



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Addressing Inventory Management Concerns

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Student Name: MD TUHIDUL ISLAM TUHIN

Student ID: 2425623

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Introduction

In the case of Brockswear Engineering Ltd, an example of what transpires due to informality can be described as rather easy and expensive to manage. The finding of the near-expiry of phenolic and furan-based resin, currently a special waste, and the increasing disposal prices of sand as well as the fact that the saving of buying in large quantities were no longer evident due to the added cost of drying of the material indicates the acuity of the changes. The firm has 250 employees in three business units, castings, fabrications and machined parts, whereby the sand-casting demand has been expanding much more with three new diecasters recruited in the recent past. To solve these problems a new Purchasing and Supply Chain Manager has been developed. The report critically assesses the manner in which the inventory of sand and resin ought to be carried out, the manner in which the current obsolete inventory ought to be dealt with as well as how the firm ought to be in a position to develop a superior outlook of the lead time within its operation and within its extended enterprise.

Question 1: Managing Sand and Resin Inventory

ABC Classification

Classification is the initial step to the management of inventories in a structured manner. ABC system orders items by annual expenditure value using the Pareto principle: A items, which usually comprise 10-20 percent of the stock lines, spend 60-80 percent of a total spend and demand the most stringent controls; B items are of a middle ground, and C items, but with large numbers, represent relatively little spending (Stevenson, 2021). Phenolic and furan-based resins should be considered as A items at Brockswear. They are tailored chemicals that have low shelf life, have high disposal costs when it expires and are subjected to environmental penalties as special wastes. Foundry sand is a cheaper material, has a high volume, and therefore may occupy one of the B or C groups; however, its disposal cost which has been tripled by far increases its strategic value. The ABC classification guarantees a sensible measure of attention to its management: resins are tested regularly and have their quantities carefully monitored, whereas sand is managed with a slightly less vigorous approach but within certain limits.

Economic Order Quantity (EOQ)

After categorizing items into groups, the company needs to decide on the amount of items it can order. EOQ model estimates the order quantity that will reduce the combined cost of the annual ordering and holding inventory (Silva, Silva and Ferreira, 2025). The formula is:

$$EOQ = \sqrt{\frac{2DC_o}{C_H}}$$

Where D is the annual demand, C_o is the ordering cost per order and C_H is the annual holding cost per unit. In the case of resins, the demand data should be obtained based on the cast schedules and should be managed on quarterly basis as the output increases. Its present conditions of constant demand and steady lead time are the assumptions of the EOQ model, which are not fully applicable to the growing operations of Brockswear (Stevenson, 2021). However, a rough EOQ is still by far much better than unconstrained bulk buys which have resulted in the current write-off. One of the critical adaptations required of Brockswear is the fact that EOQ of resins has to be limited to the amount to be used before the soonest date on the shelf-life, irrespective of the formula generated. Discounting to bulk orders cannot be more important than this limit - because, as this experience shows, the expense of clearing away expiry or special wastes is many times greater than the possible saving obtained with bulk buying.

Maximum, Minimum and Re-Order Levels

In addition to EOQ, formal stock level limits based on the Re-Order Point (ROP) model must also be determined (Silva, Silva and Ferreira, 2025):

- Re-order Level = Maximum usage x Maximum lead time.
- Minimum Level = Re-order Level - (Normal usage × Average lead time)
- Maximum Level = Re-order Level + EOQ – (Minimum usage × Minimum lead time)

These triggers provide the stores personnel with firm and clear indicators when to place an order and when to receive it. They also establish a formal ceiling which discourages excessive-ordering. In the case of resins, the upper limit should also be limited by shelf life, so that, by delivery there should be no absolute amount of stock in the hands that cannot be used up before expiry. These calculations will only be possible with quality lead time data, as Question 3 discusses in more detail.

Vendor Managed Inventory (VMI)

Due to the nature of the resins, these being specialist and hazardous, Vendor Managed Inventory is a strategic point of interest. With VMI, the supplier tracks inventory and consumption history of Brocksweir and automatic replenishment occurs, instead of a purchase order (Silva, Silva and Ferreira, 2025; Waters, 2019). This can especially be the right option when dealing with chemicals that face limitations in their shelf-life: the suppliers can better control the time of delivery, proper rotation of stock, and promptly address the sudden alterations in demand. VMI is also found to minimize the amplification of demands throughout the supply chain and enhances visibility and minimizes superfluous inventory (Silva, Silva and Ferreira, 2025).

VMI is however risky. Brocksweir would be increasingly reliant on a supplier, and application would involve sharing of data - casting schedules and consumption rates should be revealed to the supplier. It should be implemented in phases, it is advisable to start with a pilot agreement with one of the major resin suppliers and set some performance standards like no cases of non-expired stocks, delivery rates on time and the minimum age of resin during delivery. A wider rollout should be informed by success on the pilot.

Safety Stock

In order to contain variability in supply safety stock must be computed as follows:

$$\text{Service Factor} \times \text{Demand Variation per Day} \times \sqrt{(\text{Lead Time in Days})}.$$

In the case of foundry sand that does not present any risk to shelf life, a larger safety stock would be appropriate considering the havoc a stock out would have to the activity of the foundry. In the case of resins, the safety stock needs to be purposely lean as the safety stock directly pushes the risk of expiry. The two-bin system is a useful sand-management tool, in which the second bin will contain the re-order quantity and the safety stock; once the first bin is empty, it will signal to order (Stevenson, 2021). Unlike an IT system, this straightforward visual stimulus can be implemented without delay.

Question 2: Dealing with Obsolete Stock

The expired resins worth £20,000 are also an accountable financial liability and is an indication of systemic failure. There are a number of options and they are not exclusive of each other.

Specialist waste disposal: The easiest path is to use specialist waste disposal. To dispose the expired resin, a licensed special waste contractor ought to be hired to take care of such wastes according to the latest environmental policies. It has to be officially charged against the accounts of the company as a by-product of not managing its inventory and reported to the managing director as such. According to Lysons and Farrington (2020), inventory write-offs must be approved at respective levels and duly recorded to create financial transparency and accountability.

Supplier return: The first step to be taken is to discover whether the supplier can return or not before engaging in disposal. Specialty chemical suppliers may also have a type of returns or buy-back programme, especially on inventory that is slightly aged, but which is properly stored. A partial recuperation of purchase worth decreases the net loss and starts to develop the sort of harmonious supplier association that foundations any forthcoming VMI setup.

Move to other foundries can be done provided that the resins are not kept outside of a working range and adequate storage conditions were observed. Such transfer may be facilitated by industry networks like the Cast Metals Federation. Any transfer has to abide by the hazardous waste laws and the recipient should possess relevant licences.

The usage should only be hastened when the technical team has verified that the materials are safe and are still functional. Poor binder resins pose the danger of failure of mould, defects in casting and unhappy customers quality complaints- maybe much higher than the material saved. This alternative can only be applied to the finest batches which have not spoilt.

Preventing Recurrence

It is not sufficient to solve the issue of waste at hand when the root problem is not rectified. Wild (2017) also notes that obsolete stock is nearly a sign of a failing plan instead of unusual conditions. Brocksweir needs to apply FIFO (First-In, First-Out) stock movement and shelf-life dates immediately with goods inward shelves carrying a label of the batch; monthly stores audits comparing stock with expiry date; a controlled approval process on order of resin that is more than the EOQ; automated alerts on expiry within whichever inventory management

system the company adopts (Slack, Brandon-Jones, and Johnston, 2022). All these measures should prevent the recurrence of the current write-off.

Question 3: Improving Lead Time Understanding

Mapping Lead Time Components

All inventory calculations Brockswear will perform, the Re-Order Level, safety stock and maximum stock level all rely on lead time data. But with no formal system of inventory lead times have never really been formally measured. The total lead time of the entire business includes: supplier lead time - The time taken by the supplier between the time when the purchase order has been made and the goods received at the delivery location (e.g., warehouses, factories, site, etc.). internal processing time - The time that it takes to perform all the various stages involved such as inspection, storage, receipt into production, etc., production lead time - The time that a business takes to complete all All the components should be measured separately (Christopher, 2022). In the case of the sand foundry, in particular, the sand drying times, and resin cure times are crucial and dynamic factors, which need to be measured during the production lead time baselines.

Data Collection and Measurement

The new Purchasing and Supply Chain Manager ought to develop a supplier performance log which documents; the date the order was placed, the supplier date quoted by supplier, and the day the supplier delivered the order. In the long term, this log will indicate the average lead times, and their dispersion by vendor. Lyons and Farrington (2020) suggest observed historical lead time instead of the lead time being quoted by the supplier, as the factual lead times are always more fluctuating and should be the determinant of safety stock and re-order level calculations. On the inside, job cards or a simple digital tracking device must record elapsed time in each production phase, allowing to identify bottlenecks and decrease cycle time progressively.

Extended Enterprise Integration

Christopher (2022) claims that sustainable competitive advantage is gradually located not in such spheres as the operations of firms but in supply chain management. The long chain business to upstream chemical and metal suppliers and downstream customers is farthest with Brockswear, which has on-site installation that increases the delivery lead time especially in the

fabrication part. The company ought to have a systematic review of its key resin and alloy suppliers to exchange demand projections, and get familiar with the capacity limits at the upstream. When the demand is more visible (Suppliers often provide shorter or more dependable lead times) it often makes the suppliers bargain a more directly commercial advantage of the discipline of data-sharing that a VMI would entail too. At the customer end, especially within the expanding machined parts business, an agreement of call-off schedules against the current contracts will enable production to be synchronized with known demand to minimize the internal lead times, as well as, dependence on finished goods inventory.

Lead Time as a KPI

The delay of long-term improvement means that it must be measured. Wild (2017) suggests monthly reporting on delivery performance of suppliers on time, quickness of the internal production cycle, and customer delivery performance. The first thing that Brocksweir needs to do would be to create a simple dashboard hand-edited at first in the absence of a system displaying actual and target lead times of major materials and customer deliveries in all three segments. These metrics must belong to the Supply Chain Manager who should report them to the managing director at the end of every month, so that appropriate action can be taken in case of deterioration of lead times.

Conclusion

Brocksweir engineering Ltd is experiencing an urgent yet solvable inventory problem. The find of the outdated 20,000 resins is indicative of larger lack of inventory management discipline that this report has responded to with three interrelated analyses. To manage sand and resin, the ABC classification, ordering by EOQ, imposition of formal maximum and minimum stocks, and a VMI pilot with major resin suppliers are implemented to offer a organized and equal response. In the case of the obsolete inventory a mix of expert disposal, supplier buyback and stringent measures to avoid future occurrence provides a short-term reprieve as well as long-term safeguards. And on lead time, the measurement systematically of all the supply chain elements, backed by supplier tracking performance and integration with the extended enterprise, forms the basis of the data on which all inventory calculations rely. The combined efforts will see Brocksweir realise the dream of its managing director of moving the business to the 21st century, on a firm operational basis.

References

- Christopher, M. (2022). *Logistics & Supply Chain Management*. 6th ed. Pearson Education, Limited.
- Lysons, K. and Farrington, B. (2020). *Procurement and supply chain management*. 10th ed. S.L.: Pearson Education Limited.
- Silva, Â., Silva, M. and Ferreira, A.C. (2025). Inventory Management and Its Influence on the Supply of High-Value Products: Case Study Evidence. *Logistics*, [online] 9(4), p.170. doi: <https://doi.org/10.3390/logistics9040170>.
- Slack, N., Brandon-Jones, A. and Johnston, R. (2022). *Operations Management*. 9th ed. Harlow, England: Pearson.
- Stevenson, W.J. (2021). *Operations Management*. 14th ed. McGraw-Hill Education.
- Waters, D. (2019). *Inventory control and management*. Chichester: Wiley.
- Wild, T. (2017). *Best practice in inventory management*. London Abingdon, Oxon New York, Ny Routledge.