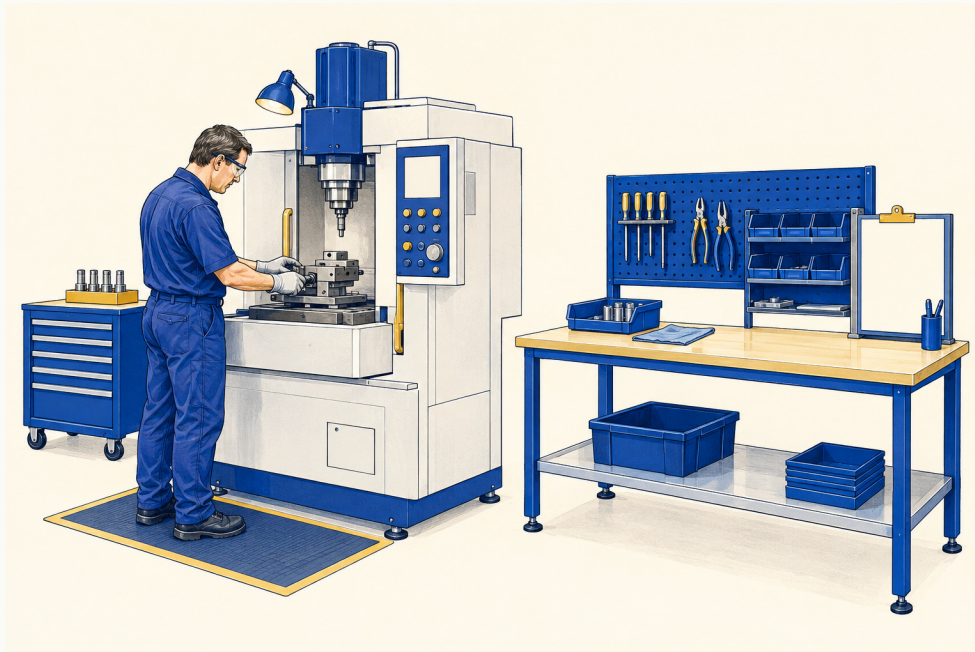


Manual, walking and machine time

Plot manual work, automatic time and waiting on one timeline, reconcile elapsed and work-content totals, and test whether a proposed overlap is actually permitted.



Thirty automatic seconds are not thirty extra labor seconds

Fictional machine-and-bench case: loading takes 10 seconds, the automatic cycle then runs for 30 seconds, a separate manual task takes 20 seconds during that cycle, and unloading takes 10 seconds after it ends. Analyst Theo must explain the supplied 50-second arrangement without double-counting overlap.

Your role and the reference condition

Process analyst observing with the operator and equipment owner.

Normal: No person or machine is assigned incompatible simultaneous work, and access, precedence and quality conditions are respected.

Gap: The draft estimate adds 40 manual seconds and 30 automatic seconds and calls the result a 70-second observed cycle.

Work within these conditions

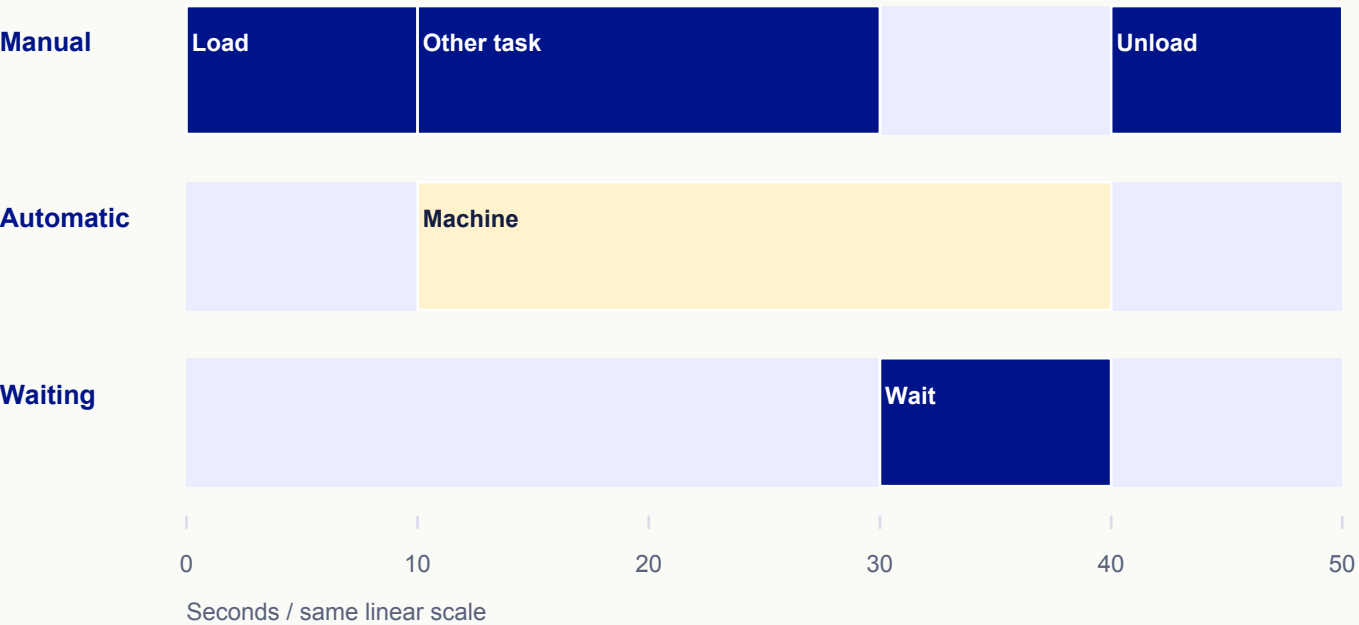
1. The overlap is hypothetical and permitted only for this teaching calculation.
2. Task availability, machine access, walking and repeat-cycle feasibility require real verification.

Fictional teaching case. Supplied observations support the exercise; proposed actions are not verified customer results.

See how the method works

An operator balance chart totals work, but it can hide when automatic processing overlaps manual activity. A combination table puts those activities on a shared time axis. Distinguish hands-on time, walking and automatic machine time, then trace the actual sequence. Check when the person is free, when a machine requires attention and where waiting occurs. Do not add all machine time to labor content or assume that any apparent overlap is feasible. Safe access, sequence and quality requirements remain binding. Use repeated observations and trial the proposed pattern with the operator before revising the method.

Observe overlap, not the sum of all lane durations



Lane	Element	Interval
Manual	Load	0-10 s
Manual	Other task	10-30 s
Manual	Unload	40-50 s
Automatic	Machine	10-40 s
Waiting	Wait	30-40 s

Manual 40 s; automatic 30 s; elapsed 50 s. Overlap is a hypothetical permitted arrangement; access, precedence, quality and task availability require validation.

Method exhibit: Load, Automatic cycle, Separate manual task, Wait / observe, Unload.

Follow the evidence and decisions

Inspect the supplied case inputs

Activity	Start-finish	Resource
Load	0-10 sec	Operator
Automatic process	10-40 sec	Machine
Separate task	10-30 sec	Operator
Wait	30-40 sec	Operator waits for machine
Unload	40-50 sec	Operator

01 / Draw one common clock

Theo places each activity on its own resource lane using the same zero point and second scale. Loading ends at 10; only then can the machine start its 30-second interval.

Why: Independent time bars without a shared clock conceal whether work actually overlaps or violates precedence.

Evidence / check: Automatic lane runs from 10 to 40, not from zero to 30.

02 / Place the separate manual task

Put the 20-second task from 10 to 30 on the operator lane while the machine runs. Leave the operator's 30-40 interval visible as waiting.

Why: The manual task overlaps machine processing but not loading or unloading. It cannot be counted twice or assumed possible during prohibited access.

Evidence / check: Operator lane: load 10, separate task 20, wait 10, unload 10 seconds.

03 / Reconcile the totals

Sum manual work as $10 + 20 + 10 = 40$ seconds. Automatic time is 30 seconds and elapsed sequence time is 50 seconds. Do not add overlapping resource durations to obtain elapsed time.

Why: The three totals answer different questions. The ten seconds of waiting remains part of elapsed time but is not manual work content.

Evidence / check: Manual 40 sec; automatic 30 sec; waiting 10 sec; elapsed 50 sec.

04 / Challenge the assumptions before improving

Confirm that the separate task is ready at second 10, that the automatic phase requires no operator attendance, and that required walking or checks have not been omitted.

Why: A combination table can expose an opportunity, but it cannot make an unsafe or unavailable overlap real.

Evidence / check: Validation list names access, attendance, task readiness, walking and repeat-cycle checks.

05 / Record an observed alternative distinctly

When a trial supplies different times, redraw the intervals from those observations and compare the full sequence. Retain the original supplied model as a prediction.

Why: A work-content total alone does not show the repeatable output interval, especially where machine and operator cycles interact across units.

Evidence / check: Actual trial timings and operating conditions accompany any proposed standard revision.

Completed resource-time reconciliation

Quantity	Calculation	Result
Manual work	$10 + 20 + 10$	40 sec
Automatic process	40 minus 10	30 sec
Operator waiting	40 minus 30	10 sec
Elapsed sequence	50 minus 0	50 sec
Incorrect sum	$40 + 30$	70 sec double-counts overlap

The separate task takes longer

In a hypothetical variant the separate task takes 35 seconds, starting at second 10.

Decision

It ends at 45, five seconds after the machine. Unloading is then 45-55 if all access assumptions still hold.

Reasoning

There is no operator wait before unloading; the machine instead waits five seconds. The original 50-second sequence no longer applies.

What would change the decision?

Manual content 55 sec; automatic 30 sec; elapsed 55 sec; machine wait 5 sec.

Practise with a changed case

Another machine and task pair

Separate fictional model: load 8 seconds, automatic process 24 seconds after loading, separate task 16 seconds during automatic operation, unload 6 seconds. No walking is included and overlap is declared permitted for the desk exercise.

Activity	Duration
Load	8 sec
Automatic	24 sec
Separate manual task	16 sec
Unload	6 sec

Your task

1. Draw the resource lanes and label all start/finish times.
2. Calculate manual content, automatic duration, operator waiting and elapsed sequence time.
3. State two real-world facts that could invalidate the proposed overlap.

Use the next page to record your reasoning before reading the answer.

Your practice worksheet

Another machine and task pair

Common time origin

Resource lane intervals

Manual / automatic / waiting totals

Elapsed completion

Unverified access or task readiness

Complete your reasoning before turning to the answer. Use the separate learner workbook for group practice.

Check your reasoning and transfer it

1. Load is 0-8; automatic 8-32; separate task 8-24; waiting 24-32; unload 32-38 seconds.
2. Manual work is $8 + 16 + 6 = 30$ seconds, automatic duration 24, waiting 8 and elapsed sequence 38 seconds.
3. Operator-attendance requirements, prohibited access, unavailable work or unmeasured travel could change the arrangement.

Suggested completed record

Measure	Interval / calculation	Result
Manual	$8 + 16 + 6$	30 sec
Automatic	8-32	24 sec
Waiting	24-32	8 sec
Elapsed	0-38	38 sec

Plausible wrong turns

1. Automatic duration is not always additive labor.
2. A hypothetical overlap does not grant permission to enter a machine area.

Evidence of a sound answer

1. Use one time scale and preserve precedence.
2. Account for waiting without calling it manual work.
3. Name a concrete feasibility check.

Take the learning back to work

Commitment	Agreed follow-through
Owner	Process engineer with operator and equipment owner
Record	Resource combination table plus observed access, timing and quality conditions
Review	After a controlled timing trial and before standard revision
Verification evidence	Feasible precedence, complete work content and representative observed sequence timing
If unresolved	Retain the approved method; revise the model from actual evidence and reassess proposed overlap.

Help someone else apply the method

Prepare

1. Timeline grid and separate operator/machine markers
2. Original and longer-task cards

Minutes	Activity and coaching prompt
4	Declare the lanes Who is doing each activity?
8	Build the 50-second sequence Where are the 20 seconds counted in both lanes?
8	Solve the changed model When can unloading actually begin?
5	Review reality checks Which condition cannot be proven by arithmetic?

Debrief

1. Ask why the longer task creates machine rather than operator waiting.
2. Do not accept a 70-second elapsed label for the supplied model.

Individual or remote practice

Draw the lanes to scale and check every shared-resource overlap before consulting the answer.

Connect the method and check its boundaries

Before application

1. Element observations
2. Machine boundaries known

Outside this lesson

1. Automatic time is not always additive labor
2. Overlap cannot bypass safe access

LEI: Standardized Work

LEI: Standardized Work

Takt, sequence, standard WIP; chart and combination table have distinct purposes

Method reference; original OPEX scenario and diagram are synthetic teaching content, not source case results.

[Open this lesson and its visual aids](#)