

## **Operations Management and Logistics (05.04.2019)**

### **Case Study CG#3 - Group Assignment #3**

#### **The Phrygian thread factory**

The Phrygian Thread Factory was founded in 1980 by Ikos Matzakis shortly after emigrating from Greece. The enterprise had begun on a small scale, supplying thread for the local garment industry. In these days, Matzakis would buy cotton fiber from relatives in Greece, import it to the United States, and dye it and spin it produce a rather wide range of end products.

Since those humble beginnings Phrygian had grown to become a not inconsequential thread supplier for the Northeastern United States. In addition to supplying the garment industry and various distributors and retailers of sewing threads, Phrygian was now supplying large industrial users. Major customers included the auto industry (for upholstery and seat belts) and the telecommunications industry (for wrapping and insulating cables).

Similarly, Phrygian no longer restricted itself to cotton thread. The bulk of its output was now nylon, although significant amounts of rayon, cotton, and silk were produced as well. Phrygian's product line was virtually unlimited, for it was standard operating procedure to do custom dye jobs to match customer colour specifications. However, colour notwithstanding, there still remained nearly a hundred distinct items in the product line.

One of Phrygian's most important products was NC-216. This was a bonded nylon thread customarily used by the auto industry in sewing seams in upholstery. To make it Phrygian began with raw nylon fiber of weight 210 denier. Two strands were spun together with a right-hand twist to form a thread. Then three threads were twisted together, again with a right-hand twist, to form the final thread. Once this was ready, it was loosely wound into large spools and sent to the dyehouse.

The dyehouse staff would dye the thread into batches of up to ninety pounds. From the dye vats, the thread would go directly to large walk-in ovens to accelerate drying. After 24-48 hours in the

ovens the thread was moved to large drying rooms to finish drying. After one to five days in the drying room, the thread was ready to be sent upstairs for bonding.

In the bonding room the thread was passed slowly through a hot liquid plastic solution and then through heaters and on to winders. Once this process was completed, random samples were taken and tested, primarily for breaking strength. The thread was finally sent down to the spooling room to be put on customer-specified spools (usually one pound spools). Once finished, the completed order was sent down to shipping to be packaged and shipped.

Other products followed the same general flow, although some required additional procedures (such as skeining dying) and others required fewer (for example, no bonding).

In the office suite life was characterized by a constant effort to track down and expedite orders. Orders were phoned in by salesmen in the field. In the case of custom colour requirements, colour samples followed by mail. For most orders, salesmen wanted to know a project delivery date. The production manager Roy and his assistant Fred would characteristically supply delivery days off the top of their heads. In this process they relied on their intelligence guided by experience. For all products they were aware of the normal production time. They also knew that these lead times were quite flexible. With constant monitoring, a product could be shipped in a much shorter time than its expected processing time. However, with no monitoring a product often took much longer than the normal lead time.

For very important orders, Roy and Fred would promise an early date and then ride the department managers closely to make sure the date was met.

Other aspects of production control were done in the same sort of ad hoc manner. Workforce levels, overtime and extra shifts were decided on pretty much a day-to-day basis. Bernie, the new plant manager, had decided things had to change. This decision had been made in response to the latest catastrophe. Phrygian had just received a large rush order from Non-Specific Motors for three thousands pounds of NC-216, a thousand pound in each of three colours. Bernie was at first jubilant when heard of it. But his jubilation was short-lived when he learned that there was not enough 210 denier nylon to meet such a large order. There was already additional nylon backordered but it was not scheduled to arrive in time to be of use for the Non-Specific Motors.

While Roy and Fred scrambled orders, robbing Peter to pay Paul, and combed the countryside for additional supplies of 210 nylon, Bernie sat in his office and plotted a strategy.

Bernie decided the first requirement was a good forecasting system so they would not be caught off guard like this again. By going over orders for the last three years, he noticed that each year Non-Specific Motors had placed a larger rush order for NC-216 at about the same time. He felt sure such information could be used in planning operations. He decided to call Roy and Fred in and have them set up a forecasting system.

The next day Bernie made his pitch. “Look, you guys, things have been going pretty well. Phrygian’s profits are up, even our market share is up. But now we’re getting bigger and I think we’ve just about hit our breaking point. Last year you hired Fred, Roy. That took some of the load off you, but already it’s getting ahead of you again. We are getting more customers complaints about orders being shipped late. And now we’ve gotten caught short on 210 for the Non-Specific order.”

“Look, Bernie, we’re getting burdened on this I know. But it’s the first time this has happened. Give us a break.”

“Roy, I know it’s the first time and I’m not really blaming you. But I want to make sure it doesn’t happen a second time. I want you two to develop a forecasting system so you’ll have a better idea of what to expect.”

“You mean some sort of automated technique for the new computer you got?”

“That’s right, Fred. Since sales orders are now being entered into a data file for the billing system anyway, there must be some way of accessing that information and using it.”

After the meeting Roy and Fred sat in Roy’s office licking around ideas. “Look, Roy, here’s the orders for NC-216 since late 2010. That’s when we introduced NC-216, to meet the demand caused by federally mandated seat belts (see Table 1). Suppose we just use this one item for discussion purposes. Now what do you propose to do?”

Table 1 – Monthly order for NC in pounds<sup>a</sup>

	2010	2011	2012	2013	2014	2015	2016	2017	2018
January		1340	3690	4110	4500	2600	5330	5140	6820
February		1500	3520	3870	4290	5830	5290	4900	6540
March		1570	3330	3550	4010	5400	4960	4400	6030
April		1360	3120	3420	3830	4210	4730	4090	5770
May		1350	2880	3250	3570	3900	4370	4600 <sup>c</sup>	5510
June		1400	2670	2910	3250	3640	4020	4540	5000
July		1610	2790	3080	3520	4010	4020 <sup>b</sup>	4930	5430
August		2280	3540	3890	4280	4830	4830	5920	6520
September		2730	3920	4310	4830	5270	4880	6480	7180
October	260	3210	4310	4860	5310	5960	5540	7170	
November	550	3350	4200	4660	5180	5830	5430	7080	
December	930	3620	4070	4520	5030	5510	5210	6930	

a As a matter of policy, no special discounts or sales campaigns have been held for NC-216

b Phrygian dropped NC-336, from their regular product line, retaining it as an option at a price premium

c Phrygian introduced NC-236, identical to NC-216, except with a right hand spin and a left-hand spin

“Well, Fred, I’m not sure. In the past I always used to talk with salesmen periodically to get a feel for what they thought was coming. Then I’d use that with my intuition to make decisions on ordering raw materials, setting up vacation and maintenance schedules.”

“Well, your intuition didn’t intuit the big Non-Specific order”.

“Actually, I’d thought of it. That’s why we had have that big order already in on 210. It’s just I thought we wouldn’t need it for almost another month.”

“Hey, Roy, maybe we could just use last year’s figure for a month’s demand, plus an inflation factor to get a forecast for the same month this year.”

“That might make sense, Fred. But look here with the NC-216. Notice that in January of 2015 the low figure. That’s probably because of our wildcat strike that entire month. If we’d used that figure to predict January 2016 we would have really been caught short.”

“Well, perhaps this forecasting system should have a manual component as well. A place for our intuition to pick up on facts like that.”

“We’re busy enough already, Fred. With almost a hundred of products, not considering colour differences, we’d be buried under the reams of data and the damned computer output. Of course we should be able to take advantage of the fact that most of our products fall into of three or four demand patterns.”

“How’s this then, Roy? Suppose we are trying to forecast January 2019. We need the forecast about three months in advance; that means the first week of October, 2018. Suppose we take the average January demand for the five years preceding and inflate it by a certain percentage. Since we will know October 2018’s real demand by then, we will let the inflation percentage be the percentage difference between October 2018’s real demand and the five preceding year’s average of October demands. Following that procedure, we should be able to develop forecasts for even the next twelve months.”

“That sounds really good, Fred. But let’s test it by going back in the data and forecasting our last twelve months’ demand. Then we can compare it with reality (see Table 2). In any case, just to protect ourselves, I think we should hire a consultant and see what ideas he has.”

“Sounds good to me. Boy, this could cut Phrygian Thread’s Gordian Knot.”

Table 2 – Fred’s forecasts for October 2017 through September 2019

	2017	2018	2019
January		5983	6796*
February		6767	7481
March		6355	6910
April		6380	6305
May		5326	6116
June		4960	5698
July		5565	6105
August		6646	7350
September	7018	7980	
October	7353	8006	
November	7009	7736	
December	6795	7578	

- From January 2019 through September 2019, inflation factor was calculated using data from October 2018

### **Assignment**

You are to act as a consultant to Phrygian Thread. Prepare a careful analysis of the demand pattern for NC-216. Then present a forecasting system for Fred and Roy to consider for their product line. Evaluate your model on whatever criteria you felt to be appropriate. Make explicit any assumptions you make. (Prepare a 10-minute ppt presentation and submit the excel files you have developed).