Production and Operations Management
MAGT304 20822-L01, 20860-L51 and 22923-L52 Spring 2014
Case Study

NORTHCUTT BIKES: THE SERVICE DEPARTMENT

Introduction

Several years ago, Jan Northcutt, owner of Northcutt Bikes, recognized the need to organize a separate department to deal with service parts for the bikes her company makes. Because the competitive strength of her company was developed around customer responsiveness and flexibility, she felt that creating a separate department focused exclusively on after-market service was critical in meeting that mission.

When she established the department, she named Ann Hill, one of her best clerical workers at the time, to establish and manage the department. At first, the department occupied only a corner of the production warehouse, but now it has grown to occupy its own 100,000-square-foot warehouse. The service business has also grown significantly, and it now represents over 15% of the total revenue of Northcutt Bikes. The exclusive mission of the service department is to provide parts (tires, seats, chains, etc.) to the many retail businesses that sell and service Northcutt Bikes.

While Ann has turned out to be a very effective manager (and now holds the title of Director of Aftermarket Service), she still lacks a basic understanding of materials management. To help her develop a more effective materials management program, she hired Mike Alexander, a recent graduate of an outstanding business management program at North Carolina State University, to fill the newly created position of Materials Manager of Aftermarket Service.

The Current Situation

During the interview process, Mike got the impression that there was a lot of opportunity for improvement at Northcutt Bikes. It was only after he selected his starting date and requested some information that he started to see the full extent of the challenges that lay ahead. His first day on the job really opened his eyes. One of the first items he had requested was a status report on inventory history and shipped orders. In response, the following note was on his desk the first day from the warehouse supervisor, Art Demming:

> *We could not compile the history you requested, as we keep no such records. There's just too much stuff in here to keep a close eye on it all. Rest assured, however, that we think the inventory positions on file are accurate, as we just completed our physical count of inventory last week. I was able to track down a demand history for a couple of our items, and that is attached to this memo. Welcome to the job!*

Mike decided to investigate further. Although the records were indeed difficult to track down and compile, by the end of his second week, he had obtained a fairly good picture of the situation, based on

an investigation of 100 parts selected at random. He learned, for example, that although there was an average of over 70 days' worth of inventory (annual sales/average inventory), the fill rate for customer orders was less than 80%, meaning that only 80% of the items requested were in inventory; the remaining orders were backordered. Unfortunately, the majority of customers viewed service parts as generic and would take their business elsewhere when parts were not available from Northcutt Bikes.

What really hurt was when those businesses sometimes canceled their entire order for parts and placed it with another parts supplier. The obvious conclusion was that while there was plenty of inventory overall, the timing and quantities were misplaced. Increasing the inventory did not appear to be the answer, not only because a large amount was already being held but also because the space in the warehouse (built less than two years ago) had increased from being 45% utilized just after they moved in to its present utilization of over 95%.

	FB378		*GS131*	
Week	*Forecast*	*Actual Demand*	*Forecast*	*Actual Demand*
1	30	30		
2	30	40		
3	33	31		
4	32	36		
5	33	46		
6	37	26		
7	34	22		
8	30	43		
9	34	30		
10	33	28		
11	32	45	10	15
12	36	39	12	25
13	37	30	16	31
14	35	34	21	51
15	35	29	30	49
16	33	48	36	42
17	38	23	38	52
18	34	38	42	57
19	35	32	47	42
20	34	23	46	60
21	31	49	50	50
22	36	37	50	58
23	36	27	52	45
24	33	34	50	54
25	33	31	51	38
26	32	43	47	57
27	35		50	

Mike decided to start his analysis and development of solutions on the two items for which Art had already provided demand history. He felt that if he could analyze and correct any problems with those two parts, he could expand the analysis to most of the others. The two items on which he had history and concentrated his initial analysis were the FB378 Fender Bracket and the GS131 Gear Sprocket. Northcutt Bikes purchases the FB378 from a Brazilian source. The lead time has remained constant, at four weeks, and the estimated cost of a purchase order for these parts is given at $35 per order. Currently Northcutt Bikes uses an order lot size of 120 for the FB378 and buys the items for $5 apiece.

The GS131 part, on the other hand, is a newer product only recently being offered. A machine shop in Nashville, Tennessee, produces the part for Northcutt Bikes, and it gives Northcutt Bikes a fairly reliable six-week lead time. The cost of placing an order with the machine shop is only about $15, and currently Northcutt Bikes orders 850 parts at a time. Northcutt Bikes buys the item for $10.75.

The table above provides the demand information that Art gave to Mike on his first day for the FB378 and the GS131. Mike realized he also needed input from Ann about her perspective on the business. She indicated that she felt strongly that with better management, Northcutt Bikes should be able to use the existing warehouse for years to come, even with the anticipated growth in business. Currently, however, she views the situation as a crisis because "we're bursting at the seams with inventory. It's costing us a lot of profit, yet our service level is very poor, at less than 80%. I'd like to see us maintain a 95% or better service level without back orders, yet we need to be able to do that with a net reduction in total inventory. What do you think, Mike? Can we do better?"

Questions (1 point for each question)

All the questions below are concerned with the product **FB378** (Fender Bracket). The holding cost is assumed to be 20% of unit price and the year is assumed to include 52 working weeks.

1. Demand forecasts:
    a. Verify that the company is using an exponential smoothing model with α equal to 0.3.
    b. Would a linear regression model provide better results?
2. Calculations:
    a. What is $\overline{d}$?
    b. What is σ_d ?
    c. What is $\overline{L}$?
    d. What is σ_L ?
    e. What are H, S and D?
3. Current inventory control system:
    a. How can you deduce that the company is using a continuous review system?
    b. How much are they ordering?
    c. When are they ordering?
    d. What is the annual inventory (holding and ordering) cost of this policy?
4. Proposed inventory policy based on the continuous review system:

a. How much should they order?
b. When should they order?
c. What is the annual inventory (holding and ordering) cost of this policy?

5. Proposed inventory policy based on the periodic review system:
    a. Show that the reorder period (for a periodic review system) is 10 weeks when obtained from the economic order quantity (rounded to the nearest number).
    b. When should they order?
    c. How much should they order?
    d. What is the annual inventory (holding and ordering) cost of this policy?
6. Next step:
    a. What should Mike do next?
    b. How can IT help him solve the problem of the company?