

Theory of Constraints

Finding and fixing what limits your throughput

The only thing to maximise is customer satisfaction. Everything else is a constraint — and the constraint decides how much your whole operation can deliver.

THE FIVE FOCUSING STEPS

- 01 Identify the constraint
- 02 Exploit it
- 03 Subordinate everything else
- 04 Elevate it
- 05 Repeat — find the next one

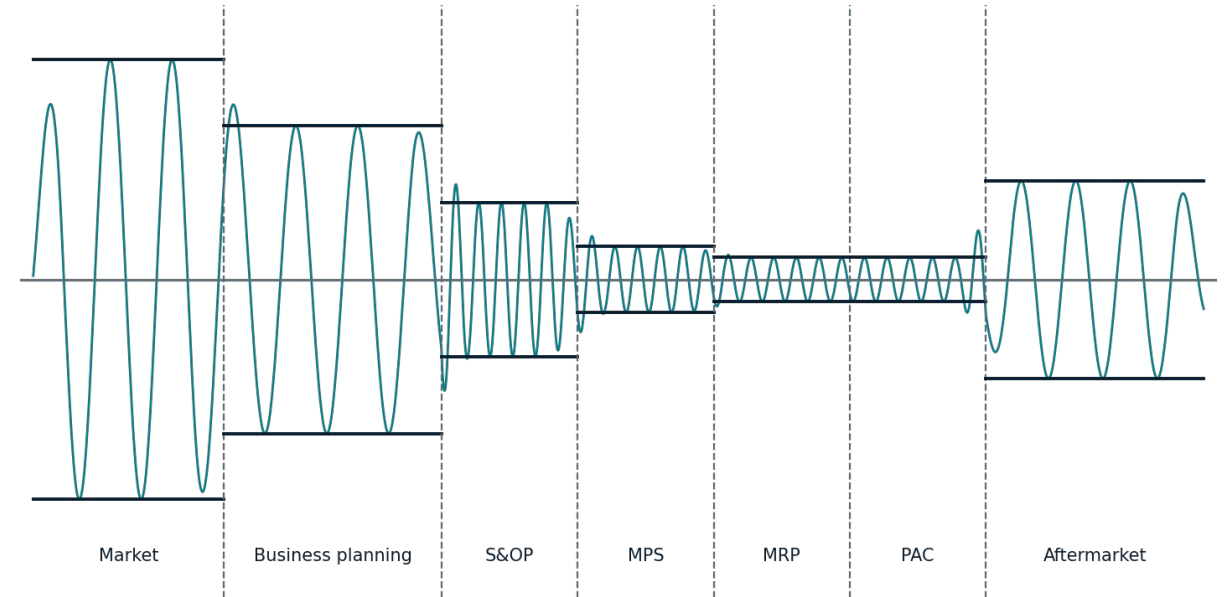
Your planning system and business processes

“Your system is perfectly designed to give you the results you are getting.” — W. E. Deming

PROCESSES



RRP resource requirements planning · RCCP rough-cut capacity planning · CRP capacity requirements planning · I/O input-output control



Each planning level narrows the variability the market throws at you. Where a level is missing or ignored, that variability reaches the shop floor and the customer.

S&OP – Sales & Operations planning · MPS – Master Production Scheduling · MRP – Materials requirements planning · PAC Production activity control

When the planning system fails, procurement, scheduling and fulfilment become a daily fire-fight: high inventory and poor service (out-of-stocks, availability, OTIF) — and the cost shows up in EBIT, OTIF and stock turns.

What the Theory of Constraints means for your business

A method for finding the one thing that limits performance, and improving it until it no longer does

PROCESSES



Every operation has a constraint: the step, resource or policy that limits how much the whole system can deliver. The Theory of Constraints identifies it, gets the most out of it, then systematically improves it — and moves on to the next one.

THE GOAL Reduce operating expense and inventory while increasing throughput — at the same time.

01 Throughput is money

The rate at which your system generates money through sales — not units produced or hours worked.

02 Efficiency is not profit

Making or buying stock to look efficient adds inventory and holding cost without adding throughput.

03 Cheap purchasing can cost you

Volume discounts help margin but hurt EBIT when they raise inventory.

04 Only goal-directed work counts

Activity that does not move you towards the goal is not productive — such as make-to-stock ahead of back-orders.

05 Operating expense, clearly defined

All the money spent turning inventory into throughput. Dropping 'value-add' removes the argument over whether direct labour is investment or expense.

06 A bottleneck loss is a system loss

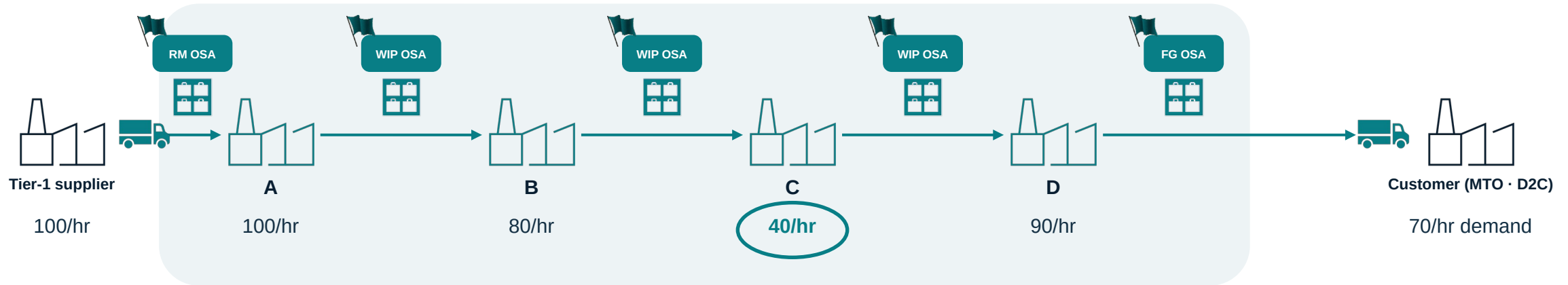
An hour lost at the bottleneck is lost for the whole plant. Its true cost is the total expense of the system divided by the hours the bottleneck produces.

Ask of every improvement: does it raise throughput, cut inventory or cut operating expense? If not, it is not helping.

The concept of flow

Your output is set by the slowest step, not by the sum of your capacity

PROCESSES



What this means for you

- Improving A, B or D has zero effect on output while C runs at 40/hr.
- Capacity you cannot flow through the constraint is cost, not capability.

MAXIMUM OTIF ACHIEVABLE

57%

40/hr through the constraint against 70/hr of customer demand. No amount of effort elsewhere changes this number.

Little's Law

Waiting time = Volume ÷ Rate of flow

Volume is the work-in-progress queued in front of a step; rate of flow is its production or output rate. Every hour of queue in front of the constraint is lead time your customer waits.

Inbound & production scheduling

Production execution & quality

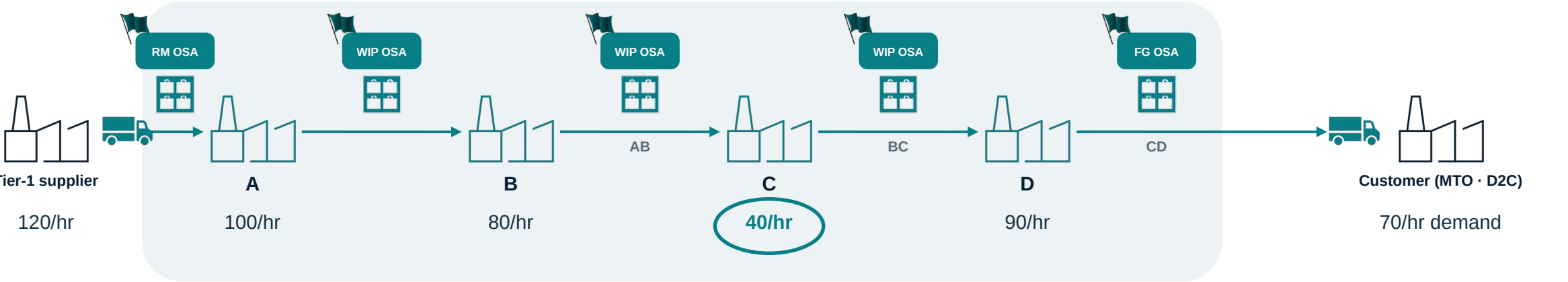
Warehousing & outbound

Supply planning — material requirements planning and inventory control

Scenario 1 — before elevating the constraint

C runs at 40/hr. Watch what happens to throughput and work-in-progress

PROCESSES



Assumptions

- Unlimited raw material before A
- No transport delays, downtime or defects
- Buffers can hold unlimited WIP
- Each hour, every step processes up to its capacity, limited by what is in its input buffer
- Start with zero WIP everywhere

Hour	A output	B output	C output	D output (throughput)	AB end	BC end	CD end	FG total
1	100	80	40	40	20	40	0	40
2	100	80	40	40	40	80	0	80
3	100	80	40	40	60	120	0	120
4	100	80	40	40	80	160	0	160

What you see: throughput settles at 40/hr, matching C — and WIP piles up in front of the constraint (BC grows by 40/hr every hour after the first).

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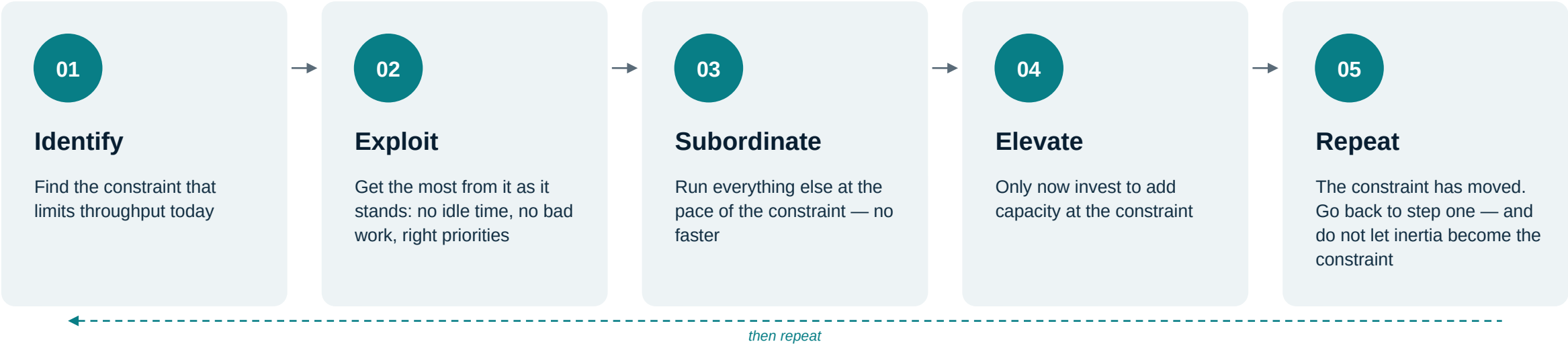
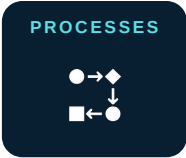
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The five focusing steps

A repeatable method your team can run, not a one-off project



FOUR QUESTIONS TO ANSWER BEFORE YOU START

What is the desired standard of performance?

The throughput, service and stock levels the business needs

What must change?

Which constraint is holding you back

What is the right change?

What you will do with the constraint

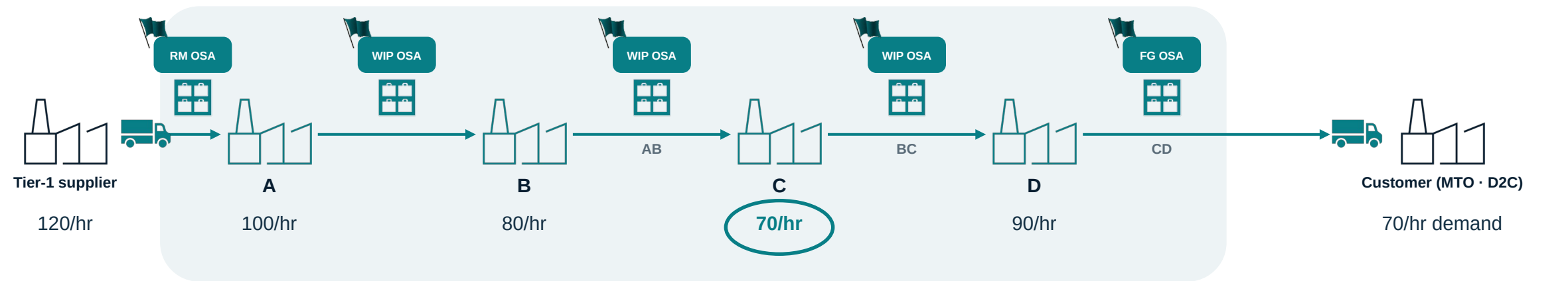
How is the change best made?

How you will implement it — and who owns it

Scenario 2 — elevating the constraint

PROCESSES

C is raised from 40/hr to 70/hr. Throughput rises and the pressure moves upstream



Assumptions

- As per Scenario 1

Hour	A output	B output	C output	D output (throughput)	AB end	BC end	CD end	FG total
1	100	80	70	70	20	10	0	70
2	100	80	70	70	40	20	0	140
3	100	80	70	70	60	30	0	210
4	100	80	70	70	80	40	0	280

Throughput rises from 40 to 70/hr (+75%). BC now grows only 10/hr — but AB still grows 20/hr because A is producing more than B can take. Subordinate A to the pace of the constraint.

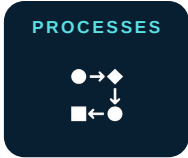
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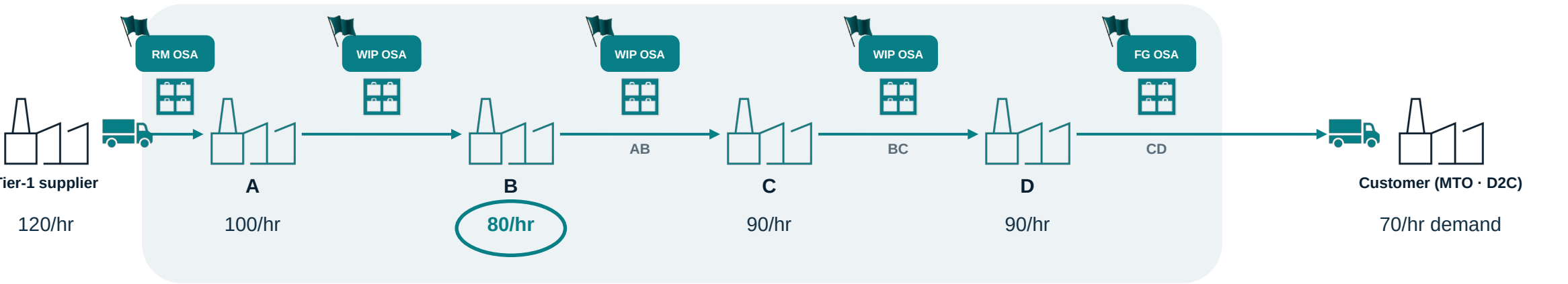
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Scenario 3 — elevate further and watch the constraint move



C is raised to 90/hr. Throughput caps at 80/hr because B is now the constraint



Assumptions

- As per Scenario 1

Hour	A output	B output	C output	D output (throughput)	AB end	BC end	CD end	FG total
1	100	80	80	80	20	0	0	80
2	100	80	80	80	40	0	0	160
3	100	80	80	80	60	0	0	240
4	100	80	80	80	80	0	0	320

Once C exceeds 80/hr the constraint shifts to B and throughput caps at 80/hr. Investment in C beyond that point buys nothing — which is why the fifth step is 'repeat', not 'finish'.

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What happens around your constraint

The symptoms you see on the floor — and why local fixes do not move the numbers

PROCESSES



Upstream — before the constraint

- WIP builds between machining and assembly
- Overtime pressure in upstream departments
- Excess raw material consumed
- Local efficiencies look good but shipments do not rise

At the constraint

- Must never be starved of work
- Every hour of downtime is lost for the whole system
- Should run the highest-margin or priority SKUs

Downstream — after the constraint

- Packing and distribution sit idle
- Expedite requests originate here

Now add real-world variability

- Supplier delivery late because of an equipment breakdown
- Transport delays
- Customer demand increases
- OEE falls: set-up issues, small breakdowns, quality problems with raw materials or internal processes
- Absenteeism

THE RESULT YOUR CUSTOMERS SEE

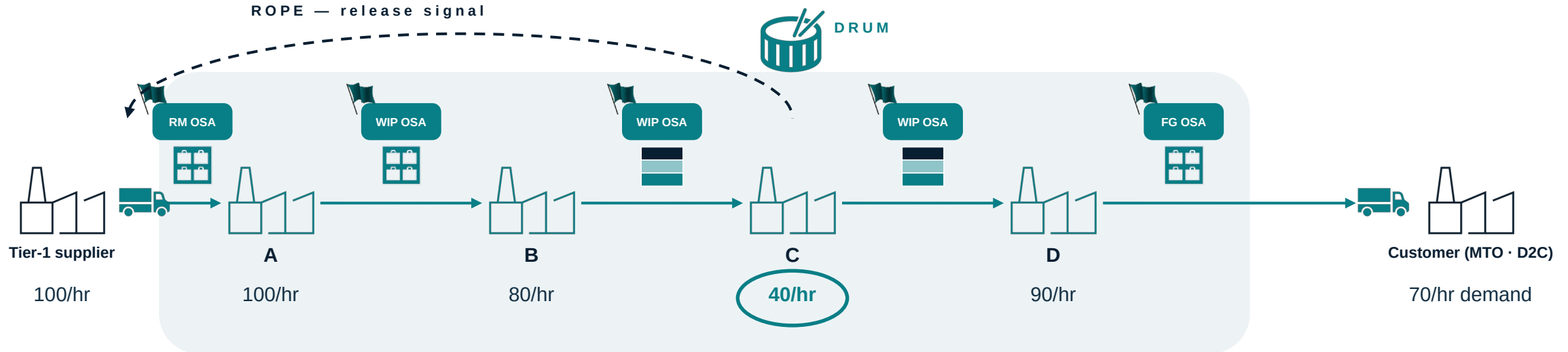
- Back-orders accumulate
- Service levels drop
- Expediting costs rise
- WIP accumulates

Unmanaged variability lands on the constraint first.

Drum, Buffer, Rope

How to schedule the whole operation around the constraint

PROCESSES



ROPE — release control

- A signal from the drum back to the release point
- Controls how much material enters the system
- Prevents over-production upstream
- If the drum runs at 40/hr, release at 40/hr — no faster, no slower

BUFFER — protection

- A time buffer, not just inventory
- Placed immediately before the constraint (and before shipping)
- Protects the drum from upstream variability, downtime and supplier delays — zones: act · watch · safe

DRUM — the pace-setter

- The system constraint sets the beat
- All upstream activity is subordinated to it
- It sets production pace and never waits
- Focus on flow, not utilisation: every lost minute is lost revenue

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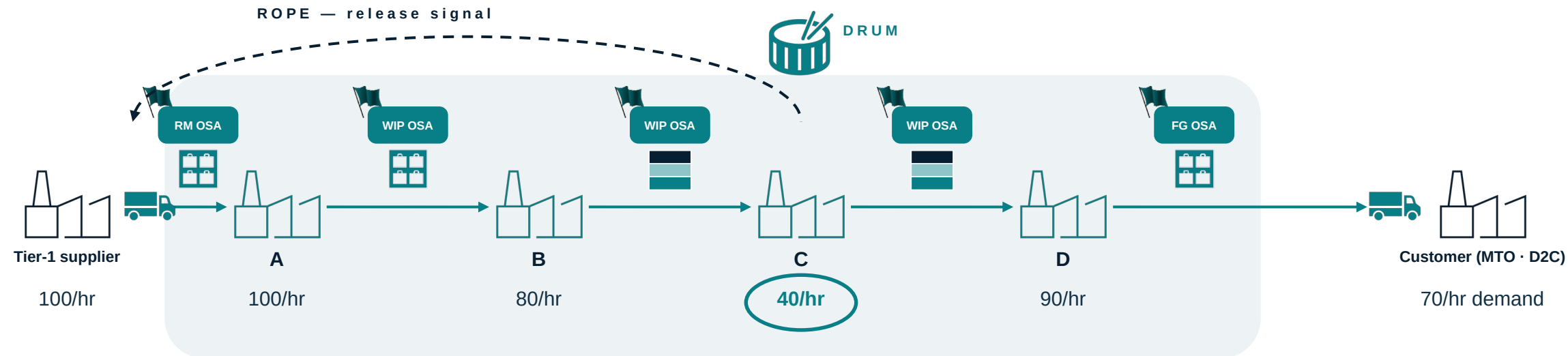
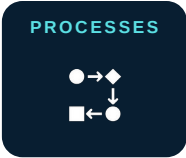
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The two-for-one rule

A simple discipline that brings work-in-progress down fast



THE RULE

No new works order is released to the shop floor until two works orders have been completed.

Why it works for you

- WIP falls by one order for every two completed
- Queues in front of the constraint shrink, so lead time shrinks (Little's Law)
- Release is tied to real completions, not to the plan

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What is the goal?

No manager can succeed without clear answers to four questions

PROCESSES



01

What is the ultimate goal?

For most businesses: make money now and in the future — expressed as throughput, inventory and operating expense.

02

What are the critical success factors?

The few things that must go right to reach the goal: service, flow, cost, cash.

03

Where do you stand today?

An honest baseline against the goal, with evidence rather than opinion.

04

What change is needed?

The magnitude and direction of the move from where you are to where you need to be.

Your answers to these four questions set the agenda for the constraint work — and the measures by which it will be judged.

The six thinking tools

Structured ways to agree what to change, what to change to, and how to make the change

PROCESSES



01 Intermediate Objectives Map

Destination finder — what must be true to reach the goal

02 Current Reality Tree

Gap analysis — the few root causes behind today's symptoms

03 Evaporating Cloud

Conflict resolution — surfaces and breaks the assumptions behind a dilemma

04 Future Reality Tree

Verifies the action will produce the desired results and exposes unfavourable side-effects

05 Prerequisite Tree

Implements the decision — the sequence of discrete activities and the obstacles in the way

06 Transition Tree

A three-phase project approach to implementing policy changes

Used together they answer the three questions of any change: what to change, what to change to, and how to cause the change.

Making it stick — the four disciplines of execution

A cadence that keeps the constraint work alive once the workshop is over (after Franklin Covey's 4DX)

PROCESSES



01

Focus on the wildly important

There will always be more good ideas than capacity to execute them. Choose the one or two goals that matter most — for constraint work, that is throughput at the drum — and narrow the team's attention to them.

02

Act on the lead measures

Eighty per cent of results come from twenty per cent of activities. Lag measures tell you whether you hit the goal; lead measures tell you whether you are likely to. Identify the actions with the highest leverage and act on them.

03

Keep a compelling scoreboard

People play differently when they are keeping score. A simple, visible scoreboard — throughput, buffer status, releases — lets the team see instantly whether they are winning.

04

Create a cadence of accountability

A short weekly review in which each person reports on last week's commitments, reviews the scoreboard and makes one or two commitments for the week ahead. Commitments made to peers drive engagement more than instructions from above.

Discipline 4 is where the constraint stays managed: fifteen-minute weekly reviews, one scoreboard, named commitments.

THE FIRST MANAGEMENT DECISION

Where is the constraint in your operation — and what is it costing you?

A short diagnostic answers that with evidence: one product family or route followed from demand to delivery, the constraint verified, and the throughput, stock and service at stake quantified.

WHAT HAPPENS NEXT

- 01 Walk the flow and locate the constraint
- 02 Quantify throughput, WIP and OTIF at stake
- 03 Agree the first exploit / subordinate actions
- 04 Set the scoreboard and weekly cadence