Lot sizing: defining lot sizes correctly in procurement and manufacturing

Lot sizing refers to the determination of the quantity in which materials, components or products are ordered, manufactured or delivered together. It links procurement planning, production planning and purchasing and directly influences inventory levels, capital tie-up and set-up costs. Those who define lot sizes systematically reduce inventory levels without jeopardising supply capability or economies of scale. The term is frequently used synonymously with lot size determination or lot size planning.

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Key facts at a glance

01 Lot sizing determines how many units of an article are consolidated per order, production order or delivery.

02 Typical conflicts of objectives exist between set-up and ordering costs on the one hand and inventory carrying and capital costs on the other.

03 Classic methods include the economic order quantity (Harris formula), dynamic lot sizing methods such as Wagner–Whitin and sliding lot formation.

04 In practice, calculated lot sizes are frequently rounded to packaging units, container sizes or delivery schedules.

05 Lot sizes that are too small increase set-up and transport effort; lot sizes that are too large tie up capital and create inventory risks.

06 Planning parameter maintenance must review lot sizes regularly, as demand, prices and set-up times change continuously.

Definition: lot sizing

Lot sizing is the consolidation of demand quantities of an article into an economical batch that is processed as an order, production order or transport unit. The result is the lot size, i.e. the quantity per

lot. It affects procurement, production and logistics costs alike.

Distinction from the order quantity

The economic order quantity typically considers the procurement of a single article from a cost perspective, whereas lot sizing is broader in scope: it also covers production lot sizes, returnable containers and delivery schedules. For trade goods and C-parts, the two terms practically coincide. In manufacturing, a distinction is additionally made between intermediate and finished product lots, whose sizes can differ across the routing steps.

Static and dynamic lot sizes

With static methods, the lot size remains constant over a longer period, for example as a fixed quantity or an integral multiple of a packing unit. Dynamic methods calculate lots on a demand-driven basis per period and adapt to demand peaks and shelf-life limits. In practice, a hybrid is often used: a static base value with periodic reviews by planning parameter maintenance.

Methods and approach for determining lot sizes

The choice of method depends on demand structure, set-up effort, the value of the article and supplier conditions. No method is universally correct; usually the ABC/XYZ analysis determines the appropriate level of methodological depth.

Cost-oriented methods

The classic economic order quantity weights ordering costs against inventory carrying costs and provides a mathematically justified quantity. Extensions take into account volume discounts, seasonally fluctuating prices or transport costs. The prerequisite is sufficiently stable, uniform demand; with strongly fluctuating demand, static formulas lead to uneconomic inventory levels.

- Record set-up costs or ordering costs per lot
- Apply inventory carrying rate, interest rate and capital tie-up realistically
- Include volume tiers and freight surcharges in the calculation

Dynamic methods and demand balancing

Methods such as part-period balancing, the sliding economic lot size or exact optimisation (e.g. Wagner–Whitin) work with period-related demand from material requirements planning. They are suitable for A-parts with irregular demand. A disadvantage is their sensitivity to forecast errors; secured demand data and a cleanly maintained planning key are mandatory.

Practical rounding and constraints

In practice, calculated lot sizes are adapted to realistic container sizes, minimum order quantities, production capacities and shelf-life limits. Customer single-use packaging or container circulation systems also set limits. The rounding rules should be documented in the article master data so that

procurement planning and the supplier work from identical assumptions.

Key KPIs for evaluating lot sizing

Lot sizes can only be managed if their impact is measurable. The balance between inventory metrics and supply capability is decisive.

Inventory and capital metrics

Relevant indicators are average inventory, inventory coverage and capital tie-up per article. High inventory levels often indicate oversized lots, particularly for B- and C-parts. In practice, a coverage of a few weeks is regarded as a common guideline for A-parts, while C-parts are deliberately stocked at higher levels.

Delivery and process metrics

Fluctuations in lot size directly affect On-Time In Full (OTIF) and PO Cycle Time: very small lots generate many orders and longer process throughput, while very large lots increase the risk of rework and expiry. The scrap and rework rate can also rise with large production lots because errors are detected later.

- OTIF per supplier and article
- PO Cycle Time as an indicator of order volume
- Order frequency and set-up time share per resource

Proof of economic efficiency

Regularly reviewing actual lot sizes against the mathematically optimal size reveals leverage potential. In practice, savings potential of a few per cent of procurement and inventory costs is often found, which becomes relevant when aggregated across many articles. It is important to assign cost changes in a traceable manner.

Lot sizing in interplay with suppliers and contracts

Lot sizes are not only decided internally; they interact with supplier terms, framework agreements and quality requirements.

Terms and framework agreements

Volume discounts, minimum order quantities and price indexation directly influence the economic lot size. Price negotiation techniques can help to align tier thresholds with your own optimal lot size instead of passively accepting them. For long-term framework agreements, adjustment via an amendment is possible if the demand structure or cost base changes.

Quality and approvals

The larger a lot, the higher the risk that an entire batch is affected if the quality agreement or quality assurance agreement is breached. First-article and process approvals such as Run at Rate must be completed before large lots. Blocked stock management ensures that rejected batches do not enter production and that reserved quantities are substituted in good time.

Inventory and delivery models

As an alternative to own lot sizing, models such as the consignment agreement relieve inventory because the supplier delivers stock to the customer's premises and invoicing takes place after withdrawal. Delivery schedules with fixed module lot sizes or customer-synchronised lot sizes in the automotive sector also set the framework for lot sizing. The Supplier Code of Conduct and agreed logistics requirements (e.g. VDA standards for automotive suppliers) provide binding specifications here.

Risks, controls and organisational integration

Lot sizes have an impact over months; errors accumulate. Controls and clear responsibilities are therefore essential.

Typical sources of error

Frequently, lot sizes are defined once and never reviewed again, even though demand, prices and set-up times change. Rounding to headcount figures, outdated set-up times or unconsidered minimum order quantities also distort the picture. A 'frozen period' concept in production planning additionally prevents short-term changes from constantly destabilising lot sizes.

Controls and approval processes

Changes to planning parameters belong in a controlled change process with the four-eyes principle; ideally with mobile approval (P2P) for quick decisions in day-to-day business. Regular stocktaking and inventory analyses reveal excessive stock and surpluses. For new articles, the follow-up request for documentation applies in order to obtain lot size specifications, packaging specifications and technical data in full.

Organisation and system support

The procurement organisation must clearly regulate roles and competences for parameter changes; modern ERP and P2P systems support this with simulated lot sizes and warning messages. Guided buying rules can steer buyers towards agreed lot sizes and suppliers without checking every individual decision. A PO policy documents in binding form which procurement routes and lot size rules apply at which quantities and values.

Current developments in lot sizing

Digitalisation, sustainability requirements and volatile supply chains are noticeably changing classic lot size planning.

Digitalisation and simulation

Artificial intelligence and advanced planning systems simulate lot size alternatives based on historical and forecast demand. This allows scenarios such as price tiers, transport costs or capacity limits to be evaluated automatically. In practice, the importance of automated planning for C-parts is increasing, while A-parts continue to be reviewed by specialists.

Sustainability and the circular economy

Lot sizes also influence the environmental balance: large lots can lead to expiry dates, excess volumes and disposal costs. The recycled content ratio and packaging requirements set additional boundary conditions when choosing container and lot sizes. Supply chain due diligence obligations also increase the need to document inventory and origins in a traceable manner.

Volatile supply chains

Delays in the supply chain, restructuring of suppliers or an outsourcing transition of in-house manufacturing expertise require flexible lot sizes and deliberate safety stock. The transition to alternative suppliers or to an RTO supplier (rent-to-own) for equipment also changes the perspective. In procurement, the RTO supplier is gaining in importance when capacities need to be secured at short notice.

Lot sizing in single-unit and small-batch production

In addition to series production, lot sizing also shapes spare parts warehouses, plant engineering and customised manufacturing. Here, cost equations are less dominant than availability and project dependencies.

Spare parts and ATEX/special materials

For spare parts and special materials, availability takes priority; the lot size frequently follows the manufacturer's minimum containers. For expensive or inventory-critical articles, joint lot sizing using customer data from service contracts can be sensible. For chemicals and hazardous substances, additional transport and storage restrictions apply, which limit lot sizes from above.

Project business and customised manufacturing

In project business, lot sizing often follows project progress and defined acceptance milestones. Advance lots or pilot lots are used to mitigate risk. Contracts with an NDA (non-disclosure agreement) protect the transfer of know-how where lot size data provides insight into unit quantities and unit costs.

Typical metrics

Metric	Typical value
On-Time In Full (OTIF)	> 95 % *common guideline value; large, inflexible lots impair delivery reliability in terms of dates and quantities*
Inventory coverage	2–8 weeks (A-parts) *common guideline value in practice; C-parts deliberately stocked at higher levels*
PO Cycle Time	< 5 working days *short throughput times indicate lot sizing that is not overly fragmented*
Inventory record accuracy	> 95 % *prerequisite for reliable lot size calculation based on demand and inventory data*

Practical example

A mid-sized mechanical engineering company with around 15,000 active articles found during an inventory analysis that the lot sizes of many B- and C-parts had remained unchanged for decades. Some items were procured in six-month quantities even though monthly demand had fallen sharply; at the same time, supply shortages increased for fast-moving A-parts because their lot sizes were too large and therefore inflexible.

- ABC/XYZ analysis of all active articles and assignment of suitable lot sizing methods
- Adaptation of planning parameter maintenance with a controlled change process and mobile approval (P2P)
- Negotiation of new volume tiers with key suppliers based on the calculated economic order quantity
- KPI monitoring with OTIF, inventory coverage and PO Cycle Time to measure impact

Conclusion

Lot sizing is a cross-functional topic that links procurement, production and logistics. The mathematically optimal lot size is only a starting point; practical constraints such as container sizes, quality approvals and supplier terms are decisive. Regular review of parameters and measurable KPIs prevent historically grown lot sizes from tying up inventory and capital. Those who manage lot sizes systematically improve supply capability and cost position at the same time. This makes lot sizing one of the most economically effective levers in operational purchasing.

Frequently asked questions

? What does lot sizing mean in procurement?

Lot sizing describes the determination of the quantity in which materials or components are ordered, manufactured or delivered together. It defines the lot size per article and directly affects inventory levels, set-up costs and capital tied up. In the stricter sense, it is a tool of procurement planning and materials management.

? How do you calculate the optimal lot size?

The classic method is the formula for the economic order quantity, which balances ordering costs against inventory carrying costs. With irregular demand, dynamic methods such as part-period balancing are used. The result is then rounded to container sizes, minimum order quantities and capacities.

? What are the disadvantages of an excessively large lot size?

Excessively large lots tie up capital, increase inventory costs and raise the risk of obsolescence or expiry. Where quality problems occur, the entire batch may potentially be affected. In addition, flexibility decreases in the event of demand changes or engineering changes.

? How often should lot sizes be reviewed?

In practice, a review every six to twelve months has proven effective, and more frequently for A-parts and after significant changes. Triggers are price changes, new volume tiers, changed set-up times or demand shifts. Maintenance is carried out via a controlled change process in the article master data.

? What is the difference between lot size and order quantity?

The order quantity refers to the quantity of a specific order, whereas the lot size is the general rule for how demand is consolidated into lots. For simple purchased items, the two often coincide. In manufacturing, production lot sizes and order quantities differ significantly, for example with intermediate products.

? What role does lot sizing play with consignment stock?

Under a consignment agreement, the supplier stores material at the customer's premises, which is only invoiced after withdrawal. Classic lot size optimisation therefore loses significance, as capital tie-up and inventory costs remain with the supplier. Nevertheless, logistical lot sizes such as container and delivery quantities remain relevant.

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