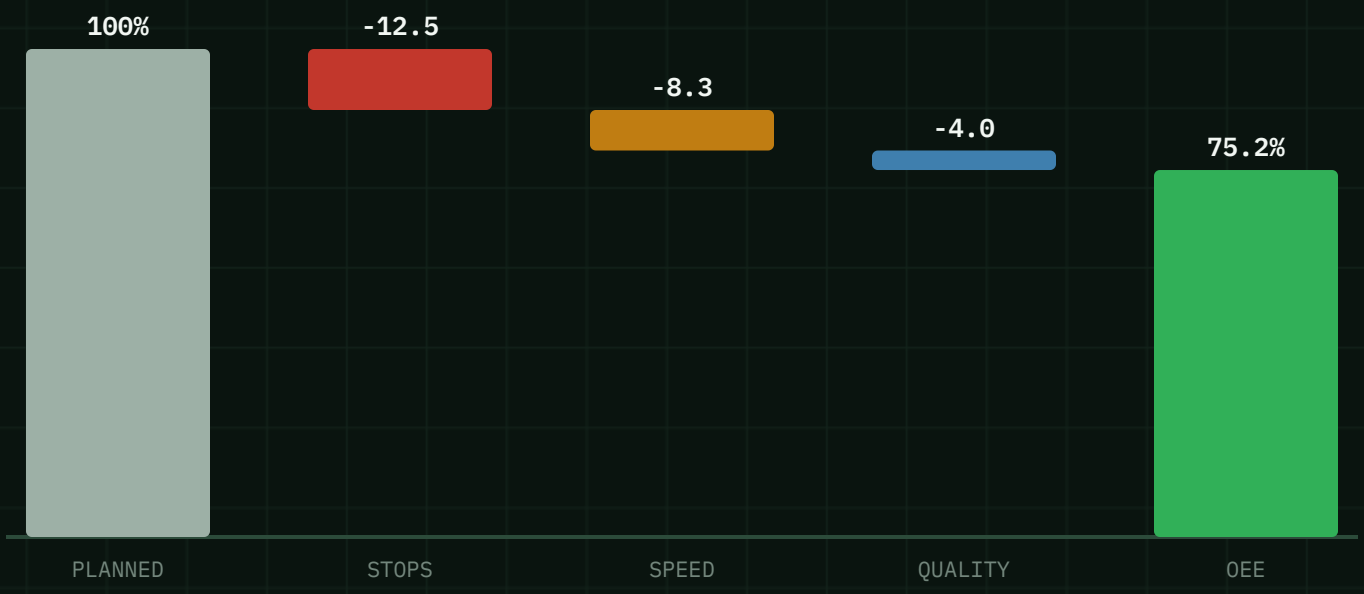
Fabrico

FIELD GUIDE · FOR PLANT, PRODUCTION AND MAINTENANCE MANAGERS

Why lines stop.

Your line loses more hours than anyone writes down. This guide shows you how to price them, count them honestly, fix the three that cost you most, and pick a system that keeps them fixed.

ONE EXAMPLE SHIFT · 480 PLANNED MINUTES · POINTS OF PLANNED TIME



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Why lines stop.

A field guide to the hours your line loses, and how you win them back.

Publisher Fabrico **Published** October 2026

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This guide does not replace an engineer who knows your plant. Your results will depend on your lines, your people and what you do next. If you read it and change nothing, your lines will keep losing what they lose today.

HOW TO READ THE NUMBERS

You will meet three kinds of number. **Published figures** name their source on the same page. **Worked examples** use round numbers so you can follow the sums, and each one says it is an example. **Your numbers** go in the sheets.

HOW TO READ THE SCREENS

The screens are real Fabrico screens from a demonstration plant, with sample data. They show the method, not a customer.

YOU WILL GET THE MOST FROM IT IF

- You run a plant, a production area or a maintenance team, and your lines stop more than you would like.
- You have an OEE number, but you do not quite believe it.
- You want one line to improve in 90 days, with proof that finance accepts.

IT IS NOT FOR YOU IF

- You want theory. The sources at the back go deeper.
- You want a tool before a method. In this guide the method comes first and the tool comes last.

WHAT YOU NEED TO START

One line, one week, a pencil, and one hour each with your production, maintenance and quality leads. Nothing to buy.

Contact: team@fabrico.io · fabrico.io

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PRICE IT AND MEASURE IT

Chapters 1 to 5: what your stops cost, and a baseline you trust.

FIX IT

Chapters 6 to 9: three losses, one meeting, one record, faster changeovers.

MAKE IT LAST

Chapters 10 and 11: a 90-day plan, a case finance signs, the right system.

IF YOU ONLY HAVE TEN MINUTES

Read page 4, then chapter 1. By the end of it you will know what one stopped hour costs on your line. That number decides how much of the rest you need.

START HERE

The guide on one page.

Your OEE number is what is left after three kinds of loss. Here is one example shift, in minutes: where its 480 planned minutes went. In chapter 4 you measure the same four parts on your own line.

ONE EXAMPLE SHIFT · WHERE 480 PLANNED MINUTES WENT

Stops · 60 min
availability loss

Slow running · 40 min
performance loss

Scrap · 19 min
quality loss

OEE = 361 good minutes ÷ 480 planned = 75.2%

Example values: 480 planned minutes, 60 minutes of stops, 380 parts made at 1.0 minute a part, 361 of them good. Chapter 4 works through it.

CHAPTER	WHAT YOU WILL HAVE AT THE END
1 What a stopped hour costs	The cost of one hour on your line, in euros, in 20 minutes
2 Where plants really stand	A first target in hours, not in OEE points
3 Measuring honestly	Six losses, and a check for the five ways a number gets inflated
4 A baseline on one line	A week of data nobody in your plant will argue with
5 The stops paper never sees	Proof of your short stops and slow running, with a pencil
6 The top three losses	Three losses, three owners, three first actions
7 The ten-minute meeting	A daily meeting that decides instead of argues
8 Stop reason to work card	One record for the stop and the repair
9 Changeovers	The first ten minutes out, without buying anything
10 The 90-day plan and the case	A plan your plant can run and a case finance can sign
11 Choosing a system	Twelve questions and ten things to see live

CHAPTER 1

What a stopped hour costs

Your line stops at 10:40. A technician walks over, finds a jammed sensor and cleans it. By 11:10 you are running again. The maintenance log gets one line: thirty minutes, one sensor cleaned, no parts. On paper, it was a cheap stop.

It was not. For thirty minutes your line made nothing you could sell. Six of your operators waited. The first parts after the restart went into the scrap bin. Thursday's shipment was already tight, so someone booked a Saturday shift. None of that is in the maintenance log.

In this chapter you put a number on one stopped hour on your own line. It takes you about twenty minutes and one sheet of paper.

The bill you see, and the one nobody adds up

A stop causes seven kinds of cost. Your maintenance log sees two of them.

COST	WHAT IT IS	WHERE IT LANDS
Spare parts	Parts used in the fix	Maintenance budget
Repair labour	Hours to find and fix the fault	Maintenance budget
Lost margin	Output you did not make, at margin	Nowhere: the sale never happened
Idle labour	Operators paid to wait	Payroll, as normal hours
Scrap and restart	Bad parts after the restart	Quality and materials
Overtime and freight	Extra shifts, express trucks	Payroll and freight
Missed deliveries	Penalties, orders at risk	Sales

You see the first two because they have their own budget line. The other five are spread over payroll, quality, freight and sales. Each looks small where it lands. Nobody sees the sum.

CHAPTER 1

Five terms price your hour

You do not need to guess. Someone in your plant already has each number. Ask the right person and write it down.

TERM	HOW YOU FIND IT	WHO HAS YOUR NUMBER
Lost margin	Units an hour × margin a unit (price minus variable cost)	Controller
Idle labour	Operators left waiting × loaded cost an hour	Payroll
Scrap and restart	12 months of restart scrap ÷ lost hours	Quality lead
Overtime and freight	12 months of overtime and express freight ÷ lost hours	Planner, logistics
Penalties	12 months of late penalties ÷ lost hours	Sales

Add the five and you have the cost of one hour on that line. Leave repair labour and parts out: they are already in your maintenance budget, and you would count them twice.

One line, worked through to the euro

Here is one line over twelve months. It lost 150 hours to 180 unplanned stops.

TERM	INPUTS	€ AN HOUR
Lost margin	600 units an hour × €4.00 margin	2,400
Idle labour	6 operators × €30 loaded cost	180
Scrap and restart	180 restarts × €150 = €27,000 ÷ 150 hours	180
Overtime and freight	10 express shipments × €1,800 = €18,000 ÷ 150 hours	120
Penalties	None in these 12 months	0
Cost of one hour		**2,880**

One stopped hour on this line costs €2,880. The year costs €2,880 × 150 = **€432,000**. Your log sees only the part below: the part you do not see is eighteen times bigger.

THE SAME LOST HOUR, TWO PRICES · EXAMPLE LINE

Example values, not typical ones. Log: repair labour and parts, €24,000 ÷ 150 hours = €160 an hour. Use your own numbers.

CHAPTER 1

Hours leak out three ways, not one

Breakdowns are the stops you remember. They are only one of three ways your line loses hours:

- **Stopped.** Breakdowns, waiting for material, changeovers that run long.
- **Running slow.** Short stops and slow cycles.
- **Making scrap.** Hours spent on parts you throw away or rework.

Take one 480-minute shift. A 40-minute breakdown goes into the log. Sixteen short stops of two minutes each, 32 minutes in total, do not: each is cleared in seconds, so they just look like slow running. Price the slow and scrap hours like downtime. They cost you the same margin.

Example values.

Four traps your controller will catch

- **Revenue instead of margin.** Use price minus variable cost. Material you did not use is not a loss.
- **Margin and overtime for the same parts.** If overtime made up the output, count the overtime, not the margin.
- **Every line as the bottleneck.** A line with spare capacity can catch up. Its lost hour costs labour and scrap, not always margin.
- **Idle labour that was not idle.** If your operators moved to other work, do not count them.

A fifth trap is the most common: lost hours from memory. You remember the long breakdowns and forget the short stops. Use your stop log, and say so.

Rank your lines by what they really cost

LINE	€ AN HOUR	LOST HOURS A YEAR	€ A YEAR
Line A	2,880	150	**432,000**
Line B	900	400	360,000
Line C	5,000	60	300,000
Line D	600	250	150,000

Line C has the dearest hour. Line B loses the most hours. Line A leads on neither, and it ranks first. That is where you start.

Example rows.

CHAPTER 1

One page for finance

Your finance team does not need your worksheets. It needs one page: every line with its lost hours, its cost an hour and its cost a year, your three biggest losses in hours, and one ask. Keep it honest: the same twelve months and the same source of lost hours for every line, every figure with the name of the person who gave it, and one ask in one sentence: fund this, for this amount, to attack this loss, which costs this much a year.

YOUR WORKSHEET · CHAPTER 1 · ONE SHEET PER LINE

The cost of one hour on your line

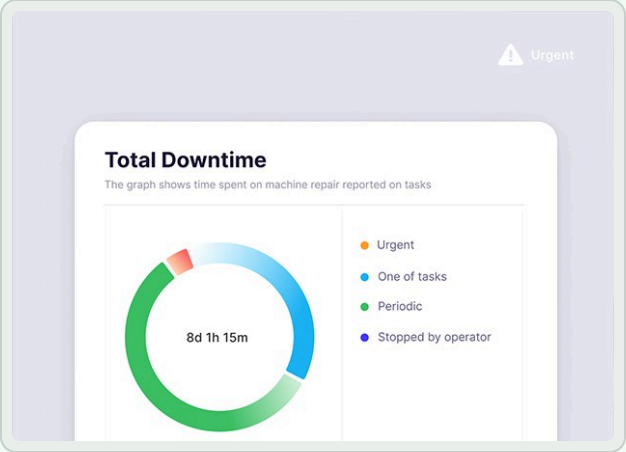
TERM	YOUR INPUTS	€ AN HOUR
Lost margin	units an hour × margin a unit	
Idle labour	operators × loaded cost an hour	
Scrap and restart	12 months ÷ lost hours	
Overtime and freight	12 months ÷ lost hours	
Penalties	12 months ÷ lost hours	
Cost of one hour	sum of the five	
Cost a year	cost of one hour × lost hours	

Margin is price minus variable cost. Repair labour and parts stay out. Lost hours come from your stop log or your machines.

Fabrico THE SAME, RUN FROM THE MACHINES

The weak number on this page is your lost hours. Fabrico takes them from the machines: stops with their reasons, per line and shift, through PLC signals, IoT sensors or cameras with computer vision (an add-on). Your operator picks the reason at the line, during the stop.

Book a demo



Real Fabrico screen: downtime by cause **Sample data**

CHAPTER 2

Where plants really stand

Sooner or later someone in your plant says it: world class is 85%, we are at 60%, so we are bad. It is the wrong conclusion from the wrong comparison. This chapter shows you what the 85% means and what plants that measure honestly find.

Where 85% comes from

The 85% figure goes back to Seiichi Nakajima's work on total productive maintenance in the 1980s. It was set as world class: the level of the best plants. It was never the level of a typical plant, and it was never a first-year target for a line that has just started to measure.

So if your plant is at 60%, you are not failing a standard. You are somewhere on a long scale that very few lines reach the top of. And if you see 85% after a few months of measuring, check the definition first. Chapter 3 shows you how a number gets there without anyone lying.

Source: Nakajima, S. (1988). Introduction to TPM: Total Productive Maintenance. Productivity Press. The usual source given for the 85% world class figure.

What plants find when they measure

Two published studies give you a sense of the range. Both come from Chalmers University in Sweden, from different decades with different methods. Read them as reference points, not as a league table.

~55%

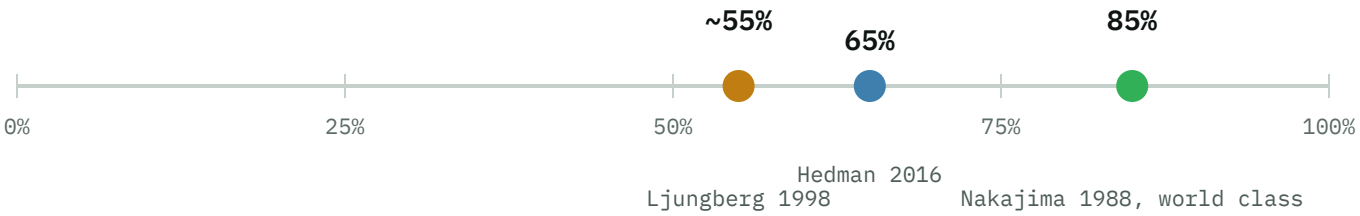
Across about 20 cases. OEE was "only around 55 per cent", and running slow and short stops were the biggest losses.

65%

The average across 884 machines in 23 companies, recorded automatically. Most machines there showed 100% performance, so the 65% mostly counts stops.

Sources: Ljungberg, Ö. (1998). International Journal of Operations & Production Management, 18(5), 495 to 507. Hedman, R., Subramaniyan, M., Almström, P. (2016). Procedia CIRP, 57, 128 to 133.

THREE PUBLISHED NUMBERS ON ONE SCALE · OEE



CHAPTER 2

Read the second study twice

In the study of 884 machines, almost half of the recorded losses could not be classified, because the loss categories were missing or poorly described. Even with automatic measurement, half the lost time had no usable reason. A number without reasons tells you how much time you lose. It tells you nothing about where to start. That is why chapter 3 spends as long on reason codes as on the formula.

Source: Hedman, R., Subramaniyan, M., Almström, P. (2016). Analysis of critical factors for automatic measurement of OEE. Procedia CIRP, 57, 128 to 133.

If your number does not match

If your line reports far above these ranges, check your definition before you celebrate. Check these four first:

- Changeovers taken out of planned time, so they never count as a loss.
- A "standard" cycle time lowered after a bad month, so speed losses vanish.
- Short stops that never reach a manual log.
- Startup scrap and rework left out of the reject count.

If your line reports far below, check the shift calendar. A line measured against 24 hours when it is only staffed for 16 looks worse than it runs.

A sensible first target

Do not set an OEE target in your first year. Set a target in hours. Take the top three losses from chapter 6 and aim to win back part of their hours on one line in 90 days, on the same definition before and after. OEE will move as a result, and nobody can say the gain came from a changed definition.

Compare your line with itself first: this month against its baseline, its best shift against its worst. The gap between your best and worst shift, on the same machines with the same products, is the most convincing target you will find. Your plant has already proven it can run that way.

CHAPTER 2

Where your line stands

YOUR WORKSHEET · CHAPTER 2 · ONE LINE, LAST FOUR WEEKS

Where we stand

WHICH SHIFT	AVAILABILITY	PERFORMANCE	QUALITY	OEE
All shifts				
Best shift				
Worst shift				

#	TOP LOSS	HOURS, FOUR WEEKS	OWNER
1			
2			
3			

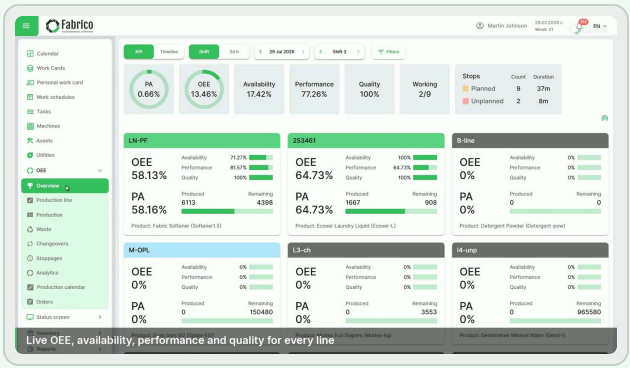
Your target: hours to win back on the top three by _____ (90 days), measured on the same definition.

No OEE target in the first year. Your hours are the target; OEE follows.

Fabrico THE SAME, RUN FROM THE MACHINES

Comparing your line with itself only works if both sides use the same definition and the same data. Fabrico calculates availability, performance and quality per line and shift from the machines, with stops and their reasons picked at the line. Your best shift, your worst shift and your baseline come from one source.

Book a demo



Real Fabrico screen: OEE overview per line

Sample data

CHAPTER 3

Measuring honestly

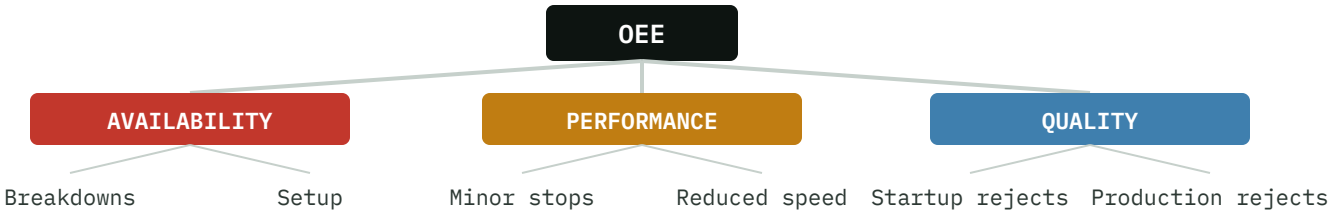
If you measure OEE, you may have a number you do not quite believe. Nobody lies to you. Every small choice in how your number is built just leans the same way: toward a better number. A changeover taken out of planned time. A speed target lowered after a bad week. Warm-up scrap binned before anyone counts it. Together, these choices make your line look better than it runs, and they hide the losses you most need to fix.

You do not fix OEE. You fix the six losses under it.

OEE is availability × performance × quality. You cannot "improve availability" on a Tuesday morning. You can act on a specific loss. The six big losses, from Nakajima's work, give every lost minute on your line one place to sit.

FACTOR	LOSS	WHAT YOU SEE ON THE FLOOR
Availability	Breakdowns	Equipment fails, your line stops for repair
	Setup and adjustments	Changeovers, last good part to first good part
Performance	Idling and minor stops	Short stops your operator clears alone
	Reduced speed	The line runs below its ideal rate
Quality	Startup rejects	Scrap after a start, before the process settles
	Production rejects	Scrap and rework during steady running

The six big losses: Nakajima, S. (1988). Introduction to TPM. Productivity Press.



One rule sits above all six: you capture losses from your machine, not from memory. A manual log keeps the long stops and loses the short ones, so your small losses disappear first.

CHAPTER 3

The six, one at a time

01 **Breakdowns: fix the repeats first.** Each failure looks like bad luck on the day. The pattern only shows across days and shifts. Capture the stop with its start and end time, and let maintenance add the cause. Your first move: a work order for every breakdown over a threshold, causes ranked by hours, the top one removed. Owner: your maintenance lead.

02 **Changeovers end at the first good part.** If you take a changeover out of planned time, it drops out of OEE and nobody attacks it. Tag it as a changeover, and let the good count mark its real end. Your first move: film one changeover (chapter 9). Owner: your production lead.

03 **Minor stops never reach your shift log.** A jam, a blocked sensor, an empty feeder, cleared in seconds. Together they can outweigh a breakdown. In one example shift your machine counts 18 stops and your shift log counts none. Your first move: count them by cause for a week and fix the most frequent one at your machine. Owner: your line supervisor.

04 **Reduced speed is the loss nobody hears.** Your line runs, just slower than it can. Against a lowered "standard" rate, performance looks fine all shift. Compare the actual cycle time with one ideal cycle time per product. Owner: your process engineer.

05 **Startup rejects belong in the scrap count.** After a start, the first parts are bad while settings settle. If they are called "warm-up" and binned, your quality looks better than it is. Your first move: a startup checklist, signed at the first good part. Owner: your shift lead.

06 **Production rejects: count rework too.** A reworked part that joins the good count hides the loss. Count rework as a reject, with a defect reason. Your first move: rank defects by machine and shift, attack the top one. Owner: your quality lead.

The 18-stop shift is an example.

CHAPTER 3

Five ways your OEE number gets inflated

Read your own OEE definition against this list. Every yes means part of your number is not real.

01 **Changeovers taken out of planned time.** Then the changeover costs nothing on paper.

02 **Speed measured against a lowered rate.** If the standard was relaxed after a bad week, you measure against the problem, not your machine.

03 **Startup scrap left out.** Warm-up rejects that nobody counts make quality look better than your process is.

04 **Rework counted as good.** A part that needed a second pass was not good the first time.

05 **Short stops lost from a manual log.** Every stop nobody wrote down turns into "slow running" or disappears.

None of these needs bad intent. Each is a default somebody chose once and nobody revisited. Write your definition down, on one page, and review it with the people who build your number.

Reason codes that stay clean

The six losses only help if every stop carries a reason, and reasons only help if your list stays clean. Six rules:

- **Five to eight codes per line.** Give your operators a long list and they pick the first one.
- **Words your operators use.** "Feeder empty", not "material flow deviation".
- **The machine finds the stop, a person adds why.** Start, end and length never come from memory.
- **One "Other", read every week.** Re-code it, or add the code that is missing.
- **A review every month.** Merge the codes nobody uses, split the one everyone uses.
- **Every code maps to one of the six losses**, so your Pareto chart rolls up to the loss tree.

CHAPTER 3

The six-losses map for your line

YOUR WORKSHEET · CHAPTER 3 · FILL IT WITH THE PEOPLE WHO OWN EACH LOSS

The six-losses map

LOSS	HOW YOU CAPTURE IT TODAY	LOST HOURS, LAST WEEK	OWNER	FIRST MOVE
Breakdowns				
Setup and adjustments				
Idling and minor stops				
Reduced speed				
Startup rejects				
Production rejects				
Total				

A changeover is a loss, so it stays in planned time. Rework counts as a reject. One owner per loss: a person, not a department.

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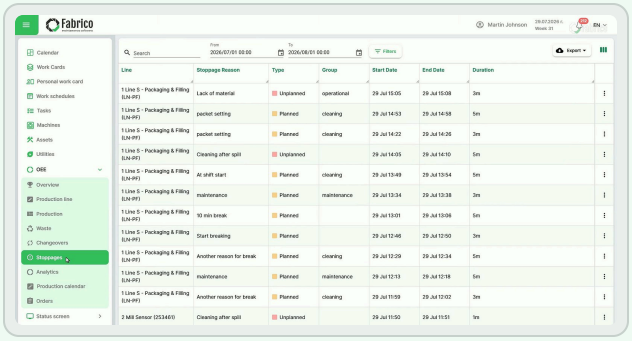
Measuring honestly is easier when your raw data does not depend on memory. Fabrico counts stops from the machine, through PLC signals, IoT sensors or cameras with computer vision (an add-on), and your operator picks the reason at the line while the stop is happening. Downtime shows by cause, line, machine and shift, and a breakdown can become a maintenance work card in the same system.

Book a demo



Real Fabrico screen: stops with their reasons

Sample data

CHAPTER 4

Days 1 to 7: a baseline on one line

Every improvement starts with one question: better than what? If your starting number is soft, every later number is an argument. In this chapter you get a baseline for one line in one week that nobody in your plant will argue with, on paper if that is all you have.

Pick one line. Not your best and not your worst: the one whose losses your people talk about most. You learn more from one line measured properly than from ten measured roughly.

Five inputs every OEE number is built from

Get these five right in week one and many OEE arguments never start. Write each one down, with a name next to it.

INPUT	WHAT "RIGHT" MEANS
Shift calendar	Planned production time per line, with breaks and other time off agreed in writing
Machine states	Run and stop, with times, from your machine where you can, never from memory
Counts	Total and good parts per product, counted at the same point on every line
Ideal cycle time	One value per product and machine, from the design or the best proven rate
Scrap and rework	Recorded per machine and shift, with a reason

WRITE IT DOWN NOW

The line you pick: _____ Why this one: _____

The one you will be tempted to skip is the ideal cycle time. If you take it from the "standard" rate your line was set to after a bad month, performance looks fine for ever. Chapter 3 called this the second way an OEE number gets inflated.

CHAPTER 4

The formula, and the shift that settles arguments

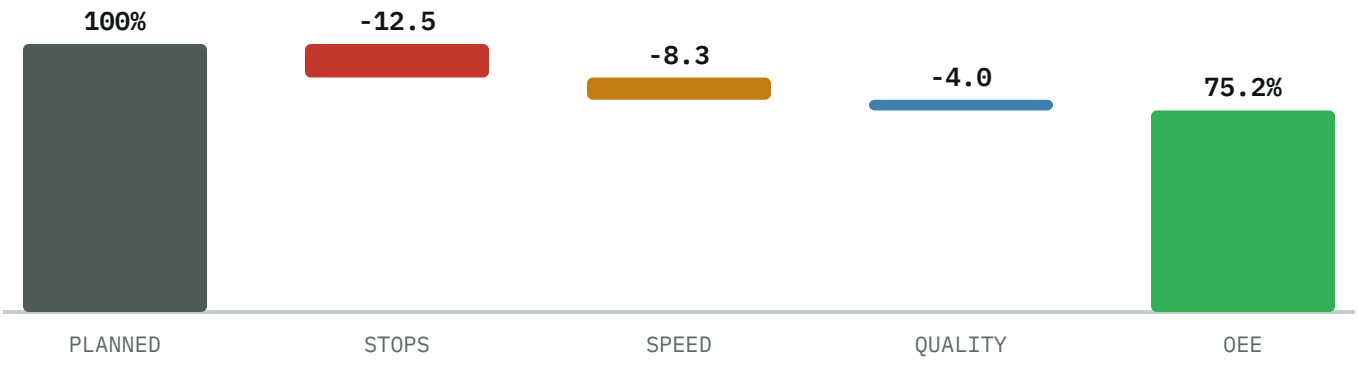
OEE is availability × performance × quality. Availability is run time ÷ planned time. Performance is ideal cycle time × total count ÷ run time. Quality is good count ÷ total count. Here is one shift, worked through.

INPUT OR RESULT	WORKING	VALUE
Planned time		480 min
Stops		60 min
Ideal cycle time		1.0 min a part
Total / good count		380 / 361
Availability	420 ÷ 480	87.5%
Performance	380 × 1.0 ÷ 420	90.5%
Quality	361 ÷ 380	95.0%
OEE	**87.5% × 90.5% × 95.0%**	**75.2%**

Example values with round numbers, not a typical value.

Here is a cross-check that never lies: OEE also equals good count × ideal cycle time ÷ planned time. Here, 361 × 1.0 ÷ 480 = 75.2%. If your two answers differ, one of your definitions is wrong. Better to find out in week one than in week ten.

ONE EXAMPLE SHIFT · 480 PLANNED MINUTES · POINTS OF PLANNED TIME



As a waterfall, your losses become visible: 12.5 points to stops, 8.3 to speed, 4.0 to quality.

CHAPTER 4

Your week, day by day

01 **Day 1. Agree the definition.** Sit down with production, maintenance and quality for one hour. Write down when your line is planned to run, and which breaks come out of planned time. Decide now that changeovers stay in. Everyone signs the page.

02 **Day 2. Fix the ideal cycle times.** One value per product. Use the design rate, or the best rate your line has held for a full shift. Write down where each value came from.

03 **Day 3. Write the stop-reason list.** Five to eight reasons, in your operators' words, each mapped to one of the six losses from chapter 3, plus one "Other" that someone reads every day. Put the list next to your line.

04 **Days 3 to 7. Record.** Every stop with its start, its end and its reason. The total and good count at the end of every hour. Scrap and rework with a reason. If your machine can give you run and stop times, take them from your machine and let your operator add only the reason.

05 **Day 7. Calculate and cross-check.** Availability, performance, quality and OEE for each shift, then the cross-check. Then add up the stop minutes by reason. That list is where chapter 6 starts.

The trap in a paper week

A paper tick sheet gives you a good baseline for availability. It will understate your short stops, because a stop of fifteen seconds often goes unmarked, and it then shows up as slow running. That is fine for a first week, as long as you know it. Write one sentence under your baseline: "short stops under one minute are not in this count". Chapter 5 is about catching them.

BY THE END OF DAY 7 YOU HAVE

One definition everyone signed, ideal cycle times with their sources, a reason list your operators use, and OEE per shift that passes the cross-check.

CHAPTER 4

Two sheets for your week

YOUR WORKSHEET · CHAPTER 4 · ONE SHEET PER SHIFT, DAYS 3 TO 7

The tick sheet

Line _____ **Date** _____ **Shift** ____ **Ideal cycle time** ____ min a part

HOUR	STOPS IN THIS HOUR: START, END, REASON CODE	TOTAL	GOOD	INITIALS
1				
2				
3				
4				
5				
6				
7				
8				

Count total and good parts at the same point, at the end of every hour. Short stops under one minute are not in this count.

YOUR WORKSHEET · CHAPTER 4 · AGREED ON DAY 3, NEXT TO YOUR LINE ALL WEEK

The stop-reason list

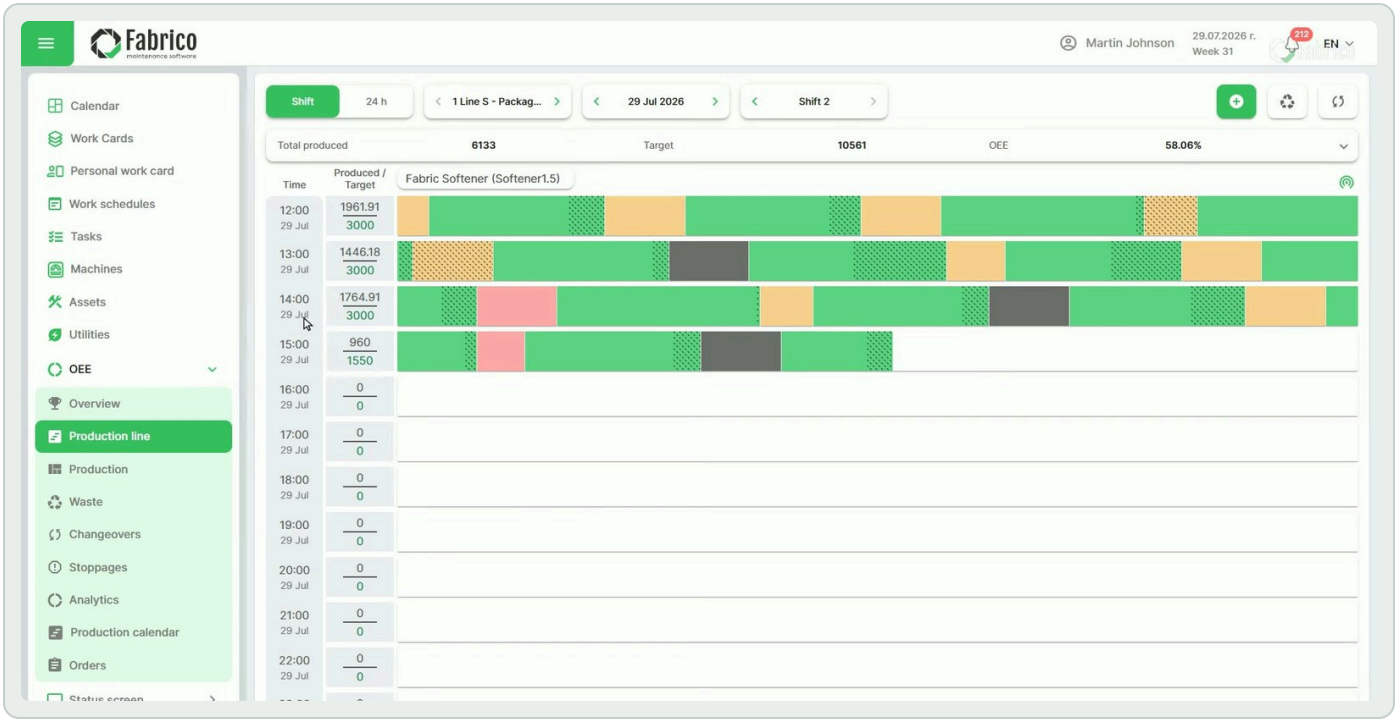
CODE	REASON, IN YOUR OPERATORS' WORDS	LOSS IT BELONGS TO
1		
2		
3		
4		
5		
0	Other	Read by one named person every week

Five to eight codes, plus one "Other". Each maps to one of the six losses: breakdowns, setup, minor stops, reduced speed, startup rejects, production rejects.

CHAPTER 4

The same week, from your machines

On paper, your week costs your operators a few minutes every hour, and it still misses the short stops. That is the trade you make for starting this week without buying anything. When you are ready to stop making that trade, this is what changes.



Real Fabrico screen: one line, hour by hour, with stops and their reasons **Sample data**

YOUR PAPER WEEK

- Your operators spend a few minutes every hour on the sheet.
- Stops under a minute are not in the count.
- You do the day 7 sums by hand, once.

THE SAME WEEK FROM YOUR MACHINES

- Your operators add only the reason, at your line.
- Short stops are there too, on connected machines.
- The numbers are there every morning, per line and shift.

Fabrico THE SAME, RUN FROM THE MACHINES

Fabrico records the machine states and counts for every line and shift from the machines, and your operator picks the reason at the line while the stop is happening. Availability, performance, quality and OEE come per line and shift in real time, on one definition. Your day 7 sums are there every morning, without a calculator.

Book a demo

CHAPTER 5

The stops paper never sees

Ask your shift lead how often your line stopped yesterday and you hear about the long stops: the breakdown at ten, the changeover after lunch. Ask your machine and you get a different answer, because many of its stops were too short to write down. A jam cleared in four seconds. A sensor wiped. A part pushed back into its guide. Each one is nothing. Together they are often one of the biggest losses on your line, and on paper they leave no trace.

What a four-second stop costs

A filling machine stops for four seconds when a bottle tips over. Your operator stands it up and your line runs again. It happens about once every two minutes.

STEP	WORKING	RESULT
Stops in 7 hours of production	420 min ÷ 2	210 stops
Time stopped	210 × 4 s	14 min
Run-up after each stop (8 s at half speed)	210 × 4 s	14 min
Lost per shift		**28 min**
Lost per week (3 shifts, 5 days)	28 × 15	**7 hours**

Example values, not typical ones.

ONE EXAMPLE SHIFT · 210 STOPS OF FOUR SECONDS · NONE IN THE SHIFT LOG

A full shift every week, lost in pieces of four seconds, and not one of them is in your shift log. Paper misses it for a simple reason: writing down a four-second stop takes longer than the stop. So shift logs use a threshold of a few minutes, and everything under it is cleared and forgotten. Nobody is hiding anything. The tool cannot see that small.

CHAPTER 5

Slow running makes no noise

A stopped line is loud. A slow line is quiet. You walk past a machine that runs at 54 parts a minute instead of 60, because it is running.

OVER 420 MINUTES OF RUNNING	WORKING	PARTS
Ideal output	420 × 60	25,200
Actual output	420 × 54	22,680
The gap	**2,520 ÷ 60 = 42 minutes at the ideal rate**	**2,520**

Example values: ideal rate 60 parts a minute, actual 54.

Your line never stopped, so no stop log shows anything. And if the "standard" rate in your system was lowered to 54 after a bad month, performance reads 100% while your line gives away 42 minutes a shift.

Lost speed has causes. A line is turned down after a jam so the jam does not come back. A tool wears. A material runs badly. A new operator plays safe. You can fix each one, but only once you see the gap.

Find the gap on paper first

Before you install anything, one shift and a calculator show you whether there is a gap worth hunting:

01 Ideal output = planned time × ideal rate.

02 Take away the output lost in the stops you logged: logged stop minutes × ideal rate.

03 Take away the total count, good parts and rejects together.

04 What is left went missing without a record: short stops and slow running.

Example: 420 minutes at 60 parts a minute is 25,200 parts. Your log shows 35 minutes of stops, so 2,100 parts. Your total count is 21,000. That leaves 2,100 parts: **35 minutes that nobody wrote down**.

Example values.

CHAPTER 5

The stopwatch hour

To split your gap into short stops and slow running, watch your machine. One hour per shift, with a stopwatch, for one week. Count every stop, its length in seconds and its cause, and count the parts in the same hour. The stops give you the short stop share. The rest of the gap is speed. On three shifts, five days a week, that is fifteen hours of watching. Use them to name your first three causes. The first one is often fixed at your machine, not in a meeting.

Three ways to count without your operator

The paper hunt proves the gap and finds your first causes. It cannot run every shift. For that, the count has to come from your machine, and you have three ways to get it.

METHOD	WHAT IT SEES	WHAT YOU INSTALL	WHERE IT FITS
PLC signals	Run state and part count from the controller	Access to the controller, through the network or a gateway	Machines with a modern controller
IoT sensors	Motor running, parts passing	A sensor, power, a network connection	Older machines with no usable signal
Camera with computer vision	Parts and flow at the process area	A mounting point above your line, light, power, network	Manual stations, mixed parts, no signal at all

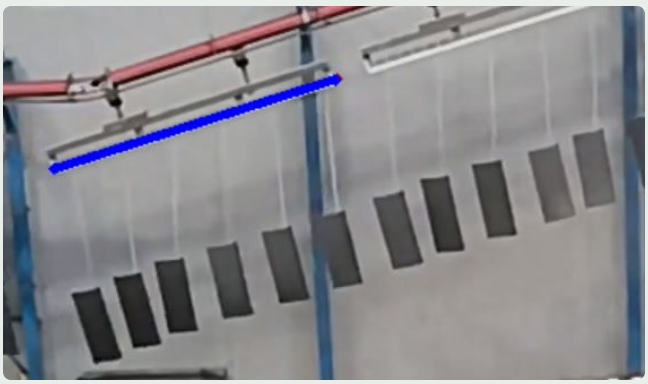
PLC signals are the cleanest source where they exist, but you need the people who look after your machine's control, because they know which signal means what. A sensor added from the outside changes nothing in the control. A camera fits where neither can see. Many of your lines will end up with a mix: the method follows your machine, not your plant.

Whichever you pick, check its first week against your stopwatch hour. If the two counts disagree, trust neither until you know why.

CHAPTER 5

The question your crew will ask

The first question on your floor is often not technical. It is "is it filming me?", and it deserves an answer before the camera goes up, not after.



Fabrico computer vision at a process area **Sample data**

WHAT IT POINTS AT

The process area: the parts, the conveyor, the station.

WHAT IT RECORDS

Video, recorded continuously in short segments linked to what your line was doing, so you can review a stop next to its machine data.

WHERE IT IS KEPT

Fabrico runs on AWS: in Germany for EU clients, in a suitable region for US clients. Ask any vendor where clips are kept, and for how long.

Before installation day, ask your vendor two more questions in writing: how long is the footage kept, and who in your plant can see it? Give your crew all the answers in the same words, and let them see what the screen shows.

Then put one person on the floor who can answer the question when it comes up again. It will come up again, usually on the night shift.

What to say at the line, in three sentences

01 **Why it is there.** We use it to find out why the line stops, not to judge people.

02 **Who sees it.** Name the people or roles from your vendor's written answer, nobody else.

03 **How to check.** Anyone on the crew can ask to see what it recorded on their shift.

CHAPTER 5

Your short stop hunt

YOUR WORKSHEET · CHAPTER 5 · ONE MACHINE, ONE WEEK

The paper gap

DAY, SHIFT	PLANNED MIN	IDEAL OUTPUT	LOST IN LOGGED STOPS	TOTAL COUNT	MISSING MIN
Week					

Missing parts = ideal output minus logged-stop output minus total count. Missing minutes = missing parts ÷ ideal rate.

YOUR WORKSHEET · CHAPTER 5 · ONE HOUR PER SHIFT AT YOUR MACHINE

The stopwatch hour

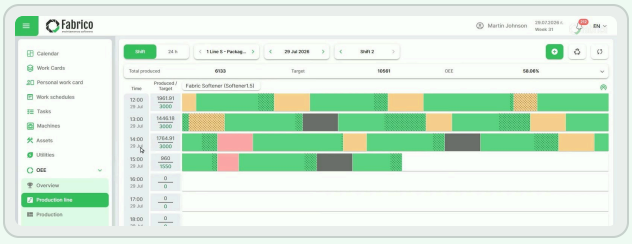
#	CLOCK TIME	LENGTH, S	CAUSE	WHAT YOUR OPERATOR DID
1				
2				
3				
4				
5				

End the week with one cause to fix, not a list.

Fabrico THE SAME, RUN FROM THE MACHINES

Fabrico counts stops from the machine, through PLC signals, IoT sensors or cameras with computer vision (an add-on), so your short stops are counted, not estimated. Slow cycles count as performance loss, not downtime. With hardware, installing and connecting the devices takes about a month, and the full rollout takes three to four months.

Book a demo



Real Fabrico screen: short stops on the line timeline **Sample data**

CHAPTER 6

Choosing the top three losses

After your baseline week you have a list of every stop and its reason. You will be tempted to attack all of it. Your programme can die right there: ten actions, nobody quite owning any of them, and in six weeks your line looks the way it did before. In this chapter you choose three, and only three.

Rank losses in hours, not in percent

"Availability is down two points" does not tell your supervisor what to do on Tuesday. Hours do. An hour is something your supervisor can see, count and win back. Take two weeks of stop data, add up the hours lost per loss type, and sort.

LOSS TYPE	HOURS LOST, TWO WEEKS
Changeovers	**18.0**
Breakdowns	**14.4**
Minor stops	**10.2**
Waiting	5.4
Startup rejects	3.6
Reduced speed	2.4
Total	**54.0**

Example values. The top three hold 42.6 of the 54.0 hours.

A few loss types carry most of your time, and they are often not the ones your people complain about most loudly. Three rules keep your ranking honest:

- **Hours from stop data, not shift notes.** Notes remember the dramatic breakdown and forget the forty short stops.
- **Top three only.** A fourth action splits your team and nothing moves.
- **Two weeks, not one.** One bad day can dominate a week. Two weeks show the pattern.

CHAPTER 6

One owner and a first action for each

Before you rank, check that every hour sits on the right branch of the loss tree: breakdowns and setup under availability, minor stops and reduced speed under performance, startup and production rejects under quality. If a big share of your hours sits under "Other", fix your reason list before you trust the ranking.

A loss without an owner is a statistic. For each of your three, name one person, not a department, and one first action that can start this week.

LOSS	TYPICAL OWNER	FIRST ACTION
Breakdowns	Maintenance lead	A work order for every stop over a threshold; find the cause of the repeats
Changeovers	Production lead	Film the longest changeover; move steps outside the stop
Minor stops	Line supervisor	Reason codes your operators will use, five to eight per line
Reduced speed	Process engineer	Running rate against ideal rate, per product
Startup rejects	Shift lead	A startup checklist, signed at the first good part
Production rejects	Quality lead	Scrap by machine and shift, reviewed with the loss owner

Then run one countermeasure per loss every two weeks. Nothing counts as done until the loss hours fall in your data. A countermeasure that "should have worked" and shows nothing in the hours did not work.

What usually goes wrong

- **Chasing your number.** The talk drifts back to OEE points. Keep it on loss hours.
- **Moving definitions.** Someone reclassifies a stop as planned halfway through. Your gain on paper is not a gain on your line. Keep the chapter 4 definition fixed.
- **Reviews without decisions.** A review with no owner and no date is a report. Chapter 7 fixes that.

CHAPTER 6

Your loss register

YOUR WORKSHEET · CHAPTER 6 · ONE LINE, TWO WEEKS OF STOP DATA

The register, sorted by hours

RANK	LOSS TYPE	HOURS LOST	SHARE	RUNNING TOTAL
1				
2				
3				
4				
5				
6				
	Total		**100%**	

#	LOSS	OWNER, A PERSON	FIRST ACTION	HOURS BEFORE	HOURS AFTER
1					
2					
3					

Before and after: two weeks each, on the same definition. Done means the hours fell.

Fabrico THE SAME, RUN FROM THE MACHINES

Your ranking is only as good as the stop data under it. Fabrico shows downtime by cause, line, machine and shift, from the machines, for the current shift, last week or a past month, so the ranking is there without a spreadsheet. From a stop, a technician can open a work card for its owner in the same system.

Book a demo

Line	Stoppage Reason	Type	Group	Start Date	End Date	Duration
1 Line S - Packaging & Filling (LN-PF)	Lack of material	Unplanned	operational	29 Jul 15:05	29 Jul 15:08	3m
1 Line S - Packaging & Filling (LN-PF)	packet setting	Planned	cleaning	29 Jul 14:53	29 Jul 14:58	5m
1 Line S - Packaging & Filling (LN-PF)	packet setting	Planned	cleaning	29 Jul 14:22	29 Jul 14:26	3m
1 Line S - Packaging & Filling (LN-PF)	Cleaning after spill	Unplanned		29 Jul 14:05	29 Jul 14:10	5m
1 Line S - Packaging & Filling (LN-PF)	At shift start	Planned	cleaning	29 Jul 13:49	29 Jul 13:54	5m
1 Line S - Packaging & Filling (LN-PF)	maintenance	Planned	maintenance	29 Jul 13:34	29 Jul 13:38	3m
1 Line S - Packaging & Filling (LN-PF)	10 min break	Planned		29 Jul 13:01	29 Jul 13:06	5m
1 Line S - Packaging & Filling (LN-PF)	Start breaking	Planned		29 Jul 12:46	29 Jul 12:50	3m
1 Line S - Packaging & Filling (LN-PF)	Another reason for break	Planned	cleaning	29 Jul 12:29	29 Jul 12:34	5m
1 Line S - Packaging & Filling (LN-PF)	maintenance	Planned	maintenance	29 Jul 12:13	29 Jul 12:18	5m
1 Line S - Packaging & Filling (LN-PF)	Another reason for break	Planned	cleaning	29 Jul 11:59	29 Jul 12:02	3m
2 Mill Sensor (253461)	Cleaning after spill	Unplanned		29 Jul 11:50	29 Jul 11:51	1m

Real Fabrico screen: downtime by cause, ranked

Sample data

CHAPTER 7

The ten-minute daily meeting

In many plants the morning meeting is where yesterday gets argued about. Whose numbers are right, why your line stopped, who should have called whom. It runs long, it ends without decisions, and by ten o'clock your day has already gone the way it was going to go.

In this chapter you run a different meeting: ten minutes, standing, at your line, about today. It works because it uses the same loss hours as your Monday review in chapter 10, and because it decides instead of discusses.

One board, one agenda, every day

Your meeting has one board and one agenda, and both stay the same every day. When the agenda stays the same, your people prepare the numbers, not a speech.

MINUTES	ITEM	WHAT IS SAID
0 to 2	**Yesterday in hours**	Planned hours, lost hours, against the target. No debate on your number.
2 to 5	**The top losses yesterday**	The two or three biggest stop reasons in hours, and what happened
5 to 8	**Actions**	Due today, done, blocked. Every blocked action gets a decision now.
8 to 10	**Today**	Anything that will stop your line today: material, a maintenance window, a changeover, people

ON YOUR BOARD

- Yesterday's lost hours, by reason, per line.
- The three losses you attack (chapter 6), with owners and this week's hours.
- Open actions, each with one owner and one date.
- Today's plan: products, changeovers, maintenance.

NOT ON YOUR BOARD

- The OEE debate. The number comes from one definition and is not argued here.
- Root cause work. Name an owner and a time for it, and move on.
- Monthly results. They belong in the monthly review.

CHAPTER 7

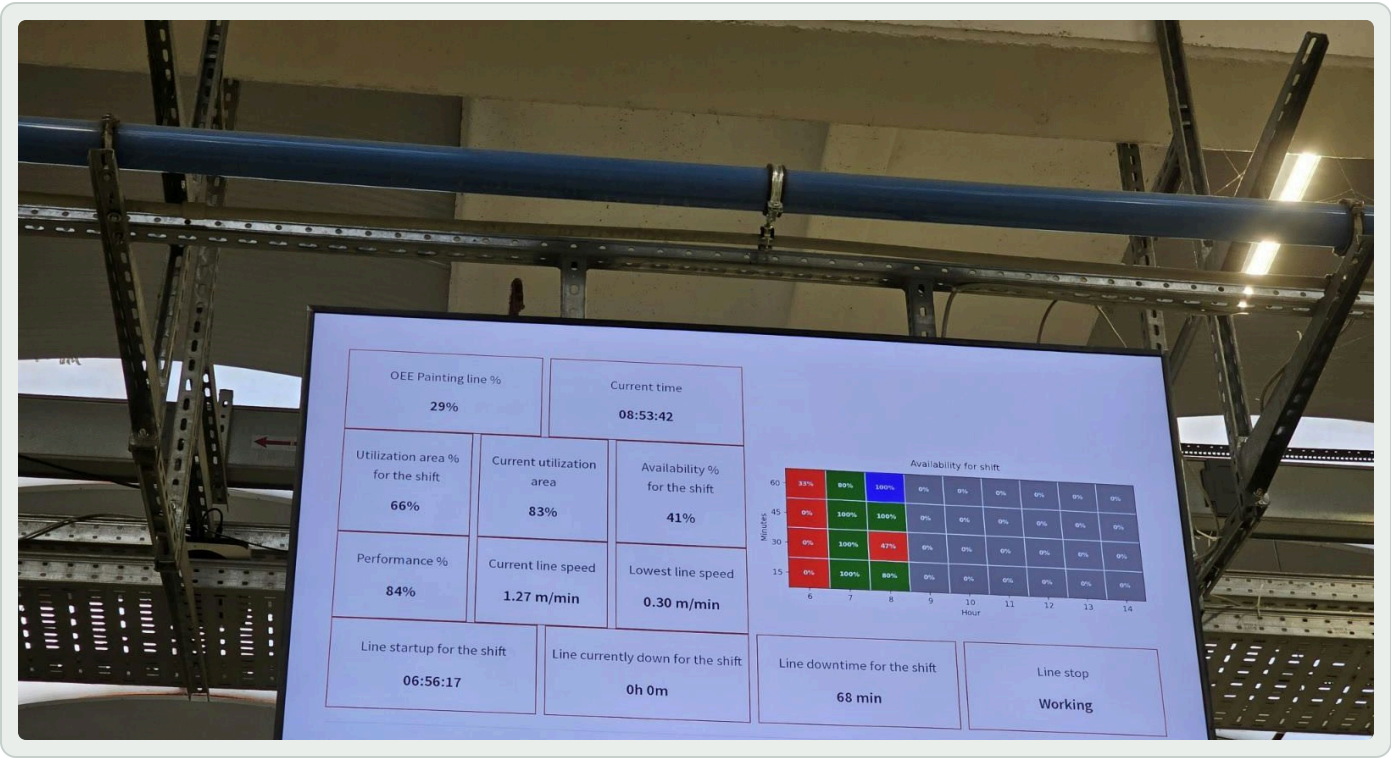
Who speaks, and when an action is done

Who speaks

Your shift lead runs your meeting. Maintenance and quality are there, because many actions need one of them. You, the plant manager, listen, and speak only to decide what is blocked. If the most senior person in the room talks most, your meeting becomes a report to that person, and the people who know what happened stop saying it.

When an action is done

An action is done when the loss hours it targets fall in your data, not when someone says it is done. "We fixed the sensor" closes when the stops on that sensor stop appearing. Until then it stays on your board. That is not a judgement on anyone. It is what keeps your board honest.



A Fabrico screen by your line shows the live state to the whole crew **Sample data**

Ten minutes a day is fifty minutes a week. Compare that with the hours you saw in chapter 1. If your meeting takes back even one stopped hour a week, it is the best-paid fifty minutes in your plant.

CHAPTER 7

Your board and your agenda card

YOUR WORKSHEET · CHAPTER 7 · PRINT IT, PUT IT AT YOUR LINE

The board for one or two lines

1 · YESTERDAY IN HOURS

Lost hours by reason, per line, against the target

2 · THE THREE LOSSES WE ATTACK

From chapter 6: owner and this week's hours

3 · OPEN ACTIONS

One owner, one date each: due today, done, blocked

4 · TODAY

Products, changeovers, planned maintenance, people

An action is done when its loss hours fall in your data.

Fabrico THE SAME, RUN FROM THE MACHINES

Your meeting is only as good as yesterday's numbers, and paper numbers often arrive late. In Fabrico, the meeting-room screen shows yesterday's downtime by cause, line and shift, and a TV by the line shows the live state, so your whole crew sees a long stop while it is happening.

Book a demo

Real Fabrico screen: downtime by cause

Sample data

CHAPTER 8

From stop reason to work card

When your line stops, two records start. Production writes down that your line stopped, for how long, and maybe why. Maintenance writes down what they repaired, with which parts, in how many hours. Both are correct. They are kept by different people, in different places, with different words, and no record shows which repair fixed which loss. That gap is one reason the same failure comes back. In this chapter you close it.

Two records, two stories

Look at one breakdown from both sides.

	PRODUCTION'S RECORD	MAINTENANCE'S RECORD
What	Line 2 stopped	Replaced the bearing on the conveyor drive
When	14:32 to 15:10	Job opened 14:40, closed 15:25
Why	"Mechanical"	"Worn bearing"
Where it lives	Shift log, OEE sheet	Work order system, notebook

Example records.

Both are true. Neither tells you that this is the third bearing on the same drive this quarter, because your stop log does not know about bearings and the work order does not know about lost hours.

EXAMPLE · ONE QUARTER · THE SAME BEARING

> *Line 2 has stopped three times this quarter for the same bearing. Each time, both records were correct. Each time, nobody connected them.*
>
> **You do not have a bearing problem. You have a record problem.**

CHAPTER 8

The handover happens at the stop

The fix is a handover at the stop, not at the end of the shift.

01 The stop is detected with its start time, from your machine where you can.

02 Your operator picks the reason from the short list (chapter 4), while the stop is happening.

03 If the reason needs maintenance, a technician opens a work card from the stop itself. It carries your line, your machine, the reason and the start time. They are typed once.

04 Your technician closes the card with the cause found, the action taken and the parts used.

05 The stop ends when your line makes good parts again, and its length goes into the same record as the repair.

Repeats: the same failure three times

A single breakdown can be bad luck. The same failure three times is missing history. Once your stops and repairs share a record, three questions become a quick search instead of a meeting:

- **Which failures repeat?** The same machine, the same cause, more than twice in a quarter.
- **What do they cost in hours?** The lost hours of every stop behind those repairs, added up.
- **Did the last repair hold?** The time from one repair to the next stop with the same cause.

The repeats are where a preventive task belongs. If the same bearing fails every six weeks, you change it every five, on a plan, before it stops your line.

The spare part is part of the stop

The other half of many long breakdowns is the part. The machine is down, and the part is "somewhere in your store". Two habits shorten those stops: write off every part against the work card that used it, so your store knows what left and why, and give the parts behind your repeats a minimum stock, so the next failure does not wait for an order.

CHAPTER 8

Your stop-to-repair handover card

YOUR WORKSHEET · CHAPTER 8 · ONE CARD PER STOP THAT NEEDS MAINTENANCE

The handover card

WHO	FIELD	WRITE IT HERE
At the stop · the operator	Line and machine	
	Stop start (time)	
	Reason picked at the line (code)	
	Work card number	
At the repair · the technician	Cause found	
	Action taken	
	Parts used, and how many	
At the restart · both	Stop end (first good part)	
	Lost minutes	

The card opens from the stop, so line, machine, reason and start time are written once. The same failure three times in a quarter means a preventive task belongs there.

How to use the card

01 **At the stop.** Your operator fills the top four lines before calling maintenance. The clock starts at the stop, not at the call.

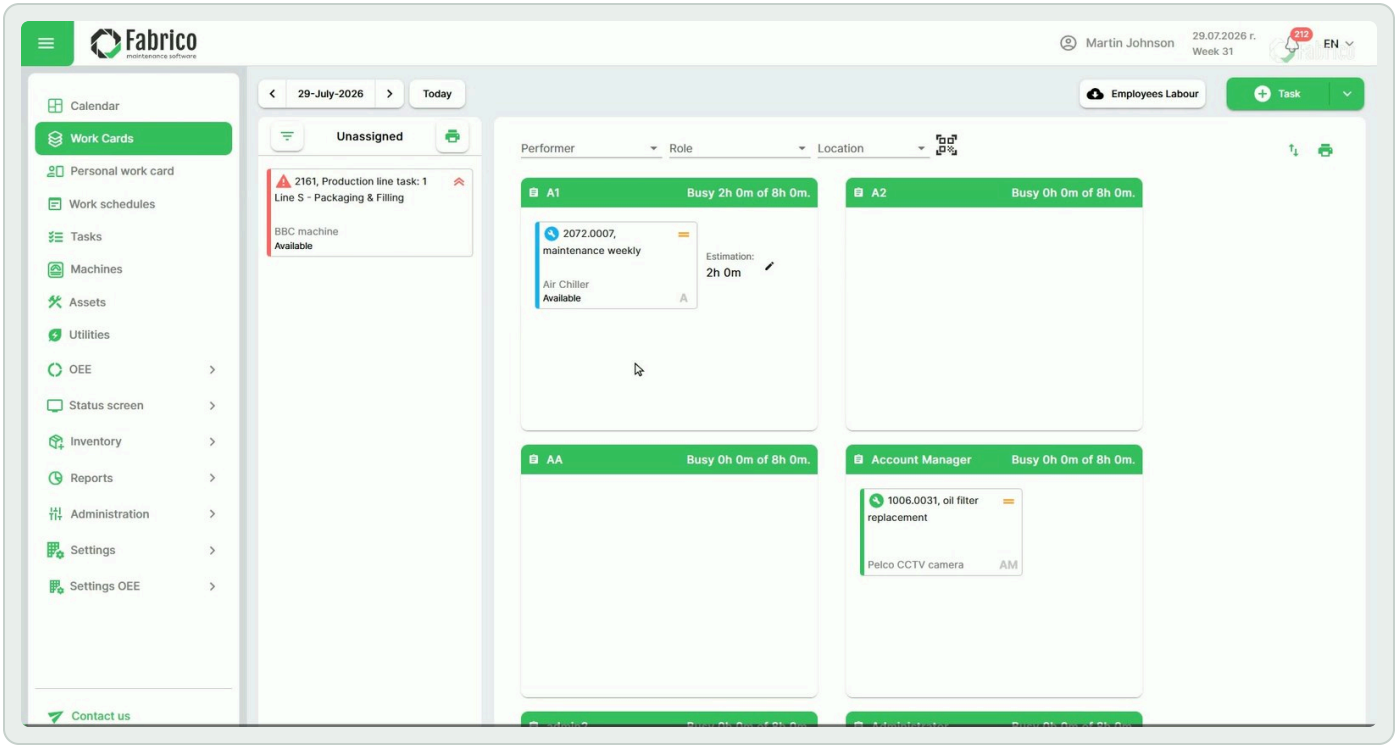
02 **At the repair.** Your technician fills the cause, the action and the parts before the card is closed. No cause, no close.

03 **Once a week.** Sort your cards by machine and reason, and add up the lost minutes in each pile. The biggest pile is your next fix.

CHAPTER 8

One record, from the stop to the fix

This is the chapter where production and maintenance become one story. On paper, the handover card does it by hand. In a system, the stop and the work card are the same record from the first second.



Real Fabrico screen: work cards with machine, priority and status **Sample data**

Check your own paper cards against this. If the same line, machine and start time are written by three people in three places, you have found the hours your handover loses.

Fabrico THE SAME, RUN FROM THE MACHINES

Fabrico keeps production and maintenance in one system. A stop is counted by the machine and its reason is picked at the line. When it needs a repair, a technician opens a work card from the stop and takes the job on a phone or tablet, with the machine and its priority. Technicians write off the parts they use against the work card, with a notification when stock falls below its minimum, and a preventive plan with recurring tasks can cover the failures that keep coming back.

Book a demo

CHAPTER 9

Changeovers

Your plant has two changeover times. The one on the schedule, and the one on a stopwatch that runs from the last good part of the old product to the first good part of the new one. Nobody lies about the first. "Done" just gets said when your machine starts, not when the first good part comes out, and the minutes in between belong to nobody.

In this chapter you time the second number, and you take the first ten minutes out without buying anything.

Time it end to end

A changeover starts at the last good part and ends at the first good part. Everything in between counts: fetching tools, cleaning, the tool change, the first runs that come out wrong, the adjustment, the second adjustment. If your stop log closes the changeover when your machine starts again, every minute of adjustment moves from setup into "slow running" or "startup scrap". The loss quietly changes branches on your loss tree.

- **The good count marks the end.** Not the green light, not your operator's word. The first part that passes ends the changeover.
- **Keep it in planned time, as a changeover.** A changeover taken out of planned time drops out of OEE, and a loss you do not count is never attacked.

Film one changeover

The standard method goes back to Shigeo Shingo's single-minute exchange of die. You do not need the whole method to start. You need one phone, one changeover, and one hour afterwards with your people who did it.

01 Film your longest regular changeover, from the last good part to the first good part.

02 Watch it together and write down every step, with its time.

03 Mark each step inside (your machine must be stopped) or outside (it could be done while the old product is still running).

04 For every outside step done during the stop, write down who could do it before the stop, and when.

You will be surprised by what most teams find: how much of your stop is walking and waiting.

CHAPTER 9

The first three moves that pay

01 **Move outside work outside.** Tools, material, the next product's settings and the inspection gauge are ready at your line before the stop starts, from a checklist. This costs you nothing but discipline.

02 **Turn inside work into outside work.** Pre-assemble what can be pre-assembled, pre-heat what can be pre-heated, stage the next tool next to your machine. Each step you move shortens the stop by its full length.

03 **Take the guessing out of adjustment.** Much of the adjustment time is your line searching for settings it has found before. Write down the settings that gave good parts, per product, on a card at your machine, and start from them.

An example, worked through

A filmed changeover takes 45 minutes from the last good part to the first good part.

STEP	BEFORE, MIN	AFTER, MIN	THE MOVE
Fetching tools and material	10	0	Moved outside, onto a checklist done before the stop
Cleaning	8	8	
Tool change	12	12	
Adjustment until parts are good	15	5	A settings card per product
Last good part to first good part	**45**	**25**	**20 minutes off, nothing bought**

Example values, not typical ones.

On your line, with two changeovers a shift, that is 40 minutes of running time a shift. Over a five-day week on three shifts, it is ten hours.

40 minutes × 15 shifts = 600 minutes, from the example above.

CHAPTER 9

Your changeover worksheet

YOUR WORKSHEET · CHAPTER 9 · ONE FILMED CHANGEOVER

Last good part to first good part

Line _____ **From product** _____ **to** _____ **Filmed on** _____

#	STEP	MIN	INSIDE OR OUTSIDE	CAN IT MOVE OUT?	WHO, AND WHEN
1					
2					
3					
4					
5					
6					
7					
8					

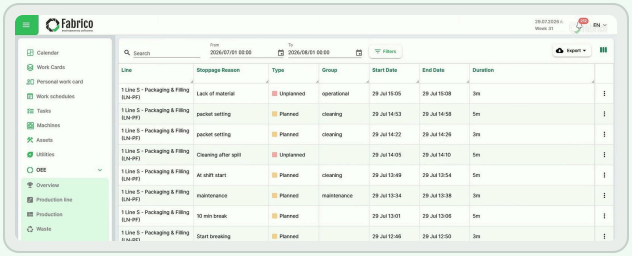
TIMED END TO END	CHANGEOVER 1	CHANGEOVER 2	CHANGEOVER 3	AVERAGE
Before, minutes				
After, minutes				

The good count marks the end, not the green light. A changeover is a loss, so it stays in planned time.

Fabrico THE SAME, RUN FROM THE MACHINES

Fabrico records a changeover as a stop, with the reason picked at the line, so changeover minutes show by line and shift next to every other loss, and the stop minutes before and after each move show without a stopwatch. The machine's stop ends at the restart, so time the run-up to the first good part by hand, as above.

Book a demo



Real Fabrico screen: changeovers as stops with a reason

Sample data

CHAPTER 10

The 90-day plan and the business case

The first nine chapters were about one line: what its stops cost, how you measure them honestly, how you pick three and attack them. In this chapter you put it together into two things you can hand to other people: a 90-day plan your plant can run, and a one-page case your finance team can sign.

Part one: 90 days on one line

OEE rises when every loss has an owner, not when your number is on a screen. Your plan has four phases over thirteen weeks, and one meeting every Monday keeps it moving.

THIRTEEN WEEKS ON ONE LINE · ONE MONDAY REVIEW EVERY WEEK

BEFORE WEEK 1, YOU NEED

One line, one owner who answers for it, and the definition from chapter 4, signed.

WEEKS	PHASE	WHAT HAPPENS	WHAT YOU HAVE AT THE END
1 to 2	**Baseline**	Agree the definition, get data flowing (chapter 4)	OEE per line and shift, on one signed definition
3 to 4	**Rank**	Loss hours per type, pick three (chapter 6)	A loss register: the top three, each with an owner
5 to 10	**Fix**	One countermeasure per loss every two weeks	Loss hours before and after, per countermeasure
11 to 13	**Lock in**	Fixes go into standard work and maintenance plans	A new baseline, and the next three losses chosen

Two weeks per countermeasure is a pace, not a law. If a fix waits on a part, start on the next loss while you wait, and keep the Monday review either way.

CHAPTER 10

The Monday review: 30 minutes, same agenda

The engine of your plan is one review every Monday, with the same data and the same agenda. In the room: you, and your production, maintenance, quality and continuous improvement leads.

MINUTES	ITEM	WHAT IS SAID
0 to 5	**OEE against baseline**	Per line, last week against the baseline. No debate on your number.
5 to 15	**Top three losses**	Hours this week against last week, per owner
15 to 22	**Countermeasures**	Done, in progress, blocked. Blocked items get a decision today.
22 to 27	**New losses**	Anything that crossed its threshold since last Monday
27 to 30	**Decisions**	Owner and date for every decision, read back aloud

Day 90: what done looks like

- The same OEE definition on every line in scope.
- Baseline and current OEE published per line.
- Your top three losses down, proven in your data.
- Owners and actions reviewed every Monday.
- Fixes written into standard work.
- The next three losses chosen, with owners named.

FOUR THINGS THAT OFTEN GO WRONG

Chasing OEE points instead of loss hours. Changing what counts as planned time halfway through, which erases your progress on paper. Relying on manual logs, so short stops go unrecorded. Reviews that end without an owner and a date, which makes them reports.

CHAPTER 10

Part two: the case finance can sign

Your finance director signs money and risk, not OEE points. Your case has three steps: hours, measured rather than estimated; money, with each hour priced once; and months: when the cash comes back, and what waiting costs.

Five drivers turn recovered hours into money

DRIVER	WHAT CHANGES	INPUT YOU NEED	WHO HAS IT
Capacity recovered	You sell more from the same lines	Margin per hour, and demand for the extra output	Finance, sales
Overtime and labour	Fewer extra shifts to hit the plan	Overtime hours and cost per hour	HR, production
Maintenance cost	Fewer emergency repairs and rush parts	Reactive repair spend per year	Maintenance
Scrap and rework	Fewer bad parts at start-up and in the process	Scrap cost per unit, rework hours	Quality, finance
Energy while idle	Less power drawn while your line waits	kW drawn at idle, price per kWh	Facilities

Capacity only counts if your market takes the extra output. If it does not, value the same hours as labour and energy saved.

Seven numbers to ask for in week one

Send this list in week one, and give every number an owner and a source:

01 Planned production hours per line

02 Lost hours by type per line

03 Margin per unit or per machine hour

04 Labour cost per hour, with the overtime premium

05 Scrap cost per unit

06 Reactive maintenance spend per year

07 Energy drawn at idle, with its price

CHAPTER 10

Price each recovered hour once

Three rules keep your case honest. Count each hour once: an hour sold as output is not also saved overtime. Your measured loss hours are the ceiling: you cannot win back more than you lose. And use the low estimate: a case that survives it is easier to sign.

One example line, one year. It loses 600 measured hours. The case claims 250 of them and leaves 350 unclaimed.

DRIVER	INPUTS	A YEAR
Capacity	150 hours × €400 margin an hour	€60,000
Overtime	100 hours × €120 crew cost an hour	€12,000
Scrap	2,000 units × €6 a unit	€12,000
Value a year		**€84,000**
Value a month	€84,000 ÷ 12	€7,000

Example values, not typical ones.

Cost the whole project, not only the software

Ask every vendor for one-time and yearly cost, in writing, and check that the total covers five items:

- The subscription for your lines and users in scope.
- Hardware and connectivity on your shop floor.
- Integration with ERP and other systems, if you need it.
- Internal time for IT, engineering and supervisors during setup.
- Training for your operators, supervisors, maintenance and new starters.

THE PAYBACK TEST, IN ONE BOX

Monthly net value = monthly value minus yearly cost ÷ 12. Payback in months = one-time cost ÷ monthly net value. For the example line, a 12-month payback needs one-time plus yearly cost of at most €84,000.

CHAPTER 10

Shrink the risk, then ask for one decision

THE RISK	HOW YOU SHRINK IT
The rollout stalls	Start with one pilot line, prove the value there, then scale.
The number is not trusted	Agree planned time, stop reasons and ideal cycle times before day one.
Finance cannot check it	Measure before and after: the same line, the same definitions, the same number of weeks.
Nobody is accountable	Name one owner who answers for the pilot and the result.

And show the cost of doing nothing. The example line loses 600 hours a year: 50 hours for every month the decision waits. In money, every month of waiting costs one month of net value.

One slide, six boxes, one decision

THE PROBLEM

In hours a year

THE VALUE

In euros a year, and from which drivers

THE COST

One-time and yearly

THE PAYBACK

In months, from your quote

THE PILOT

Its line, its length, its owner

THE DECISION

An amount and a date

If you can say it in one breath, your slide is ready: we lose this many hours a year; winning back these is worth this much; it pays back in this many months.

Fabrico THE SAME, RUN FROM THE MACHINES

Both halves of this chapter rest on one number: lost hours, measured. Fabrico takes the stops from the machines, and your operator tags each stop with its cause, so you see downtime by cause, line, machine and shift. With hardware, installing and connecting the devices takes about a month, and the full rollout takes three to four months, so your first baseline may be taken by hand. Hosted on AWS, ISO 27001 certified by DNV.

Book a demo

CHAPTER 11

Choosing an OEE and MES system

Everything in this guide works on paper first. When you want it to run every shift without the paper, you will look at systems. If your choice goes wrong, it will be on scope and data, not on features. This chapter gives you three steps: know what you are buying, weight twelve questions before any vendor presents, and make them show it live.

Three kinds of system are sold under one name

Pick your scope first. Each column usually includes the one to its left. Score vendors only against the scope you chose. A light MES sits between the last two: OEE plus maintenance and shift records, without job dispatching or routings.

	PRODUCTION MONITORING	OEE SOFTWARE	MES
What it records	Run and stop states, counts and speed	Stop reasons, ideal cycle times and scrap: the inputs for OEE	The OEE picture plus the work around it: maintenance, quality and shift records. A full MES also runs job dispatching, routings and genealogy
Who uses it	Supervisors and line leads	Plant managers, CI and maintenance leads	Production, maintenance, quality and leadership, from one record
You need it when	Nobody knows which lines are running	Lines stop, but nobody knows which loss costs most	Each department keeps its own version of what happened

1 · SCOPE

Monitoring, OEE software and MES are different scopes. Choose one, then compare like with like.

2 · SCORE

Agree what matters most with production, maintenance and IT, before any vendor presents.

3 · PROOF

A stop arriving, a reason added, OEE moving, a work order raised. On screen, not in slides.

Take the steps in order. If you skip the first one, you score vendors against the wrong scope, and your best score can still be the wrong system.

CHAPTER 11

Twelve questions, weighted before the first demo

Agree the weights with production, maintenance and IT before any vendor presents: 3 for a must-have, 2 for important, 1 for useful. Then score each answer from 1 to 5.

NO.	YOUR QUESTION	WHY IT MATTERS	WEIGHT
Q1	Where does machine data come from, and how fast?	Manual logs miss short stops and arrive late	
Q2	How are stops and their reasons captured?	An unexplained stop cannot be ranked or fixed	
Q3	Can we see exactly how OEE is calculated?	Two systems can give one shift two OEE values	
Q4	How are reason codes set up, and by whom?	Codes must fit your lines and stay stable	
Q5	What does your operator screen look like?	If your operators avoid it, every number is wrong	
Q6	How are alerts set, and who receives them?	An alert nobody owns is noise	
Q7	Does a loss link to a maintenance action?	Losses only fall when someone acts on them	
Q8	How does it handle several lines and sites?	Comparisons need one definition everywhere	
Q9	What does IT need to approve it?	IT questions asked late stall the project	
Q10	Who owns your data, and can we export it?	Your history should outlive any contract	
Q11	What does rollout on one line look like?	A real plan shows they have done it before	
Q12	How is pricing structured?	The pricing unit decides what growth costs	

SCORE	1	2	3	4	5
Means	No answer, or a red flag	Described, not shown	Shown, with workarounds	Shown live, small gaps	Shown live, fits as is

CHAPTER 11

Weight first, score second, then multiply

THE FORMULA

Score % = sum of (score × weight) ÷ (5 × sum of weights). A score of 1 on a weight 3 question rules the vendor out.

Two vendors, same raw score, different result

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	SUM
Weight	3	3	3	2	2	1	3	1	3	2	2	2	**27**
A score	4	5	3	4	4	3	5	3	4	2	4	3	44
A points	12	15	9	8	8	3	15	3	12	4	8	6	**103**
B score	3	2	2	5	5	5	2	5	3	4	3	5	44
B points	9	6	6	10	10	5	6	5	9	8	6	10	**90**

The most you can score is 5 × 27 = 135. Vendor A: 103 ÷ 135 = **76.3%**. Vendor B: 90 ÷ 135 = **66.7%**. Their raw scores tie at 44. Your weights decide.

Example scores, not real vendors.

YOUR WORKSHEET · CHAPTER 11 · FILL IT AFTER THE LAST DEMO

Your decision grid

QUESTION	WEIGHT	VENDOR A	VENDOR B	VENDOR C
Q1 to Q6, points				
Q7 to Q12, points				
Total points				
Score %				
Any 1 on a weight 3 question?				

CHAPTER 11

Ten things to see live, on screen, not in slides

Send this script to every vendor one week before the demo. Ask for each item on a real screen.

01

A stop arrives from a machine

Timestamped, with nobody typing it. You note the delay.

02

Your operator adds the reason

On the real operator screen, in your operators' language.

03

OEE recalculates

Availability, performance and quality move. You open the definitions.

04

A short stop shows up

You see a stop of a minute or two, not only the long ones.

05

The stop becomes a work order

Assigned to a named person in maintenance.

06

The shift view

One line, one shift: stops, reasons, counts and scrap.

07

A new reason code

Added live. You ask who is allowed to do it.

08

An alert fires

You set a threshold, trigger it, and see who receives it.

09

A second site

You see the same definitions and screens, side by side.

10

A report leaves the system

Exported to a file you can open without the vendor.

After each demo, score the twelve questions while it is fresh. After the last one, fill your decision grid on the worksheet page.

CHAPTER 11

Red flags, and what IT needs before anyone signs

Listen for these answers in every demo. A red flag scores 1 on its question. On a weight 3 question, that ends the vendor's chances.

Q	RED FLAG	WHAT YOU HEAR	WHY IT COSTS THE DEAL
Q3	**Hidden definitions**	"It's calculated automatically."	You cannot check the maths yourself.
Q1	**Manual entry only**	"Operators log it at shift end."	Short stops never reach your data.
Q10	**No export**	"Our reports cover everything."	Your history stays inside their system.
Q9	**No answer on security**	"We'll check with our IT."	Your IT review stalls at the end.
Q11	**"It depends" on rollout**	"Every plant is different."	No first-line plan, no steps, no owner.

Seven answers IT needs

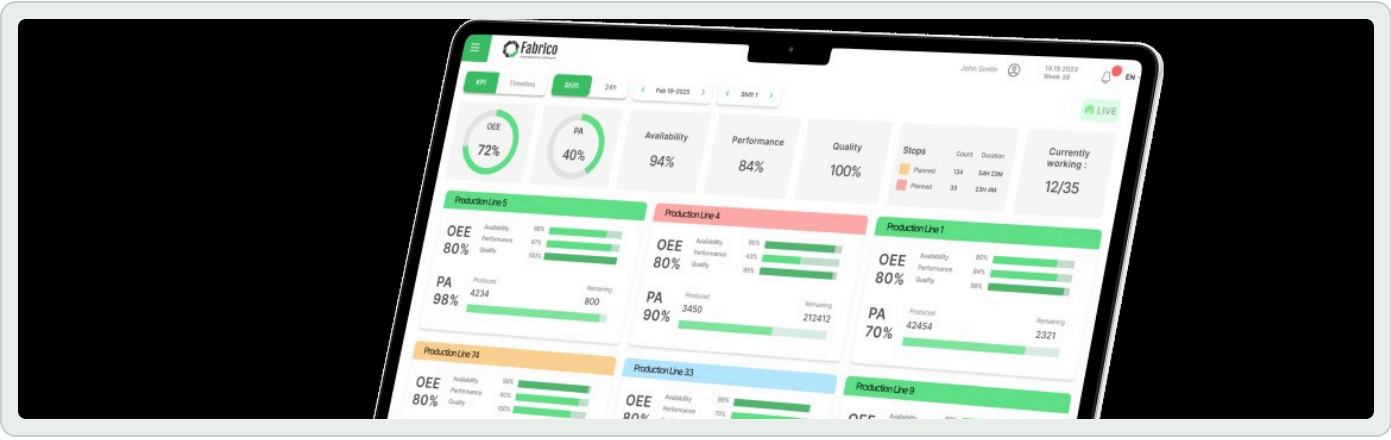
ITEM	ASK FOR
Security certification	The certificate, its scope and the certifying body
Hosting	The cloud provider and the region where your data is stored
Single sign-on	Login with company accounts, and how leavers are removed
ERP integration	What flows each way, and who builds and maintains it
Quality system	How scrap and quality records reach your quality system
Data ownership and export	Contract wording, the export format, your data after exit
User roles	Who can view, edit and configure, per site and per line

Collect all seven before your shortlist. A slide is not an answer. Ask for each one in writing and file it with your scorecard, so the answer you scored is the answer you sign.

AFTER THE LAST CHAPTER

Where Fabrico fits

When you want this method to run every shift without the paper, this is where we fit. Fabrico is a cloud-based light MES and OEE platform for manufacturers, with maintenance management (CMMS) built in. Your machine data, your stops with their causes, your work cards and your reports live in one place. Job dispatching, BOMs, routings and genealogy stay in your ERP.



Fabrico on web and mobile **Sample data**

Score us with your sheet from chapter 11

- **Q1 · Machine data:** on a demo you see availability, performance and quality per line and shift, from PLC signals, IoT sensors or cameras with computer vision (cameras as an add-on; chapters 4 and 5).
- **Q2 · Stops and reasons:** you see stops with their causes, and your operator picks the reason at the line while the stop is happening (chapter 3).
- **Q7 · Loss to maintenance action:** your technician opens a work card straight from the stop, in the same system, and writes off the parts used against it (chapter 8).
- **Q9 · IT:** ISO 27001 certified by DNV, hosted on AWS. Ask for the certificate and its scope, as you would from any vendor.
- **Q11 · Rollout:** plan on this: with hardware, installing and connecting the devices takes about a month, and the full rollout takes three to four months.

WHY THIS GUIDE IS FREE

We make money when your plant decides to run this method in Fabrico. You may run it on paper first, and that is fine: the method works either way.

Fabrico

YOUR NEXT STEP

See how lost hours show on the screens, in 30 minutes

A 30-minute demo with a Fabrico consultant, on a line like yours, with your questions. No commitment. Bring the cost of one hour from chapter 1, or your scorecard from chapter 11.

0 to 5 min	Your line and your worst loss
5 to 20 min	A stop arrives, a reason is added, OEE moves, a technician opens a work card
20 to 30 min	Your questions, and what a rollout on your lines would look like

Book a demo **Contact us**

Scan to book a demo

Or e-mail **team@fabrico.io** with the subject line "Why lines stop" and the loss you want to win back. A consultant replies to set up the 30 minutes.

fabrico.io · ISO 27001 (DNV) · hosted on AWS

AFTER THE LAST CHAPTER

Sources

Every published figure in this guide comes from the sources below. Worked examples use round numbers and say so on their page. If you disagree with a number, disagree with the source.

WHERE	SOURCE	WHAT IT GIVES YOU
Ch. 2, 3	Nakajima, S. (1988). *Introduction to TPM: Total Productive Maintenance.* Productivity Press.	The six big losses; the usual source for the 85% world class figure
Ch. 2	Ljungberg, Ö. (1998). Measurement of overall equipment effectiveness as a basis for TPM activities. *International Journal of Operations & Production Management*, 18(5), 495 to 507. doi 10.1108/01443579810206334.	OEE around 55% across about 20 cases
Ch. 2	Hedman, R., Subramaniyan, M., Almström, P. (2016). Analysis of critical factors for automatic measurement of OEE. *Procedia CIRP*, 57, 128 to 133. doi 10.1016/j.procir.2016.11.023.	An average OEE of 65% across 884 machines in 23 companies; almost half of the losses unclassified
Ch. 9	Shingo, S. (1985). *A Revolution in Manufacturing: The SMED System.* Productivity Press.	Single-minute exchange of die: inside and outside work

About the examples and the screens

- Every example line, shift, vendor and record in this guide is constructed to show the method. None is a customer.
- The screens are real Fabrico screens from a demonstration plant, with sample data.
- The scoring method in chapter 11 is our own; use it as a starting point and change the weights to fit your plant.

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