

Vital Vitamins[®]



A College-Industry Council on Material Handling Education Case Study



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Project Summary

Student Teams will design a manufacturing, warehouse and distribution center using good material handling practices. The project will require analysis and design of material flow from receiving through shipping, selection of appropriate material handling equipment, and a detailed description of the operation. The final designs will be judged in a competition.

Report Format Suggestions

Cover Page - With project title and team members.

Table of Contents - With page numbers.

Executive Summary - One page or less. Brief description of problem(s), approach, main findings and recommendations.

Introduction - Include an overview of the problem and operations. Briefly discuss the project thrust.

Problem Statement - Concise description of problem(s) that are addressed by this project. What is wrong? Who is being affected? Etc.

Approach and Methodology - This can have sub-sections. Justify your approach. What other approaches were available to you? This section should contain a literature review, with pertinent references cited from your reference section. Describe how you approached the problem - methods and procedures, assumptions, analysis techniques used, data sources. Why did you choose your approach?

Report Format Suggestions

Results - Provide a summary of numeric and qualitative results. Discussion of results and their sensitivity to changes in assumptions. Some graphs and charts would be good in this section. Detailed printouts or calculations should be put in an appendix. Note, all pertinent information must appear within the body of the report. The reader should only need to refer to the appendices to get more detailed information.

Recommendations and Implementation - Describe a clear list and discussion of your short-term and long-term recommendations. Follow this with an implementation plan. Discuss benefits for implementing your recommendations, as well as any limitations.

Conclusions and Acknowledgments.

Report Format Suggestions

References - (Including oral conversations, listed as “Personal Communication.”) Note, citations should be made throughout your report where appropriate.

Vital Vitamins[®]



Case Study Background & Objectives

Company Profile

Vital Vitamins is a manufacturer and distributor of over the counter vitamin supplements, specializing in sports nutrition proteins, powders, and drinks, and weight management products. They ship to company-operated retail stores, and directly to consumers on internet and phone orders. They also have a line of Vital Brand™ products, which are generic labeled knock-offs of some of their best sellers, manufactured in-house. Due to tremendous growth, Vital has outgrown its existing facilities and is in the process of building a new warehouse. This new building will house offices, manufacturing, distribution and warehousing of finished goods, raw materials and packaging supplies. Vital Vitamins currently operates its manufacturing and shipping staff on a 10 hour schedule. They wish to remain on this schedule.

Facility Description

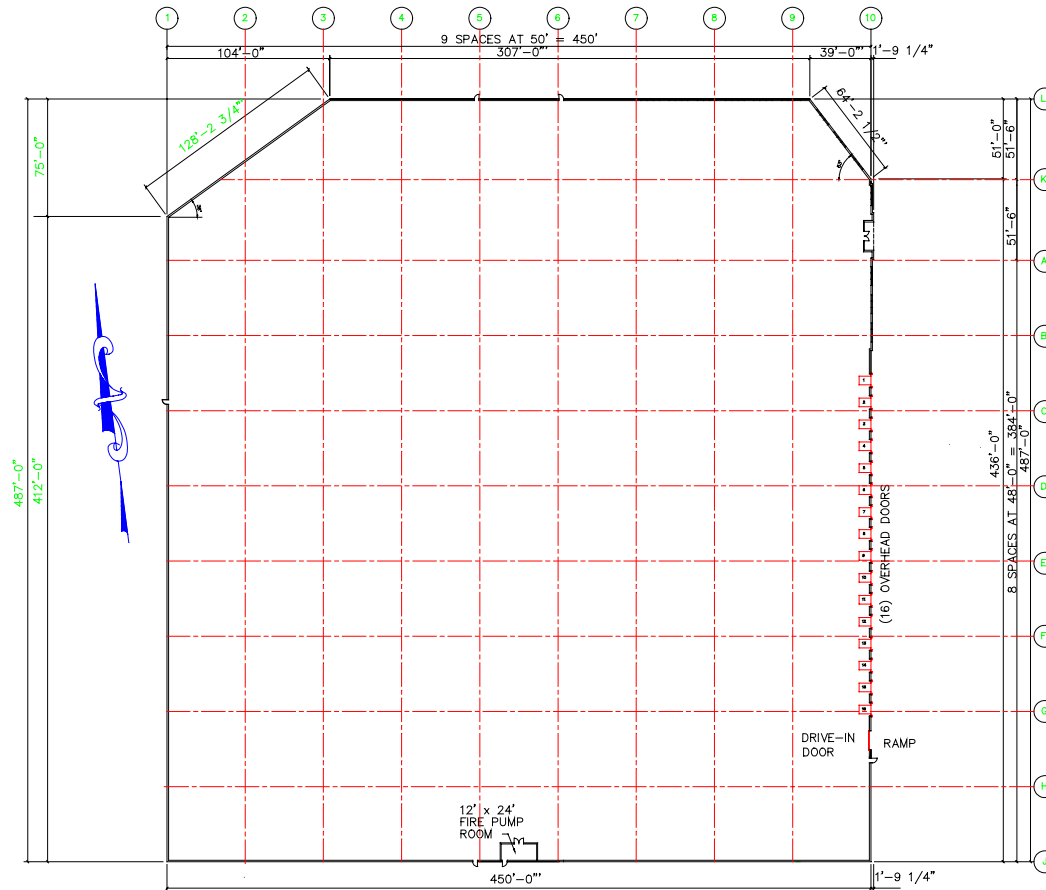
Vital's new facility will be constructed at up to 215,000 sq. ft. with a clear stacking height of 36 feet. Included in the building is 25,000 sq. ft. for corporate offices, 4,000 sq. ft. for Vital Brand manufacturing, and 3,000 sq.ft. for a Vital Vitamins outlet store on-site. The remaining 183,000 sq. ft will be used for warehouse and distribution space. There is space for up to 16 dock doors to be located on the east side of the building, but due to driveway and curb restrictions on the outside of the docks, the builder is trying to limit construction to 12 dock doors to reduce costs. Vital is in negotiations for the additional doors. There is also space along the east wall for a drive-in door.

Facility Description (cont.)

The new facility can be built at either 173,000 sq.ft. in a rectangular shape, or at the full 215,000 sq.ft. with expansion to the north fitting in around the curve of an existing roadway. The cost of the additional square footage is \$50 per sq.ft. or \$2.15 million, but must be built if necessary to meet Vital Vitamin's 5-year growth goals. A mezzanine in the 173,000 sq.ft. portion of the facility could be used to offset that requirement.

The outlet store requires nearby customer parking, and the corporate offices should be near the outlet store, but not connected. The parking lot is currently located on the west side of the site.

Empty Facility Space (file available on website)



Operational Details

The Vital Vitamins facility will receive in both raw materials and finished products. There are 2 types of raw materials: bulk vitamins, which come in large plastic filled boxes on pallets, and empty bottles to fill with vitamins. These materials will go into either bulk storage or be directly taken to manufacturing for processing. The finished products, which are a variety of bottles and product types that are not manufactured by Vital, go directly into reserve storage.

Operational Details

In the manufacturing room, work orders are processed on a daily basis, by filling the empty bottles with specific vitamins, labeling the bottles with Vital Brand™ labels, and price ticketing the finished product. Vital currently has two filling lines and is considering adding a third if growth plans require the additional output. They could also upgrade the two existing lines to produce more bottles. The cost of a new high-speed line is \$1 million. The cost to turn an existing line into a high-speed line is \$570,000 each. The new line will require an additional 3,000 sq.ft. of manufacturing space.

Operational Details

Finished goods, both Vital Brand™ and outside vendor products, are sold in company stores across the United States, or direct to the consumer through catalogs and internet sales. All orders are routed through an in-house warehouse management system (WMS), which has the ability to drop orders for picking in a variety of ways – all store orders vs. all direct orders or mixed, in waves, in batches, or just as they come in. The official company policy on orders is catalog and internet orders received by 3 pm will be shipped the same day, which requires a high speed picking system. Store orders are direct replenishment of store sales (i.e. For each bottle of Vitamin D sold, an order is placed into the WMS for 1 bottle of Vitamin D). Replenishment of store sales for today will be picked and shipped tomorrow and received the following day (a 2-day maximum turnaround).

Operational Details

All products, except for Vital Brand™, which are ticketed during manufacturing, need to have price tickets added before they are sold. The company currently places price tickets on products in the company stores, but an internal audit has determined that this process costs the company \$1 million annually in store employee labor costs, and hopes to justify moving this process to the warehouse. They do not currently ticket products sold directly to consumers, but are willing to do this if necessary for the operation as long as the costs incurred to not exceed the savings from moving the process to the warehouse. The ticketing operation can occur during or after picking, during replenishment, or during or after receiving. Due to frequent price changes in their products, though, 33% of tickets applied 1 month or more before sale will need to be re-ticketed.

Operational Details

Finished goods are received in one of 2 ways: large orders for fast-selling items come from consolidators in full case shipments on pallets; smaller orders for slow-selling items come from small local vendors in totes on pallets, with each tote potentially containing multiple SKUs (product types).

All orders are currently picked into totes. Store replenishment orders are shipped in these totes to company stores, and later returned to the warehouse. Customer direct orders are transferred at packing to shipping cartons, which are currently 3 sizes. All orders are scan verified at packing since picks are made using a paper-based system. The WMS is capable of RF-scan picking, and the company is looking to implement this technology as part of the move to the new facility.

Operational Details

Picked orders, both Vital Brand™ and other vendor products, are shipped to stores on company-owned trucks and to customers on parcel shipment vehicles (UPS, FedEx, or Airborne). These trucks are available for loading after 11 am through close of operations. Current operation hours are 8 am to 8 pm, with staggered staffing to keep employees on 10-hour day schedules. The union contract calls for overtime rates for any warehouse employee working past 8 pm. The cut-off for same day delivery for the parcel carriers is 10 pm. The company is willing to pay overtime when necessary to get shipments out for same day orders (before 3 pm).

Customer returns are outsourced to another facility, and will not need to be included in this analysis.

Operational Details

- How Product is Received
 - Raw Materials
 - Palletized, standard US 48” x 40” pallets; pallet height 78 inches including pallet
 - Finished Goods
 - Consolidators: Palletized, standard US 48” x 40” pallets; pallet height 60 inches including pallet
 - Small Vendors: Totes, 24” x 12” x 12,” containing multiple SKUs per tote
- How Product is Shipped
 - Store Replenishment Orders
 - Palletized totes, standard 48” x 40” pallet; pallet height 5’ including pallet
 - Customer Direct Orders
 - Individual cartons, directly loaded onto parcel carriers

Project Description

Vital Vitamins has hired your team to design their new facility. Vital has provided all the current inventory and sales data for this facility. The company anticipates the following growth parameters:

Internet and Catalog Sales: 2% growth per year

Store Sales: 20% growth per year

It is assumed that order characteristics (lines per order, units per line, etc.) will continue at current levels.

Develop the best material handling, storage and product flow for this facility including the Vital Brand™ manufacturing space. They have hired another contractor to design the corporate office space and outlet store, and only need to know the locations of these in the warehouse, not the internal design. They expect the new warehouse to be sufficient for 5 years growth at peak volume levels.

Project Description

The project team's resulting design must be submitted to upper management of Vital Vitamins for budget approval. As such, all significant financial decisions need to be justified, including but not limited to the following:

- Overall size of the building (173,000 sq.ft. or 215,000 sq.ft.)
- The number of dock doors required
- A decision on whether to price ticket in the warehouse or the stores
- The number of new manufacturing lines required, or updates required for existing lines
- Storage and handling equipment to be purchased
- Staffing savings to justify equipment purchases

Design Year Receiving Data

RECEIVING SUMMARY				
	Raw Materials	Finished Goods- from Consolidators		Finished Goods - Small Distributors
Average Day				
# of Trucks	0.5	3	# of Trucks	2
# of Pallets	17.5	48	# of Totes	250
Peak Day				
# of Trucks	1.2	5	# of Trucks	3
# of Pallets	32	87.5	# of Totes	500
Average # of Cases per Pallet:	50	72	Avg # of Totes per Pallet	66

Receiving Times

<u>Current Time to Unload Truck (Total Dock Time per Truck):</u>			
Raw Materials	1 hr	for 2 employees	
Consolidators	1.5 hr	for 2 employees	
Small Distributors	2.5 hr	for 2 employees	
Additional Labor can reduce time by 15 minutes per employee, to a maximum of 30 minutes reduced.			
Receiving can be scheduled for specific times between Monday and Friday, but only between 8 am and 3 pm.			

Design Year Inventory Requirements

Range (in pallets)	No. of SKUs	% of SKUs	No. of Pallets Required	% of Pallets	Average Pallets per SKU
<i>FINISHED GOODS STORAGE</i>					
>=10	51	0.6%	630	11.7%	12.35
5 to 10	208	2.6%	1,425	26.5%	6.85
0.5 to 5	1,177	14.5%	2,444	45.4%	2.08
0.25 to 0.5	1,444	17.8%	480	8.9%	0.33
<0.25	5,211	64.4%	402	7.5%	0.08
Total Finished Goods	8,091		5,381		
<i>BULK RAW MATERIALS</i>					
>=0.5	292	64.0%	723	93.8%	2.48
<0.5	164	36.0%	48	6.2%	0.29
Total Raw Materials	456		771		
<i>SUPPLIES STORAGE</i>					
all	n/a		112		

Current Year Manufacturing Data

Line Production Rates		
	Units per Day (Peak)	Downtime per Line for Product Line Change
Existing Line 1	22,000	2 hrs
Existing Line 2	17,550	1 hr
High Speed Line	36,000	1/2 hr

Vital Brand Product Lines		
	Sales (as a % of Vital Brand Sales)	Units per Pallet Load Finished Goods
Basic Vitamins	14%	1,150
Body Builders	22%	775
Weight Loss	28%	1,260
Energy Supplements	10%	1,080
Super Saver	17%	1,120
Herbal Remedies	3%	1,410
Other (11 Lines total)	6%	1,050

Vital Brand Sales (as a % of total unit sales)		
Year 1	25%	
Year 2	28%	*
Year 3	30%	*
Year 4	32%	*
Year 5	33%	*
	*Projections	

Current Order Data (Year 1)*

ORDER SUMMARY			
Year 1 Order Data			
	Direct Consumer	Store Retail	Total
<i>At Peak:</i>			
Pieces per day	37,012	102,100	139,112
Orders per day	4,400	4,026	8,426
Lines per day	12,205	32,718	44,923
Totes (cartons) per day	5,550	2,900	8,450
Lines per Order:	2.77	8.13	5.33
Units per Line:	3.03	3.12	3.10
Units per Order:	8.41	25.36	16.51

*Year 5 (design year) movement needs to be calculated.

Current Movement by SKU

PEAK (Year 1) Weekly Pick Movement (in cu.ft.)	No. of SKUs	% of SKUs	Total Units Moved	% of Units
>=100 cu.ft.	120	1%	142,999	21%
Between 50 and 100 cu.ft.	280	3%	230,114	33%
Between 15 and 50 cu.ft.	525	6%	193,112	28%
Between 5 and 15 cu.ft.	1,288	16%	106,005	15%
<5 cu.ft.	5,878	73%	21,589	3%
Totals:	8,091		693,819	

Customer Orders by Hour

CURRENT PEAK ORDERS				
<u>Direct Customer Orders Only</u>				
(Store Replenishment Orders for the day are received overnight)				
7:00 AM	550 *			
8:00 AM	102			
9:00 AM	88			
10:00 AM	122			
11:00 AM	117			
12:00 PM	266			
1:00 PM	207			
2:00 PM	189			
3:00 PM	144			
4:00 PM	217			
5:00 PM	229			
6:00 PM	397			
7:00 PM	546			
8:00 PM	575			
9:00 PM	457			
10:00 PM	210			
*includes orders placed between 11 pm and 7 am				