

Lot splitting: planning and controlling lot sizes in manufacturing

Lot splitting describes the deliberate breakdown of a total quantity into several smaller manufacturing or procurement lots. It is a central instrument of production planning for reconciling lead times, inventories and machine utilisation. Lot splitting is relevant to buyers because it directly influences demand, delivery call-offs and order quantities. Those who understand the logic of lot splitting can better assess demand signals from production and make more informed procurement decisions.

Key facts

- Lot splitting breaks a total order down into several smaller lots that are planned, manufactured and reported independently of one another.
- Typical objectives are shorter lead times, lower work-in-progress inventories and more even machine utilisation.
- Set-up and changeover times often act as a natural limit: too many small lots significantly increase set-up effort.
- In practice, lot size is often determined using classic lot-sizing formulas or inventory-driven optimisation in the ERP system.
- For procurement, this means: smaller and more frequent lots lead to more frequent, smaller purchase orders and delivery call-offs.
- Sound master data governance is a prerequisite, as set-up, process and storage times must be maintained correctly in the systems.

Definition: lot splitting

Lot splitting means dividing a total demand quantity – for example a customer order, manufacturing order or delivery call-off – into several sub-lots with defined quantities and deadlines. In production control, each sub-lot is handled, reported and tracked as an independent unit.

Distinction from lot-size planning

Lot-size planning determines the optimal quantity of a lot, for example using the classic lot-sizing formula or model-based procedures. Lot splitting comes into play where the planned or customer-specified quantity as a whole would be uneconomic or unrealistic: it breaks this quantity down into portions manageable in production. In many ERP systems the two steps run together, but conceptually they should be separated. Planning defines the target lot size, while splitting determines how and in what sequence the total quantity is converted into these lots.

Typical triggers for lot splitting

The practical reasons for splitting a lot are manifold. Capacity logic often dominates: a machine cannot process a quantity in a single pass, or only with disproportionate lead times. Customer part call-offs,

material availability or quality requirements can also force a breakdown. Typical triggers include, among others:

- Customer orders with part delivery dates or delivery call-offs
- Limited holding capacities of furnaces, presses, electroplating lines or autoclaves
- Storage or material restrictions, for example in commodity-related procurement of pre-products
- Quality strategies such as first-article inspection concepts or fixed release quantities
- Integration with a material availability check (ATP) when components are only available in stages

Methods and procedures for lot splitting

The choice of approach depends on the type of manufacturing, the capacity situation and system support. Fixed grids dominate in series production, while in single-item and small-batch production case-by-case planning often decides.

Static methods: fixed and tiered lot sizes

The simplest method is to break the quantity down into equally sized sub-lots, for example with a target lot size of 500 units. Alternatively, tiered patterns may be used, for instance when larger lots at the start of the process serve to secure supply and later lots become smaller. Such schemes are easy to understand and stable, but respond inflexibly to demand fluctuations and forecast errors. They remain popular with systems nonetheless, because they work without complex parameters and allow simple posting logic in inventory management.

Dynamic and lot-size-optimised methods

Dynamic methods calculate the sub-quantities based on demand dates, capacity loads and set-up costs. Common approaches include Wagner-Whitin-type dynamic lot-sizing procedures, periodic balancing calculations or heuristic methods, as offered by ERP and APS systems. The aim is to minimise the sum of set-up and inventory holding costs. In practice, model quality depends heavily on well-maintained set-up times, changeover matrices and cost rates – another argument for consistent master data governance.

The role of control parameters in the ERP system

Modern systems support lot splitting via control parameters such as fixed lot sizes, lot multiples, splitting tolerances and rounding rules. It is important to distinguish between order quantities and production quantities: if a lot is increased to account for scrap, this changes procurement demand. Procurement should know these parameters, or at least be able to view them, because they explain why a demand of 10,000 units suddenly becomes four manufacturing orders with different quantities and deadlines.

Key KPIs and assessment metrics

Whether lot splitting is successful is shown by key figures from production and materials management. Particularly relevant for procurement are measures that make the relationship between lot structure and procurement behaviour visible.

KPIs from a production perspective

Key figures include average lot size, set-up time as a share of machine utilisation, lead times per lot and inventories in interim storage. A frequent check is the comparison of planned and actual lot structure: if

planned lots are constantly split or merged, the lot-sizing parameters do not match the real capacity situation. Delivery reliability and parts per million (PPM) at lot level also indicate whether smaller lots lead to more handovers – and thus to more sources of error.

KPIs from a procurement perspective

Procurement assesses the consequences of lot splitting based on order frequency, order quantity and price deviation from the purchase order, and adherence to delivery call-offs. More frequent small lots can jeopardise volume discounts if order quantities fall below thresholds. Freight expenditure also tends to rise, for example through more part deliveries. The number of spontaneous changes to lot structures shortly before production start serves as an early warning indicator – it often points to capacity bottlenecks or unstable demand planning.

Risks and controls around lot splitting

Splitting lots offers clear advantages but also creates new risks. Without clear rules and controls, the optimisation effect can be eaten up by coordination effort and additional costs.

Typical risks in production and the supply chain

Lots split too finely increase the number of set-up operations, queues and material movements – lead times can paradoxically rise rather than fall. More lots also mean more production confirmations, more inspection effort and more transport movements. In the supply chain, more frequent part call-offs lead to smaller order quantities from the supplier, which reduces economies of scale and increases logistics costs per unit. In international procurement, for example in the context of global sourcing, minimum order quantities as well as customs and freight framework conditions must also be taken into account.

Controls and organisational rules

A clear splitting policy has proven its worth: defined minimum lot sizes, a maximum splitting depth and fixed release rules for exceptions. Changes to lot structures should be documented in a traceable manner and investigated for systematic causes using a root cause analysis such as the 5-Why approach or an Ishikawa diagram. Alignment with suppliers is also important: anyone who permanently calls off smaller and more frequent lots should anchor this in framework agreements, price lists and logistics agreements, so that price, freight and capacity issues do not have to be negotiated ad hoc.

Interface with procurement

Procurement must actively manage the impact of lot splitting on order quantities, deadlines and prices. This includes checking whether volume-based price breaks still apply to split orders, whether consolidated orders across several lots are possible and whether the lot deadline structure is compatible with the agreed delivery times. In the event of strong demand fluctuations, close integration with the material availability check (ATP) and reliable agreements on deviation tolerances in the framework contract help.

Current developments: digitalisation and data-driven lot splitting

Modern planning systems and growing data density are changing the picture: dynamic, data-driven decisions on lot sizes and splitting are gaining importance over fixed rules.

APS capacity planning and simulation

Advanced Planning Systems (APS) link lot-sizing parameters directly with capacity planning and simulation. This makes it possible to test how alternative splitting strategies affect lead time, on-time delivery and set-up load before they are trialled in operations. Such simulations are particularly valuable for bottleneck resources, such as heat treatment furnaces or injection moulding machines, where set-up operations are expensive and holding capacities are binding.

Integration via EDI and automated processes

For split lots to arrive smoothly in the supply chain, seamless data integration is crucial. Delivery call-offs, deadline shifts and call-off changes are exchanged automatically via EDI; identifiers such as the Global Location Number (GLN) ensure unambiguous site assignment. Increasingly, digital procurement connections such as punchout or supplier portals also enable the rapid processing of the many smaller orders resulting from fine-grained lot splitting. This reduces the administrative effort per order – an important prerequisite for keeping smaller lots economical.

The influence of volatility and raw material prices

Raw material price volatility influences the lot structure: when prices rise, it may pay to pull larger quantities forward; when prices fall, restraint is advisable. Conversely, high inventory holding costs force smaller lots. This tension between procurement strategy and production logic should be explicitly addressed in the procurement business plan. Systems linked to the commodity index can provide support by evaluating demand quantities and price developments together – however, the final decision remains a business judgement call.

Typical metrics

Average lot size: product-dependent

A comparison of plan versus actual shows whether lot-sizing parameters match real capacity.

Set-up time share: typically 5–20 % of machine utilisation

If the share rises after splitting, the lots have been chosen too small.

On-time delivery per lot: > 95 %

Common benchmark for stable production control with split lots.

Price deviation from the purchase order: < ±2 %

More frequent small orders can undermine price breaks; monitor deviations.

Practical example

A mid-sized mechanical engineering company manufactures housing components in a lot size of 2,000 units per customer order. Repeatedly, long lead times and high work-in-progress inventories occurred because the tool changes on the milling machine could only be performed once for large lots, while the downstream heat treatment could only handle small batches. The head of procurement was confronted with frequent, smaller call-offs that undermined volume-based price breaks. The company therefore restructured its lot splitting:

- Splitting the total demand into four lots of 500 units each, aligned with the furnace capacity of the heat treatment process
- Anchoring the part call-off structure in the framework agreement with a price guarantee on the annual volume instead of individual lots

- Linking lot deadlines to the material availability check (ATP) to avoid partial stoppages
- Regular evaluation of set-up times and price deviation from the purchase order as an early warning indicator of miscontrol

Conclusion

Lot splitting is more than a technical process in production planning: it shapes order rhythm, quantity structure and costs across the entire supply chain. For buyers, it is worth looking at lot-sizing parameters and splitting rules, because they explain why demand arrives in a particular form and frequency. Clear rules, well-maintained master data and contractual agreements with suppliers prevent the optimisation effect from being eroded by multiple processes and price disadvantages. Those who interlink production logic and procurement strategy achieve shorter lead times with stable procurement costs. Lot splitting should therefore be understood as a cross-cutting topic between planning, manufacturing and procurement.

Frequently asked questions

What does lot splitting mean?

Lot splitting refers to breaking down the total quantity of a manufacturing or procurement order into several smaller sub-lots. Each sub-lot is planned, manufactured and reported independently. The aim is better alignment with capacities, deadlines and material availability.

Why is a lot split?

Common reasons include limited holding capacities of equipment, customer call-offs in part quantities, material availability constraints and quality requirements such as first article inspections. Long lead times for large lots are also an argument in favour of splitting. The key is always to weigh this against higher set-up costs.

What is the difference between lot size and lot splitting?

Lot sizing determines the optimal quantity per lot, typically based on set-up and inventory holding costs. Lot splitting defines how an overarching total quantity is broken down into these lots. The two steps are interrelated but answer different questions.

What are the disadvantages of fine-grained lot splitting?

Very small lots increase the number of set-up operations, production confirmations and transport movements, which can increase lead times and costs. For the supplier, smaller call-offs jeopardise volume-based discounts and increase logistics costs per unit. A clear splitting policy with minimum lot sizes limits these risks.

How does lot splitting affect procurement?

Split lots lead to more frequent and smaller purchase orders or call-offs. This can affect price breaks, freight costs and the administrative effort per order. Procurement should know the lot structure and, where necessary, negotiate consolidated call-offs or price guarantees on annual volumes.

How is lot splitting controlled in the ERP system?

Via parameters such as fixed lot sizes, rounding rules, lot multiples and splitting tolerances. Modern systems also offer dynamic lot-sizing procedures and integration with capacity planning. The prerequisite is correct maintenance of set-up, process and cost data in the master data.