

## EXPERIENTIAL EXERCISE MIN-YO GARMENT COMPANY

The Min-Yo Garment Company is a small firm in Taiwan that produces sportswear for sale in the wholesale and retail markets. Min-Yo's garments are unique because they offer fine embroidery and fabrics with a variety of striped and solid patterns. Over the 20 years of its existence, the Min-Yo Garment Company has become known as a quality producer of sports shirts with dependable deliveries. However, during that same period, the nature of the apparel industry was undergoing change. In the past, firms could be successful producing standardized shirts in high volumes with few pattern or color choices and long production lead times. Currently, with the advent of regionalized merchandising and intense competition at the retail level, buyers of the shirts are looking for shorter lead times and much more variety in patterns and colors. Consequently, many more business opportunities are available today than ever before to a respected company such as Min-Yo.

Even though the opportunity for business success seemed bright, the management meeting last week was gloomy. Mr. Min-Yo Lee, president and owner of Min-Yo Garment, expressed concerns over the performance of the company: "We are facing strong competition for our products. Large apparel firms are driving prices down on high-volume licensed brands. Each day more firms enter the customized shirt business. Our profits are lower than expected, and delivery performance is deteriorating. We must reexamine our capabilities and decide what we can do best."

### PRODUCTS

Min-Yo has divided its product line into three categories: licensed brands, subcontracted brands, and special garments.

**Licensed Brands.** Licensed brands are brands that are owned by one company but, through a licensing agreement, are produced by another firm that also markets the brand in a specific geographic region. The licensor may have licensees all over the world. The licensee pays the licensor a fee for the privilege of marketing the brand in its region, and the licensor agrees to provide some advertising for the product, typically through media outlets that have international exposure. A key aspect of the licensing agreement is that the licensee must agree to provide sufficient quantities of product at the retail level. Running out of stock hurts the image of the brand name.

Presently, only one licensed brand is manufactured by Min-Yo. The brand, called the Muscle Shirt, is owned by a large "virtual corporation" in Italy that has no manufacturing facilities of its own. Min-Yo has been licensed to manufacture Muscle Shirts and sell them to large retail chains in Taiwan. The retail chains require prompt shipments at the end of each week. Because of competitive pressures from other licensed brands, low prices are important. Min-Yo sells each Muscle Shirt to retail chains for \$6.

The demand for Muscle Shirts averages 900 shirts per week. The following demand for Muscle Shirts has been forecasted for the next 12 weeks.

WEEK	DEMAND	WEEK	DEMAND
1*	700	7	1,100
2	800	8	1,100
3	900	9	900
4	900	10	900
5	1,000	11	800
6	1,100	12	700

\*In other words, the company expects to sell 700 Muscle Shirts at the end of week 1.

Min-Yo has found that its forecasts of Muscle Shirts are accurate to within  $\pm 200$  shirts per week. If demand exceeds supply in any week, the excess demand is lost. No backorders are taken, and there is no cost penalty to Min-Yo for lost sales.

**Subcontracted Brands.** Manufacturers in the apparel industry often face uncertain demand. To maintain level production at their plants, many manufacturers seek subcontractors to produce their brands. Min-Yo is often considered as a subcontractor because of its reputation in the industry. Although price is a consideration, the owners of subcontracted brands emphasize dependable delivery and the ability of the subcontractor to adjust order quantities on short notice.

Currently, Min-Yo manufactures only one subcontracted brand, called the Thunder Shirt because of its bright colors. Thunder Shirts are manufactured to order for a company in Singapore. Min-Yo's price to this company is \$7 per shirt. When orders are placed, usually twice a month, the customer specifies the delivery of certain quantities in each of the next two weeks. The last order the customer placed is overdue, forcing Min-Yo to pay a penalty charge. To avoid another penalty, 200 shirts must be shipped in week 1. The company is expected to specify the quantities it requires for weeks 2 and 3 at the beginning of week 1. The delivery schedule containing the orders for weeks 4 and 5 is expected to arrive at the beginning of week 3, and so on. The customer has estimated its average weekly needs for the year to be 200 shirts per week, although its estimates are frequently inaccurate.

Because of the importance of this large customer to Min-Yo and the lengthy negotiations of the sales department to get the business, management always tries to satisfy its needs. Management believes that, if Min-Yo Garment ever refuses to accept an order from this company, Min-Yo will



TABLE C1.1 *Min-Yo Open-Order File\**  
(as of the end of week 0)

WEEK OF DELIVERY	PRODUCT TYPE	QUANTITY
1	Thunder	200 (past due)

\*All orders are to be delivered at the end of the week indicated, after production for the week has been completed and before the next week's production is started.

lose its business. Under the terms of the sales contract, Min-Yo agreed to pay this customer \$1 for every shirt not shipped on time for each week the shipment of the shirt is delinquent. *Delinquent shipments must be made up.*

**Special Garments.** Special garments are made only to customer order because of their low volume and specialized nature. Customers come to Min-Yo Garment to manufacture shirts for special promotions or special company occasions. Min-Yo's special garments are known as Dragon Shirts because of the elaborate embroidery and oriental flair of the designs. Because each shirt is made to a particular customer's specifications and requires a separate setup, special garments cannot be produced in advance of a firm customer order.

Although price is not a major concern for the customers of special garments, Min-Yo sells Dragon Shirts for \$8 a shirt to ward off other companies seeking to enter the custom shirt market. Its customers come to Min-Yo because the company can produce almost any design with high quality and deliver an entire order on time. When placing an order for a Dragon Shirt, a customer specifies the design of the shirt (or chooses from Min-Yo's catalog), supplies specific designs for logos, and specifies the quantity of the order and the delivery date. In the past, management checked to see if such an order could be fitted into the schedule and either accepted or rejected it on that basis. If Min-Yo accepts an order for delivery at the end of a certain week and fails to meet this commitment, it pays a penalty of \$2 per shirt for each week delivery is delayed. This penalty is incurred weekly until the delinquent order is delivered. The company tried to forecast demand for specific designs of Dragon Shirts but has given up.

Table C1.1, Min-Yo's current open-order file, shows a past-due order of Thunder Shirts that has already been promised for delivery. Orders for Dragon Shirts (none shown here) are specified by order number to emphasize that each order quantity is unique.

## MANUFACTURING

**Process.** Min-Yo Garment has the latest process technology in the industry—a machine, called a garment maker, which is run by one operator on each of three shifts. This single machine process can make every garment Min-Yo produces; however, the changeover times consume a substantial amount of capacity. Company policy is to run the

machine three shifts a day, five days a week. If there is insufficient business to keep the machine busy, the worker(s) are idle because Min-Yo has made a definite commitment to never fire or lay off a worker. By the same token, the firm has a policy of never working on weekends. Thus, the capacity of the process is 5 days  $\times$  24 hours = 120 hours per week. The hourly wage is \$10 per hour, so the firm is committed to a fixed labor cost of  $\$10 \times 120 = \$1,200$  per week. Once the machine has been set up to make a particular type of garment, it can produce them at the rate of 10 garments per hour, regardless of type. The cost of the material in each garment, regardless of type, is \$4. Raw materials are never a problem and can be obtained overnight.

**Scheduling the Garment Maker.** Scheduling at Min-Yo Garment is done once each week, after production for the week has been completed and shipped, after new orders from customers have arrived, and before production for the next week has started. Scheduling results in two documents. The first is a profit and loss (P&L) statement for the week that factors in sales and production costs, including penalty charges and inventory carrying costs, as shown in Table C1.2. The inventory carrying cost for any type of product is \$0.10 per shirt per week left in inventory after shipments for the week have been made.

The second document, a production schedule, is shown in Table C1.3. The schedule shows what management wants the garment maker process to produce for each week in the future. Because the schedule loses validity (owing to uncertainty) the farther into the future that it is projected, it is reformulated each week. Note that the schedule specifies two things that are important in the "action" bucket (the next period for which definite, irrevocable commitments must be made). The first is the number of hours (setup + run) that are allocated to each product to be produced. The garment maker can produce 10 shirts per hour, so the hours required to produce a particular product is calculated by adding the setup time to the production quantity divided by 10. For example, in Table C1.3 the setup times for Muscle Shirts and Thunder Shirts are 8 and 10 hours, respectively. The time spent on Muscle Shirts is  $8 + 800/10 = 88$  hours. For Thunder Shirts, it is  $10 + 200/10 = 30$  hours. The total time spent by the garment maker process on all products in a week cannot exceed 120 hours.

The second important piece of information is a circled number indicating the sequence in which products are to be produced. This information is important because, at the end of a week, the garment maker process will be set up for the last product produced. If the same product is to be produced first the following week, no new setup will be required (as indicated by this number sequence). The only exception to this rule is Dragon Shirts. As each order is unique, a new setup is required for each Dragon Shirt order. Table C1.3 shows that in week 0 the sequence was Muscle Shirts followed by Thunder Shirts.





before the simulation begins. In class, the simulation will proceed as follows.

1. You will start by specifying the production schedule for week 1, based on the forecasts for week 1 in the case narrative for Muscle Shirts and additional information on new and existing orders for the customized shirts. This decision is to be made in collaboration with your executive committee colleagues in class.
2. When all the teams have finalized their production plans for week 1, the instructor will supply the *actual* demands for Muscle Shirts in week 1. At this point, one of the members of the executive committee is to complete the P&L statement for week 1, assuming that the production schedule for week 1 has been completed. Blank copies of Table C1.2 will be provided.
3. While the P&L statement for week 1 is being completed, the instructor will announce the new order

requests for Thunder Shirts and Dragon Shirts to be shipped in week 2 and the weeks beyond.

4. You should look at your order requests, accept those that you want, and reject the rest. Add those that you accept for delivery in future periods to your open-order file (blank copies will be provided). You are then irrevocably committed to them and their consequences.
5. You should then make out a new production schedule, specifying at least what you want your garment maker process to do in the next week (it will be for week 2 at that time).
6. The instructor will impose a time limit for each period of the simulation. When the time limit for one period has been reached, the simulation will proceed to the next week.

## REPORT

**1. Changeover Improvement Study**

The Engineering Department reports that the efforts to reduce the changeover times of the garment maker machine have produced the following results:

<b>Product</b>	<b>Changeover Time</b>
Muscle Shirts	8 hours
Thunder Shirts	10 hours
Dragon Shirts	25 hours

The Engineering Department continues to work on reducing changeover times, but no further improvements are expected in the near future.

**2. Inventory Levels**

The Materials Management Department indicates that at present there are 600 Muscle Shirts in stock. The finished goods inventories of all other products have been depleted. The Materials Management Department respectfully reminds the Production Department that there is an order for 200 Thunder Shirts that is past due.

**3. Notice of Termination**

The Min-Yo Garment Company has been purchased by a large international textile company and will cease all operations at the end of **week 6**. All employees will be reassigned to other duties in the firm. In the meantime, everyone is expected to do whatever they can to maximize the contribution to profits until then. We regret any inconvenience this may impose.

# Min-Yo Guide

## MIN-YO Spreadsheet

The spreadsheet is intended to minimize the paper work necessary to conduct the Min-Yo simulation. The simulation is interactive with an environment that is unaffected by other teams. Your team will be making decisions each period with the goal of maximizing your firm's profits by the end of the simulation. The spreadsheet has four major elements:

### 1. Open Order File

The open order file contains your commitments for orders placed by your Thunder shirt and Dragon shirt customers. You do not have to accept all of the orders you have access to, however the orders you do accept must be recorded by entering the quantity into the week that the order is due. For example, given the order possibilities in week 1, if you decide to accept a Thunder shirt order of 100 due in week 3, you must enter 100 in the week 3 column for Thunder shirts. Similarly, if you decide to accept Dragon order #3 for 50 units due in week 2 and Dragon order #5 for 70 units due in week 4, you must enter the quantities in the appropriate weeks for Dragon order #3 and Dragon order #5. The Muscle shirt quantities will be automatically transferred from the Production Schedule when you make that decision. You will use this same file for the entire simulation.

### 2. Production Schedule

There is a Production Schedule sheet for each week of the simulation. Enter the production quantities for Muscle shirts, Thunder shirts, and each Dragon shirt order you want to produce this week. For each production quantity, enter a "1" in the changeover column. For example, if you want to produce two Dragon shirt orders, you must have a changeover for each one. The same holds true for the Muscle shirts and Thunder shirts with one exception – if you ended production last week on Muscle (Thunder) shirts, you can start the next week on Muscle (Thunder) shirts without incurring a changeover because the machine is already set to go. This does not hold for Dragon shirts because each Dragon order is unique. That is why the Dragon shirt orders have individual numbers. Example: Suppose you want to produce Muscle shirts, Thunder shirts, Dragon order #1 and Dragon order #3, and last week you ended up producing Muscle shirts, you would have only 3 three changeovers (one Thunder and two Dragon). The spreadsheet adds the total hours (Changeover and Production) and checks to make sure it does not exceed 120 hours for the week. The production quantities are automatically transferred to the Profit and Loss statement if the 120 hour limit is not exceeded.

### 3. Profit and Loss Statement (P&L)

This statement is provided for each week just below the Production Schedule. The spreadsheet will automatically update the demand for Thunder and Dragon orders

from the Open Order File. You will have to manually enter the demand for Muscle shirts when the instructor provides that information. All production quantities will be automatically transferred from the Production Schedule for that week. The P&L statement will keep track of beginning inventories (which are the ending inventories of the previous week) and calculate the profits for the week.

#### 4. Summary Sheet

The spreadsheet will automatically update the summary sheet. It shows weekly production decisions, weekly profit contributions, and cumulative profit contributions. One very important performance measure is cumulative profits for the duration of the simulation.

### **Simulation Procedure**

The simulation proceeds week-to-week until the instructor declares that it is over. Teams should not try to guess the end of the simulation. The simulation can only proceed to the next week if all firms are committed to their decisions for the current week. The first weeks of the simulation typically take longer than the following weeks as you get more familiar with the nature of the decisions you have to make. There are five steps for each week of the simulation:

1. The instructor provides order opportunities for the week. These will be customer orders for Thunder shirts (not every week) and Dragon shirts (each week).
2. Teams decide which of the offered orders to accept. Customers withdraw their order if you do not accept it. Consequently, once an order is “rejected” it cannot be accepted in following weeks. The accepted orders are entered into the Open Order file by entering the required quantity in the week it is due. Keep in mind that if you ever reject an order from your Thunder shirt customer, you are effectively out of business in Thunder shirts. Past orders must be honored, but you cannot accept any future orders.
3. Teams decide on the production quantities for that week. Keep in mind that if you accepted an order for delivery in a future week, you do not have to produce it in the current week. Or, you can produce an order in the current week for delivery in a future week by holding it in inventory. Your Thunder shirt customer and the Dragon shirt customers do not want early shipments of the product.
4. Teams “commit” to their order choices and production schedule for the week. That means no more changes can be made. Once all teams have committed, the simulation can proceed.
5. When all teams have committed, the instructor provides the ACTUAL demand for Muscle shirts. Teams enter that value in the demand column for Muscle shirts in their P&L statement for that week. This ends the play for one week.







1	2	3	4	5	6	7	8	9
Product	Price	Beg. Inv.	Production	Available <sup>3</sup>	Demand	Sales <sup>4</sup>	End. Inv. <sup>1</sup> (Past Due)	Inv./Past Due Costs <sup>2</sup>
Muscle	\$6							
Thunder	\$7							
Dragon	\$8							

Sales (total of column 7) =

Costs:

Labor: 10 @ 120

Materials: (total of column 4 × \$4)

Inv./Past Due: (total of column 9)

TOTAL COST

Contribution to profit

Cumulative contribution

= (add to next period's contribution)

\$1,200

=  
=

1. Past due refers to the quantity of shirts not shipped as promised. Column 8 becomes column 3 of next period's P&L statement.
2. Inventory cost = \$0.10 times the number of units in ending inventory. Past due costs equals number of units not shipped when promised times the penalty (\$1 for Thunder Shirts, \$2 for the Dragon Shirts).
3. Available = column 3 + column 4.
4. Sales equals column 6 × column 2 when demand is less than available inventory; column 5 × column 2 otherwise.