IE 341 Transportation & Logistics Engineering, Fall 2014
PROJECT #2
Due on 04 January 2015, Sunday, 23:59 (through Blackboard)

You should work <u>as a team (3 members at most)</u>

CASE STUDY
Specialty Packaging Corporation, Part A

Julie Williams had a lot on her mind when she left the conference room at Specialty Packaging Corporation (SPC). Her divisional manager had informed her that she would be assigned to a team consisting of SPC's marketing vice president and staff members from their key customers. The goal of this team was to improve supply chain performance, as SPC had been unable to meet demand effectively over the previous several years. This often left SPC's customers scrambling to meet new client demands. Julie had little contact with SPC's customers and wondered how she would add value to this process. She was told by her division manager that the team's first task was to establish a collaborative forecast using data from both SPC and its customers. This forecast would serve as the basis for improving the firm's performance, as managers could use this more accurate forecast for their production planning. Improved forecasts would allow SPC to improve delivery performance.

SPC

SPC turns polystyrene resin into recyclable/disposable containers for the food industry. Polystyrene is purchased as a commodity in the form of resin pellets. The resin is unloaded from bulk rail containers or overland trailers into storage silos. Making the food containers is a two-step process. First, resin is conveyed to an extruder, which converts it into polystyrene sheet wound into rolls. The plastic comes in two forms—clear and black. The rolls are either used immediately to make containers or are put into storage. Second, the rolls are loaded onto thermoforming presses, which form the sheet into containers and trim the containers from the sheet. The two manufacturing steps are shown in Figure 7-9.

Over the past five years, the plastic packaging business has grown steadily. Demand for containers made from clear plastic comes from grocery stores, bakeries, and restaurants. Caterers and grocery stores use the black plastic trays as packaging and serving trays. Demand for clear plastic containers peaks in the summer months, whereas demand for black plastic containers peaks in the fall. Capacity on the extruders is not sufficient to cover

TABLE 7-4 Quarterly Historical Demand for Clear and Black Plastic Containers

Year	Quarter	Black Plastic Demand ('000 lb)	Clear Plastic Demand ('000 lb)
2005	I	2,250	3,200
	II	1,737	7,658
	III	2,412	4,420
	IV	7,269	2,384
2006	I	3,514	3,654
	II	2,143	8,680
	III	3,459	5,695
	IV	7,056	1,953
2007	I	4,120	4,742
	II	2,766	13,673
	III	2,556	6,640
	IV	8,253	2,737
2008	I	5,491	3,486
	II	4,382	13,186
	III	4,315	5,448
	IV	12,035	3,485
2009	I	5,648	7,728
	II	3,696	16,591
	III	4,843	8,236
	IV	13,097	3,316

demand for sheets during the peak seasons. As a result, the plant is forced to build inventory of each type of sheet in anticipation of future demand. Table 7-4 and Figure 7-10 display historical quarterly demand for each of the two types of containers (clear and black). The team modified SPC's sales data by accounting for lost sales to obtain true demand data. Without the customers involved in this team, SPC would never have known this information, as the company did not keep track of lost orders.
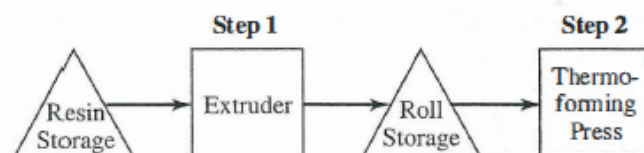

Step 1 — Resin Storage → Extruder → Roll Storage   **Step 2** — Thermoforming Press

FIGURE 7-9 Manufacturing Process at SPC

WHAT TO DO: As a first step in the team's decision making, you should **forecast the quarterly demand for each of the two types of containers for the years 2010 to 2012.** Based on historical trends, demand is expected to continue to grow until 2012, after which it expected to plateau. Julie must select the **appropriate forecasting method** and estimate the likely forecast error.

Use the following methods to **forecast quarterly demand for the years 2010 to 2012 in EXCEL:**

      (a) **Moving Average**

      (b) **Exponential Smoothing method**

      (c) **Exponential Smoothing with Trend**

      (d) **Time Series Decomposition**

      (e) **For parts (a), (b) and (c),** also compute the:

          i.   **forecasting errors (MAD, MSE, MAPE).**

         ii.   **standard error of forecast (S_F),** "**Bias" and "Tracking Signal",**

        iii.   also assuming <u>normally distributed forecast errors</u>, **90% confidence range for the 2010-2012 forecasts** (i.e., using $z_{90\%} = 1.28$).

      (f) **Which method should she choose? Why?** *<u>Explain by typing your answer in the EXCEL file submitted.</u> Hint: Plot of the quarterly demand (versus time) for clear and black plastic containers will help you to determine on the forecasting method.*

WHAT TO SUBMIT: <u>**One of the team members**</u> should submit **a SINGLE EXCEL file** (.xls OR .xlsx only) **including all the TEAM MEMBERS' NAMES/IDs in the file** through the "IE341-Project2-Fall2014-EXCEL File Submission" available under "Assignments" in Blackboard. **Failure of submission will result in a 0 mark for the project.** *You can use the "Week08-Forecasting-InClassExercise.xlsx" (under "Course Materials" in Blackboard) as a template for your answer. **Note that for parts (a), (b), (c), (d), (e) and (f), you should have separate worksheets in the same file.** No need to submit your answers as a printout (as I will only mark your EXCEL file only.)*