pick and stage orders
 - b. Cost of the fork trucks and/or pallet jackets
 - c. Material handler time to restock the line with components
 - d. Material handler time to remove dunnage
 - e. Cost of packaging waste - corrugated/plastic (offset by any recycling revenue)
3. Alternative Options Quality & Rework
 - a. What is the rework rate on this SKU

4. Human Resources
 - a. Recruiting, hiring, badging for security
 - b. Onboarding and training
 - c. Turnover
5. Learning Curve
 - a. Productiv's data show that there is a 300% difference in productivity between new employees and those who are up the Learning Curve
6. Downtime
 - a. Are changeovers efficient?
 - b. Have you accounted for all Total Labor Payroll when measuring it against # of units produced? If team members clock in at 7:00 and the line doesn't start producing until 7:15, is that 15 mins accounted for?

In the next section, we will discuss how to lower our CPU. We have many levers to pull and we will categorize them into two main buckets:

1. Increase # of good units per hour
2. Reduce manhours in: Production, Make-readies, and Downtime

TAKE AWAY TOOL: CPU WORKSHEET

Here's a simple chart that will help you calculate CPU. Suppose we have 12 people working today who have called in. We pay our staffing agency \$14/hour. The shift is 7:00am - 4:00pm with 1 hour of unpaid breaks.

A Typical Day and the CPU Metric:

Here is our daily production schedule for the day.

SKU	# OF UNITS DUE	# OF UNITS COMPLETE	TIME PRODUCED	# OF PEOPLE	MANHOURS	CPU
SKU A	1,000	-	-	-	-	-
SKU B	3,000	-	-	-	-	-
SKU C	5,000	-	-	-	-	-

And, after a day of monitoring the components of the CPU formula, here are our results.

SKU A	1,000	1,000	7:00 - 9:00a	12	24	\$0.34
SKU B	3,000	3,000	9:00a - 12:00p	12	36	\$0.17
SKU C	5,000	5,000	1:00 - 4:00p	12	36	\$0.10

Every Minute Counts

You'll notice in the take away tool on the previous page that the Time Produced accounts for every minute of the shift. This is important if we are to capture or Total Labor costs. We can't just start the first time produced once the line starts. For instance, one area where many companies see leakage is start times.

If the shift starts at 7:00am but the line doesn't start until 7:10am, we need to account for those 10 minutes somewhere in our CPU metrics. For a plant with 100 people at \$14/hour working 24/5, the annual cost of those 10 minutes is \$175,000.

So we can pick up \$175,000 of cash and profit just by having our teams start on time. There are many places where we see "Minute Leakage" throughout the day that we'll identify and provide solutions for in subsequent chapters

SUMMARY

- » The first step in implementing any continuous improvement program is to baseline our current metrics
- » For hand packaging and kitting, Cost Per Unit (CPU) is an easy, real time figure that we can use
- » When we look at CPU, we must include not only our production time, which can be expressed as CPU for each SKU but also our downtime and make-readies
- » In addition to our workforce manhours, there are also numerous indirect costs that include supervision, material handling, human resources and the learning curve
- » In the next section, we will start discussing how to improve CPU ■

About the Author

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