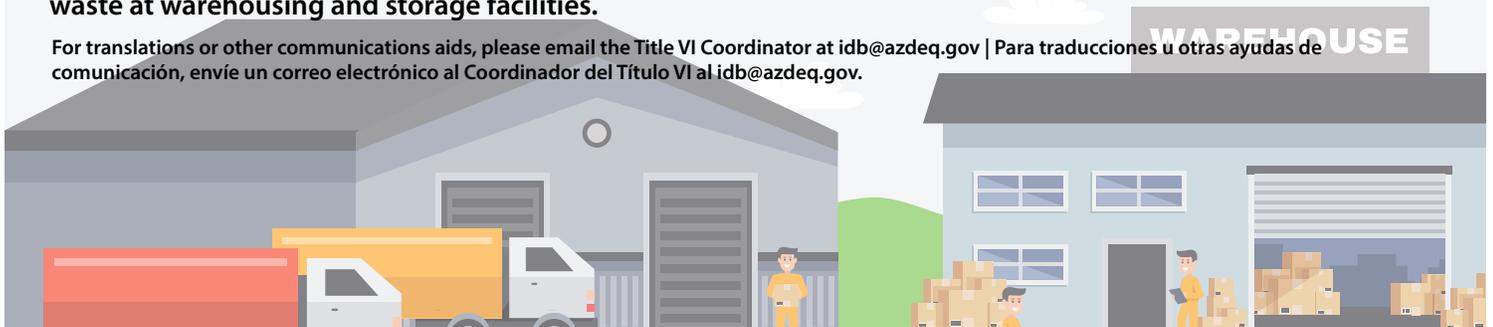


## Lean and Sustainable Warehousing

Warehousing and storage is becoming an increasingly important part of all supply chains due to globalization, increased service areas, and customer demand for customized, fast delivery. On average, warehousing accounts for over 24% of logistics costs.<sup>1</sup> As costs and size increase, warehouse waste streams can also be expected to increase. This resource summary provides information on optimizing operations and reducing waste at warehousing and storage facilities.

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### Lean Warehousing

Lean, a process developed by Toyota for mass production, is defined as the elimination of waste in any, or all parts, of the operation. Waste can be time, resources, energy, or underutilized human potential. The lean process has five steps which can be applied to warehousing.<sup>2</sup>

**Identify the voice of the customer (VOC) and determine value** -- What do your customers want? How can your warehouse deliver a product or add value to the process? How is delivery speed or customer service impacted for warehouses? For example, are there unnecessary processes, materials or chemicals that don't add value to the business?

**Create a value stream map** -- Plot all steps of the warehousing process and include descriptions of each step, which resources are used, and what waste is produced. The more visual the map, the better. This will allow employees to easily find bottlenecks and alleviate them. Break the steps per department and involve the direct employees in identifying the process, resources and waste.

**Make the process flow** -- After identifying bottlenecks or waste streams, lessen the issues or remove them altogether. For example, if there is expired material that is continually disposed, identify the root cause for the expired material and work on a strategy to reduce or eliminate the waste.

**Pull from the customer** -- Base any actions (especially stocking) on the customer. Allow customer needs to drive new orders rather than corporate projections. This will reduce the need for surplus stock and clearance sales.

**Pursue perfection** -- Continue to identify waste and remove it. Make the goal to reduce or eliminate toxic substance use and hazardous waste generation.

Menlo Logistics, a third-party logistics company, uses a variety of lean tactics to increase efficiency. Some examples are:

- Keeping drivers and tractors constantly moving using a live-load system.
- Mapping out the most efficient travel routes to reduce distance traveled, reducing greenhouse gas emissions.
- Customer return and reuse of used containers and packaging to reduce waste and use of new material.

As a result, Menlo has increased

productivity, decreased defects, and completed more orders on-time.<sup>3</sup>

### Sustainable Warehousing & Decision-Making Processes

Sustainable warehousing is defined as the management of a warehouse and all related flows of materials and information that balance economic, social, and environmental factors (also called the pillars of sustainability).<sup>4</sup> This includes any practices within the warehouse, such as HVAC retrofitting or additional employee training, and processes that affect the nearby socio-ecological system. Unilever suggests that firms use this decision-making process to consider all three pillars.<sup>5</sup>

Determine which issue(s) you want to address. Establish objectives. What do you hope to achieve with these improvements? Classify objectives into musts and wants. Which are crucial for operations? Generate alternatives. Research new sustainability opportunities. Evaluate alternatives. What are the advantages and disadvantages? Compare the alternatives and existing technologies and processes, then implement changes if they are viable.

## Interfirm Cooperation

Interfirm cooperation is a large aspect of sustainability for warehouses. By pooling resources and information, nearby firms can keep costs down, ensure healthy local ecosystems and hold one another accountable. Below are two types of interfirm cooperation for warehousing operations.

**Freight villages<sup>5</sup>** -- Nearby firms create one transit and logistics system to reduce redundancy, storage and fuel costs.

**Eco-industrial Parks<sup>6</sup>** -- An interlinked system of firms which recycle, reuse, or repurpose materials. In other words, waste from one firm can be used as inputs for another.

For interfirm collaboration to work three key factors need to be in place:

1. All parties must benefit in some way
2. Stakeholders in the system should be involved and managed
3. Mediation of conflict should be left to an autonomous party.

For more information of collaboration models, please see Unilever's paper, *Sustainable Warehousing*.<sup>5</sup>

## Systems Modeling

Systems modeling is crucial for tracking and understanding your warehouse. These models can be used for internal as well as interfirm operations. For example, see the model of the resource cycling in an eco-industrial park in Kalundborg, Denmark which demonstrates how in one relationship, fly ash from Asnaes, a coal-fired plant, is used by cement manufacturers.<sup>7</sup>

For more information on modeling, see Ed Yourdon's free ebook on systems analysis, *Just Enough Structured Analysis*.<sup>8</sup>

## Facilities Management

Warehouses can reduce waste by maintaining efficient building infrastructure. This includes employing energy efficiency practices, HVAC, water reduction, indoor air quality and safer cleaning. For more information on facilities management, refer to ADEQ Facilities Management Resource Summary.<sup>9</sup>



## Employee Involvement

Involving employees is the best way to reduce waste. Employees are not only directly involved in processes and have a better view of where the waste is, they can also offer ideas to improve efficiency and reduce waste. Some ideas to increase engagement include:

- Interview employees that work within the processes.
- Train and involve both new and veteran employees in sustainable initiatives and ideas to promote source reduction.
- Encourage participation by holding brainstorming discussions with employees in each department.
- Provide incentives for ideas such as gift cards, free company merchandise or recognition certificates.
- Promote healthy competition to reduce waste among departments.

## References

- <sup>1</sup> [Amjed, Tayyab Waqas and Harrison, Norma J. \*A Model for Sustainable Warehousing: From Theory to Best Practices\*.](#)
- <sup>2</sup> [Andreatta, et. al. \*Lean Warehouse: Low-Hanging Fruit\*.](#)
- <sup>3</sup> [Menlo Logistics. \*2012 Sustainability Report\*.](#)
- <sup>4</sup> [Tan, Ahmed & Sundaram. \*Sustainable Warehouse Management\*.](#)
- <sup>5</sup> [Mulder, Sjaak. \*Sustainable Warehousing: An Empirical Research on Building Options and Collaboration Models\*](#)
- <sup>6</sup> [Sharma, Archana. \*Symbiosis in Eco-Industrial Parks: Lessons on Planning a Symbiotic City\*.](#)
- <sup>7</sup> [International Institute for Sustainable Development. \*Business and Sustainable Development: a Global Guide, "Kalundborg"\*.](#)
- <sup>8</sup> [Yourdon, Ed. \*Just Enough Structural Analysis\*.](#)
- <sup>9</sup> [ADEQ. \*Pollution Prevention \(P2\) for Facilities Management\*.](#)